Flora, Vegetation and Black - Cockatoo Survey

Kings Park Road Shared Path

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Flora, Vegetation and Black-Cockatoo Survey

Kings Park Road Shared Path

Report No:
A22.047-RPT-FVSR_1
Issue Date:
27-Feb-2023
Status
FINAL

Prepared for:
Arup

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Internal Review

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27-Feb-2023	**27-Feb-2023**	**27-Feb-2023**

Distribution Record

Copies	Document ID / Version	Date	Received by
1	A22.047-RPT-FVSR_1_FINAL	27-Feb-2023	Scott Arbor

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WEPL will not be liable to update or revise this report to take into account any events or circumstances or facts becoming apparent after the date of this report

Executive Summary

Arup commissioned Western Environmental Pty Ltd (WEPL) to undertake a flora, vegetation and Black-Cockatoo assessment within a section of the proposed Kings Park Road Shared Path. The Kings Park Road Shared Path occurs within an Environmentally Sensitive Area (ESA), and the purpose of the assessment was to delineate key flora and fauna values within, and adjacent to, the Disturbance Footprint Area.

Flora and Vegetation

The desktop assessment identified 92 flora taxa of conservation significance recorded within 10 km of the Disturbance Footprint Area. Two Priority 4 flora species were considered to have a 'High' likelihood of occurrence within the Disturbance Footprint Area: *Dodonaea hackttiana* and *Jacksonia sericea*. Both of these species were recorded during the survey. No other Commonwealth or State listed Threatened Flora or State Priority flora are expected to occur within the area.

One Declared Pest was recorded during the survey: Bridal creeper (**Asparagus asparagoides*).

Two vegetation types were described and mapped during the survey:

- VT1: *Eucalyptus gomphocephala, Corymbia calophylla* (*Allocasuarina fraseriana*) woodland over *Banksia ivattenuata, B. prionotes* low open woodland over *Banksia sessilis, Jacksonia sternbergiana*, *Grevillea crithmifolia, Dodonaea hackettiana* tall sparse shrubland. Described as being in Good condition, this vegetation was surrounded by cleared tracks and introduced species were dominant in the understorey.

- VT2: *Eucalyptus gomphocephala* open forest over introduced grasses and herbs. VT2 represented the majority of the Survey Area, and included a canopy dominated by Tuart (*Eucalyptus gomphocephala*) with a cleared understorey. This vegetation was described as being in Degraded to Completely Degraded Condition.

Two Commonwealth listed Threatened Ecological Communities (TECs) have previously been mapped over the Disturbance Footprint Area, and vegetation recorded during the survey was representative of these communities:

- Tuart Woodland and Forests TEC, represented by the Tuart canopy of both VT1 and VT2.

- Banksia Woodlands of the Swan Coastal Plain TEC, represented by VT1.

Black Cockatoo Assessment

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*), and Forest Red-tailed Black-Cockatoo (*C. banksii naso*) and known to occur within 12 km of Kings Park.

Seven habitat trees (Tuart with DBH >500 mm) were recorded during the survey. However, no hollows were observed from the ground. Vegetation recorded during the survey (VT1) was assessed as being of

'Very High' and 'High' quality habitat for Carnaby's Black-Cockatoos and Forest Red-tailed Black-Cockatoos respectively.

Impact Assessment

Despite the potential impact area for the Proposal being relatively small, several biological values occur within or adjacent to the Disturbance Footprint Area, including:

- Priority flora species.
- Declared Pest.
- Commonwealth listed TECs.
- Potential Cockatoo breeding habitat.
- Cockatoo foraging habitat.

Whilst the proposal is being undertaken within the Kings Park ESA, the final alignment for the Shared Pathway has been designed to avoid impacts to the above listed values, with the exception of the two Priority 4 individuals. As such that a Native Vegetation Clearing Permit is potentially not required. The project should be referred to DWER to seek consideration of the need for a clearing permit.

Acronyms and Abbreviations

Abbreviation	Full Title
°C	Degree Celsius
BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016*
CR	Critically Endangered
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEWHA	Department of the Environment, Water Heritage and the Arts
DotEE	Department of the Energy and Environment
DSEWPaC	Department of Sustainability Environment Water Population and Communities
DWER	Department of Water and Environmental Regulation
EIA	Environmental Impact Assessment
EN	Endangered
EP Act	*Environmental Protection Act 1986*
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection Biodiversity and Conservation Act 1999*
ESA	Environmentally Sensitive Area
GPS	Global Positioning System
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
IUCN	International Union for Conservation of Nature
km	Kilometres
m	Metres
MNES	Matters of National Environmental Significance
NVIS	National Vegetation Information System
P	Priority
PEC	Priority Ecological Community
PF	Priority Flora
PMST	Protected Matters Search Tool
T	Threatened
TEC	Threatened Ecological Community
TPFL	Threatened and Priority Flora Database
TPFRF	Threatened and Priority Flora Report Forms
VU	Vulnerable

Abbreviation	Full Title
WA	Western Australia
WAH	Western Australian Herbarium
WC Act	*Wildlife Conservation Act 1950*
WEPL	Western Environmental Pty Ltd

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Appendices

1. Introduction

1.1 Project Background

Arup are the lead consultant providing engineering services for the Perth CBD Transport Plan Cycling Upgrades. This Plan consists of several packages of work, aimed at improving pedestrian and cyclist linkages within the Perth CBD.

One such project is the Kings Park Road Shared Path. Arup recently completed 50% design of the shared path to the south of the Kings Park Road, from Thomas St to Harvest Terrace, and are progressing through 100% design/Issued for Tender and Issued for Construction documentation.

To support the environmental approvals required for the development of the Kings Park Shared Path, Arup required targeted ecological surveys.

1.2 Location

The proposed Shared Path clearing area occurs adjacent to King Park Road, along in the northern section of Kings Park within the City of Perth. The western side of the proposed clearing area intersects remnant bushland vegetation (Thomas Road to Kulunga Grove), and this comprised the area requiring ecological surveys; herein known as the Disturbance Footprint Area (see Figure 1).

1.3 Objectives

Arup commissioned Western Environmental Pty Ltd (WEPL) to undertake a flora, vegetation and Black-Cockatoo assessment within the Disturbance Footprint Area. The purpose of the assessment was to delineate key flora and fauna values within the Disturbance Footprint Area and identify potential environmental sensitivities and values that may occur.

The scope of works included:

- Completion of a flora, vegetation and Black-Cockatoo assessment, comprising a desktop review and a reconnaissance/ targeted field survey.
- Environmental impact assessment of proposed works against Commonwealth and State guidance for flora, vegetation and Black-Cockatoo values.
- Preparation of a technical report detailing the findings of the biological survey and impact assessment.
- Preparation of a geospatial data package prepared in accordance with Index of Biodiversity Surveys for Assessments (IBSA) requirements.

Figure 1: Disturbance Footprint Location

N; 0 20 40 60 80 m		PROJECT/REPORT NAME: Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path	
SCALE: 1:1,500	SHEET SIZE: A3 COLOUR	CLIENT: Arup	
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 50		PROJECT NUMBER: A22.047	VERSION: 0
DATA SOURCE: LANDGATE AERIAL IMAGERY 2022		DRAWN BY / REVIEWED BY: AC / LT	DATE: 23/2/2023

Legend

Disturbance Footprint

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	23/2/2023

NOTES:

Site Boundary obtained from DWG provided by the client (16/11/2022)

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1.4 Legislation and Guidance

This environmental assessment was conducted in accordance with Commonwealth and State legislation, guidelines and advice:

- Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).
- Western Australian *Environmental Protection Act 1986* (EP Act).
- Western Australian *Biodiversity Conservation Act 2016* (BC Act).
- Western Australian Biodiversity Conservation Regulations 2018.
- Commonwealth Department of the Environment (DotE). (2013). *Matters of National Environmental Significance. Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999.*
- Commonwealth Department of Sustainability, Environment, Water, Populations and Communities (DSEWPaC). (2018). *Approved Conservation Advice (incorporating listing advice) for the Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain ecological community*
- Commonwealth Department of the Environment and Energy (DotEE) (2016) *Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community*
- Commonwealth Department of Climate Change, Energy, the Environment and Water (DCCEEW, 2022). *Referral guidelines for 3 Threatened Black Cockatoo species*
- WA EPA. (2020). *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment*. Known herein as the 'Fauna Technical Guidance'.
- WA EPA. (2016). *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment.* Known herein as the 'Flora and Vegetation Technical Guidance'.
- WA EPA. (2021). *Statement of Environmental Principles, Factors and Objectives.*

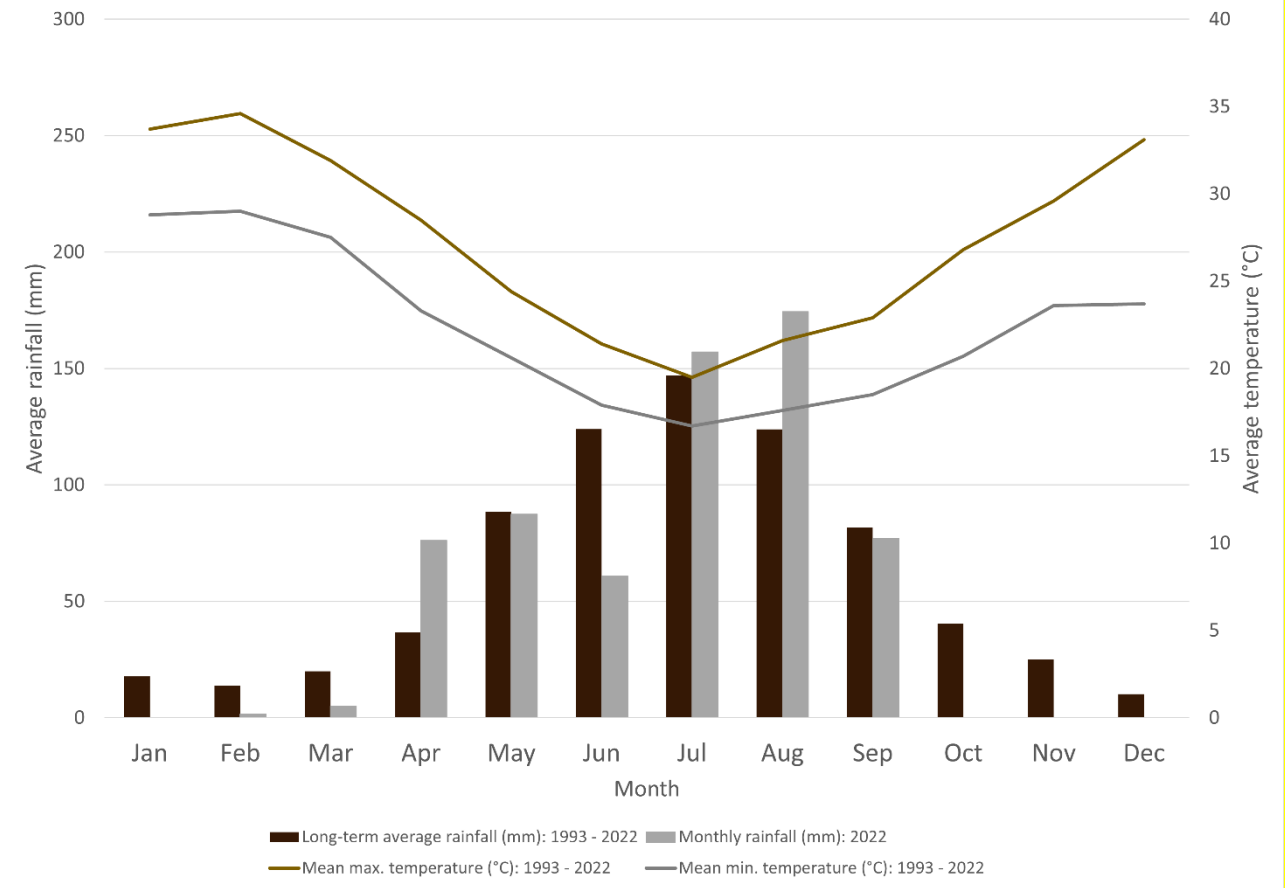
Brief descriptions of relevant Commonwealth and State legislation is provided in Appendix A. While definitions and criteria for Commonwealth ad State conservation codes is provided in Appendix B.

2. Existing Environment

2.1 Climate

The Disturbance Footprint Area is located on the Swan Coastal Plain, this region experiences a Mediterranean climate characterised by hot, dry, summers and cool, wet, winters (Bureau of Meteorology [BoM] 2022) (Graph 1).

The average annual rainfall recorded at Perth Metro is 729.1 mm, with most of the precipitation occurring during the winter months (BoM 2022) (Graph 1). Perth Metro recorded 562.4 mm of rain in the eight months prior to the survey (January 2022 – August 2022). This was slightly below the long-term average for the same period of 571.7 mm (1993 to 2022). Conditions during winter 2022 showed below average rainfall in June (60.8 mm in 2022 compared to 124 mm) and above average rainfall in July (157.0 mm compared to 147.1 mm) and August (174.4 mm in 2022 compared to 123.8 mm) (BoM 2022).



Graph 1: Long Term and Monthly Total Rainfall, Maximum and Minimum Temperatures for Perth Metro WA (9225) (BoM 2022)

2.2 Interim Biogeographic Regionalisation for Australia

The Interim Biogeographic Regionalisation of Australia (IBRA) divides Australia into 89 bioregions based on major biological, geographical and geological attributes. These bioregions are subdivided into 419 subregions as part of a refinement of the IBRA framework (Commonwealth of Australia, 2012). The Survey Area occurs within the Swan Coastal Plain bioregion and the Perth (SWA02) subregion.

2.3 Geology and Soil

The Survey Area is located within the Spearwood Dunes system, and features soils of the Karrakatta Soil Association:

- "The Spearwood Dune System forms a belt 3 to 15 km wide, west of the Bassendean Dune System. The dunes are large-scale, convex, asymmetric, topographically irregular ridges that reach heights of 95 m in places. The Spearwood dunes are younger than the Bassendean dunes, but are still late Quaternary (Pleistocene) in age. The shape of the dunes suggests that they were formed as large-scale, bare, dune sheets that advanced over the land surface" (Gozzard 2007).

The Atlas of Australian Soils mapped one soil type within the Survey Area (Northcote et al. 1960):

- "Coastal dune formations backed by the low-lying deposits of inlets and estuaries: chief soils are calcareous sands (Uc1.11) on the dunes. Associated are various (Uc), (Um), (Uf), (Ug), and acid peat (O) soils in the swale behind the coastal dunes, similar to unit Kf10."

2.4 Wetlands and Hydrology

The Survey Area does not intersect any surface wetlands or drainage lines. Further, the Geomorphic Wetlands Swan Coastal Plain (GWSCP) dataset does not identify any wetlands within the Survey Area (DBCA 2021).

No wetlands listed under the Ramsar Convention or Commonwealth Wetlands of National Significance program are present in the region (Department of Climate Change, Energy, the Environment and Water [DCCEEW], 2022a; DBCA, 2022a).

2.5 Pre-European Vegetation

2.5.1 Vegetation Association Mapping

During the 1970s, John Beard and associates conducted a systematic survey of native vegetation, describing the vegetation systems in Western Australia. Beard (1981) mapped the vegetation of the Swan Coastal Plain at 1:1,000,00 scale. This mapping described one broad vegetation unit for the Survey Area:

- Spearwood 6.1: Jarrah (*Eucalyptus marginata*) – Marri (*Corymbia calophylla*) – Wandoo (*E. wandoo*) woodland.

Beard's mapping attempted to depict the native vegetation as it was presumed to be at the time of settlement and is known as the pre-European vegetation type and extent. Beard's vegetation maps are maintained in digital form by DPIRD (2018). Extents are updated periodically by Department of Biodiversity, Conservation and Attractions (DBCA) (DBCA, 2019).

2.5.2 Vegetation Complex Mapping

The vegetation complexes of the Swan Coastal Plain have been mapped by Heddle et al. (1980) at a scale of 1:250,000. According to this data, the Survey Area occurs within a single vegetation complex:

- Karrakatta Complex – Central and South: "Predominantly open forest of *Eucalyptus gomphocephala* (Tuart) – *Eucalyptus marginata* (Jarrah) – *Corymbia calophylla* (Marri) and woodland of *Eucalyptus marginata (*Jarrah) – *Banksia* species. *Agonis flexuosa* (Peppermint) is co-dominant south of the Capel River."

An extension of the vegetation complex mapping of Heddle et al. (1980) was conducted by Webb et al. (2016), including an update of the vegetation complex extents.

2.5.3 Existing extent of Pre-European Vegetation Association and Vegetation Complex

The pre-European and current extents of the Beard (1981) vegetation association within the Perth (SW02) IBRA subregion, and the Heddle (1980) vegetation complex, are presented in Table 1 (Government of Western Australia, 2019a, Government of Western Australia, 2019b).

Beard's vegetation association (Spearwood 6.1) and Heddle's (1980) vegetation complex represent comparable areas on the Swan Coastal Plain (Table 1). Both units demonstrate extensive clearing of pre-European vegetation in the Perth metropolitan area, with under a quarter of vegetation remaining. Less than 4% of each unit is currently managed for conservation on the Swan Coastal Plain (Table 1). However, within the City of Perth local government area much of the remaining extend of these units is managed, with 99.4% of the Spearwood vegetation association occurring within DBCA managed estates ((Government of Western Australia, 2019a, Government of Western Australia, 2019b).

Table 1: Pre-European Vegetation Association and Complex Representation.

Vegetation	Original Extent (ha)	Current Extent (ha)	% Remaining	% Managed for Conservation
Spearwood 6.1 within the Perth (SW02) IBRA subregion (Government of Western Australia 2019a)	54,427.13	13,287.64	24.41	3.42
Karrakatta Complex – Central and South within the Swan Coastal Plain (Government of Western Australia 2019b)	53,080.99	12,467.20	23.49	3.87

2.6 Conservation Estate, Bush Forever and Environmentally Sensitive Areas

Kings Park is Perth's largest urban bushland remnant with high Cultural, conservation and recreational values. As such Kings Park is protected under State legislation and Policies (Figure 2), including:

- Kings Park and Botanic Garden is an A-Class Conservation Reserve (R1720), which is managed under the Botanic Gardens and Parks Authority (BGPA) Act and Regulations.
- Kings Park is listed under the State Government Bush Forever Policy and program (Site 317), which identified 51,200 ha of regionally significant vegetation for protection in the Perth Metropolitan Region (WA Planning Commission 2000).
- Kings Park is an Environmentally Sensitive Area (ESA) (ID:18665) as declared by the Department of Water and Environmental Regulation (DWER), due to the presence of and Bush Forever values.

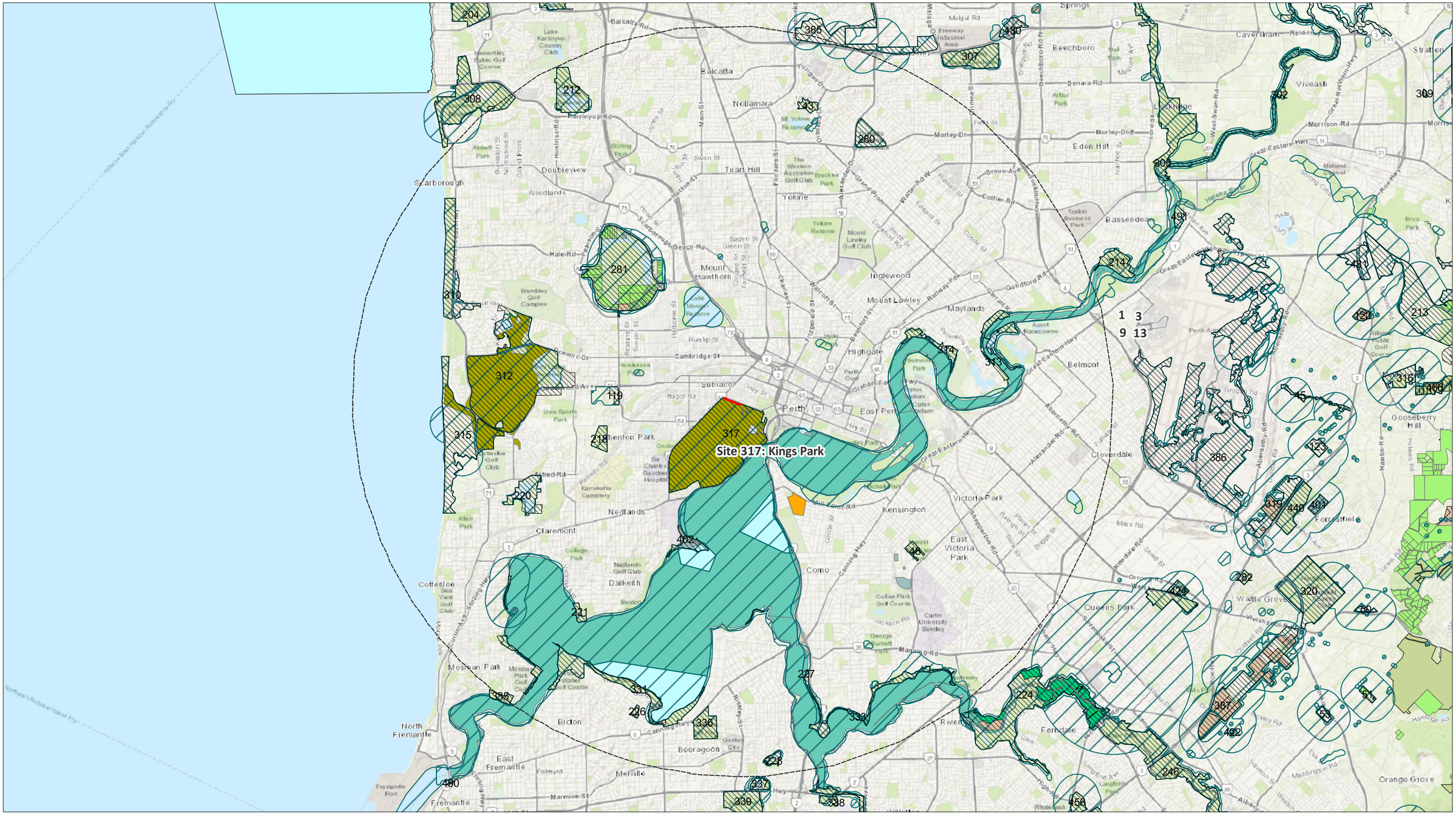


Figure 2: Vegetation, Bush Forever and Conservation Estate

N

0 1,500 3,000 4,500 6,000 m

PROJECT/REPORT NAME	Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path
SCALE	1:100,000
SHEET SIZE	A3 COLOUR
CLIENT	Arup
COORDINATE REFERENCE SYSTEM	GDA2020 / MGA zone 50
PROJECT NUMBER	A22.047
VERSION	0
DATA SOURCE	LANDGATE AERIAL IMAGERY 2022
DRAWN BY / REVIEWED BY	AC / LT
DATE	23/2/2023

Legend

- Disturbance Footprint
- Bush Forever Areas - 2000 (DPLH-019)
- Clearing Regulations - Environmentally Sensitive Areas (DWER-046)

DBCA - Legislated Lands and Waters (DBCA-011)

- National Park
- Nature Reserve
- Conservation Park
- Section 5(1)(g) Reserve
- Section 5(1)(h) Reserve
- Marine Park
- SCRM Act - River Reserve
- Crown Freehold - Dept Managed
- Botanic Gardens and Parks Auth. Reserve
- Zoological Parks Authority Reserve

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	23/2/2023

NOTES:

Cadastral boundary from LANDGATE 2022

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3. Methodology

3.1 Desktop Assessment

3.1.1 Literature Review

Background information on the Disturbance Footprint Area and surrounds was reviewed prior to the field survey. In addition, the literature review considered a selection of publicly available biological reports detailing assessments undertaken in the region. These included:

- Bush Forever report description for the Kings Park Bushland site 317 (WA Planning Commission 2000a).
- The Floristic Survey of the Southern Swan Coastal Plain by Gibson et al. (1994).
- Kings Park and Botanic Garden Management Plan 2021 – 2026 (DBCA and Botanic Gardens & Parks Authority, 2021)
- Biota (2020) Perth Children's Hospital Pedestrian Bridge Vegetation, Flora and Black Cockatoo Assessment. Report prepared for Main Roads WA.
- A description of the plant communities of Kings Park bushland and associated vegetation mapping was prepared by BGPA (McChesney 2017; as provided in Biota (2020)).
- The 2018 Great Cocky Count: A community-based survey for Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black-Cockatoo (*Calyptorhynchus baudinii*) and Forest Red-tailed Black-Cockatoo (*Calyptorhynchus banksii naso*) (Peck et al 2019).

3.1.2 Database Searches

Database searches were undertaken to compile a list of potential conservation listed flora, communities and Matters of National Environmental Significance (MNES), within or surrounding the Survey Area (Table 2).

Table 2: Database Searches of the Survey Area

Database Name	Date Received and Reference Number	Search Type	Search Area
Protected Matters Search Tool (Department of Climate Change, Energy, the Environment and Water)	25/10/2022	Commonwealth listed Threatened flora and fauna and TECs	10 km buffer around the Survey Area
Threatened and Priority Ecological Communities database search (Department of Biodiversity Conservation and Attractions)	12/10/2022 22-0922EC	TECs and PECs	10 km buffer around the Survey Area

Database Name	Date Received and Reference Number	Search Type	Search Area
Threatened and Priority Flora (TPFL) database search (Department of Biodiversity Conservation and Attractions)	12/10/2022 42-1022FL	Threatened and Priority Flora	10 km buffer around the Survey Area
Western Australian Herbarium (WAHerb) flora database search (Department of Biodiversity Conservation and Attractions)	12/10/2022 42-1022FL	Threatened and Priority Flora	10 km buffer around the Survey Area
Dandjoo: Biodiversity Data Repository (Department of Biodiversity Conservation and Attractions)	25/10/2022	Black Cockatoo Records	12 km buffer around the Survey Area

3.1.3 Likelihood of Occurrence

Conservation listed flora and communities identified from the database searches were assessed to determine the likelihood of their occurrence within the Disturbance Footprint Area. The assessment was conducted both prior and post field survey and based on the likelihood of occurrence criteria presented in Table 3.

Only species either recorded during the survey or considered as having a high or medium likelihood of occurrence in post field survey assessment will be discussed in detail. Species classified as having low likelihood of occurrence will not be discussed unless a justification for this classification is required.

Table 3: Likelihood of Occurrence Criteria

Likelihood	Criteria
Recorded	Recorded in the Disturbance Footprint Area from database searches (if confident record is accurate), previous survey by others or by current survey.
High	Suitable habitat occurs within the Disturbance Footprint Area; and • Records of flora species <2 km from the Disturbance Footprint Area. With record <30 years old.
Medium	Suitable or marginally suitable habitat occurs within the Disturbance Footprint Area; and • Records of flora species <5 km from the Disturbance Footprint Area. • Species is strongly linked to a specific habitat, which occurs within the Disturbance Footprint Area and records are present <10 km from the Disturbance Footprint Area.
Low	• The species has a well understood and specific habitat preference/ requirements, which is absent from the Disturbance Footprint Area. • Records are historical only, or are pre mapping procedures (e.g. records assigned to towns or place names). • Suitable habitat is present, but there are no existing records of the species from the region despite reasonable previous search effort.

3.2 Field Survey

The Disturbance Footprint Area represented the potential impact area for the Shared Pathway, and as such was very small (up to 4 m wide by 797 m long). To ensure sufficient information was collected to contextualise values and meet regulator expectations, areas immediately adjacent to the Disturbance

Footprint Area were also surveyed, including for significant flora searches and Tuart (*Eucalyptus gomphocephala*) mapping (as demonstrated by track logs on Figure 3).

3.2.1 Field Survey Timing and Survey Team

The reconnaissance and targeted field survey was conducted during a half day on 12 October 2022 by the survey team listed in Table 4.

Table 4: Survey Team

Name	Position and years of Experience	DBCA Licence No.
Dale Newsome	Director/ Principal Environmental Scientist, 23 years	NA
Ciaran Gibson	Associate Environmental Scientist, 15 years	FB62000464
Julia Burr	Graduate Scientist, 1 year	NA
Lovisa Thambert	Graduate Scientist, 1 year	NA

3.2.2 Floristic Sampling

Due to the small size of the Disturbance Footprint Area, and the reduced condition of much of the vegetation, quadrats could not be conducted. Alternatively, a relevé was conducted. Relevé sampling included observations for an area similar in size to an unmarked quadrat (approximately 10 x 10 m).

The following information was collected from within the relevé:

- Observer.
- Date.
- Quadrat/site number.
- Global Position System (GPS) location (GDA2020) of the north-west corner.
- Digital photograph (spatially referenced with a reference number), taken from the north-west corner, looking diagonally across the quadrat.
- Broad soil type and colour.
- Topography.
- List of flora species recorded with total foliar cover within the quadrat for each species.
- National Vegetation Information System (NVIS) Vegetation description (as per below).
- Vegetation condition.

Mapping notes were also used to record changes in vegetation, condition and the presence of Tuart trees (*Eucalyptus gomphocephala*).

Data collected from the Relevé is provided in Appendix D. Survey effort, including the location of the relevé and track logs, is presented on Figure 3.

3.2.3 Targeted Searches

Threatened and Priority Flora identified during the desktop analysis as potentially occurring within the Disturbance Footprint Area were targeted for searches in areas of potential habitat. Track logs for searches are presented on Figure 3.

The locations of all targeted species collected were recorded using a handheld GPS with the following data recorded:

- Observer, date and time.
- Local abundance/population size and/or population boundary.
- Representative photos of each species and habitat.
- Collection of representative specimens.
- Notes on habitat and vegetation type.

3.2.4 Vegetation Description and Classification

Vegetation was described from the relevé, and mapping notes, using the height and estimated cover of dominant and characteristic species of each stratum based on NVIS, recorded at Level V (NVIS Technical Working Group, 2017). Up to three species per stratum from each stratum (upper, mid and ground) were used to formulate vegetation descriptions for each quadrat and each vegetation type. Vegetation types were defined by observation of species dominance and structural composition by the field survey team. Due to the small size of the Disturbance Footprint Area and degraded condition of the vegetation, statistical analysis was not applied to assist in defining Floristic Community Types, as per Gibson et al. (1994).

3.2.5 Vegetation Condition Assessment

Vegetation condition was assessed during traverses of the Disturbance Footprint Area using the Vegetation Condition Scale for the appropriate bioregion as per the Flora and Vegetation Technical Guidance (EPA, 2016).

Figure 3: Survey Effort

N

0 19 38 57 76 m

PROJECT/REPORT NAME	Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path
SCALE	1:1,300
SHEET SIZE	A3 COLOUR
CLIENT	Arup
COORDINATE REFERENCE SYSTEM	GDA2020 / MGA zone 50
PROJECT NUMBER	A22.047
VERSION	0
DATA SOURCE	LANDGATE AERIAL IMAGERY 2022
DRAWN BY / REVIEWED BY	AC / LT
DATE	23/2/2023

Legend

- Disturbance Footprint
- Track Log Kings Park Dale
- Track Log

QuadratReleve

- KPR01

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	23/2/2023

NOTES:

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3.2.6 Flora Taxonomy and Lodgement of Specimens

Where field identification of plant taxa was not possible, specimens were collected for identification using resources of the Western Australian Herbarium (WAH). Identification of flora collections, including confirmation of Priority flora, was completed by senior ecologist Ciaran Gibson and consultant taxonomist (Udani Sirisena).

The finalised species list was checked against FloraBase (Western Australian Herbarium 2022) to determine the conservation status and known distribution of each taxon. Introduced species were compared against the current *Biosecurity and Agriculture Management Act 2007* (BAM Act) Declared Pest list to determine their control status (Department of Agriculture, Water and the Environment 2022b; Department of Primary Industries and Regional Development, 2022).

Threatened and Priority Flora Report Forms (TPFRFs) were submitted to DBCA for new populations of conservation listed flora.

3.3 Black Cockatoo Assessment

The Swan Coastal Plain is used by Black-Cockatoos primarily for foraging resources, with some small patches of breeding habitat. Vegetation used by Black-Cockatoos is dominated by *Banksia* spp. and Tuart (*Eucalyptus gomphocephala*) woodlands, as well as Marri (*Corymbia calophylla*) and Jarrah (*E. marginata*) (DCCEEW 2022).

The black cockatoo habitat field survey followed the *Commonwealth referral guidelines for Threatened Black Cockatoos* (DotEE 2017, DCCEEW 2022) for identifying breeding and foraging habitat.

Breeding Habitat

The Commonwealth defines breeding habitat as trees species, known to support breeding, within the range of the species, which either have a suitable nest hollow or are of a suitable diameter at breast height (DBH) (1.3 m from the ground) to develop a hollow, including:

- Greater than 500 mm DBH for most Eucalypts (Jarrah, Marri or Tuart); or
- 300 mm in the case of Wandoo and Salmon Gum (DCCEEW 2022).

All trees of species with the potential to form hollows (primarily Jarrah, Marri and Tuart) and with sufficient diameter (i.e. DBH >500 mm) were recorded using a GPS. The following was recorded for each such tree:

- Species.
- DBH (approximately 1.3 m from the ground).
- tree health (such as presence of *Phytophthora cinnamomi* or Marri Canker (*Quambalaria coyrecup*) and other threatening processes).
- presence of hollows (as observable form the ground).

Track logs for searches are presented on Figure 3, and notes of recorded trees are presented in Appendix G.

Foraging Habitat

The Commonwealth defines foraging habitat as areas including plants of species known to support foraging within the range of each Black-Cockatoo species. Marri (*Corymbia calophylla*) and Jarrah (*Eucalytpus marginata*) woodlands are particularly important to Baudin's Black-Cockatoo and the Forest Red-tailed Black-Cockatoo, while proteaceous heaths (shrublands dominated by *Banksia, Hakea* and *Grevillea* species) are also utilised by Carnaby's Black-Cockatoo (DCCEEW 2022).

The potential of the habitat within the Disturbance Footprint Area to support foraging was described, and any evidence was recorded, along with opportunistic sightings of any Black-Cockatoo individuals.

Vegetation mapping of the Disturbance Footprint Area was used in conjunction with the site assessment to determine the foraging quality using the Foraging Habitat Scoring Tool (DCCEEW 2022).

Information collected for the Disturbance Footprint Area was contextualised with consideration to the wider availability of foraging habitat for Black-Cockatoo's in the surround area (12 km radius).

3.4 Survey Limitations and Constraints

Limitations and constraints of the flora, vegetation and Black-Cockatoo survey as outlined in the Flora and Vegetation Technical Guidance and Fauna Technical Guidance are detailed below in Table 5.

Table 5: Limitations and Constraints of the Flora, Vegetation and Black Cockatoo Survey

Possible Limitation	Degree of Limitation (Significant, Moderate or Negligible)	Potential Constraints on Survey Outcomes
Survey Level/ Scope	Negligible	The detailed flora and vegetation survey was undertaken in accordance with the *EPA Flora and Vegetation Technical Guidance* and was considered appropriate to support approvals applications and EIA processes. Targeted searching for flora of conservation significance was undertaken at a sufficient level of detail. A Black-Cockatoo survey was undertaken in accordance with *Commonwealth referral guidelines for Threatened Black Cockatoos*. The primary objectives were to identify biological values of conservation significance within the Disturbance Footprint Area, by verifying the adequacy of the desktop study, and mapping the habitats present. The survey was adequate to address these requirements.
Availability of contextual information at a regional and local scale	Negligible	All data required to complete the scope of works including regional and local contextual information was available. A significant volume of previous survey reports for Kings Park and region is available. Available literature was reviewed, and publicly available databases of information relating to rare species and communities were also searched. The current surveys added new data specific to the Disturbance Footprint Area. Contextual information is therefore not considered to be a limiting factor for this study.

Possible Limitation	Degree of Limitation (Significant, Moderate or Negligible)	Potential Constraints on Survey Outcomes
Site Access	Negligible	The Disturbance Footprint Area was accessible by foot, and the entire the Disturbance Footprint Area was traversed.
Survey Intensity and Extent	Negligible	One relevé was sampled within the Disturbance Footprint Area, with additional mapping notes undertaken to aid vegetation and condition mapping and delineation. Quadrat sampling was not suitable due to the small size, and reduced vegetation condition of the Disturbance Footprint Area. The entire Disturbance Footprint Area was traversed to search to conservation significant flora and black cockatoo foraging and roosting values. Sufficient time was allocated to survey, given the size and complexity of the Disturbance Footprint Area. The survey effort was considered adequate to assess values of the Disturbance Footprint Area and provide information required to support approvals applications.
Experience	Negligible	The field survey team and leading scientist (Ciaran Gibson) had sufficient experience in conducting flora and vegetation surveys and fauna surveys in Western Australia, and on the Swan Coastal Plain (see Table 4).
Timing, weather, season	Negligible	The recommended primary survey period for flora and vegetation surveys for the region as per the EPA Technical Guidance occurs during Spring (September through November). The survey was completed in October, after sufficient rainfall in July and August 2022 (see Graph 1). Observed conditions were optimal with many species in fruit and flower and annuals present.
Proportion of the flora and fauna recorded and/or collected, and any identification issues	Negligible	A total of 43 vascular flora taxa were recorded. All species were identifiable by the field survey team. The lower flora diversity recorded is as a result of the small; size and degraded condition of the Disturbance Footprint Area.
Mapping Reliability	Negligible	The entire of the Disturbance Footprint Area was traversed by foot and mapping reliability is considered high.
Disturbances (fire, flood etc.)	Negligible	Areas of disturbance associated with access tracks, previous clearing and weeds were recorded but were not a constraint on the results of the survey.

4. Results

4.1 Desktop Assessment

4.1.1 Threatened and Priority Flora

The desktop assessment identified 92 flora taxa of conservation significance recorded within 10 km of the Disturbance Footprint Area. The occurrence of these species is shown on Figure 4 (records from DBCA database searches). Appendix C presented the assessment of these species against the likelihood of occurrence criteria (see Table 3).

Two Priority 4 flora species were considered to have a 'High' likelihood of occurrence within the Disturbance Footprint Area:

- *Dodonaea hackttiana* (Priority 4).
- *Jacksonia sericea* (Priority 4).

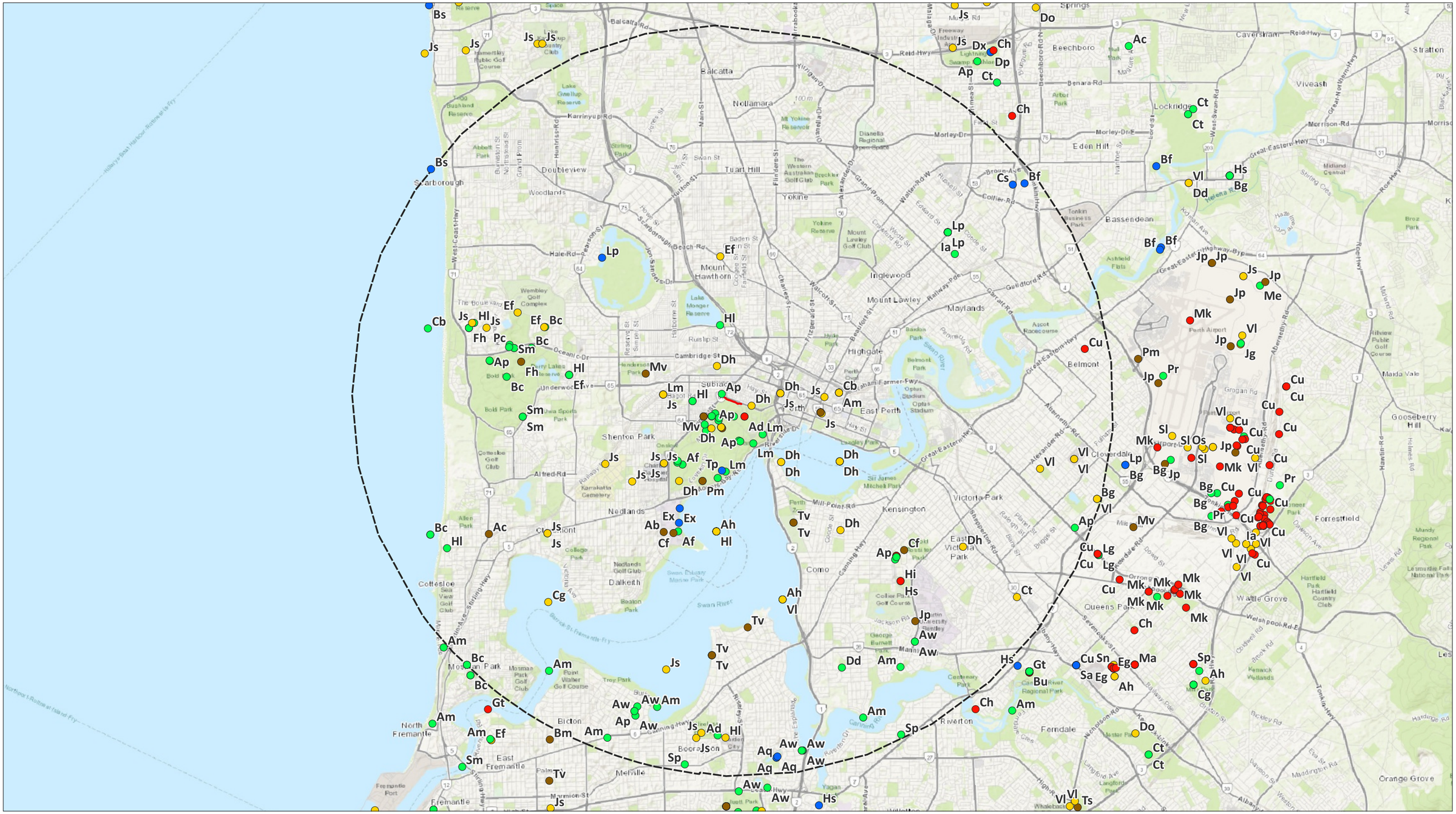

Figure 4: Flora of conservation significance known from the locality (DBCA 2022)

N

0 1,500 3,000 4,500 6,000 m

PROJECT/REPORT NAME	Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path
SCALE	1:100,000
SHEET SIZE	A3 COLOUR
CLIENT	Arup
COORDINATE REFERENCE SYSTEM	GDA2020 / MGA zone 50
PROJECT NUMBER	A22.047
VERSION	0
DATA SOURCE	LANDGATE AERIAL IMAGERY 2022
DRAWN BY / REVIEWED BY	AC / LT
DATE	7/2/2023

Legend

- Disturbance Footprint
- 10km Buffer

Conservation Status

- P1
- P2
- P3
- P4
- T

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	7/2/2023

NOTES:
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4.1.2 Threatened and Priority Ecological Communities

The desktop assessment identified that nine Threatened Ecological Communities (TECs) and Priority Ecological Communities (PECs) occurred within 10 km of the Disturbance Footprint Area, including:

- Four Commonwealth listed TECs.
- One State listed TECs.
- Four PECs.

These communities are listed along with a justification for the likelihood that occur within the Disturbance Footprint Area in Table 6. The occurrence of these communities within the locality is presented on Figure 5 (records from DBCA database searches).

Table 6: TECs and PECs identified within 10 km of the Disturbance Footprint Area, and the likelihood of occurrence within the Disturbance Footprint Area.

Floristic Community Type/ Common ID	Community name	Conservation Status		Source		Likelihood of Occurrence
		State	Commonwealth	PMST	DBCA	
Banksia WL SCP	Banksia Woodlands of the Swan Coastal Plain ecological community	P3	EN	x	x	**Recorded / High.** The buffer for this TEC intersects with the Disturbance Footprint Area.
Tuart woodlands	Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain	P3	CR	x	x	**Recorded / High** The buffer for this TEC intersects with the Disturbance Footprint Area.
SCP20a	*Banksia attenuata* woodlands over species rich dense shrublands	EN	EN		x	Low Suitable habitat does not occur within the Disturbance Footprint Area
SCP30a	*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain	VU			x	Low Suitable habitat does not occur within the Disturbance Footprint Area
Wooded waterbird wetlands	Wooded wetlands which support colonial waterbird nesting areas	P2			x	Low Suitable habitat does not occur within the Disturbance Footprint Area
Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	P3	VU	x	x	Low Suitable habitat does not occur within the Disturbance Footprint Area
SCP24	Northern Spearwood shrublands and woodlands	P3			x	Low Suitable habitat does not occur within the Disturbance Footprint Area
SCP25	Southern *Eucalyptus*	P3			x	Low

Floristic	Community name	Conservation Status		Source		Likelihood of Occurrence
	gomphocephala-Agonis flexuosa woodlands					Suitable habitat does not occur within the Disturbance Footprint Area
SCP29b	Acacia shrublands on taller dunes	P3			x	Low Suitable habitat does not occur within the Disturbance Footprint Area

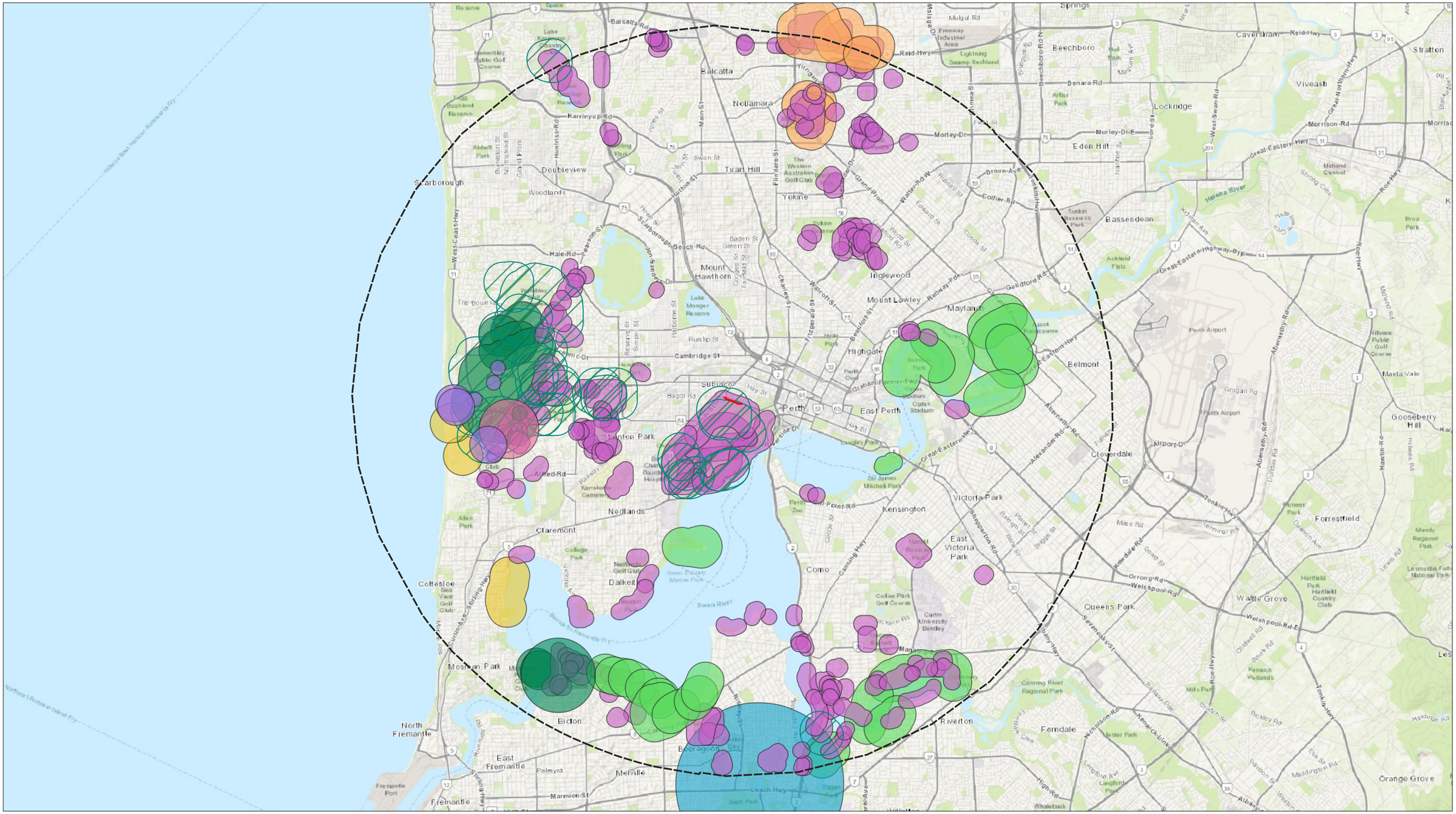

Figure 5: Communities of conservation significance known from the locality (DBCA 2022)

N

0 1,500 3,000 4,500 6,000 m

SCALE: 1:100,000	SHEET SIZE: A3 COLOUR	CLIENT: Arup	
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 50		PROJECT NUMBER: A22.047	VERSION: 0
DATA SOURCE: LANDGATE AERIAL IMAGERY 2022		DRAWN BY / REVIEWED BY: AC / LT	DATE: 7/2/2023

PROJECT/REPORT NAME: Flora, Vegetation and Black Cockatoo Assessment
Kings Park Road Shared Path

Legend

- Disturbance Footprint
- 10km Buffer

TEC s and PECs

- Banksia WL SCP - Banksia Woodlands of the Swan Coastal Plain ecological community
- Coastal Saltmarsh - Subtropical and Temperate Coastal Saltmarsh
- SCP20a - Banksia attenuata woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson et al. (1994))
- SCP24 - Northern Spearwood shrublands and woodlands
- SCP25 - Southern Eucalyptus gomphocephala-Agonis flexuosa woodlands
- SCP29b - Acacia shrublands on taller dunes
- SCP30a - Callitris preissii (or Melaleuca lanceolata) forests and woodlands, Swan Coastal Plain (floristic community type 30a as originally described in Gibson et al. (1994))
- Tuart woodlands - Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain
- Wooded waterbird wetlands - Wooded wetlands which support colonial waterbird nesting areas

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	7/2/2023

NOTES:
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4.1.3 Previous Vegetation Mapping within Kings Park and the Survey Area

McChensey 2017 mapped the vegetation within Kings Park, delineating communities through multivariate analysis of native plant cover data sampled throughout the Park. Consistent with the Bush Forever (WA Planning Commission 2000) description of vegetation (Bush Forever Site 317), McChensey (2017) concluded the vegetation within Kings Park was related to two Floristic Community Types (FCT), as described by Gibson et al (1994):

- FCT 27: "Species poor mallees and shrublands on limestone".
- FCT 28. "Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands".

According to McChensey (2017) remnant vegetation adjacent to the Disturbance Footprint Area is related to FCT28. Further, McChensey (2017) described this vegetation in more detail as:

"CBp Mixed Eucalyptus - *Allocasuarina – Banksia* Woodland generally on yellow-phase medium textured Karrakatta sands with higher relative abundance of *Eucalyptus gomphocephala, Banksia prionotes, Tricoryne elatior, Desmocladus fasciculatus* and *Ptilotus polystachyus* than other plateau woodlands

Dominant species: an overstorey of *Allocasuarina fraseriana, Eucalyptus gomphocephala, Eucalyptus marginata, Corymbia calophylla, Banksia prionotes, Banksia attenuata* over: the shrubs *Scaevola canescens, Hibbertia hypericoides, Gompholobium tomentosum, Hardenbergia comptoniana, Jacksonia sericea, Gastrolobium capitatum, Stirlingia latifolia;* the rushes/sedges *Mesomelaena pseudostygia, Tetraria octandra, Desmocladus flexuosus, Lepidosperma scabrum; the herbs Burchardia congesta, Conostylis aculeata, Sowerbaea laxiflora, Trachymene pilosa, Ptilotus polystachyus, Tricoryne elatior, Caesia micrantha, Thysanotus manglesianus, Dianella revoluta, Anigozanthos manglesii*

Indicator species (bold are strong indicators): *Alexgeorgea nitens,* ***Banksia prionotes****, Conostylis aculeata, Corynotheca micrantha,* ***Desmocladus fasciculatus****,* ***Eucalyptus gomphocephala****, Grevillea vestita, Lepidosperma scabrum,* ***Ptilotus polystachyus, Tricoryne elatior*****."**

4.1.4 Black Cockatoos

Three species of Black-Cockatoo occur in the south-west of Western Australia: Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*), Baudin's Black-Cockatoo (*C. baudinii*) and Forest Red-tailed Black-Cockatoo (*C. banksii naso*). Both Carnaby's Black Cockatoo and Baudin's Black-Cockatoo are listed as Endangered under Commonwealth EPBC Act and the State BC Act. The Forest Red-tailed Cockatoo is listed as Vulnerable under Commonwealth EPBC Act and the State BC Act.

Two of these species, are known to occur within 12 km of Kings Park: Carnaby's Black-Cockatoo and Forest Red-tailed Black-Cockatoo (DCCEEW 2022). These species are well understood and have been subject to many studies. Descriptions for each is provided below:

Carnaby's Black-Cockatoo

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) has a known distribution from Kalbarri to Esperance. Breeding season for this species occurs between July and November. They generally breed in woodlands or forests, however, can also breed in partially cleared woodland or forest, including isolated trees. Nests are found in hollows (in live or dead trees), particularly Salmon Gum (*E. salmonophloia*), Wandoo (*E. wandoo*), Tuart (E. *gomphocephala*), Jarrah (*E. marginata*), Flooded gum (*E. rudis*), York Gum (*E. loxophleba* subsp. *loxophleba*), Powderbark (*E. accedens*), Karri (*E. diversicolor*) and Marri (*Corymbia calophylla*) (DCCEEW 2022). Long term studies show that Carnaby's Black-Cockatoos utilise hollows ranging from 10 – 65 cm in diameter (average 26 cm) and approximately 130 cm deep (Saunders et al. 2014a). Night roosting occurs generally in or near riparian environments or natural and artificial permanent water sources.

Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) prefers to feed in native shrubland, kwongan heathland and woodland on seeds, flowers and nectar of native proteaceous plant species (*Banksia* spp., *Hakea* spp., *Dryandra* spp., and *Grevillea* spp.). They will, however, will also eat the seeds of introduced species (DCCEEW 2022).

Forest Red-tailed Black-Cockatoo

Forest Red-tailed Black-Cockatoo's (*C. banksii naso*) occur from Gingin to near Albany. This species generally breeds in woodlands or forests, however, can also breed in partially cleared woodland or forest, including isolated trees. They nest in live or dead trees, particularly Marri (*Corymbia calophylla*), Wandoo (*E. wandoo*), Tuart *(E. gomphocephala*), Jarrah (*E. marginata*), Blackbutt (*E. patens*) and Karri (*E. diversicolor*). Hollows with the following dimensions are favoured: entrance diameters ranging from 10 x 12 cm to 44 x 150 cm (mean 28 x 30 cm), and depths of between 100 cm and 500 cm (average 144 cm) (Johnstone et al. 2013).

Forest Red-tailed Black-Cockatoo's feed primarily on seeds of Jarrah and Marri in woodlands and forests, as well the edges of Karri forests, including areas of Wandoo and Blackbutt. They will also forage on *E. caesia, E. erythrocorys, Allocasuarina* cones and fruits of snottygobble (*Persoonia longifolia*) (DCCEEW 2022).

4.2 Field Survey

4.2.1 Flora

A total of 43 vascular flora species were recorded during the survey. The flora inventory is presented in Appendix E.

The families with the highest number of taxa were Fabaceae (eight taxa), Proteaceae (seven taxa), Myrtaceae (four taxa). The most commonly recorded genera were *Banksia* (three taxa), and *Grevillea, Eucalyptus* and *Jacksonia* (all two taxa). These families and genera are typical and common for the locality.

Threatened and Priority Flora

No Commonwealth or State listed Threatened Flora were recorded during the survey.

Two Priority 4 flora species were recorded during the survey. The locations of these species are presented on Figure 6 and provided in Appendix F.

Dodonaea hackettiana **(Priority 4)** is an erect shrub to 5 m in height, with yellow-green flowers (Plate 2). This species was recorded from 15 locations during the survey, one of which occurred within the Disturbance Footprint Area. Individuals were observed throughout the Degraded vegetation within 2 m of the existing track, and the patch of vegetation in the west. This species has a distribution from Yanchep to Mandurah and is common in the bushland of Kings Park (Barrett and Tay 2005).

Jacksonia sericea **(Priority 4)** is a low spreading shrub which grows to 60 cm in height and produces orange flowers (Plate 1). This species was recorded at 13 locations during the survey, one of these occurred within the Disturbance Footprint Area. Individuals were observed throughout the Degraded vegetation within 2 m of the existing track, and the patch of vegetation in the west. The distribution of this species is confined to the Swan Coastal Plain, however, records of this species appear common in Kings Park. Biota (2020) recently recorded 219 individuals of this species in Kings Park (to the southwest of the Disturbance Footprint Area), and Barrett and Tay (2005) noted that this species is present throughout the bushland in Kings Park.

Plate 1: ***Dodonaea hackettiana*** **(P4)**

Plate 2: ***Jacksonia sericea*** **(P4)**

Plate 3: Bridal Creeper
(*Asparagus asparagoides)

Figure 6: Priority Flora and Declared Pest recorded within the Disturbance Footprint

N

0 19 38 57 76 m

SCALE: 1:1,300	SHEET SIZE: A3 COLOUR	PROJECT/REPORT NAME: Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path	
		CLIENT: Arup	
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 50		PROJECT NUMBER: A22.047	VERSION: 0
DATA SOURCE: LANDGATE AERIAL IMAGERY 2022		DRAWN BY / REVIEWED BY: AC / LT	DATE: 23/2/2023

Legend

- Disturbance Footprint

Priority Flora and Declared Pest

- *Asparagus asparagoides(Declared Pest)
- Dodonaea hackettiana (P4)
- Jacksonia sericea(P4)

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	23/2/2023

NOTES:

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Introduced Flora

A total of nine introduced taxa were recorded within the Disturbance Footprint Area (Table 7). All the introduced species recorded are common weeds from urban bushland areas in Perth (Hussey et al 2007). Due to previous clearing and disturbances, the presence of introduced species in the Disturbance Footprint Area was widespread and diverse. As such only dominant species were recorded.

One species recorded, Bridal Creeper (**Asparagus asparagoides*), is listed as a Declared Pest pursuant to the BAM Act and considered a Weed of National Significance. Bridal creeper is a perennial climber with white flowers (Plate 3). This species was recorded from eight locations during the survey; one of which occurred within the Disturbance Footprint Area (see Figure 6). This species is expected to be widespread in Kings Park and is currently subject to management within Kings Park (Biota 2020).

Table 7: Introduced species recorded in the Disturbance Footprint Area.

Family	Species	Common Name	Status Under BAM Act 2007
Asparagaceae	**Asparagus asparagoides*	Bridal Creeper	Declared Pest
Poaceae	**Avena barbata*	Wild Oat	-
Poaceae	**Briza maxima*	Blowfly Grass	-
Poaceae	**Ehrharta calycina*	Perennial Veldt Grass	-
Iridaceae	**Freesia alba × leichtlinii*	Freesia	
Papaveraceae	**Fumaria capreolata*	Whiteflower Fumitory	
Asteraceae	**Hypochaeris glabra*	Smooth Cats-ear	
Primulaceae	**Lysimachia arvensis*	Pimpernel	
Fabaceae	**Trifolium dubium*	Suckling Clover	

4.2.2 Vegetation

Two vegetation units were identified during the survey, as described in Table 8 and shown on Figure 7.

Table 8: Vegetation within and adjacent to the Disturbance Footprint Area

Vegetation Description	Vegetation Condition	Photo
VT1: *Eucalyptus gomphocephala, Corymbia calophylla* (*Allocasuarina fraseriana*) woodland over *Banksia attenuata, B. prionotes* low open woodland over *Banksia sessilis, Jacksonia sternbergiana, Grevillea crithmifolia, Dodonaea hackettiana* tall sparse shrubland over *Hibbertia hypericoides, Xanthorrhoea preissii* sparse shrubland over *Jacksonia sericea* low sparse shrubland over mixed sparse grassland and forbland.	Good (to Very Good): introduced species, surrounded by paths/clearing.	
VT2: *Eucalyptus gomphocephala* open forest over introduced grasses and herbs. Associated trees: **Eucalyptus cladocalyx* (planted) *Corymbia calophylla, Eucalyptus marginata, Callitris preissii* (planted), *Agonis flexuosa* (planted).	Degraded (to Completely Degraded): cleared area dominated by introduced flora with some remaining remnant canopy; rubbish.	

Due to the small size of the Disturbance Footprint Area and the reduced condition, statistical analysis was not applied to assist in defining vegetation types.

Considering the structural and species composition of VT1, this vegetation is representative of the unit previously mapped adjacent to the Disturbance Footprint Area by McChensey (2017): "CBp: Mixed Eucalyptus - *Allocasuarina – Banksia* Woodland (see Section 4.1.3)'. This unit is related to FCT 28: "Spearwood *Banksia attenuata* or *Banksia attenuata – Eucalyptus* woodlands" as described by Gibson et al. (1994).

As VT2 lacked structural features, including native middle or lower storey, it was not possible to relate this vegetation to previously mapped units or an FCT.

Figure 7: Vegetation within and adjacent to the Disturbance Footprint

N

0 20 40 60 80 m

PROJECT/REPORT NAME	Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path
SCALE	1:1,500
SHEET SIZE	A3 COLOUR
CLIENT	Arup
COORDINATE REFERENCE SYSTEM	GDA2020 / MGA zone 50
PROJECT NUMBER	A22.047
VERSION	0
DATA SOURCE	LANDGATE AERIAL IMAGERY 2022
DRAWN BY / REVIEWED BY	AC / LT
DATE	24/2/2023

G:\GIS\Project Data\A22.047\A22.047.qgz

Legend

Disturbance Footprint

Vegetation Condition

Good condition

Completely degraded condition

Degraded condition

Vegetation Type

VT1: Eucalyptus gomphocephala, Corymbia calophylla (Allocasuarina fraseriana) woodland over Banksia attenuata, B. prionotes low open woodland over Banksia sessilis, Jacksonia sternbergiana, Grevillea crithmifolia, Dodonaea hackettiana tall sparse shrubland over Hibbertia hypericoides, Xanthorrhoea preissii sparse shrubland over Jacksonia sericea low sparse shrubland over mixed sparse grassland and forbland

VT2: Eucalyptus gomphocephala open forest over introduced grasses

VT2: Eucalyptus gomphocephala open forest over introduced grasses

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	24/2/2023

NOTES:

Site Boundary obtained from DWG provided by the client (16/11/2022)

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Threatened and Priority Ecological Communities

Two Commonwealth listed TECs have been mapped within the Disturbance Footprint Area and have extensive distributions in Kings Park (see Table 6; Figure 5). Both of these communities are also listed a Priority 3 PECs by the DBCA.

According to the Commonwealth criteria (DotEE 2016, DEWSPaC 2018), the vegetation within Disturbance Footprint Area and adjacent surrounds is representative of the Tuart Woodland and Forests TEC and the Banksia Woodlands TEC (Table 9). These TECs are known to co-occur on the Spearwood dunes, where the canopy of Tuarts occurs above a Banksia dominated layer (DBCA 2020).

Tuart (*E. gomphocephala*) canopy within and directly adjacent to the Disturbance Footprint Area (VT1 and VT2) extends to the surrounding area and is representative of The Tuart Woodlands and Forests TEC (Table 9). Established Tuart trees were recorded within, and adjacent to the Disturbance Footprint Area. These trees have been mapped along with an interpreted canopy layer (30 m from tree) to determine the continuity of the patch of this TEC (Figure 8). A patch, 4.4 ha in size, was mapped during this survey, however, the full extent of the patch was not recorded.

Vegetation in the west of the Disturbance Footprint Area, VT1, is representative of the Banksia Woodlands of the Swan Coastal Plain TEC (Table 9). The small area of VT1 adjacent to the Disturbance Footprint Area forms part of a larger patch of this TEC, that extends into the remnant bushland to the south of the Disturbance Footprint Area (Figure 5) and 6, Vegetation mapping of McChensey (2017)).

Table 9: Assessment of vegetation from the Disturbance Footprint against DEWSPaC (2018) and DotEE (2016) criteria for the determination of TECs.

Tuart Woodlands and Forests Diagnostic Criteria (DotEE 2018)		Vegetation
Characteristics	Location and physical Environment	Meets criterion Occurs on Swan Coastal Plain IBRA Region
	Soil and Landform	Meets criterion: Occurs on Spearwood sands.
	Structure and composition	Meets criterion: At least two living established Tuart (*E.gomphocephala*) trees occur in the uppermost canopy of woodland (VT1 and VT2), with a gap no more than 60 m between outer edges of canopy. Understorey of native species is present under majority of canopy.
Thresholds	Condition and Patch Size	
Surrounding Context	"A patch may include small areas without understorey vegetation, such as bare ground, as well as waterbodies or hardscape (e.g. roads, paths, car parks, or buildings) that do not significantly alter the overall function of the ecological community. These small areas do not break up a patch, or divide a patch into multiple patches, as long as there are some parts of the canopy within 60 m of the outer edges of the canopies of adjacent Tuart trees".	Meets criterion: Canopy layer of Tuarts (E. *gomphocephala*) exists within the Disturbance Footprint Area (VT2) and extends to surrounding bushland, to form part of a larger patch, Figure 7).
Banksia Woodlands Diagnostic Criteria (DotEE 2016)		**Vegetation**
Characteristics	Location and physical Environment	Meets criterion Occurs on Swan Coastal Plain IBRA Region
	Soil and Landform	Meets criterion: Occurs on Spearwood sands.
	Structure and composition	Meets criterion: VT1 representative of FCT28.
Thresholds	Condition and Patch Size	
Surrounding Context	"A patch is a discrete and mostly continuous area of the ecological community. A patch may include smallscale (30 m) variations, gaps and disturbances, such as tracks, that do not significantly alter the overall functionality of the ecological community. Such breaks are generally included in patch size calculation. The landscape position of the patch, including its position relative to surrounding vegetation also influences how important it is in the broader landscape."	Meets criterion: A dominant Banksia layer was observed during the survey (VT1). Considering the surrounding context, vegetation recorded during the survey (VT1) comprises the edge of a patch of Banksia Woodland TEC which occurs in the Kings Park bushland, Vegetation mapping of McChensey (2017), and analysis by Biota (2020)).

Figure 8: Established Tuart (*Eucalyptus gomphocephala)* Trees within and surrounding the Disturbance Footprint and estimation of Tuart Woodlands and Forests TEC Patch

N

0 20 40 60 80 m

SCALE: 1:1,500	SHEET SIZE: A3 COLOUR	
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 50	PROJECT NUMBER: A22.047	VERSION: 0
DATA SOURCE: LANDGATE AERIAL IMAGERY 2022	DRAWN BY / REVIEWED BY: AC / LT	DATE: 23/2/2023

PROJECT/REPORT NAME: Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path

CLIENT: Arup

Legend

- Disturbance Footprint
- Estimated patch
- Tuart

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	23/2/2023

NOTES:

Site Boundary obtained from DWG provided by the client (16/11/2022)

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4.2.3 Black Cockatoo

Breeding Habitat

A total of 11 trees with DBH >500 mm were recorded during the survey. The locations of these trees are provided on Figure 9 with descriptions provided in Appendix G. While Jarrah (*Eucalyptus marginata),* Marri (*Corymbia calophylla*) and Tuart (*E. gomphocephala*) occurred, only individuals of Tuart were observed to have DBH >500 mm.

None of these trees were observed, from the ground, to support hollows (the average DBH of trees measured was 101 cm).

Foraging Habitat

One vegetation recorded during the survey supported suitable foraging plants VT1 (Section 4.2.2).

The canopy trees within VT1 and VT2 were favourable to Forest Red-tailed Black-Cockatoos including Marri (*Corybmia calophylla*), Jarrah (*Eucalyptus marginata*), *Allocasuarina fraseriana and Tuart (E. gomphocelphala)*, while the shrub layer of VT1 was favourable for Carnaby's Black-Cockatoo including *Banksia attenuata,* and *B. sessilis*.

Despite suitable habitat no evidence of foraging was observed during the survey.

Application of the Commonwealth Foraging Habitat Scoring Tool indicates that vegetation recorded during the survey presents 'Very High' and 'High' quality habitat for Carnaby's Black-Cockatoos (VT1) and Forest Red-tailed Black-Cockatoos respectively (VT1 and VT2) (Table 10).

Carnaby's Black-Cockatoos are consistently recorded within Kings Park, including two known roost locations (Figure 9), and several nearby roosts at Floreat, Nedlands and Como (Peck et al. 2019). No known roosts for Forest Red-tailed Black-Cockatoo occur within Kings Park, however, several significant roosts occur within 12 km, including at Floreat, Yokine and Morely (Peck et al. 2019).

The Commonwealth states that high quality foraging habitat in proximity to roosting locations is necessary for the maintenance of population size, particularly outside of the breeding season (DCCEEW 2022). Considering Kings Park is one of the largest remaining remnant bushland areas in the Perth metropolitan area with nearby roosts, maintenance of foraging habitat in the Park is significant to the maintenance of Black-Cockatoos in the area.

Table 10: Foraging Habitat Score (as per DCCEEW 2022)

Final Score	Habitat Summary for Carnaby's Black-Cockatoo
8: Very High Quality	**Starting Score:** 7: Banksia shrubland (VT1: *B. attenuate, B. prionotes, B. sesslis*) **Additions: improving functionality of foraging habitat:** +3: within Swan Coastal Plain +2: contains trees with potential to be used for breeding **Subtractions: reducing functionality of foraging habitat:** -2: no clear evidence of feeding debris
Final Score	**Forest Red-tailed Black-Cockatoo**
7: High Quality	**Starting Score:** 7: Eucalyptus woodland (*E. gomphocelpha*, with *E. marginata, Corymbia calophylla, Allocasuarina fraseriana)* **Additions: improving functionality of foraging habitat:** +2: contains trees with potential to be used for breeding **Subtractions: reducing functionality of foraging habitat:** -2: no clear evidence of feeding debris

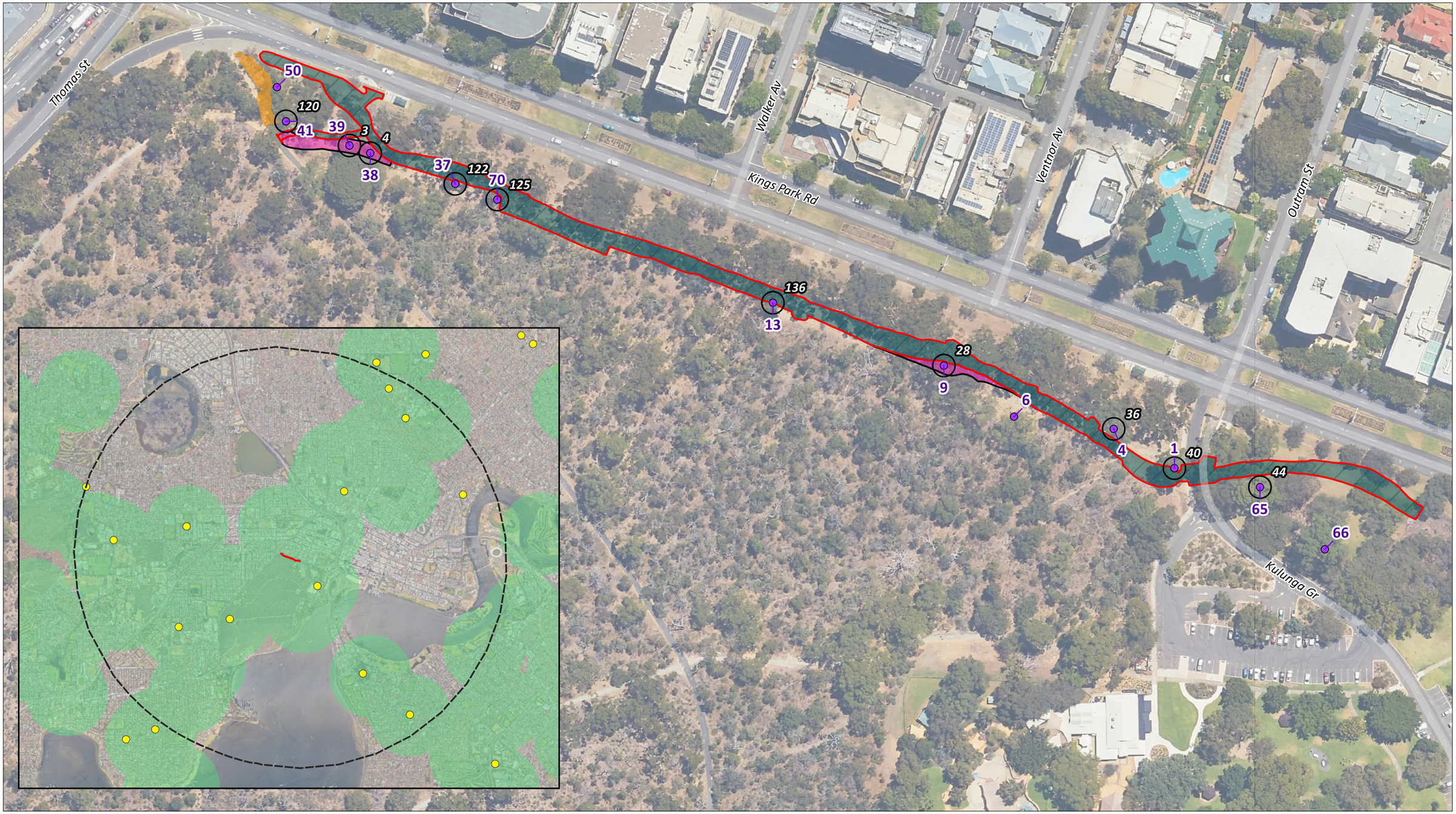

Figure 9: Black Cockatoo Habitat

N

0 20 40 60 80 m

PROJECT/REPORT NAME	Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path
SCALE	1:1,500
SHEET SIZE	A3 COLOUR
CLIENT	Arup
COORDINATE REFERENCE SYSTEM	GDA2020 / MGA zone 50
PROJECT NUMBER	A22.047
VERSION	0
DATA SOURCE	LANDGATE AERIAL IMAGERY 2022
DRAWN BY / REVIEWED BY	AC / LT
DATE	24/2/2023

Legend

- Disturbance Footprint
- Tuart (DBH>500mm)
- Aborist Tree Register (only corresponding Tuart)
- Black Cockatoo Roosting Sites - Buffered (DBCA-064)
- Carnaby's Black-Cockatoo Roosting Sites

Vegetation Condition

- Good condition
- Degraded condition
- Completely degraded condition

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	24/2/2023

NOTES:

Site Boundary obtained from DWG provided by the client (16/11/2022).

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5. Impact Assessment Advice

5.1 Brief Description of Proposal

The Proposal includes the construction of the Kings Park Road Shared Path. The proposed path runs to the south of the Kings Park Road, from Thomas St to Harvest Terrace. The western side of the proposed path requires clearing of native vegetation; Thomas Road to Kulunga Grove. The biological assessment, and following advice regarding impacts of the Proposal, refer to this as the 'Disturbance Footprint Area' and 'potential impact area'. The Disturbance Footprint comprises a total area extent of 0.3573 ha.

5.2 Stakeholder Consultation

As the managers of Kings Park, BPGA was identified as the key Stakeholder for the proposed works and has been extensively consulted on the design and positioning of the Shared Pathway (Table 11).

Table 11: Summary of Key Stakeholder Consultation

Type	Date	Attendees	Key topics/ Outcome
Meeting	**24/09/2021**	Shane Kearney	Initial discussion and site walk-through
	15/11/2021	Shane Kearney	Workshop #1 option assessment
Meeting	**08/06/2022**	Miriam Everall, Shane Kearney	50% Design Workshop
Meeting	**04/10/2022**	Sue McDougal, Stephen Easton, Ryan G	Consultation for BGPA feedback on design
Meeting	**19/10/2022**		BGPA 100% Design Comments Discussion
Meeting	**21/12/2022**	Chelsea Payne, Stephen Easton	Kings Park Realignment walk through discussion with BGPA
Meeting	**06/01/2023**	Sue McDougall, Stephen Easton	Heritage Survey with BGPA
Meeting	**14/02/2023**	Sue McDougall, Stephen Easton, Mike Balwin, Ryan G	Realignment on-site walk through with BGPA
Meeting	**15/2/2023**	DWER BPGA City of Perth WEPL	Revision 2 discussed. Outcome: Proposal within an ESA, and therefore clearing of native vegetation of significance requires an NVCP.

5.3 Conservation Significance values within the Final Alignment

No Threatened flora pursuant the Commonwealth EPBC Act or the State BC Act were recorded within, or are expected to occur, within the Survey Area. Therefore, the Proposal is not expected to impact any Threatened Flora.

Two Priority flora species (*Dodonaea hackettiana* and *Jacksonia sericea*) occurred within and adjacent to the Proposal. Both of these species are listed as Priority 4 by the DBCA and known to occur throughout the bushland in Kings Park (Biota 2020, Barrett and Tay 2005). Where possible, individuals of this species should be avoided or transplanted (in consultation with the Botanic Parks and Gardens Authority). The majority of P4 species locations (20 out of 22) have been avoided. One P4 *Dodonnaea hackettiana* is located on the north-eastern boundary of the disturbance area which corresponds with the boundary to the ESA Kings Park Bush Forever Area. This individual will be avoided and is not expected to be impacted. One individual of *Jacksonia sericea* and one individual of *Dodonnaea hackettiana* are located within the survey area and will be impacted.

Bridal Creeper (**Asparagus asparagoides*) a Declared Pest pursuant to section s22(2) of the BAM Act occurred within and adjacent to the Disturbance Footprint Area. This species is subject to weed control and management within Kings Park. The BPGA should be liaised with regarding management of this species during the construction phase of the Proposal, including correct disposal of individuals (if removed) and measures to reduce the potential for this species to be spread (i.e. weed hygiene measures and management).

5.4 Vegetation of Conservation Significance

Two Commonwealth listed TEC's, Tuart Woodlands and Forests of the Swan Coastal Plain and Banksia Woodlands of the Swan Coastal Plain TEC were mapped during the survey and occur adjacent to the proposed alignment.

The amended alignment avoids all impacts to these vegetation types and therefore the project will not impact and vegetation of conservation significance.

Tuart Woodland and Forests TEC

This community is represented by the canopy layer of Tuart (*E. gomphocelphala*) throughout the Disturbance Footprint Areas (VT2). The Disturbance Footprint Area has been realigned to avoid the removal of any Tuarts. According to the arborist survey (data provided by Arup[1], Appendix G), five Tuart trees which occur outside the current Disturbance Footprint Area may experience structural root zone (SRZ encroachment as a result of the Proposal. The associated tree numbers are 1, 9, 13, 37 and 70 as shown in Figure 10.

[1] Arborist data includes information for tree IDs 1 to 188. However, spatial mapping provides location of 212 trees. Only tree locations with corresponding information were considered for this assessment.

Considering that the removal of Tuart trees is avoided, no significant impact on the TEC has been identified.

The vegetation survey identified additional locations of Tuart trees within the 2 m of the boundary of the Survey Area (data for some of these trees was not included with the Arborist data provided). These trees are displayed on Figure 10 as tree numbers 10, 26 and 29. Construction works associated with the Proposal should consider the potential for these trees to experience structural root zone encroachment.

Figure 10: Potential impacts from the Proposal

N 0 20 40 60 80 m		PROJECT/REPORT NAME: Flora, Vegetation and Black Cockatoo Assessment Kings Park Road Shared Path	
SCALE: 1:1,500	SHEET SIZE: A3 COLOUR	CLIENT: Arup	
COORDINATE REFERENCE SYSTEM: GDA2020 / MGA zone 50		PROJECT NUMBER: A22.047	VERSION: 0
DATA SOURCE: LANDGATE AERIAL IMAGERY 2022		DRAWN BY / REVIEWED BY: AC / LT	DATE: 24/2/2023

Legend

- Disturbance Footprint
- Tuart

Potential impacts to Tuart Trees (potential Black -Cockatoo breeding habitat)

- Tuarts proposed SRZ Encroachment
- Tuarts to investigate potential SRZ Encroachment

Potential impacts to Tuart Woodland and Forest TEC patch

- Estimated patch
- Patch size after proposed removal of Tuart trees

Potential impacts to Banksia Woodlands of the Swan Coastal Plain TEC

- Removal of vegetation (VT1)

Potential Impacts to Cockatoo Foraging Habitat

- Removal of vegetation (VT1)
- Bush Forever Areas - 2000 (DPLH-019)

Priority Flora and Declared Pest

- Asparagus asparagoides(Declared Pest)
- Dodonaea hackettiana (P4)
- Jacksonia sericea(P4)

No	Description	Drawn	Approved	Date
A	Original issue	AC	LT	24/2/2023

NOTES:

Site Boundary obtained from DWG provided by the client (16/11/2022).

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5.5 Black Cockatoo Habitat

Potential breeding habitat, and foraging habitat for Black-Cockatoos exists within the Disturbance Footprint Area. No potential breeding trees (Tuart trees with DBH > 500mm) will be impacted by the Proposal.

The revised alignment avoids impact to all Black Cockatoo habitat.

5.6 Native Vegetation Clearing Permit

Despite the potential impact area for the Proposal being relatively small, several biological values occur within or adjacent to the proposal, including:

- Priority flora species.
- Declared Pest.
- Commonwealth listed TECs.
- Potential Cockatoo breeding habitat.
- Cockatoo foraging habitat.

Whilst the proposal is being undertaken within the Kings Park ESA, the avoidance of impacts to the above listed values, with the exception of the two P4 individuals, reduces the significance of the project, such that a clearing permit is potentially not required. The project should be referred to DWER to seek consideration of the need for a clearing permit.

6. References

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Appendix A
Legislation

Environment Protection and Biodiversity Conservation Act 1999

The EPBC Act aims to protect matters of national environmental significance (MNES). Under the EPBC Act, the Commonwealth Department of Climate Change, Energy and the Environment lists threatened species and communities in categories determined by criteria set out in the EPBC Act.

Projects likely to cause a significant impact on MNES should be referred to the DCCEEW for assessment under the EPBC Act.

Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 aims to conserve and protect biodiversity and biodiversity components within the State and to promote ecologically sustainable use of biodiversity components in the State.

Environmental Protection Act 1986

Declared Rare Flora (DRF) and Threatened Ecological Communities (TECs) are given special consideration in environmental impact assessments and have special status as Environmentally Sensitive Areas (ESAs) under the EP Act and the Environmental Protection (Clearing of Native Vegetation) Regulations 2004. Exemptions for a clearing permit do not apply in an ESA. In addition, habitat necessary for the maintenance of indigenous fauna is considered in the clearing principles and assessed during consideration of applications for a clearing permit.

Biosecurity and Agricultural Management Act 2007

Plants may be 'Declared' by the Minister for Agriculture and Food under the BAM Act. The Western Australian Organism List contains information on the area(s) in which a plant is declared and the control and keeping categories to which it has been assigned in Western Australia. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties.

Weeds of National Significance

The Australian Government along with the State and Territory governments has endorsed 32 WoNS. Four major criteria were used in determining WoNS:

- The invasiveness of a weed species.
- A weed's impacts.
- The potential for spread of a weed.
- Socio-economic and environmental values.

Each WoNS has a national strategy and a national coordinator, responsible for implementing the strategy. WoNS are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts.

Department of Biodiversity, Conservation and Attractions Priority Lists

DBCA lists 'Priority' flora and fauna that have not been assigned statutory protection as "Threatened" under the BC Act and are under consideration for declaration as Threatened. Flora and fauna assessed as Priority 1-3 are considered to be in urgent need of further survey. Priority 4 flora requires monitoring every 5 -10 years.

DBCA maintains a list of Priority Ecological Communities (PECs) which identifies plant communities that require further investigation before possible nomination for TEC status. Once listed, a community becomes a PEC and, when endorsed by the WA Minister for Environment, becomes a TEC and protected as an ESA under Environmental Protection (Clearing of Native Vegetation) Regulations 2004.

Informal Recognition of Flora and Fauna

Certain populations or communities of flora and/or fauna may be of local significance or interest because of their patterns of distribution and abundance. For example, specific locations of flora and may be locally significant because they are range extensions to the previously known distribution, or are newly discovered taxa (and have the potential to be of more than local significance). In addition, many species are in decline as a result of threatening processes (land clearing, grazing, and changed fire regimes) and relict populations of such species assume local importance for DBCA. It is not uncommon for DBCA to make comment on these species of interest.

Appendix B
Definitions and Criteria

EPBC Act Categories for Flora, Fauna and Ecological Communities

Category	Threatened Species	Threatened Ecological Communities
Extinct	A native species is eligible to be included in the extinct category at a particular time if, at that time, there is no reasonable doubt that the last member of the species has died.	N/A.
Extinct in the wild	A native species is eligible to be included in the extinct in the wild category at a particular time if, at that time: (a) it is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; or (b) it 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.	N/A.
Critically Endangered (CE)	A native species is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the critically endangered category at a particular time if, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (EN)	A native species is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the endangered category at a particular time if, at that time: (a) it is not critically endangered; and (b) it is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (VU)	A native species is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.	An ecological community is eligible to be included in the vulnerable category at a particular time if, at that time: (a) it is not critically endangered or endangered; and (b) it is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation Dependent	A native species is eligible to be included in the conservation dependent category at a particular time if, at that time: (a) the species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or (b) the following subparagraphs are satisfied: (i) the species is a species of fish. (ii) the species is the focus of a plan of	N/A.

Category	Threatened Species	Threatened Ecological Communities
	management that provides for management actions necessary to stop decline of, and support the recovery of, species so that its chances of long-term survival in nature are maximised. (iii) the plan of management is in force under a law of the Commonwealth or of a State or Territory. (iv) cessation of the plan of management would adversely affect the conservation status of the species.	

Conservation Codes for Western Australian Flora and Fauna (DBCA)

Conservation Codes for Western Australian Flora and Fauna	
Threatened, Extinct and Specially Protected fauna or flora[1] are species[2] 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. **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*.** **Categories of Threatened, Extinct and Specially Protected fauna and flora are:**	
T	**Threatened species** 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 International Union for Conservation of Nature (IUCN) Red List categories and criteria as detailed below.
CR	**Critically endangered species** 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 undersection 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.
EN	**Endangered species** Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.

Conservation Codes for Western Australian Flora and Fauna	
VU	**Vulnerable species** 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 undersection 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.**	
EX	**Extinct species** Species where "there is no reasonable doubt that the last member of the species has died", and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for extinct fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.
EW	**Extinct in the wild species** 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.**	
MI	**Migratory species** 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.

Conservation Codes for Western Australian Flora and Fauna	
CD	**Species of special conservation interest (conservation dependent fauna)** 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.
OS	**Other specially protected species** 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.
P	**Priority species** 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.
1	**Priority 1: Poorly-known species** Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
2	**Priority 2: Poorly-known species** Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
3	**Priority 3: Poorly-known species** Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of 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.

Conservation Codes for Western Australian Flora and Fauna	
4	**Priority 4: Rare, Near Threatened and other species in need of monitoring** (a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

[1] The definition of flora includes algae, fungi and lichens.

DBCA Definitions and Criteria for TECs and PECs

Criteria	Definition
Threatened Ecological Communities	
Presumed Totally Destroyed (PD)	An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future. An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B): A. Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or B. All occurrences recorded within the last 50 years have since been destroyed.
Critically Endangered (CR)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated. An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C): A. The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii): i. geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years). ii. modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years). ii. there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes.

Criteria	Definition
	iii. there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes. C. The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).
Endangered (EN)	An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future. An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C): A. The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii): i. the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short-term future (within approximately 20 years). ii. modification throughout its range is continuing such that in the short-term future (within approximately 20 years) the community is unlikely to be capable of being substantially restored or rehabilitated. B. Current distribution is limited, and one or more of the following apply (i, ii or iii): i. geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short-term future (within approximately 20 years). ii. there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes. iii. there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes. The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).
Vulnerable (VU)	An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range. An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C): A. The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated. B. The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few

Criteria	Definition
	locations. C. The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.
Priority Ecological Communities	
Priority One	**Poorly known ecological communities** Ecological communities with apparently few, small occurrences, all or most not actively managed for conservation (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) and for which current threats exist. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
Priority Two	**Poorly known ecological communities** Communities that are known from few small occurrences, all or most of which are actively managed for conservation (e.g. within national parks, conservation parks, nature reserves, state forest, unallocated Crown land, water reserves, etc.) and not under imminent threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities, but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
Priority Three	**Poorly known ecological communities** i. Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or. ii. Communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or. iii. Communities made up of large, and/or widespread occurrences, that may or may not be represented in the reserve system, but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities, but do not meet adequacy of survey requirements and / or are not well defined, and known threatening processes exist that could affect them.
Priority Four	**Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list**. These communities require regular monitoring. i. Rare. Ecological communities known from few occurrences 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 communities are usually represented on conservation lands. ii. Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. iii. Ecological communities that have been removed from the list of threatened communities during the past five years.

Criteria	Definition
Priority Five	**Conservation Dependent Ecological Communities** Ecological Communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

Appendix C
Desktop Flora Assessment Results and Likelihood of Occurrence Assessments

Flora Database Search Results (DBCA Database Search using 15 Km Buffer, PMST 10 km buffer), Likelihood and Flora Survey Records

Species	Conservation Status		Source			Species information (WAH 2022)		Habitat Occurs Within the Survey Area	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence
	State	Federal	PMST	DBCA	Biota (2020)	Flowering Period	Preferred Habitat			
Acacia denticulosa	T			x		Sep-Oct	Sand, loam, clay. Granite outcrops, rarely on sandplains.	No	Low	Low
Caladenia huegelii	CR	EN		x		Sep-Oct	Grey or brown sand, clay loam.	Yes	Low	Low
Eremophila glabra* subsp. *chlorella	EN	EN	x	x		Jul-Nov	Sandy clay. Winter-wet depressions.	No	Low	Low
Eucalyptus rhodantha* var. *rhodantha	T			x		Jul or Sep-Dec or Jan	Grey/yellow/red sand over laterite. Undulating country, hillslopes.	No	Low	Low
Grevillea thelemanniana	T			x		May-Nov	Sand, sandy clay. Winter-wet low-lying flats.	No	Low	Low
***Hypocalymma* sp. Cascade (R. Bruhn 20/896 CAS)**	T			x		Aug	Sandy loam.	Yes	Low	Low
Macarthuria keigheryi	EN	EN	x	x		Sep-Dec or Feb-Mar	White or grey sand.	Yes	Low	Low
Morelotia australiensis	T			x					Low	Low
Conospermum undulatum	VU	VU	x	x		May-Oct	Grey or yellow-orange clayey sand.	No	Low	Low
Andersonia gracilis		EN		x		Sep-Nov	White/grey sand, sandy clay, gravelly loam. Winter-wet areas, near swamps.	No	Low	Low
Diuris drummondii		VU	x			Nov-Dec or Jan	Low-lying depressions, swamps.	No	Low	Low

Species	Conservation Status		Source			Species information (WAH 2022)		Habitat Occurs Within the Survey Area	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence
Diuris purdiei		EN	x			Sep-Oct	Grey-black sand, moist. Winter-wet swamps.	No	Low	Low
Eleocharis keigheryi		VU	x			Aug-Nov	Clay, sandy loam. Emergent in freshwater: creeks, claypans.	No	Low	Low
***Synaphea* sp. Fairbridge Farm (D. Papenfus 696)**		CR	x			Oct	Sandy with lateritic pebbles. Near winter-wet flats, in low woodland with weedy grasses.	No	Low	Low
***Baeckea* sp. Limestone (N. Gibson & M.N. Lyons 1425)**	P1			x		Nov-Jan	Occurs on grey sand on limestone breakaways.	No	Low	Low
Bolboschoenus fluviatilis	P1			x		Oct-Dec	Scattered, in open swamps	No	Low	Low
***Calandrinia* sp. Bayswater (C. Andrews s.n. 11/1902)**	P1			x					Low	Low
Calandrinia uncinella	P1			x		Aug-Oct	Seasonally wet swamps or on saline river flats on ground or embankments just above water, growing in soils described as grey-brown sandy or silty loams or white to creamy sands over clays usually with poor drainage.	No	Low	Low
Drosera patens	P1			x		Dec or Feb	Sandy soils. Margins of winter-wet depressions, swamps and lakes.	No	Low	Low
Drosera* x *sidjamesii	P1			x		Nov-Dec or Jan-Mar	Peaty sand. Along lake margins, close to winter high-water line.	No	Low	Low

Species	Conservation Status	Source			Species information (WAH 2022)		Habitat Occurs Within the Survey Area	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence
Eucalyptus* x *mundijongensis	P1			x		Loam. Paddocks.	No	Low	Low
Haloragis scoparia	P1			x				Low	Low
Hydrocotyle striata	P1			x		Clay. Springs.	No	Low	Low
Lepidium pseudohyssopifolium	P1			x	Jun-Sep	Swampy ground.	No	Low	Low
Levenhookia preissii	P1			x	Sep-Dec or Jan	Grey or black, peaty sand. Swamps.	No	Low	Low
Ptilotus sericostachyus subsp. roseus	P1			x	Sep-Dec			Low	Low
Acacia benthamii	P2			x	Aug-Sep	Sand. Typically on limestone breakaways.	No	Low	Low
Bossiaea modesta	P2			x	Oct-Dec	Soils derived from granite. Damp areas close to stream.	No	Low	Low
Calectasia grandiflora	P2			x	Jun-Nov	White, grey or yellow sand, sandy clay, gravel, laterite, granite. Swampy areas, rock outcrops, flats, slopes, ridges.	Yes	Low	Low
Calothamnus macrocarpus	P2			x	Feb or Apr or Aug-Dec	Rocky quartzite soils, sand. Slopes.	No	Low	Low
Chamelaucium floriferum* subsp. *diffusum	P2			x	Aug-Oct	Grey sand or shallow loam. Granite hills & outcrops.	No	Low	Low
Eucalyptus educta	P2			x	Apr	Shallow soils. Granite rocks.	No	Low	Low
Fabronia hampeana	P2			x				Low	Low

Species	Conservation Status		Source			Species information (WAH 2022)		Habitat Occurs Within the Survey Area	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence
Grevillea ornithopoda	P2			x					Low	Low
Hypocalymma inopinatum	P2			x		Sep-Nov	Shallow white sandy soil on the crest of a low hill or moderate slope.	No	Low	Low
Johnsonia pubescens subsp. cygnorum	P2			x		Sep	Grey-white-yellow sand. Flats, seasonally wet sites.	No	Low	Low
Melaleuca viminalis	P2			x					Low	Low
Poranthera moorokatta	P2			x					Low	Low
Thelymitra variegata	P2			x		Jun-Sep	Sandy clay, sand, laterite.	No	Low	Low
***Thysanotus* sp. Badgingarra (E.A. Griffin 2511)**	P2			x		Dec	Grey sand with lateritic gravel.	No	Low	Low
Acacia horridula	P3			x		May-Aug	Gravelly soils over granite, sand. Rocky hillsides.	No	Low	Low
Angianthus micropodioides	P3			x		Nov-Dec- or Jan-Feb	Saline sandy soils. River edges, saline depressions, claypans.	No	Low	Low
Austrostipa mundula	P3			x		Oct-Nov	Sandy soils in mallee-scrub and in low woodland. Isolated occurrence on limestone.	No	Low	Low
Babingtonia urbana	P3			x			Brown clay over ironstone. Heath of *Calothamnus hirsutus, Jacksonia, Melaleuca* and *Baeckea emergent*.	No	Low	Low
Beyeria cinerea* subsp. *cinerea	P3			x			White to brown/grey sand over limestone on upper slopes and ridges	No	Low	Low

Species	Conservation Status	Source			Species information (WAH 2022)		Habitat Occurs Within the Survey Area	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence
Byblis gigantea	P3		x		Sep-Dec or Jan	Sandy-peat swamps. Seasonally wet areas.	No	Low	Low
Carex tereticaulis	P3		x		Sep-Oct	Black peaty sand.	No	Low	Low
Conostylis bracteata	P3		x		Aug-Sep	Sand, limestone. Consolidated sand dunes.	No	Low	Low
Cyathochaeta teretifolia	P3		x		Jan	Grey sand, sandy clay. Swamps, creek edges.	No	Low	Low
Dampiera triloba	P3		x		Aug-Dec	Loamy sand in lower lying areas.	No	Low	Low
Dicrastylis micrantha	P3		x		Sep-Dec	Red sand. Sandplains.	No	Low	Low
Dillwynia dillwynioides	P3		x		Aug-Dec	Sandy soils. Winter-wet depressions.	No	Low	Low
Eryngium pinnatifidum **subsp. *palustre* (G.J. Keighery 13459)**	P3		x		Oct-Nov	Clay, sandy clay. Claypans,seasonally wet flats	No	Low	Low
Eryngium **sp. Subdecumbens (G.J. Keighery 5390)**	P3		x		Oct-Nov	Clay, grey sand. Seasonally wet flats, claypans, swamps	No	Low	Low
Hibbertia leptotheca	P3		x		Jul-Oct	Sand. Near-coastal limestone ridges, outcrops & cliffs.	No	Low	Low
Hypocalymma **sp. Nambung (R. Spjut & R. Smith s.n. 22/09/1992)**	P3		x					Low	Low
Isopogon autumnalis	P3		x		Feb-May	Sandy soils, often in *Banksia* woodlands.	Yes	Low	Low

Species	Conservation Status		Source			Species information (WAH 2022)		Habitat Occurs Within the Survey Area	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence
Jacksonia gracillima	P3			x					Low	Low
Lasiopetalum glutinosum subsp. glutinosum	P3			x					Low	Low
Lasiopetalum membranaceum	P3			x		Sep-Dec	Sand over limestone.	No	Low	Low
Meionectes tenuifolia	P3			x					Low	Low
Myriophyllum echinatum	P3			x		Nov	Winter-wet flats.	No	Low	Low
Pimelea calcicola	P3			x		Sep-Nov	Sand. Coastal limestone ridges.	No	Low	Low
Platysace ramosissima	P3			x		Oct-Nov	Sandy soils.	Yes	Low	Low
Schoenus benthamii	P3			x		Oct-Nov	White, grey sand, sandy clay. Winter-wet flats, swamps.	No	Low	Low
Schoenus capillifolius	P3			x		Oct-Nov	Brown mud. Claypans.	No	Low	Low
Schoenus pennisetis	P3			x		Aug-Sep	Grey or peaty sand, sandy clay. Swamps, winter-wet depressions.	No	Low	Low
***Schoenus* sp. Waroona (G.J. Keighery 12235)**	P3			x		Oct-Nov	Clay or sandy clay. Winter-wet flats.	No	Low	Low
Stylidium aceratum	P3			x		Oct-Nov	Sandy soils. Swamp heathland.	No	Low	Low
Stylidium maritimum	P3			x		Sep-Nov	Sand over limestone. Dune slopes and flats. Coastal heath and shrubland, open Banksia woodland.	No	Low	Low

Species	Conservation Status	Source				Species information (WAH 2022)		Habitat Occurs Within the Survey Area	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence
Stylidium paludicola	P3			x		Oct-Nov	Peaty sand over clay. Winter wet habitats. Marri and Melaleuca woodland, Melaleuca shrubland.	No	Low	Low
Styphelia filifolia	P3			x					Low	Low
Aponogeton hexatepalus	P4			x		Jul-Oct	Mud. Freshwater: ponds, rivers, claypans.	No	Low	Low
Calothamnus graniticus **subsp. *leptophyllus***	P4			x		Jun-Aug	Clay over granite, lateritic soils. Hillsides	No	Low	Low
Cyanothamnus tenuis	P4			x		Aug-Dec	Laterite and granite in stony soils.	No	Low	Low
Dodonaea hackettiana	P4			x		Jul-Oct	Sand. Outcropping limestone.	No	Low	Recorded
Drosera occidentalis	P4			x		Oct-Dec or Jan	Sandy & clayey soils. Swamps & wet depressions.	No	Low	Low
Eucalyptus caesia **subsp. *caesia***	P4			x		May-Sep	Loam. Granite outcrops.	No	Low	Low
Eucalyptus caesia **subsp. *magna***	P4			x		May-Sep	Loam. Granite outcrops.	No	Low	Low
Eucalyptus foecunda **subsp. *foecunda***	P4			x					Low	Low
Eucalyptus kruseana	P4			x		Jun-Sep	Sandy loam. Granite outcrops & hills.	No	Low	Low
Grevillea pimeleoides	P4			x		May-Nov	Gravelly soils over granite. Rocky hillsides.	No	Low	Low
Hydrocotyle lemnoides	P4			x		Aug-Oct	Swamps.	No	Low	Low
Hypolaena robusta	P4			x		Sep-Oct	White sand. Sandplains.	No	Low	Low

Species	Conservation Status	Source				Species information (WAH 2022)		Habitat Occurs Within the Survey Area	Pre-Survey Likelihood of Occurrence	Post-Survey Likelihood of Occurrence
Jacksonia sericea	P4			x	x	Dec or Jan-Feb	Calcareous & sandy soils.	No	**High**	Recorded
Ornduffia submersa	P4			x					Low	Low
Schoenus natans	P4			x		Oct	Winter-wet depressions.	No	Low	Low
Stylidium longitubum	P4			x		Oct-Dec	Sandy clay, clay. Seasonal wetlands.	No	Low	Low
Tripterococcus **sp. Brachylobus (A.S. George 14234)**	P4			x			Grey, black or peaty sand winter-wet flats.	No	Low	Low
Verticordia lindleyi **subsp. *lindleyi***	P4			x		Mar or Nov - Dec or Jan	Sand, sandy clay. Winter-wet depressions.	No	Low	Low

Threatened Ecological Communities Database Search Results (DBCA Database Search using 10 Km Buffer, PMST 10 km buffer), Likelihood and Ecological Communities Survey Records

Floristic Community Type	Community Description	Conservation Status		Database			Likelihood of Occurrence	Justification
		State	Federal	PMST	DBCA	Biota (2020)		
SCP30a	*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain (floristic community type 30a as originally described in Gibson et al. (1994))	VU				x		
SCP24	Northern Spearwood shrublands and woodlands	P3				x		
Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	P3				x		
Wooded waterbird wetlands	Wooded wetlands which support colonial waterbird nesting areas	P2				x		
SCP20a	*Banksia attenuata* woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson et al. (1994))	EN				x		
Banksia WL SCP	Banksia Woodlands of the Swan Coastal Plain ecological community	P3	EN	x		x		
Tuart woodlands	Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain	P3	CR	x		x		
SCP29b	Acacia shrublands on taller	P3				x		

Floristic Community Type	Community Description	Conservation Status	Database			Likelihood of Occurrence	Justification
	dunes						
SCP25	Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands	P3			x		

Threatened Ecological Communities Database Search Results (DBCA Database Search using 10 Km Buffer, PMST 10 km buffer), Likelihood and Ecological Communities Survey Records

Floristic Community Type	Community Name	Conservation Status		Database		Likelihood of Occurrence	Justification
		State	Federal	PMST	DBCA		
SCP30a	*Callitris preissii* (or *Melaleuca lanceolata*) forests and woodlands, Swan Coastal Plain (floristic community type 30a as originally described in Gibson et al. (1994))	VU			x		
SCP24	Northern Spearwood shrublands and woodlands	P3			x		
Coastal Saltmarsh	Subtropical and Temperate Coastal Saltmarsh	P3			x		
Wooded waterbird wetlands	Wooded wetlands which support colonial waterbird nesting areas	P2			x		
SCP20a	*Banksia attenuata* woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson et al. (1994))	EN			x		
Banksia WL SCP	Banksia Woodlands of the Swan Coastal Plain ecological community	P3	EN	x	x		
Tuart woodlands	Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain	P3	CR	x	x		
SCP29b	Acacia shrublands on taller dunes	P3			x		
SCP25	Southern *Eucalyptus gomphocephala-Agonis flexuosa* woodlands	P3			x		

Appendix D
Relevé Data Sheet

Flora Site Sheet			
Project Name	A22.047		
Site	KPR01		
Location	MGA 50	389821 mE	64642400 mN
Described By	Ciaran Gibson		
Date	12 October 2022		
Type	Releve (unbounded sampling site)		
Landform	Hill		
Slope	Gentle		
Rock Type	None		
Soil Type	Sand		
Soil Colour	Grey		

Vegetation	Eucalyptus *gomphocephala, Corymbia calophylla* woodland over *Banksia attenuata, B. prionotes* low open woodland over *Banksia sessilis, Jacksonia sternbergiana, Grevillea crithmifolia, Dodonaea hackettiana* tall sparse shrubland over *Hibbertia hypericoides, Xanthorrhoea preissii* sparse shrubland over *Jacksonia sericea* low sparse shrubland over mixed sparse grassland and forbland.

Condition	Very Good	Disturbance	Weeds, previous clearing, rubbish, tracks, rehabilitation area
Fire Age	<10		

SPECIES LIST

Taxon	Cover (%)	Notes
Acacia pulchella	<1	
Allocasuarina fraseriana	<2	
**Avena barbata*	1	
Banksia attenuata	2	
Banksia prionotes	3	
Banksia sessilis	5	
**Briza maxima*	<1	
Conostylis candicans	<1	
Corymbia calophylla	30	
Dodonaea hackettiana	1	P4
**Ehrharta calycina*	<1	
Eucalyptus gomphocephala	40	
**Freesia alba × leichtlinii*	<1	
**Fumaria capreolata*	<1	
Grevillea crithmifolia	2	
Grevillea preissii	<1	
Hakea amplexicaulis	<1	
Hardenbergia comptoniana	<1	
Hibbertia hypericoides	1	
Hypocalymma angustifolium	<1	

Flora Site Sheet		
**Hypochaeris glabra*	<1	
Jacksonia sericea	<1	P4
Jacksonia sternbergiana	2	
Lysiandra calycina	<1	
**Lysimachia arvensis*	<1	
Mesomelaena pseudostygia	<1	
Patersonia occidentalis	<1	
Sowerbaea laxiflora	<1	
Thysanotus manglesianus	<1	
**Trifolium dubium*	<1	
Xanthorrhoea preissii	1	

Appendix E
Flora Inventory

Family	Species	Conservation Status
Amaranthaceae	*Ptilotus polystachyus*	
Asparagaceae	*Thysanotus manglesianus*	
Asparagaceae	**Asparagus asparagoides*	Declared Pest
Asparagaceae	*Sowerbaea laxiflora*	
Asteraceae	**Hypochaeris glabra*	
Casuarinaceae	*Allocasuarina fraseriana*	
Colchicaceae	*Burchardia congesta*	
Cupressaceae	*Callitris preissii*	
Cyperaceae	*Mesomelaena pseudostygia*	
Dilleniaceae	*Hibbertia hypericoides*	
Fabaceae	*Acacia pulchella*	
Fabaceae	*Gompholobium tomentosum*	
Fabaceae	*Hardenbergia comptoniana*	
Fabaceae	*Hypocalymma angustifolium*	
Fabaceae	*Jacksonia sericea*	P4
Fabaceae	*Jacksonia sternbergiana*	
Fabaceae	*Kennedia prostrata*	
Fabaceae	**Trifolium dubium*	
Haemodoraceae	*Anigozanthos manglesii*	
Haemodoraceae	*Conostylis candicans*	
Hemerocallidaceae	*Dianella revoluta*	
Iridaceae	**Freesia alba × leichtlinii*	
Iridaceae	*Patersonia occidentalis*	
Myrtaceae	*Agonis flexuosa*	
Myrtaceae	*Corymbia calophylla*	
Myrtaceae	*Eucalyptus gomphocephala*	
Myrtaceae	*Eucalyptus marginata*	
Papaveraceae	**Fumaria capreolata*	
Phyllanthaceae	*Lysiandra calycina*	
Poaceae	**Avena barbata*	
Poaceae	**Briza maxima*	
Poaceae	**Ehrharta calycina*	
Primulaceae	**Lysimachia arvensis*	
Proteaceae	*Banksia attenuata*	
Proteaceae	*Banksia prionotes*	
Proteaceae	*Banksia sessilis*	
Proteaceae	*Grevillea crithmifolia*	
Proteaceae	*Grevillea preissii*	
Proteaceae	*Hakea amplexicaulis*	
Proteaceae	*Stirlingia latifolia*	
Sapindaceae	*Dodonaea hackettiana*	P4
Xanthorrhoeaceae	*Xanthorrhoea preissii*	

Appendix F
Locations of Priority Flora and Declared Pest

Species	Conservation Status	Location (GDA2020 / MGA50)	
		Easting	Northing
Dodonaea hackettiana	P4	389802.5	6464411
Dodonaea hackettiana	P4	389803.2	6464410
Dodonaea hackettiana	P4	389805	6464407
Dodonaea hackettiana	P4	389808.7	6464394
Dodonaea hackettiana	P4	389809.2	6464415
Dodonaea hackettiana	P4	389816.8	6464399
Dodonaea hackettiana	P4	389820.6	6464400
Dodonaea hackettiana	P4	389822.1	6464409
Dodonaea hackettiana	P4	389823.5	6464399
Dodonaea hackettiana	P4	389823.8	6464405
Dodonaea hackettiana	P4	389825.6	6464385
Dodonaea hackettiana	P4	389830.5	6464386
Dodonaea hackettiana	P4	390079.3	6464292
Dodonaea hackettiana	P4	390089	6464288
Dodonaea hackettiana	P4	390105.9	6464279
Jacksonia sericea	P4	389800.6	6464412
Jacksonia sericea	P4	389818.8	6464397
Jacksonia sericea	P4	389819	6464404
Jacksonia sericea	P4	389819.6	6464408
Jacksonia sericea	P4	389820.6	6464400
Jacksonia sericea	P4	389820.7	6464395
Jacksonia sericea	P4	389823.5	6464399
Jacksonia sericea	P4	389860.3	6464372
Jacksonia sericea	P4	389879.5	6464361
Jacksonia sericea	P4	389900.3	6464356
Jacksonia sericea	P4	389935.2	6464339
Jacksonia sericea	P4	389956.9	6464332
Jacksonia sericea	P4	390070.5	6464297
**Asparagus asparagoides*	Declared Pest	389825.6	6464385
**Asparagus asparagoides*	Declared Pest	389834	6464382
**Asparagus asparagoides*	Declared Pest	389859.1	6464373
**Asparagus asparagoides*	Declared Pest	389879.5	6464361
**Asparagus asparagoides*	Declared Pest	390079.3	6464292
**Asparagus asparagoides*	Declared Pest	390092.5	6464283

Species	Conservation Status	Location (GDA2020 / MGA50)	
**Asparagus asparagoides*	Declared Pest	390103.5	6464276
**Asparagus asparagoides*	Declared Pest	390123.7	6464275

Appendix G
Potential Black Cockatoo Breeding Habitat

Tree number	Species	DBH (mm)	Hollow notes	Tree Health	Location (GDA2020 / MGA50)		Corresponding Tree Identified by Arborist Survey (as provided by Arup)
					Easting	Northing	
1	Tuart	1000	None	Healthy	390173.9	6464255	40: SRZ Encroachment
4	Tuart	1180	None	Healthy	390145.7	6464266	36: Retain
6	Tuart	1700	None: Multistemmed just above breast height	Healthy	390109	6464273	Not recorded: Retain
9	Tuart	1300	None	Healthy but witches broom infected	390080.6	6464292	28: SRZ Encroachment
13	Tuart	500	None	Healthy	390010.8	6464317	136: SRZ Encroachment
37	Tuart	20	None	Healthy	389883.1	6464366	122: Remove
38	Tuart	500	None	Healthy	389852.8	6464380	4: Retain
39	Tuart	1100	None; Has broken branches but no sign of hollow development	Moderate-poor health	389845.3	6464384	3: Retain
41	Tuart	900	None; Broken branches and a possible branch to develop a small hollow	Healthy	389815.6	6464392	120: Retain
50	Tuart	600	None	Healthy	389811.8	6464406	Not known: Retain
65	Tuart	1200	None	Healthy	390205	6464243	44: Retain
66	Tuart	1800	None	Healthy	390234.3	6464219	Not recorded: Retain
70	Tuart	559	None	Dead	389899.6	6464358.8	125: Remove