Memorandum

Ref: CPS 9448

To: Ryan Mincham

From: Martine Scheltema

CC: Paul West, Tony Carlino, Clare Collett

Date: 27 June 2024

Subject: GEHBI NVCP 9448 Biological Survey Desktop Assessment and Gap Analysis

Introduction

Main Roads Western Australia (Main Roads) submitted an application to the Department of Water and Environmental Regulation (DWER) to clear native vegetation for the Great Eastern Highway Bypass Interchanges (GEHBI) project in 2021 (CPS 9448/1). GEHBI has recently been approved under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) (EPBC 2020/8784).

GEHBI is proposing to clear 23.31 ha of native vegetation including 5.78 ha of SCP20a Threatened Ecological Community (TEC) '*Banksia attenuata* woodlands over species rich dense shrublands' (Critically Endangered), 14.94 ha of Banksia Woodlands of the Swan Coastal Plain Priority Ecological Community (PEC), 23.24 ha of Black-Cockatoo habitat, 2.47 ha of Conservation Category Wetland (CCW) and 12.75 ha of Bush Forever.

Purpose

The biological survey for the GEHBI clearing area was conducted between October 2019 and May 2020, with additional survey work conducted in November 2020. Given the length of time that has lapsed since biological surveys were conducted for GEHBI, DWER has requested that a desktop assessment and gap analysis be undertaken to identify whether additional environmental values need to be considered over and above those reported within Main Roads initial application.

Methodology

Main Roads has conducted a desktop assessment and gap analysis to assess whether the environmental values of the application area for CPS 9448 remain largely unchanged since the biological surveys were undertaken in 2020. This consisted of:

- Analysis of survey methodology to determine if there were any significant changes in how surveys are required to be carried out

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- Assessment of disturbance within the application area since the initial survey
- Desktop assessment of the current Department of Biodiversity, Conservation and Attractions (DBCA) threatened species and communities databases within 5km of the 2020 survey area.
- The results of the 2024 database searches were compared against the findings of the 2020 desktop and field assessments to identify any gaps.

The following terms are used in this document:

- Survey Area - the area surveyed in 2020 by Biota as illustrated in Figure 2.1 of the 2021 Biota Report.
- Study Area - the 2020 survey area plus a 5km buffer.
- Application Area - the CPS 9448 Application area.

Results

Survey Methodology

The 2020 biological survey included a desktop study area which encompassed the survey area plus a 5 km buffer. The entire CPS 9448 application area was surveyed, with the Biota biological survey assessing an area greater than the CPS 9448 application area. An onsite inspection to clarify the boundaries of the Floristic Community Types (FCTs) and ecological communities was conducted by Main Roads and DBCA in October 2020. DBCA (Val English) also reviewed the FCT analysis, as can be seen in the numerous '*pers. comm.*' references in section 5.3 of Biota (2021).

A Detailed or Level 2 Flora and Vegetation Survey was conducted within the application area, which included:

- a single-phase detailed flora and vegetation survey
- targeted significant flora searches
- vegetation mapping
- Threatened Ecological Community (TEC) assessment and TEC/Priority Ecological Community (PEC) mapping
- selected resampling.

A Level 1 (now referred to as a 'basic') Fauna survey and a Targeted Black-Cockatoo assessment were also conducted within the application area.

The approach and methodology of the biological assessment was undertaken in accordance with all relevant legislation and Commonwealth and State guidance, including:

- Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment (Environmental Protection Authority (EPA) 2016a)
- Environmental Factor Guideline: Flora and Vegetation (EPA 2016b)
- Approved Conservation Advice for the Banksia Woodlands of the Swan Coastal Plain ecological community (DotEE 2016)
- Technical Guidance – Terrestrial Fauna Surveys (EPA 2016c)
- EPBC Act referral guidelines for three Threatened black cockatoo species: Carnaby's cockatoo (Endangered) *Calyptorhynchus latirostris*, Baudin's cockatoo (Vulnerable) *Calyptorhynchus baudinii*, Forest red-tailed black cockatoo (Vulnerable)

Calyptorhynchus banksii naso (DSEWPaC 2012).

The Biota (2021) survey met the requirements of EPA (2016a) as there were no constraints or limitations on the survey that would have affected the results and the flora survey findings were reviewed by DBCA. Initially, access restrictions within the survey area were a limitation that impacted on survey timing, however all areas were ultimately accessed. There were no further survey limitations.

The survey methodology for both the flora and vegetation survey and the fauna survey is not considered to have limited the assessment of environmental values. The flora and vegetation survey was conducted in accordance with the EPA guidelines (EPA 2016a) that remain as the current guidelines for flora and vegetation surveys in WA. The fauna survey was conducted in accordance with EPA (2016c) guidelines. These have subsequently been updated (EPA 2020) however, the survey methodology has not significantly changed. FCT analysis for identifying TECs was not done in accordance with DBCA (2024), however it was reviewed and accepted by DBCA experts at the time of survey and analysis and is therefore not a constraint or gap.

Disturbance

No significant disturbance has occurred within the application area since Biota conducted their assessment in 2020. The extent of vegetated areas has not been significantly altered (**Figure 1**).

There have been no significant fires recorded in the survey area. A review of DBCA Fire History dataset (DBCA-060) shows a record of a small fire (<1 ha) occurring within the survey area on 4 December 2019 prior to the Biota (2021) survey. This is not likely to have affected the survey.

Figure 1 - CPS 9448 - Historical Imagery 2020 versus 2024

FOCUSED VISION consulting

Threatened and Priority Ecological Communities

The DBCA Restricted TEC/PEC database search conducted in 2024, identified eight TECs and five PECs occurring within the 5 km study area (**Figure 2**).

Biota (2021) identified four State listed TECs as occurring within the study area of which two were recorded within the survey area (SCP20a and SCP20c). The 2024 DBCA TEC/PEC database search identified eight State listed TECs within the 5 km study area which included the four TECs considered during the 2020 assessment (**Table 1**). It is likely that the reason Biota (2021) did not identify SCP 2, SCP3a, SCP3b and SCP3c in the desktop assessment is because these FCTs were considered unlikely to occur.

The conservation status of six of the eight TECs identified in **Table 1**, has been revised since 2020. The description of these TECs have not changed.

Given the FCT analysis was reviewed by DBCA, it is unlikely that the FCTs identified within the survey area would differ to that previously reported, unless there has been major disturbance to the site or the definition of TECs had changed significantly since 2020. Neither of these has occurred and therefore, it is considered highly unlikely that there is an unidentified TEC within the survey area.

The DBCA Restricted TEC/PEC database search conducted in 2024, identified five State listed PECs within the 5 km study area (**Table 2**). Biota (2021) identified three State listed PECs within the 5 km study area with two of these recorded within the survey area. The two additional PECs identified in the recent database search are unlikely to occur within the survey area. The instances of 'Subtropical and Temperate Coastal Saltmarsh' (P3 PEC) identified in this database search occur along the Swan River, and the P4 PEC, 'Central Northern Darling Scarp Granite Shrubland Community', is found on the Darling Scarp and not on the Swan Coastal Plain (**Figure 2**). No PECs listed in **Table 2** have had their conservation status change since 2020.

Table 1 – Likelihood of Occurrence of Threatened Ecological Communities

Abbrev Identifier	Community Name	2020 Status	2024 Status	Biota (2021) Findings	Commentary
Change in Threatened Status – 2020 - 2024					
SCP 2	Southern wet shrublands, Swan Coastal Plain (floristic community type 2 as originally described in Gibson *et al*. 1994)	Endangered	Critically Endangered	Not previously recorded (Biota 2021)	**Does not occur.** The closest occurrence of this TECis 6 km south of the application area. A limited number of typical and common species present within this TEC have been recorded to occur within the survey area.
SCP 3b	*Corymbia calophylla — Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain (floristic community type 3b as originally described in Gibson *et al.* 1994)	Vulnerable	Endangered	Not previously recorded (Biota 2021)	**Does not occur.** The *Corymbia calophylla – Eucalyptus marginata* woodlands on sandy clay soils of the southern Swan Coastal Plain ecological community (SCP 3b) is characterised by an overstorey of dominated by both *Corymbia calophylla* (Marri) and *Eucalyptus marginata* (Jarrah) (DBCA 2020b). Typical heavy soils associated with this TEC are unlikely to occur within the survey area. One occurrence of SCP 3b occurs within the 5 km study area. DBCA database results did not identify SCP 3b to occur within the GEHBI survey area. Floristic analysis of sampled quadrats and relevés within the GEHBI survey area did not identify the presence of SCP 3b (Biota 2021)
SCP 3c	*Corymbia calophylla — Xanthorrhoea preissii* woodlands and shrublands, Swan Coastal Plain (floristic community type 3c as originally described in Gibson *et al.* 1994)	Critically endangered	Endangered	Not previously recorded (Biota 2021)	**Does not occur.** The SCP 3c community is found on heavy soils on the eastern side of the Swan Coastal Plain between Bullsbrook and Stratham and is dominated by *Corymbia calophylla* and *Xanthorrhoea preissii* occasionally with *Eucalyptus wandoo*. A total of 12 occurrences and/or their buffer occur within the 5 km study area. However, DBCA database results did not identify SCP 3c to occur within the GEHBI survey area. Floristic analysis of sampled quadrats and relevés within the GEHBI survey area did not identify the presence of SCP 3c (Biota 2021)

Abbrev Identifier	Community Name	2020 Status	2024 Status	Biota (2021) Findings	Commentary
SCP 7	Herb rich saline shrublands in clay pans (floristic community type 7 as originally described in Gibson *et al.* 1994)	Vulnerable	Endangered	Not recorded within the survey area (Biota 2021)	**Does not occur.** Three occurrences and/or their buffer occur within the 5 km study area, approximately 2.5 km west of the application area. DBCA database results did not identify SCP 7 to occur within the GEHBI survey area. Floristic analysis of sampled quadrats and relevés within the GEHBI survey area did not identify the presence of SCP 7 (Biota 2021)
SCP 20a	*Banksia attenuata* woodlands over species rich dense shrublands (floristic community type 20a as originally described in Gibson *et al.* 1994)	Endangered	Critically Endangered	Recorded within the survey area (Biota 2021)	**Occurs within survey area.** DBCA database search results identified the presence of SCP 20a occurring within the survey area. Floristic analysis of sampled quadrats and relevés within the GEHBI survey area confirmed the presence of SCP 20a as occurring (Biota 2021)
SCP 20b	*Banksia attenuata* and/or *Eucalyptus marginata* woodlands of the eastern side of the Swan Coastal Plain (floristic community type 20b as originally described in Gibson *et al.* 1994)	Endangered	Critically Endangered	Not recorded within the survey area (Biota 2021)	**Does not occur.** Four occurrences and/or their buffers occur within the 5 km study area. DBCA database results did not identify SCP 20b as occurring within the GEHBI survey area. Floristic analysis of sampled quadrats and relevés within the GEHBI survey area did not confirm the presence of SCP 20b (Biota 2021)
No change in Threatened Status – 2020 - 2024					
SCP 3a	*Corymbia calophylla – Kingia australis* woodlands on heavy soils (floristic community type 3a as originally described in Gibson *et al.* 1994)	Critically Endangered	Critically Endangered	Not previously recorded (Biota 2021)	**Does not occur.** Six occurrences and/or their buffer occur within the 5 km study area. The closest occurrence is approximately 4 km south-west of the application area. DBCA database results did not identify SCP 3a to occur within the GEHBI survey area. Whilst one vegetation unit within the survey area. P2, consists of Marri and *Kingia australis* Woodland, floristic analysis of sampled quadrats and relevés did not show affinity to this FCT (Biota 2021) and therefore none of the defined vegetation units are considered to be representative of this FCT. Typical heavy soils associated with this TEC are unlikely to occur within the survey area.

Abbrev Identifier	Community Name	2020 Status	2024 Status	Biota (2021) Findings	Commentary
SCP 20c	Shrublands and woodlands of the eastern side of the Swan Coastal Plain (floristic community type 20c as originally described in in Gibson *et al.* 1994)	Critically Endangered	Critically Endangered	Recorded within the survey area (Biota 2021).	**Occurs within survey area.** DBCA database search results identified the presence of SCP 20c occurring within the survey area. Floristic analysis of sampled quadrats and relevés within the GEHBI survey area confirmed the presence of SCP 20c (Biota 2021)

Table 2 – Likelihood of Occurrence of Priority Ecological Communities

Community	2020 Status	2024 Status	Biota (2021) Findings	Comments
Banksia Woodlands of the Swan Coastal Plain ecological community	Priority 3	Priority 3	Recorded within the survey area (Biota 2021).	**Occurs within survey area.** Banksia woodlands of the SCP PEC occurs throughout the study and the survey areas. This State listed PEC is synonymous with the Commonwealth-listed Endangered TEC. Biota (2021) has documented the presence of the Commonwealth Banksia Woodlands of the Swan Coastal Plain TEC within the survey area.
Low lying Banksia attenuata woodlands or shrublands (SCP21c)	Priority 3	Priority 3	Previously recorded within survey area (Biota 2021)	**Occurs within survey area.** One occurrence if this PEC intersects the survey area. Floristic analysis of sampled quadrats and relevés within the GEHBI survey area identified the presence of SCP 21c (Biota 2021)
Clay pans of the Swan Coastal Plain (Claypans with mid dense shrublands of *Melaleuca lateritia* over herbs)	Priority 1	Priority 1	May potentially occur (Biota 2021)	**Does not occur.** Biota (2021) desktop assessment determined that this PEC had the potential to occur. Subsequent floristic analysis of sampled quadrats and relevés within the GEHBI survey area identified no FCTs associated with the Claypans (Biota 2021)
Subtropical and Temperate Coastal Saltmarsh	Priority 3	Priority 3	Not previously recorded (Biota 2021)	**Does not occur.** This PEC is considered unlikely to occur. It typically occurs within a relatively narrow margin of the Australian coastline. The physical environment for the ecological community is coastal areas under regular or intermittent tidal influence. There are no coastal or tidal areas within the survey area. The survey area traverses the Helena River, where vegetation has been defined as 'planted vegetation', 'Flooded Gum over Weedy Understorey on Riverbank', 'Flooded Gum over Weedy Grasses on Floodplain' and 'Marri over Melaleuca Low Open Woodland on Clay Pits'.
Central Northern Darling Scarp Granite Shrubland Community	Priority 4	Priority 4	Not previously recorded (Biota 2021)	**Does not occur.** This PEC typically occurs in the central region of the Northern Darling Scarp on deeper loams and red earths on fragmented granite/quartzite. The survey area occurs on the Swan Coastal Plain and does not contain granite, typical of the Darling Scarp. No species typically occurring within this PEC community were recorded Biota (2021).

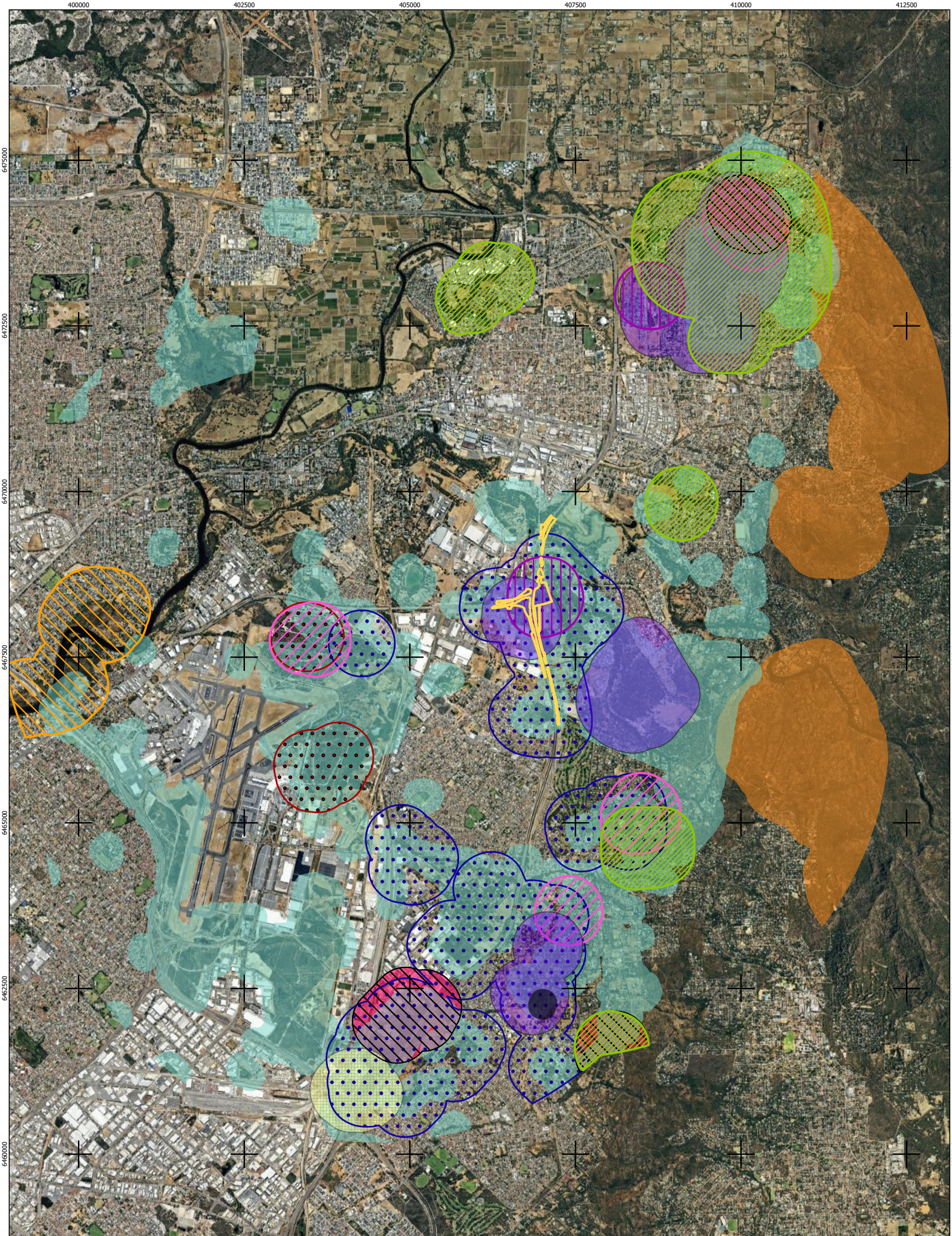

Figure 2 - CPS 9448 - TEC/PEC

Threatened and Priority Flora

The 2024 review of the DBCA Threatened and Priority flora database identified 56 Threatened and Priority flora previously recorded within the 5 km study area (**Figure 3**). The likelihood of occurrence for each species within the survey area was assessed based on criteria outlined in Table 3, including, the age of previous known records, current known distribution, and preferred habitat.

Table 3 - Likelihood of Flora Occurrence Criteria

Criteria	Explanation
Suitable habitat	The likelihood of suitable habitat being present within the survey area was based on known habitat information gathered from DBCA database information, FloraBase (WAH 1998-) and literature sourced from the Species Profile and Threats Database (SPRAT) (DCCEEW 2024) (e.g., recovery plans, conservation advice).
Age of previous records	The age of previous records for significant species resulting from the desktop assessment was evaluated to determine how likely the species was to still occur in the survey area (i.e., habitat of species recorded decades ago may no longer occur or a species may be locally extinct).
Proximity of previous records	The proximity of previous significant flora and vegetation results in relation to the survey area contributed to the likelihood of occurrence conclusions, with those previously recorded close by considered more likely to occur within the survey area. It is noted that species identified from the PMST have not necessarily been recorded within proximity to the survey area and may have resulted due to habitat possibly occurring within the survey area.
Current condition of survey area	All three sections of the survey area are modified and degraded from historic and/or ongoing impacts from partial clearing, vehicle access and/or pastoral activity and these activities have resulted in significant infestation of weeds and erosion. Highly modified and degraded environments usually represent a lower likelihood of the occurrence of significant flora, whilst intact remnants are known to harbour significant species and communities that may have otherwise been cleared or impacted throughout their range.

The likelihood of occurrence assessment determined that three Threatened or Priority flora are known to occur, six taxa may occur, and 47 taxa are unlikely to occur (see **Table 4** – with species "recorded" or "may occur" highlighted).

Three species identified through the 2024 database search as known to occur were recorded as occurring within the survey area during the field assessment (Biota 2021). These species are *Conospermum undulatum* (Vulnerable), *Isopogon autumnalis* (Priority 3) and *Johnsonia pubescens* subsp. *cygnorum* (Priority 2). All Threatened flora species identified through the 2024 DBCA database search were also considered during the 2020 survey.

Thelymitra magnifica was listed a Priority 1 flora in 2020 and was reclassified as a Threatened Species (Critically Endangered) in 2023. This species was determined to be unlikely to occur during the 2020 survey. This species typically occurs on lateritic gravelly loam soils and stony ridges and rocky outcrops of the Darling Scarp and is considered unlikely to occur within the survey area.

Ten Priority flora were identified in the 2024 database search that weren't previously recorded or assessed by Biota (2021). The likelihood of occurrence assessment has determined that four of these species 'may occur', with the other six species being 'unlikely to occur'. Five of those Priority species were listed as Priority in 2020, but were not assessed by Biota (2021). A further five Priority species that were identified in the 2024 database search have been listed as Priority since the 2020 survey.

The following Priority flora were listed and relevant in 2020, but were not assessed:

- *Bolboschoenus fluviatilis* (P1) – may occur
- *Jacksonia gracillima* (P3) – may occur
- *Schoenus benthamii* (P3) – may occur
- *Thysanotus brachiatus* (P2) – unlikely to occur
- *Thysanotus glaucus* (P4) – unlikely to occur

The following Priority flora have been identified in the 2024 database search as having been listed since the 2020 survey:

- *Cyanothamnus tenuis* (P4) – unlikely to occur
- *Drosera patens* (P1) – unlikely to occur
- *Grevillea dissectifolia* (P3) – unlikely to occur
- *Levenhookia preissii* (P1) – may occur
- *Tricostularia drummondii* (P3) – unlikely to occur

Biota (2021) did not consider or conduct a specific targeted survey for any of these ten Priority species during the 2020 survey.

Table 4 - Flora Likelihood of Occurrence

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Change in Threatened Status – 2020 - 2024						
Acacia anomala	Threatened	Vulnerable	Slender, rush-like shrub with several slender stems with 2mm wings, growing from 0.2 to 0.5 m high. Produces yellow flowers in a cylindrical head from August to September.	Brown-grey sandy loam soil with laterite. Slopes.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey. Therefore, considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 4 km south-east of the survey area (1982). No suitable habitat present in the survey area.
Acacia aphylla	Threatened	Vulnerable	Erect, divaricately branched, spinescent, glaucous shrub growing between 0.9 to 2.5 m high. Produces yellow flowers in globular heads from August to October.	Sand, loam, clay loam soils. Granite and laterite outcrops, hills.	Considered as likely to occur in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 1.4 km east of the survey area. No suitable habitat present in the survey area.
Anthocercis gracilis	Threatened	Vulnerable	Erect, spindly, almost leafless shrub growing to 0.6 m high. Produces yellowish-white or yellowish-green flowers from September to October and in April.	Sandy or loamy soils. Granite outcrops, gullies, and slopes with granite on the Darling Scarp.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 4 km south-east of the survey area. No suitable habitat present in the survey area.
Calytrix breviseta subsp. breviseta	Threatened	Critically endangered	Shrub growing from 0.4 to 0.6 m high. Produces purple or pink or mauve flowers from October to November.	Grey/brown sand, sandy loam soils. Swampy flats, slopes.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 0.5 km south-east of the survey area. Recorded within industrial area (Biota 2021). No suitable habitat present within survey area.
Conospermum undulatum	Threatened	Vulnerable	Erect, compact shrub growing from 1.5 to 2 m high with distinctive fibrous, longitudinally fissured stems	Grey or yellow-orange clayey sand soils. Flats and slopes often over	Recorded during field survey (Biota 2021)	**Recorded** during field survey (Biota 2021)

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
			and hairless, wavy leaves to 0.12 m long. Produces white flowers held above the leaves from May to October.	laterite and occasionally in slightly swampy areas.		
Darwinia apiculata	Threatened	Endangered	Densely branched shrub growing to 0.5 m high. Produces 4 to 8 flowers of red to orange and green to yellow colour in terminal clusters in October.	Brown-grey, sandy loam soils with laterite or granite. Ridges, slopes, and flats.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 3.8 km south of the survey area (1982). No suitable habitat present within the survey area.
Diplolaena andrewsii	Threatened	Endangered	Erect shrub growing to 1 m high with densely hairy leaves. Produces pendulous cream flowers with red anthers from July to October.	Loam and clay soils. Granite outcrops and hills on the Darling Scarp.	Considered to not occur in 2020 assessment.	**Unlikely to occur**. Nearest record 3.8 km north-east of the survey area., from historic record (1927). No suitable habitat present within survey area.
Diuris drummondii	Threatened	Endangered	Tuberous, perennial tall orchid growing from 0.5 to 1 m high. Produces 3 to 8 pale yellow flowers from November to January.	Brown sandy clay, moist peat soils. Low lying depressions, swamps	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 4.4 km north-west of the survey area, from historic record (1901) Suitable habitat may be present within the survey area, however it was not recorded during the previous field survey therefore considered unlikely to occur
Macarthuria keigheryi	Threatened	Endangered	Small, erect shrub growing to 0.4 m high with bright yellow to green stems. Leaves mainly at the base of stems and on young growth. Produces flowers with white and green parts from	Open patches of white or grey sandy soil. Winter wet depressions, jarrah, and banksia woodlands.	Considered likely to occur in 2020 assessment, however was not recorded during the field survey therefore considered unlikely post field survey.	**Unlikely to occur**. Nearest record 4.2 km south-west of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
			September to December and February to March.			
Thelymitra magnifica	Priority 1	Critically endangered	Sturdy, erect perennial herb growing to 0.4 m high. Produces red-brown flowers with yellow streaks from March to April and October to November.	Lateritic gravelly loam soil. Stony ridges, rocky outcrops of the Darling Scarp, slopes, and hilltops (old records from Maida Vale-Midland).	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. The closest occurrence is 1.7 km south of the survey area. Suitable habitat unlikely to occur within the survey area.
Trithuria occidentalis	Threatened	Endangered	Tufted annual herb with red leaves growing from 0.02 to 0.05 m high. Produces red flowers from September to October.	Sandy clay soils. Shallow clay pans, winter wet depressions.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 1.7 km north-west of the survey area, from an old historic record (1901). No suitable habitat present within the survey area.
Change in Priority Status – 2020 - 2024						
Cyanothamnus tenuis	Not listed in 2020	Priority 4	Procumbent or erect slender shrub growing between 0.1 to 0.5 m high. Produces white-pink or light blue flowers from August to November.	Pale orange sandy gravel, brown loam, clayey soils, associated with laterite and granite. Outcrops, slopes, and winter-wet areas.	Not previously recorded	**Unlikely to occur**. No suitable habitat present within the survey area. Last recorded 1953.
Drosera patens	Not listed in 2020	Priority 1	Fibrous rooted, perennial herb growing to 0.05 m high with basal rosette of leaves. Produces white flowers from November to January.	Sandy soil. Margins of winter wet depressions, lakes, and wetlands.	Not previously recorded	**Unlikely to occur**. Nearest record 3.5 km north-west of the survey area, from old record (1966). No suitable habitat present within survey area.

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Grevillea dissectifolia	Not listed in 2020	Priority 3	Erect to spreading single stemmed shrub growing to 2 m high. Produces creamy white flowers from April to November.	Sandy loam, sand, loam soils with lateritic gravel. Outcrops, slopes, and flats.	Not previously recorded	**Unlikely to occur**. Nearest record 3.3 km south-east of the survey area. No suitable habitat present within survey area.
Levenhookia preissii	Not listed in 2020	Priority 1	Erect, compact, annual herb growing to 0.1 m high. Produces pink flowers from October to December.	Grey-brown sandy soil. Winter wet areas, undulating plains.	Nil	**May potentially occur**. Nearest record 3.5 km north-west of the application area. Suitable habitat may occur – mixed sedge dampland (vegetation unit L4 Biota 2020). Last recorded 1954
Tricostularia drummondii	Not listed in 2020	Priority 3	Rhizomatous perennial herb to 50 cm x 20 cm. Flowers brown	Low sand ridge, grey sand	Not previously recorded	**Unlikely to occur**. Nearest record 4.8 km north-east of the survey area. No suitable habitat present within the survey area.
No Change in Priority Status – 2020 - 2024						
Acacia drummondii subsp. *affinis*	Priority 3	Priority 3	Erect shrub growing between 0.3 to 1m high. Produces golden to yellow flowers in long cylindrical heads from July to December.	Sandy loam soil. Laterite plateaus and hillsides.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 2.6 km south-east of survey area No suitable habitat present in the survey area.
Acacia oncinophylla subsp. *oncinophylla*	Priority 3	Priority 3	Shrub growing between 0.9 to 2.5 m high with 'minni to ritchi' bark and phyllodes 8 to 13 cm long. Produces yellow flowers in short cylindrical heads from August to October.	Loam soil. Granite outcrops and slopes.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 3 km north-east. No suitable habitat present in the survey area.
Asteridea gracilis	Priority 3	Priority 3	Annual herb growing from 0.15 to 0.35 m high. Produces	Sand, clay, gravelly soils. Slopes and	Considered as potentially occurring in 2020 assessment,	**Unlikely to occur**. Nearest record 5 km south-east of the survey area.

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
			white to pink flowers from September to December.	flats.	however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	No suitable habitat present in the survey area.
Banksia pteridifolia subsp. *vernalis*	Priority 3	Priority 3	Prostrate, lignotuberous shrub growing from 0.4 m high. Produces cream-white and yellow flowers from August to November.	Sand over laterite, sometimes with gravel. Hills, slopes, and flats, sometimes with laterite rocks.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 2 km south of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Beaufortia purpurea	Priority 3	Priority 3	Erect or spreading shrub growing between 0.3 to 1.5 m high. Produces red to purple flowers from October to February.	Lateritic or granitic soils. Rocky slopes.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 1.6 km south of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Bolboschoenus fluviatilis	Priority 1	Priority 1	Tall perennial sedge growing to 2.0 m high. Produces brown flowers in November (likely longer period).	Dark brown sandy clay, grey sandy soils. Wetlands, floodplains, and riparian zones.	Not previously recorded	**May potentially occur**. Nearest record 4.7 km west of the application area. Some suitable habitat recorded within proximity to survey area. WA Herbarium record. Last recorded 2018.
Boronia humifusa	Priority 1	Priority 1	Low, wiry, perennial herb growing from 0.1 to 0.2 m high. Produces pink to red flowers from June to September.	Clayey loam soil with laterite gravel. Ridges, slopes, and flats.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 4.3 km south-west of the survey area. No suitable habitat present within the survey area. Last recorded 2002.
Byblis gigantea	Priority 3	Priority 3	Small, branched perennial herb (or sub-shrub) growing to 0.45 m high. Produces	Grey sandy clay, brown-white sand, loamy soils.	Considered as potentially occurring in 2020 assessment, however it was not recorded	**Unlikely to occur**. Nearest record 3.6 km north-west of the survey area. Suitable habitat considered

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
			purple flowers from September to December or January.	Seasonally wet areas, swamps, and flats.	during the field survey therefore considered unlikely to occur post field survey.	unlikely to be present within the survey area. Known form old historic record (1939).
Calothamnus accedens	Priority 4	Priority 4	Erect and slender shrub growing to 2 m high. Produces pink-red flowers from July to January.	Brown sandy loam soil. Hilltops and slopes.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 1.3 km south of the survey area. Suitable habitat unlikely to occur within the survey area, extensive surveys were not able to locate any records.
Carex tereticaulis	Priority 3	Priority 3	Rhizomatous, tufted perennial sedge growing to 0.7 m high. Produces brown flowers from September to October.	Black peaty sandy soil. Riparian areas.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Known from old historic records (1903). Nearest record 3.6 km north-west of the survey area. No suitable habitat present within survey area.
Darwinia pimelioides	Priority 4	Priority 4	Erect shrub growing to 0.5 m high. Produces red flowers from September to October.	Sand, clay, clayey loam, and gravelly soils, often with granite. Slopes, outcrops, and drainage lines.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 3.8 km north-east of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Eryngium sp. Subdecumbens (G.J. Keighery 5390)	Priority 3	Priority 3	Small, annual or short lived perennial herb growing to 0.1 m high. Produces green-white flowers from September to January.	Grey-white clay soil. Winter-wet clay pans and swamps.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 1.6 km north-west of the survey area, from old historic record (1899). Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Haemodorum loratum	Priority 3	Priority 3	Bulbaceous, erect perennial herb growing between 0.45 to 1.2(to 2) m high. Produces	Sand. Slopes and flats.	Considered as potentially occurring in 2020 assessment, however it was not recorded	**Unlikely to occur**. Nearest record 3.6 km south-west of the survey area. Although suitable habitat

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
			black to dark green flowers from October to November.		during the field survey therefore considered unlikely to occur post field survey.	may occur within the survey area, extensive surveys were not able to locate any records.
Halgania corymbosa	Priority 3	Priority 3	Erect shrub growing between 0.35 to 1 m high. Produces blue to purple flowers from August to November.	Sand, brown loam, clay, laterite gravelly soils. Slopes.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 1.3km north-east of the survey area, from old record (1977). Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Hydrocotyle lemnoides	Priority 4	Priority 4	Aquatic, floating annual herb. Produces purple flowers from August to October.	Permanent water in swamps.	Considered to not occur in 2020 assessment.	**Unlikely to occur**. Nearest record 3.5 km north-east of the survey area, from historic records (1906). No suitable habitat present within survey area.
Hydrocotyle striata	Priority 1	Priority 1	Annual herb growing from 0.1 to 0.3 m high. Produces cream flowers from December (likely longer period).	Sandy peaty soil. Winter wet drainage lines and depressions.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 3.6 km north-east of the survey area, from historic record (1901). No suitable habitat present within survey area.
Isopogon autumnalis	Priority 3	Priority 3	Erect multi stemmed shrub growing from 0.5 to 1 m high. Produces yellow flowers from February to June.	White, grey, yellow sandy soil with laterite gravel. Flats and slopes, rocky.	Recorded to occur during field survey (Biota 2021)	**Recorded** as occurring during field survey (Biota 2021).
Jacksonia gracillima	Priority 3	Priority 3	Prostrate, spreading or scrambling spindly shrub growing from 0.5 to 1 m high and 1 m wide. Produces flowers with yellow, red, and orange parts from October	Sand and loam soils. Wetlands, winter wet flats, slopes, and flats.	Not previously recorded	**May potentially occur**. Nearest record 3.4 km south-east of the application area. Suitable habitat may occur – Melaleuca over sedges (Vegetation unit L1 Biota 2021).

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
			and November.			
Jacksonia sericea	Priority 4	Priority 4	Low spreading shrub growing to 0.6 m high. Produces flowers with yellow and red and orange parts usually from December to February.	Grey to white, yellow or brown sandy loam soils, often associated with limestone. Limestone ridges, slopes, and flats.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 0.7 km west of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Johnsonia pubescens subsp. *cygnorum*	Priority 2	Priority 2	Tufted, perennial, grass like herb (lily) growing to 0.25 m high. Produces greenish cream flowers from September to October.	Grey or yellow sand, sandy clayey soils. Gentle slopes and flats.	Recorded to occur during field survey (Biota 2021)	**Recorded** to occur during field survey (Biota 2021).
Lasiopetalum bracteatum	Priority 4	Priority 4	Erect, open shrub growing to 1.5 m high. Produces pink-purple flowers from August to November.	Sandy clay, clayey soils with lateritic gravel. Drainage lines, creek lines, gullies, and granite outcrops.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 1.4 km east of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records. Last recorded 2008
Lasiopetalum glutinosum subsp. *glutinosum*	Priority 3	Priority 3	Multi stemmed shrub growing from 0.5 to 1 m high. Produces dark pink-purple flowers from September to December.	Brown clay gravel, sandy loam. Outcrops on Darling Scarp, rocky hillsides, and slopes.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 1.3 km south-east of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Lepyrodia curvescens	Priority 2	Priority 2	Dioecious, shortly creeping, tufted rhizomatous herb growing from 0.24 to 0.4 m high. Produces dark red to	Grey sandy loam, sand, clayey sand soils with laterite. Seasonally	Was identified in database search, however was not recorded during the field survey therefore considered	**Unlikely to occur**. Nearest record 0.07 km south-west of the survey area. Although suitable habitat may occur within the survey area,

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
			purple flowers from September to November.	inundated swampland, low rises, and slopes.	unlikely to occur post field survey.	extensive surveys were not able to locate any records. Last recorded 2006.
Meionectes tenuifolia	Priority 3	Priority 3	Semi aquatic annual herb growing to 0.3 m high. Produces orange or red flowers with green from September to December.	Clay, loam soils. Swamps, seasonally wet areas, and valleys.	Considered unlikely to occur in 2020 desktop assessment.	**Unlikely to occur**. Nearest record 1.6 km north-west of the survey area, from historic record (1930). No suitable habitat present within survey area.
Myriophyllum echinatum	Priority 3	Priority 3	Erect, semi-aquatic annual herb growing to 0.03 m high. Produces pink-red flowers from September to November.	Clay. Winter-wet flats and swamps.	Considered unlikely to occur in 2020 desktop assessment.	**Unlikely to occur**. Nearest record 2.1 km west of the survey area. No suitable habitat present within survey area.
Ornduffia submersa	Priority 4	Priority 4	Aquatic floating herb with submerged leaves growing to 0.3 m high. Produces white-cream flowers from August to November.	Black-grey sandy clay. Permanent and seasonally inundated wetlands, swamps and claypans.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 2.7 km south of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Phyllangium palustre	Priority 2	Priority 2	Minute annual herb growing to 0.02 m high. Produces white flowers from October to November.	Clay soil. Winter wet depressions, swamps, and wetlands.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 1.7 km north-west of the survey area, from historic record (1901). No suitable habitat present within survey area.
Pithocarpa corymbulosa	Priority 3	Priority 3	Erect to scrambling, perennial herb growing between 0.5 to 1 m high. Produces white flowers from January to April.	Sandy loam, loamy clay soils with lateritic gravel. Granite outcrops, ridges, and slopes.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 3.1 km east of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Schoenus benthamii	Priority 3	Priority 3	Tufted perennial sedge growing from 0.15-0.45 m high. Produces brown flowers from October to November.	White, grey sand, sandy clay soils. Winter-wet flats and swamps.	Not previously recorded	**May potentially occur**. Nearest record 4.6 km south-west of the application area. Suitable habitat may occur – Melaleuca over sedges (vegetation type L1 Biota 2020). WA Herbarium record. Last record 2018.
Schoenus griffinianus	Priority 4	Priority 4	Small, tufted perennial grass-like herb growing to 0.1 m high. Produces brown flowers from September to October.	White/grey sandy soil. Undulating plains, depressions.	Was found as a recorded species in the 2020 assessment, however was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 0.07 km south-west of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Schoenus pennisetis	Priority 3	Priority 3	Tufted annual sedge growing to 0.1-0.4 m high. Produces purple-black flowers from August to October.	Grey or brown peaty sand, sandy clay soils. Swamps, winter-wet depressions, and flats.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 3.4 km south-west of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Senecio gilbertii	Priority 1	Priority 1	Erect slender perennial herb growing to 1.5 m high. Produces yellow flowers from September to November.	Peaty sandy soil. Swamps and slopes.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 2.2 km south-east of the survey area. No suitable habitat present within survey area.
Senecio leucoglossus	Priority 4	Priority 4	Erect annual herb growing to 1.3 m high. Produces white flowers from August to December.	Brown sandy loam soil. Hilltops and slopes, laterite, and granite.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 3.8 km north-east of the survey area. No suitable habitat present within survey area. Last recorded 1901.

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Sporobolus blakei	Priority 3	Priority 3	Tufted perennial, grass-like or herb, growing from 0.45 to 0.6 m high. Produces green-purple flowers from March to July.	Sandy clay, loamy soils. Flats and creek lines.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 4.3 km south-east of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records. Last recorded 1994.
Stackhousia sp. Red-blotched corolla (A. Markey 911)	Priority 3	Priority 3	Erect caespitose herb 20 cm high. Flowers pale yellow-cream in October-November. Cauline leaves more or less linear	Brown clayey sand over laterite, slope light brown yellow silty gravel, with surface granite, loamy sand near stream, white sandy clay over granite, edges of granite rock.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 4.8 km south-east of the survey area, from a historic record (1897). No suitable habitat present within survey area.
Stylidium longitubum	Priority 4	Priority 4	Erect annual (ephemeral) herb growing from 0.05 to 0.12 m high. Produces pink flowers with white markings from October to December.	Sandy clay, clay soils. Seasonal wetlands.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 2.9 km north-west of the survey area, from historic record (1901). Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.
Stylidium striatum	Priority 4	Priority 4	Erect perennial herb with basal rosette of leaves growing to 0.5 m high. Produces yellow/pale yellow flowers with red/maroon	Yellow/brown sand, sandy clayey loam soils sometimes with gravel. Slopes and flats, laterite.	Considered unlikely to occur in 2020 assessment.	**Unlikely to occur**. Nearest record 2.2 km south-east of the area, from historic record (1957). No suitable habitat present within survey area.

Taxon	2020 WA Cons. Status	2024 WA Cons Status	Description	Preferred Habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
			throat markings from September to November.			
Thysanotus brachiatus	Priority 2	Priority 2	Rhizomatous, leafless perennial, herb, to 0.3 m high. Fl. purple, Nov to Dec. Grey sand.	Sandplain. Dry white sand.	Not previously recorded	**Unlikely to occur**. Nearest record 1.7 km north-east of the survey area from old historic record (1899). No suitable habitat present within the survey area.
Thysanotus glaucus	Priority 4	Priority 4	Erect, tuberous perennial herb growing to 0.2 m high. Produces purple flowers from October to January.	Sandy soil. Undulating terrain.	Not previously recorded	**Unlikely to occur**. Nearest record 1.7 km north of the survey area. No suitable habitat present within the survey area.
Verticordia lindleyi subsp. *lindleyi*	Priority 4	Priority 4	Erect shrub growing from 0.2 to 0.75 m high. Produces pink flowers with white fringes from November to January or May.	Sand, sandy clay soils. Winter-wet depressions.	Considered as potentially occurring in 2020 assessment, however it was not recorded during the field survey therefore considered unlikely to occur post field survey.	**Unlikely to occur**. Nearest record 1.7 km north-west of the survey area. Although suitable habitat may occur within the survey area, extensive surveys were not able to locate any records.

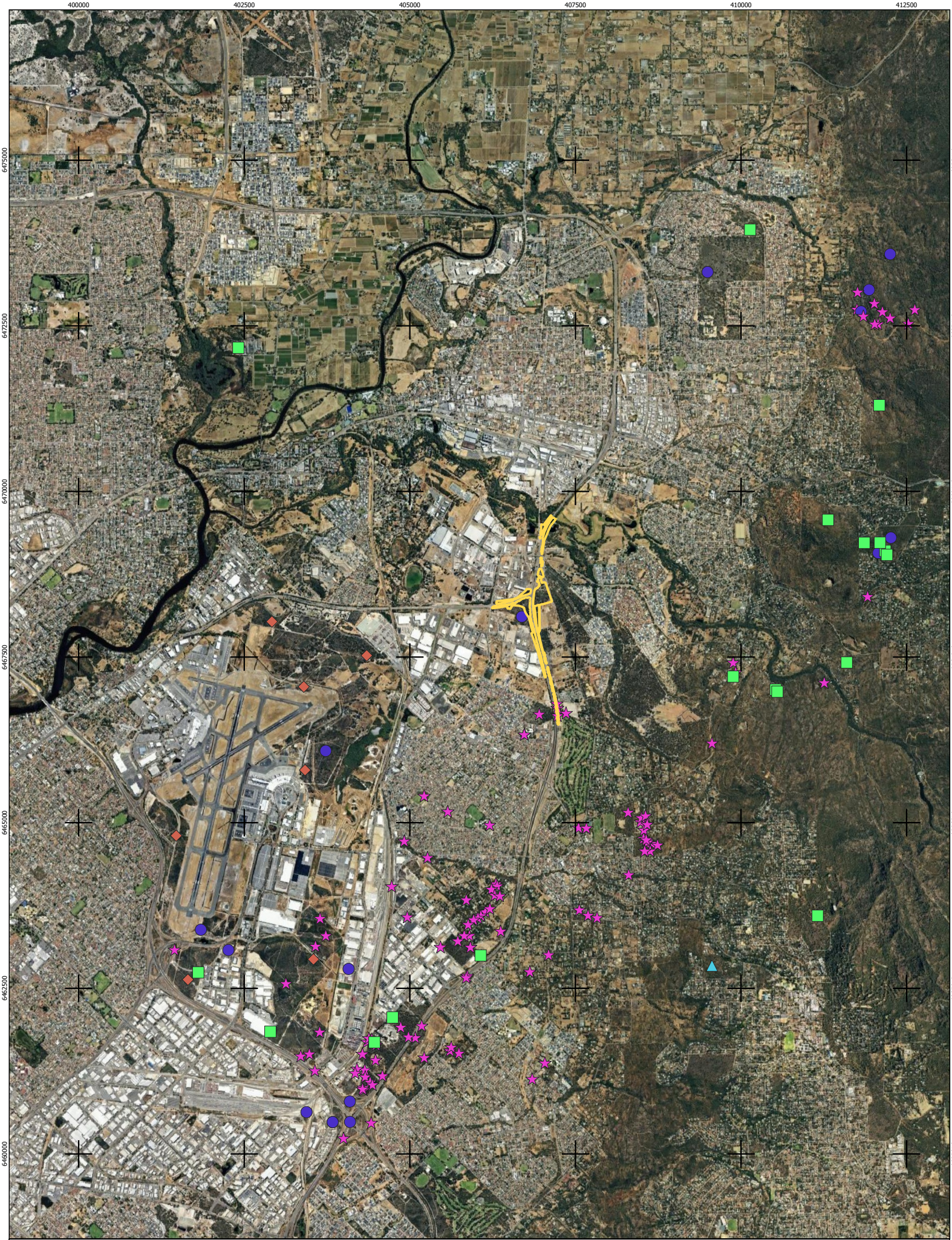

Figure 3 - CPS 9448 - Threatened and Priority Flora

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MRWA24002 04 June 2024

Threatened and Priority Fauna

A review of the DBCA Threatened and Priority fauna database, identified 23 conservation-significant fauna species as potentially occurring within the survey area comprising of 12 birds, five invertebrates, five mammals and one reptile.

The likelihood of occurrence for each conservation significant fauna species identified in the database search was assessed based on the criteria EPA (2020) (Table 5)

Table 5 - Likelihood of Fauna Occurrence Criteria (EPA 2020)

Occurrence Category	Description
Resident	Species with a population permanently present in the survey area.
Regular migrant or visitor	Species that occur within the survey area regularly in at least moderate numbers, such as part of an annual cycle.
Irregular Visitor	Species that occur within the survey area irregularly such as nomadic and irruptive species. The length of time between visitations could be decades but when the species is present, it uses the survey area in at least moderate numbers and for some time.
Vagrant	Species that occur within the survey area unpredictably, in small numbers and/or for very brief periods. Therefore, the survey area is unlikely to be of importance for the species.
Locally extinct	Species that would have been present but have not been recently recorded in the local area and therefore are almost certainly no longer present in the survey area.

Of the 23 conservation-significant fauna species resulting from the desktop assessment database search, seven are considered 'Regular visitors' or 'Migrants', three are considered to be 'Vagrant' and 13 are considered 'Irregular visitors'. These results were based on the proximity and currency of previous records and the suitability of habitat provided within the survey area (**Table 6**).

No conservation significant fauna species identified in the database searches have had any revision of status since the 2020 surveys.

Seven Priority fauna taxa were identified in the 2024 database search that weren't previously recorded or assessed by Biota (2021):

- *Hydroprogne caspia* (Migratory)
- *Pandion haliaetus* (Migratory)
- *Australotomurus morbidus* (Priority 3)
- *Idiosoma sigillatum* (Priority 3)
- *Idiosoma sp.* (Endangered or Priority 3)
- *Synemon gratiosa* (Priority 4)
- *Westralunio carteri* (Vulnerable)

These species are highlighted in **Figure 4** - Priority fauna identified in gap analysis

Table *6* and displayed in **Figure 4**.

Both the Caspian Tern (*Hydroprogne caspia*) and the Osprey (*Pandion haliaetus*) may overfly the survey area, but there is unlikely to be suitable habitat within the survey area for these species. No further survey is warranted for these species.

A targeted survey for *Westralunio carteri* (Carter's Freshwater Mussel) (Vulnerable) was conducted by Biologic in 2022 following a request for additional information by DWER to Main Roads. This species is considered to have been adequately surveyed for, and was recorded within and adjacent to the survey area.

The Biota (2021) desktop assessment identified three significant invertebrate species that may occur within the 5 km study area, but it was reported that these were outside the scope of the study and are not discussed further in their report.

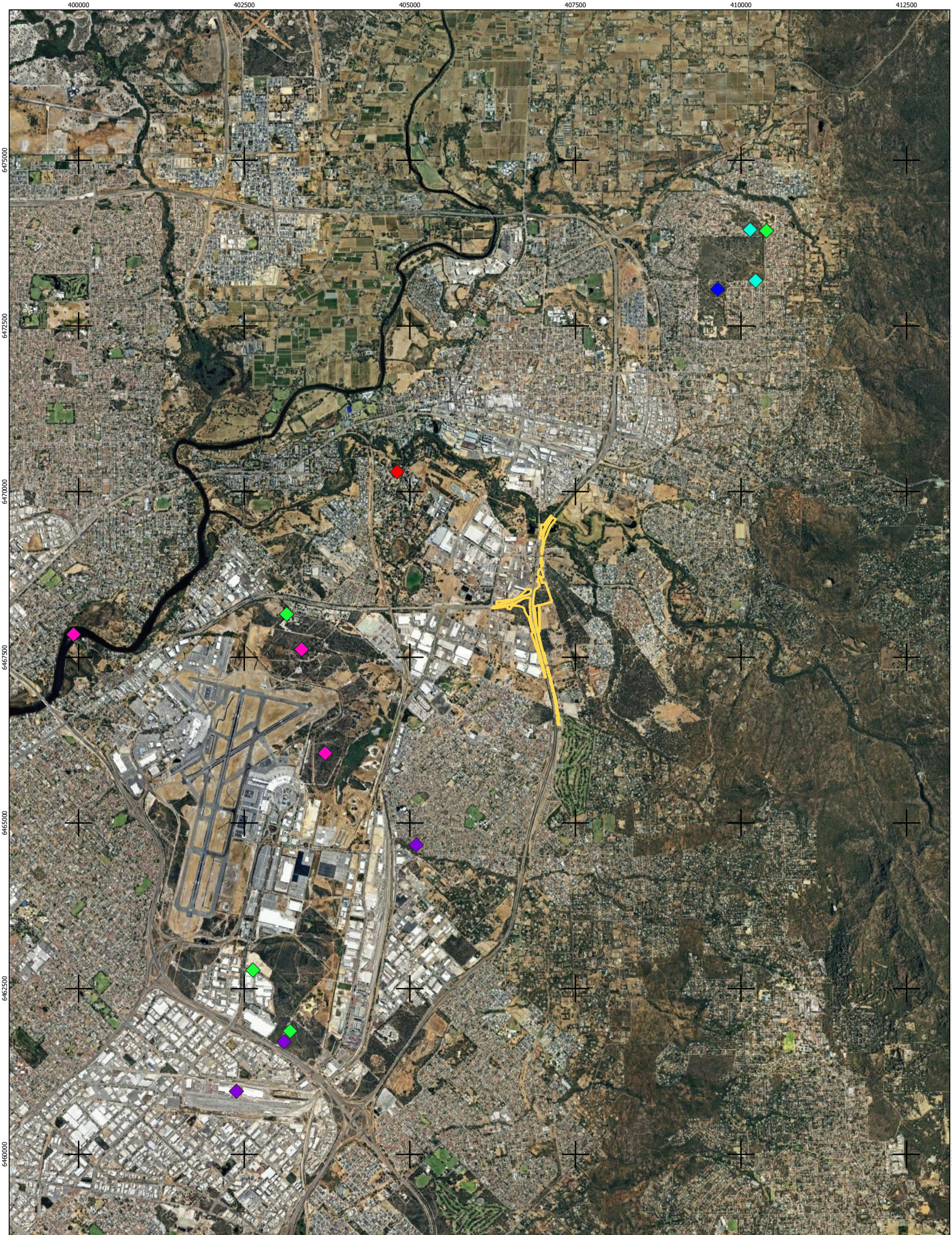

Figure 4 - CPS 9448 - Priority Fauna Identified in Gap Analysis

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Table 6 - Fauna Likelihood of Occurrence

Taxon	Common name	2020 WA Cons status	2024 WA Cons status	Preferred habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Considered in 2020						
Cacatua pastinator pastinator	Muir's Corella	Conservation dependent	Conservation dependent	Endemic to south-west WA, restricted to area around Lake Muir inland from Albany. Eucalypt forests and woodlands and lone trees along paddocks. Feeds on corms, tubers and seeds from native and introduced plants. Breeds in marri and jarrah, and less so flooded gum, yate and paperbark.	Considered unlikely to occur in 2020 assessment.	Irregular visitor – Six occurrences within the 5 km study area. Suitable habitat does not occur within the survey area.
Calyptorhynchus banksii naso	Forest Red-tailed Black-Cockatoo	Vulnerable	Vulnerable	Sub species endemic to south-west WA, from north of Perth and east to Mount Helena, Christmas Tree Well, North Banister to Albany. Inhabits dense jarrah, karri and marri forests receiving more than 600 mm average rainfall annually. Feeds primarily on marri seeds and jarrah fruit, also feed on blackbutt, karri, sheoak, snottygobble and hakea, and exotic spotted gum and cape lilac. Breed in large hollows of old eucalypts, generally marri trees (Chapman 2008).	Considered likely to occur in pre - field assessment. Recorded during Biota field survey.	**Regular visitor** – known to occur (Biota 2021). Numerous occurrences within the 5 km study area. Suitable species habitat present.
Falco peregrinus	Peregrine Falcon	Other specially protected	Other specially protected	Widespread globally. Arid shrublands, coastal heath to alpine. Cliffs along coasts, rivers and inland ranges and woodlands near watercourses and lakes, and occasionally nest on high city buildings (Australian Museum 2019).	Considered likely to occur in 2020 assessment	**Regular visitor** – numerous occurrences within the 5 km study area. Suitable habitat occurs within the survey area.
Ixobrychus flavicolis	Black Bittern (SW population)	Priority 2	Priority 2	The Black Bittern inhabits both terrestrial and estuarine wetlands, generally in areas of permanent water and dense vegetation. Where permanent water is present, this species may occur in flooded grassland, forest, woodland, rainforest and mangroves.	Considered as not occurring during 2020 assessment.	Irregular visitor – one occurrence within the 5 km study area recorded in 1903. No suitable habitat occurs within the survey area.
Oxyura australis	Blue-billed Duck	Priority 4	Priority 4	South-west WA and south-east Australia. Inhabits wetlands, permanent bodies of water, swamps and rivers with dense vegetation	Considered unlikely to occur during 2020 assessment	Irregular visitor – Seven occurrences within the 5 km study area. No suitable habitat occurs within the survey area.

Taxon	Common name	2020 WA Cons status	2024 WA Cons status	Preferred habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Plegadis falcinellus	Glossy Ibis	Migratory	Migratory	Widespread across Australia. Inhabits shallow freshwater swamps, marshes and mud flats, rivers, occasional coastal locations (DCCEEW 2023a).	Considered as potentially occurring during 2020 pre and post field survey assessments.	Irregular visitor – one occurrence within the 5 km study area. Suitable habitat may occur within the survey area.
Thalasseus bergii	Crested Tern	Migratory	Migratory	Widespread around Australia. Generally coastal areas, occasional arid interior ().	Considered as not occurring during 2020 assessment	Irregular visitor –6 occurrences within the 5 km study area. No suitable habitat occurs within the survey area.
Tringa nebularia	Common Greenshank	Migratory	Migratory	Worldwide. Inhabits coastal shorelines, wetlands. Arrives in West Australia from August and moves north in two waves around February and March before returning to breeding ground in Eurasia.	Considered as unlikely to occur during 2020 assessment	Irregular visitor – two occurrences within the 5 km study area. No suitable habitat within the survey area.
Zanda baudinii	Baudin's Black-Cockatoo	Endangered	Endangered	Endemic to south-west WA, from Gidgegannup to Albany, east to Mount Helena, Wandering, Quindanning and Kojonup. Inhabit temperate forest and woodland of jarrah, marri and karri forest. Feed on marri, banksia, hakea and jarrah, and fruit orchids and pine plantations. Breed in large hollows of old eucalypts, particularly karri, marri, wandoo, tuart and bullich (Chapman 2008).	Considered likely to occur during 2020 assessment.	**Regular visitor** –numerous occurrences within the 5 km study area. Suitable habitat occurs within survey area.
Zanda latirostris	Carnaby's Black-Cockatoo	Endangered	Endangered	Endemic to south-west WA, from Cervantes north of Perth, south along the coastline to Esperance and inland east over the Darling Scarp. Inhabits forests, woodlands, heathlands, farms; feeds on banksia, hakea and marri, pine plantations. Breed in large hollows of old eucalypts, particularly salmon gum and wandoo, and more recently jarrah and marri on the Darling scarp and tuart on the coast (DPAW 2013).	Considered likely to occur in pre - field assessment and recorded during field survey.	**Regular visitor** –known to occur (Biota 2021). Numerous occurrences within the 5 km study area. Suitable habitat occurs within survey area.

Taxon	Common name	2020 WA Cons status	2024 WA Cons status	Preferred habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Dasyurus geoffroii	Chuditch, Western Quoll	Vulnerable	Vulnerable	Restricted to south-west WA. Inhabits jarrah forests and woodlands in the south-west, woodlands, mallee shrublands and heaths along the south coast and wheatbelt. Extinct from the Swan Coastal Plain (DEC 2012a).	Considered unlikely to occur during 2020 assessment	Vagrant –11 occurrences occur within the 5 km study area. No suitable habitat occurs within the survey area.
Hydromys chrysogaster	Water-rat, Rakali	Priority 4	Priority 4	Widespread around Australia. Coastal, variety of aquatic environments, streams, rivers, lakes, dams, and estuaries (Menkhorst and Knight 2011).	Considered unlikely to occur during 2020 assessment	**Regular visitor** - 12 occurrences within the 5 km study area. Suitable habitat occurs within survey area.
Isoodon fusciventer	Quenda, Southwestern Brown Bandicoot	Priority 4	Priority 4	Wide but patchy distribution near south-west coast from Guilderton north of Perth to Esperance. Inhabits dense scrubby, often swampy, vegetation with dense cover, often associated with wetlands on the Swan Coastal Plain. Feeds in adjacent open or cleared forest and woodland and pasture (DEC 2012b).	Considered likely to occur in pre - field assessment and recorded during field survey.	**Regular visitor**. Numerous occurrences within the 5 km study area. Suitable habitat occurs within the survey area.
Phascogale tapoatafa wambenger	South-western Brush-tailed Phascogale, Wambenger	Conservation dependent	Conservation dependent	Sub species endemic to south-west WA. Inhabits semi-arid zone, dry sclerophyll eucalypt forest and woodland (Menkhorst and Knight 2011).	Considered unlikely to occur during 2020 assessment.	Vagrant – two occurrences within the 5 km study area between 2018 and 2022. Suitable habitat may be available within the survey area.
Pseudocheirus occidentalis	Western Ringtail Possum, Ngwayir	Critically endangered	Critically endangered	Endemic to south-west WA. Inhabits undisturbed coastal heath, jarrah/marri woodland and forest, peppermint woodlands, myrtaceous heaths and shrublands, Bullich (*Eucalyptus megacarpa*) dominated riparian zones and karri forest.	Considered as not occurring during 2020 assessment.	Vagrant – three occurrences within the 5 km study area the survey area. No suitable habitat occurs within the survey area.
Pseudemydura umbrina	Western Swamp Tortoise	Critically endangered	Critically endangered	Endemic to south-west WA, restricted to 2 remnant populations on the Swan Coastal Plain. Inhabits shallow ephemeral wetlands on clay soils of the Swan Coastal Plain and permanent waterbodies (DCCEEW 2023b)	Considered as not occurring during 2020 assessment.	Irregular visitor – numerous occurrences within the 5 km study area. No suitable habitat occurs within the survey area.

Taxon	Common name	2020 WA Cons status	2024 WA Cons status	Preferred habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Not Considered in 2020						
Hydroprogne caspia	Caspian Tern	Migratory	Migratory	Worldwide. Coastal, large wetlands and estuaries (Higgins and Davies 1996)	Not previously recorded	Irregular visitor – one occurrence within the 5 km study area. No suitable habitat occurs within the survey area.
Pandion haliaetus	Osprey	Migratory	Migratory	Worldwide. Inhabits inshore waters, bays, coastal islands and cliffs, beaches, rivers, estuaries and Mangroves (Simpson and Day 1989).	Not previously recorded	Irregular visitor –12 occurrences within the 5 km study area. No suitable habitat occurs within the survey area.
Australotomurus morbidus	Cemetery Springtail, Guildford Springtail	Priority 3	Priority 3	Endemic to south-west WA. Long undisturbed native grasslands and heathlands at low elevations (Greenslade and Jordana 2014)	Not previously recorded	Irregular visitor – one occurrence within the 5 km study area. No suitable habitat occurs within the survey area.
Idiosoma sigillatum	Swan Coastal Plain Shield-backed Trapdoor Spider	Priority 3	Priority 3	Jarrah and marri woodland, semi-arid woodlands of the Swan Coastal Plain.	Not previously recorded	Irregular visitor – one occurrence within the 5 km study area. Suitable habitat likely to occur.
Idiosoma sp.	Trapdoor Spider	Endangered or Priority 3	Endangered or Priority 3	Semi-arid woodlands	Not previously recorded	Irregular visitor – one occurrence within the 5 km study area.
Synemon gratiosa	Graceful Sunmoth	Priority 4	Priority 4	Endemic to WA, mostly restricted to the Swan Coastal Plain. Inhabits banksia woodland containing host plant *Lomandra hermaphrodita* and coastal heath containing *Lomandra maritima* (TSSC 2013).	Not previously recorded	**Regular visitor** – one occurrence within the 5 km study area. Suitable habitat occurs within the survey area.

Taxon	Common name	2020 WA Cons status	2024 WA Cons status	Preferred habitat	2020 Likelihood of Occurrence	2024 Likelihood of Occurrence
Westralunio carteri	Carter's Freshwater Mussel	Vulnerable	Vulnerable	Endemic to south-west WA. Avon and Blackwood rivers, freshwater rivers and streams of SW WA (Klunzinger *et al.* 2015).	Not previously recorded	Irregular visitor –5 occurrences within study area. Biologic (2022) undertook a targeted CFM survey and did not record any within the survey area. No suitable habitat occurs within the survey area.

Conclusion

A desktop assessment and gap analysis was undertaken to assess whether there is likely to be any change in the environmental values of the GEHBI survey area since biological surveys were undertaken in 2020, and reported in Biota (2021). This gap analysis involved a review of current DBCA databases to identify potential Threatened and Priority species and ecological communities occurring within 5 km of the 2020 survey area. The results of the 2024 database searches were then compared against the findings of the Biota (2021) survey to identify any gaps. Where gaps were identified, Main Roads assessed the likelihood of occurrences within the survey area.

There has been no significant disturbance within the application area since the biological survey was undertaken by Biota in 2020 that would lead to a significant change in the environmental values on the ground.

Key findings of the gap assessment identified that since Biota completed its biological survey:

- No new TECs nor PECs are expected to occur with the application area.
- No new Threatened Flora species are likely to occur within the application area.
- Based on the habitat present, four new Priority flora species "may occur" with the application area. However, given the degraded nature of the application area (i.e. over 80% of the vegetation within the survey area is in Completely Degraded to Good Condition), it is considered unlikely these species will actually occur and therefore additional surveys are not considered necessary.
- Noting the original survey did not consider invertebrate fauna, seven Priority fauna taxa were not identified or assessed in 2020 (two birds and five invertebrate taxa), as follows:
    - Two bird species have records of occurrence within 5 km of the survey area, however, whilst these species are likely to overfly the survey area, no critical habitat is present.
    - Carter's Freshwater Mussel has been sufficiently surveyed following DWER's previous request for further information on the species.
    - No suitable habitat occurs within the survey area for *Australotomurus morbidus* (Priority 3)
    - Of the remaining three Threatened and Priority invertebrate taxa not assessed in 2020, two are considered "Irregular Visitors". Only the P4 Graceful Sunmoth, *Synemon gratiosa,* is considered to be a regular visitor.

Should you require further information or clarification regarding the information provided in this report, please contact Clare Collett on (08) 9323 6368 or by email at clare.collett@mainroads.wa.gov.au.

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