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Flora & Fauna Significance Assessment

Brookfield Estate, Margaret River

18 October 2021

Prepared for:
RPS AAP Consulting Pty Ltd

Limitations Statement

This report has been prepared in accordance with the Agreement between Ecosystem Solutions Pty Ltd and RPS AAP Consulting Pty Ltd ("**Client**"). It has been solely prepared for a to inform a clearing application for a sewer extension at Brookfield Estate, Margaret River ("**Site**").

Information

In undertaking this work the authors have made every effort to ensure the accuracy of the information used. Unless otherwise stated in the report, Ecosystem Solutions Pty Ltd has not independently verified such information and cannot guarantee its accuracy or completeness.

Conclusions

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RPS AAP Consulting Pty Ltd

Brookfield Estate, Margaret River

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1 Introduction

Ecosystem Solutions were contracted by RPS AAP Pty Ltd to survey an area of Brookfield Estate, Margaret River for a proposed sewer extension (hereafter called the "Site") within the Shire of Augusta-Margaret River. A survey was undertaken to document the presence and distribution of flora and fauna on the Site to facilitate clearing of vegetation on the Site.

The purpose of this report is to identify flora, fauna and assess vegetation values within the Site.

The fauna species specifically targeted are conservation significant species with known breeding to occur within the area, Western Ringtail Possum (*Pseudocheirus occidentale*) and Black Cockatoo Species (*Calyptorhynchus baudinii*, C. *latirostris and C. banksii subsp. naso*). Other conservation significant fauna likely to occur within the proposed area of disturbance have also been considered.

The flora elements specifically targeted include Threatened and Priority species and Threatened or Priority Ecological Communities.

This flora and fauna assessment was limited to observing species identifiable and present during the time of the surveys.

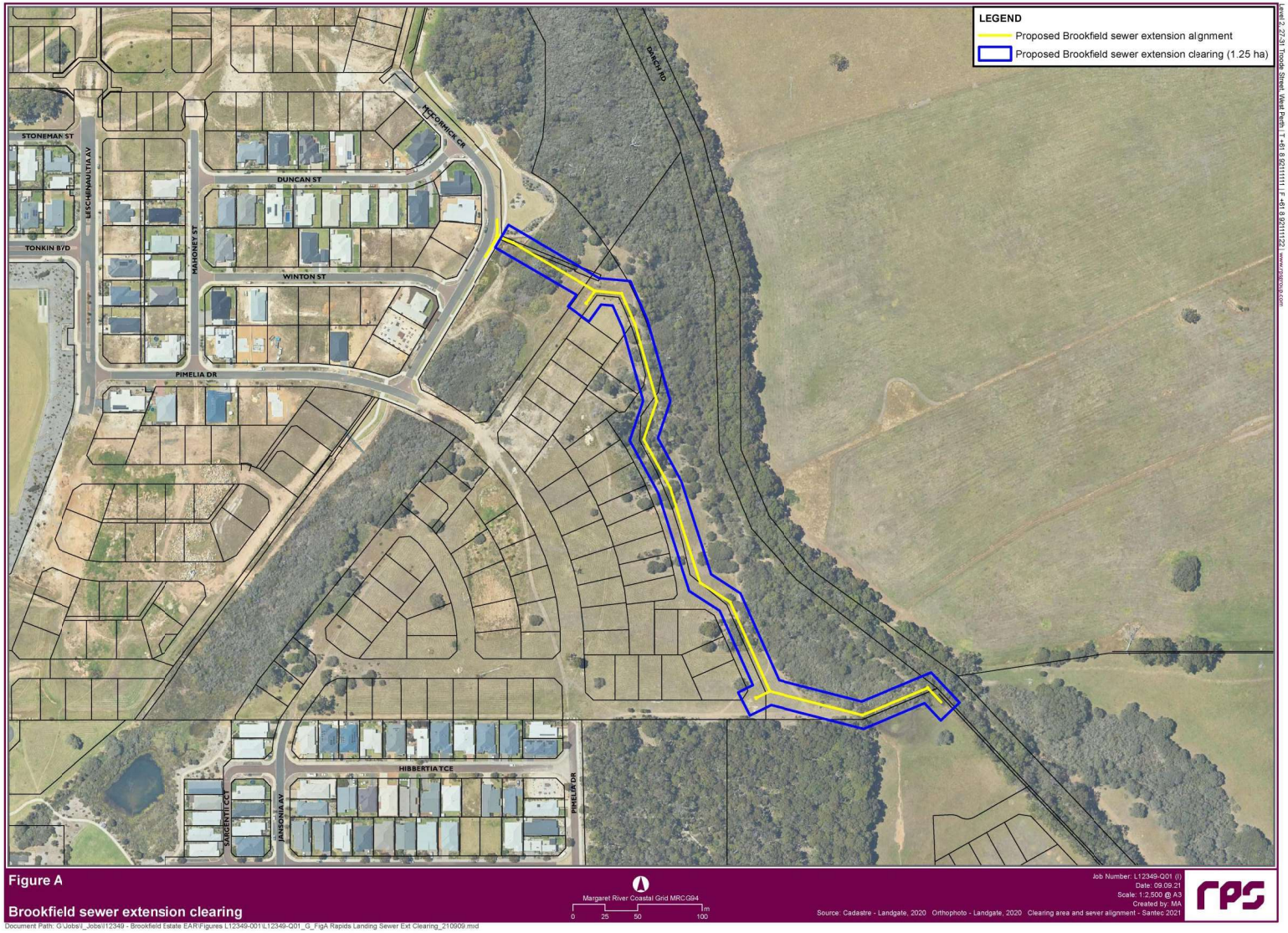

Figure 1 Extent of Works Plan for the Brookfield Estate Sewer extension

2 Site Details

The Site is located within Lot 9014, along the eastern portion of Pimelia Drive, Margaret River. The extent of works is approximately 1.25 ha (Figure 1 above) and comprises areas that have previously been cleared, along with smaller patches of remnant vegetation concentrated in the wetter areas of the Site.

The Site sits at approximately 80m AHD and slopes gently down to Darch Brook, which runs along the eastern boundary of the Site. The central coordinates of the Site are 33º 57' 56" S, 115º 05' 30" E.

3 Flora and Vegetation

3.1 Desktop analysis

3.1.1 Landscape, soils and vegetation

Soil-Landscape systems are areas with recurring patterns of landforms, soils and vegetation and are used by the Department of Agriculture to maintain a consistent approach to land resource surveys (DAFWA, 2007).

The Site is entirely within the Leeuwin Zone, which is defined as:

- Leeuwin Block (tectonic geology), moderately dissected lateritic plateau on granite. Colluvial soils in the valleys. On the western margin the granite is overlain by Tamala Limestone and there are some coastal dunes (DPIRD, accessed October 2021).

There is one soil landscape system represented on the Site, the Cowaramup Uplands System:

- Cowaramup Uplands System (216Co) - Lateritic plateau, in the Leeuwin Zone. Sandy gravel, loamy gravel and grey sandy duplex. Jarrah-marri forest.

Soil systems are further divided into mapping units. The soils within the Site are identified as:

- Cowaramup wet vales Phase - 216CoCOvw - Small, broad U-shaped drainage depressions with swampy floors. Gravelly duplex (Forest Grove) soils on sideslopes and poorly drained alluvial soils on valley floor (Figure 2).

The majority of the Site has been historically cleared, with only a small amount of remnant vegetation remaining. Havel and Mattiske (1990) complex mapping describes a small area of Cowaramup Valleys Cw1 that intersects the south eastern extent of the Site. Cowaramup Uplands are also in proximity to the Site (Figure 2).

- Cowaramup valleys (Cw1) – Mixture of open forest to woodland of *Eucalyptus diversicolor* - *Corymbia calophylla* and woodland of *Eucalyptus marginata* subsp. *marginata* – *Corymbia calophylla* on slopes and low woodland of *Melaleuca preissiana* – *Banksia littoralis* on depressions in the hyperhumid zone.
- Cowaramup uplands (C1) – Open to tall open forest of Eucalytpus marginata subsp. marginata – Corymbia calophylla – Banksia grandis on lateritic uplands in the hyperhumid zone.

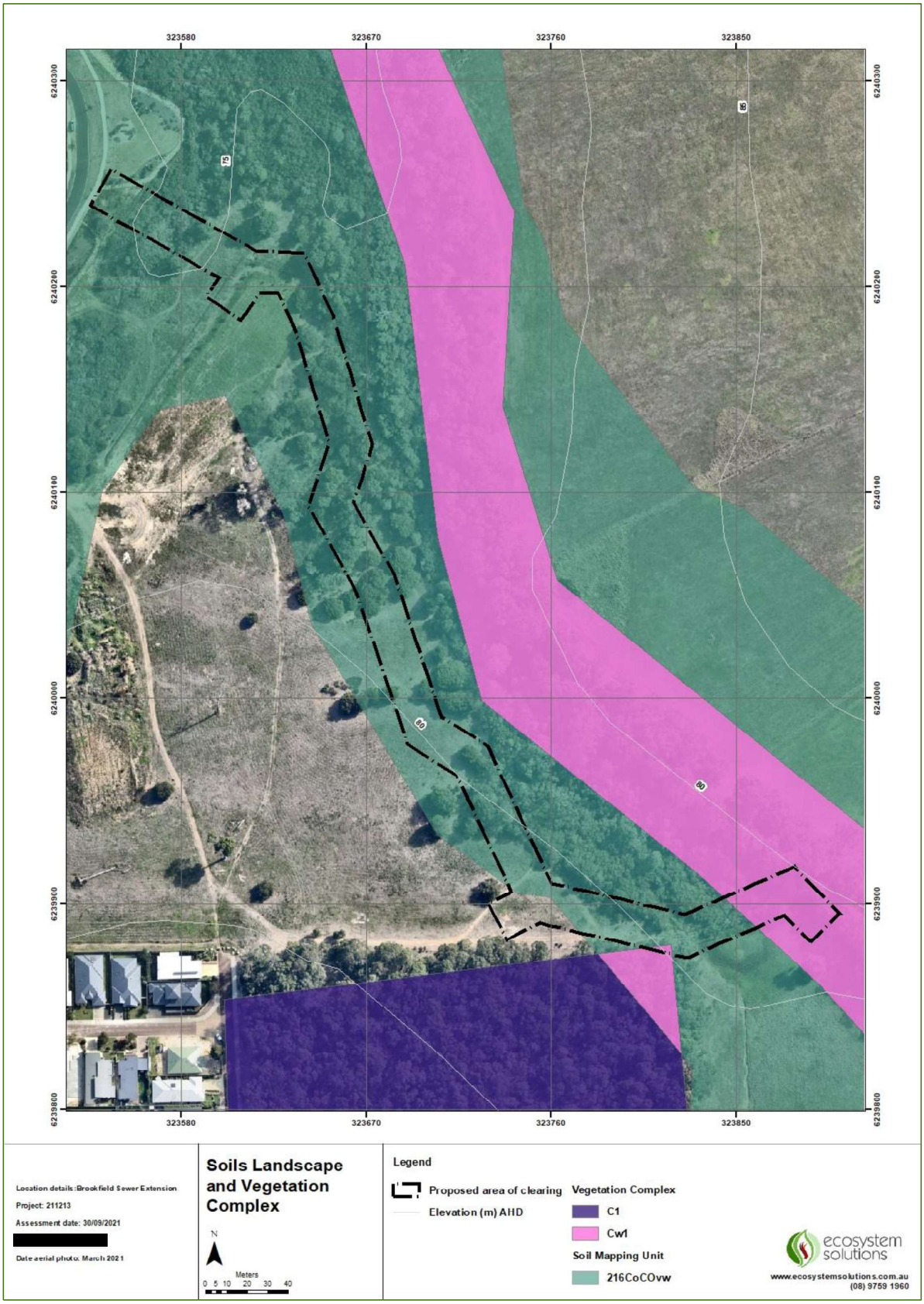

Figure 2 Soil-Landscape and Vegetation Complex Mapping for Brookfield Sewer extent of works

3.1.2 Threatened and Priority Flora

Extracts from the Department of Biodiversity, Conservation and Attractions (DBCA) NatureMap Database (Appendix A) and the Commonwealth Environmental Protection and Biodiversity Conservation (EPBC) Protected Matters Search Tool (Appendix B) were obtained, using a 10 km buffer from the Site, to determine if records of any rare or threatened flora are known within the boundary or surrounding the Site.

Appendix C presents the definitions for conservation codes under the *Biodiversity Conservation Act (2016)* which was previously the *Wildlife Conservation Act 1950*.

3.2 Field Survey

The Site was surveyed on 30th September 2021 by [redacted] from Ecosystem Solutions.

The Site was walked in a systematic manner to cover the entire area. Zones with consistent vegetation structure and composition were noted and the main species in each of the strata were identified and recorded through relevés (Figure 3, Appendix D). The condition of the vegetation based on Keighery (1994) was also recorded using Global Positioning System (GPS) (Figure 3).

3.2.1 Threatened and Priority Flora

The NatureMap Database identified three Threatened species and thirteen Priority listed species within a 10 km radius of the Site. The Protected Matters Search Tool identified ten threatened species, within a 10 km radius of the Site. Two of those are considered Critically Endangered, six Endangered and two Vulnerable (Appendix A & B). Extracts of the conservation significant flora database from DBCA were also obtained within a 10km radius of the Site, with an additional four Priority species added to the list of potential species. Table 2 summarises the conservation significant flora known to occur within 10 km of the Site, with a total of 10 Threatened and 17 Priority flora species previously recorded.

A spring flora survey was conducted across the Site. No Threatened or Priority flora species were observed.

Table 1 Conservation significant flora species known to occur within 10 km of the Site

Species	DBCA Conservation Code	EPBC Act Status	Life Form	Habitat	Likelihood of occurrence within the proposed development area
Caladenia lodgeana	T	Critically Endangered	Herb	Black loamy soils	Unlikely to occur within the Site. DBCA record 2.5km north west of the Site is from 1979 and is a manual entry. Currently only known from locations near Augusta (Brown et al., 2013).
Calectasia cyanea	T	Critically Endangered	Herb	White, grey or yellow sand, gravel.	Unlikely to occur, DBCA records with a 20km buffer do not include any records of this species. Species distribution appears to be east of Denmark (Florabase, accessed October 2021)
Banksia nivea subsp. uliginosa	T	Endangered	Shrub	Sandy Clay, gravel. Occurs in two areas, near Busselton and Scott River Plain on clay over laterite in thick scrub, in winter wet southern ironstones.	Unlikely to occur, habitat not present.
Caladenia excelsa	T	Endangered	Herb	White, grey or brown sands, sandy loams, loam, clay, laterite and granite. Hilltops, ridges, slopes, swales and low plains in deep pale yellow or grey sandy soils.	Unlikely to occur, all recent records of Caladenia excelsa are over 5km to the west of the Site. The only in closer proximity is from 1979, with the coordinates used a manual input. It is not expected that this species occurs within the Site.

Species	DBCA Conservation Code	EPBC Act Status	Life Form	Habitat	Likelihood of occurrence within the proposed development area
Caladenia hoffmanii	T	Endangered	Herb	Clay, loam, laterite, granite. Rocky outcrops and hillsides, ridges, swamps and gullies. Confined to the Geraldton sandplains.	Unlikely to occur, DBCA records with a 20km buffer do not include any records of this species. It's distribution is recorded as between Geraldton and the Murchison River (Brown et al., 2013) and it is presumed to be an error that it is included in the PMST search results.
Caladenia huegelii	T	Endangered	Herb	Grey or Brown sand, clay loam. Current distribution confined to Dunsborough and north of Busselton.	Unlikely to occur, DBCA records with a 20km buffer do not include any records of this species. This species is found on the Swan Coastal Plain and is unlikely to occur within the Site.
Gastrolobium papilio	T	Endangered	Shrub	Sandy clay over ironstone and laterite. Flat plains. Species is restricted to Hithergreen and Walsall area in Busselton	Unlikely to occur, habitat not present and DBCA records with a 20km buffer do not include any records of this species.
Lambertia echinata subsp. *occidentalis*	T	Endangered	Shrub	White sandy soils over laterite, orange/brown-red clay over ironstone. Flats to foothills, winter wet sites	Unlikely to occur, habitat not present and DBCA records with a 20km buffer do not include any records of this species.
Banksia squarrosa subsp. argillacea	T	Vulnerable	Shrub	White/grey sand, gravelly clay or loam. Winter -wet flats, clay flats. Confined to the western base of the Whicher scarp, east of Busselton	Unlikely to occur, habitat not present.
Drakaea micrantha	T	Vulnerable	Herb	Brown loamy clay. Winter-wet swamps, in shallow water.	Species or species habitat likely to occur within area. Closest record is 9km to the north east of the Site.

Species	DBCA Conservation Code	EPBC Act Status	Life Form	Habitat	Likelihood of occurrence within the proposed development area
Deyeuxia inaequalis	P1		Grass	Loam, sand, creeklines	Potential to occur. Closest record 6km to the south of the Site.
Synaphea macrophylla	P1		Shrub	Gravelly Loam	Unlikely to occur, habitat not present. Closest record is over 5km to the south of the Site.
Synaphea sp. Redgate Road	P1		Low Shrub	Dry grey sands	Potential to occur. Can be identified outside of flower season. Closest record over 7km to the south of the Site.
Amperea micrantha	P2		Herb	Black peaty sand, clay, swamps, creeks	Potential to occur. Closest record nearly 8km to the north west of the Site.
Xyris maxima	P2		Herb	Black peaty sand, drainage flats	Unlikely to occur, habitat not present Closest record 3.5km to the east of the Site.
Acacia inops	P3		Shrub	Black peaty sand, clay, swamps, creeks. Grows along watercourses and swamps	Unlikely to occur, habitat not present Closest record 1.5km to the north of the Site, however this record is from 1898 and the location will be inaccurate.
Dampiera heteroptera	P3		Herb or Shrub	Sandy soils, swampy areas	Potential to occur. Closest record 10km to the north of the Site.
Gastrolobium formosum	P3		Shrub	Clay loams, along river backs or in swamps	Unlikely to occur, habitat not present Closest record 2km to the north west of the Site.

Species	DBCA Conservation Code	EPBC Act Status	Life Form	Habitat	Likelihood of occurrence within the proposed development area
Grevillea brachystylis subsp. *brachystylis*	P3		Shrub	Black sand, sandy clay. Swampy situations.	Unlikely to occur, habitat not present Closest record nearly 10 km to the north of the Site.
Grevillea manglesioides subsp. ferricola	P3		Shrub	Red sandy clay over ironstone. Winter wet flats	Unlikely to occur, habitat not present Closest record nearly 10 km to the north of the Site.
Juncus meianthus	P3		Herb	Black sand, sandy clay, seepage areas	Unlikely to occur, habitat not present Closest record 2.5 km to the east of the Site.
Pimelea ciliata subsp. longituba	P3		Shrub	Grey sand over clay loam	Potential to occur. Closest record over 7km to the north of the Site.
Pultenaea pinifolia	P3		Shrub	Loams or clay, floodplains, swampy areas	Unlikely to occur, habitat not present Closest record 2 km to the north west of the Site, however this is a manual entry from 1973. Other records are all over 10km to the north east of the Site.
Stylidium lowrieanum	P3		Herb	Sand or sandy loam over limestone in peppermint woodlands	Potential to occur. Closest record 2 km to the north west of the Site.
Eucalyptus marginata x megacarpa	P4		Tree	Sandy loam. Interdunal areas.	Unlikely to occur, habitat not present Closest record 8 km to the south west of the Site.

Species	DBCA Conservation Code	EPBC Act Status	Life Form	Habitat	Likelihood of occurrence within the proposed development area
Franklandia triaristata	P4		Shrub	White or grey sand	Potential to occur. Closest record 3 km to the north of the Site, however this is a manual entry from 1991 and likely to be inaccurate.
Gahnia sclerioides	P4		Shrub	Jarrah forest on loam, sandy soils, often along creek lines. Moist shaded situations	Potential to occur. Closest record 1.4 km to the north of the Site.

3.2.2 Vegetation Communities

The extract obtained from the DBCA database identified one Threatened Ecological Community (TEC) and one Priority Ecological Community (PEC) occurring within 10 km of the Site:

- Rimstone Pools and Cave Structures Formed by Microbial Activity on Marine Shorelines (Endangered)
- Melaleuca lanceolata forests, Leeuwin Naturaliste Ridge (Priority 2).

Relevés were completed within the Site, with location noted in Figure 3 and data collected presented in Appendix D. During the Site assessment the remnant vegetation within the Site was observed to comprise of two communities (described according to Keighery, 1994, adapted Muir (1977) and Aplin (1979), Appendix D – Table 7) of:

- Vegetation Community A – *Corymbia calophylla* open woodland over *Agonis flexuosa* and Corymbia calophylla low open forest over *Agonis flexuosa, Hovea elliptica* and *Hakea amplexicaulis* tall open shrubland over *Acacia myrtifolia, Taxandria linearifolia* and *Agonis flexuosa* shrubland over *Taxandria linearifolia, Acacia myrtifolia* and *Hibbertia hypericoides* low open shrubland over *Loxocarya cinerea* sedgeland.
- Vegetation Community B – *Corymbia calophylla* scattered trees over *Melaleuca viminea, Taxandria linearifolia* and *Agonis flexuosa* tall closed scrub over *Leptocarpus* sp. sedgeland.

The vegetation communities within the Site do not have the characteristics of any TEC or PECs.

Vegetation Community A occupies just under 0.5 ha of the Site, with Vegetation Community B, concentrated in the seasonally wet areas to the north and south, being just under 0.25 ha in area (Figure 3).

Figure 3 Vegetation Communities and Relevé locations at Brookfield Sewer Extension

3.2.3 Vegetation Condition

Areas of vegetation were assessed within the Site to determine the vegetation condition condition according to the scale of condition developed by Keighery (1994, Table 2).

The majority of the Site has been previously cleared and the condition reflects this, with the majority of the Site Degraded or Completely Degraded, having been parkland cleared and lacking in native understorey species. The wetter areas of the Site have regenerated well over the last decade, and are of Good and Very Good condition, with weeds being the biggest disturbance within these areas (Figure 4).

Table 2 Keighery Condition Scale (Keighery 1994)

Category	Description
Pristine	Pristine or nearly so, no obvious signs of destruction.
Excellent	Vegetation structure intact, disturbance affecting individual species and weeds are non-aggressive species. For example, damage to trees caused by fire, the presence of non-aggressive weeds and occasional vehicle track.
Very Good	Vegetation structure altered, No obvious signs of disturbance. For example, disturbance to vegetation structure caused by repeated fires, the presence of some more aggressive weeds, dieback, logging and grazing.
Good	Vegetation structure significantly altered by very obvious signs of multiple disturbances. Retains basic vegetation structure or ability to regenerate to it. For example, disturbance to vegetation structure caused by very frequent fires, the presence of some very aggressive weeds at high density, partial clearing, dieback and grazing.
Degraded	Basic vegetation structure severely impacted by disturbance. Scope for regeneration, but not to a state approaching good condition without intensive management. For example, disturbance to vegetation structure caused by very frequent fires, the presence of very aggressive weeds, partial clearing, dieback and grazing.
Completely Degraded	The structure of the vegetation in no longer intact and the area is completely or almost completely without native species. These areas are often described as “parkland cleared” with the flora composing weed or crop species with isolated native trees or shrubs.

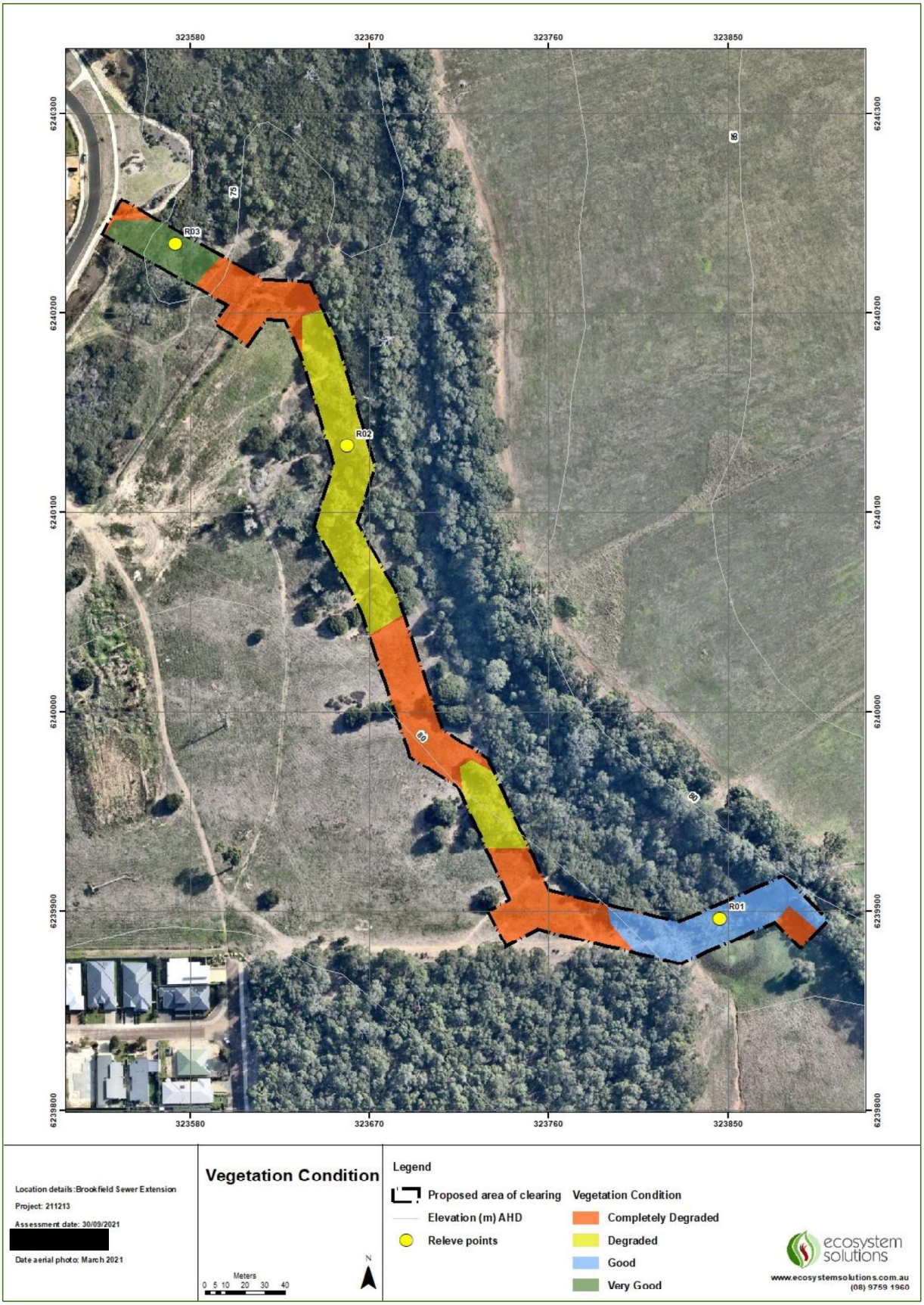

Figure 4 Vegetation Conndition Map for Brookfield Sewer

4 Fauna

4.1 Desktop Analysis

The conservation status of fauna within Western Australia is determined by criteria outlined within two acts of legislation: Commonwealth EPBC Act 1999 and the State-based Western Australian *Biodiversity Conservation Act 2016* (WA). The conservation codes for fauna under the *Biodiversity Conservation Act (2016)* which was previously the *Wildlife Conservation Act 1950* are presented in Appendix C. These categories are consistent with the International Union for Conservation of Nature (IUCN) classifications and therefore link into a global ranking system for taxa at risk of extinction.

A desktop study and analysis of the records of NatureMap and the Protected Matters Search Tool (Appendix A & B) were made to determine the presence or likely presence of fauna or fauna assemblages within the Site. The analysis primarily targeted terrestrial threatened vertebrate species listed under the *Biodiversity Conservation Act 2016* (WA) and *Environmental Protection Biodiversity Conservation Act 1999* (Commonwealth). A list of fauna expected to occur within a 10-kilometre radius of the Site was compiled from searches conducted on the DBCA database (NatureMap) and the Commonwealth EPBC Protected Matters Search Tool.

Marine species and freshwater fish have been excluded due to the location of the Site. Invertebrates have also been excluded as this is a specialist area not covered under the Scope of this report. The results of the native fauna database search for species known to be within or utilising the Site are listed below (Table 3).

Table 3 Conservation significant fauna species recorded within 10 km of the Site

Species	Conservation Status		Preferred Habitat	Likelihood of occurrence within the proposed clearing area.
	DBCA Conservation Code	EPBC Act Status		
Pseudocheirus occidentalis Western Ringtail Possum	Threatened	Critically Endangered	Coastal Areas of Peppermint woodland and peppermint woodland and peppermint / tuart associations.	Species or species habitat known to occur within area (PMST). Naturemap database has multiple close records less than 1km around the site, collected in 2017, 2016, 2013 and 2012. Likely to occur within the Site.
Botaurus poiciloptilus Australasian Bittern	Threatened	Endangered	Wetlands with tall, dense vegetation, favours permanent and seasonal freshwater habitats, dominated by sedges rushes and reeds, growing over a muggy or peaty substrate.	Species or species habitat may occur within area (PMST). Naturemap database closest record is over 50km northeast of the site.
Atrichornis clamosus Noisy Scrub-bird	Threatened	Endangered	Dense vegetation, including low forest, scrub/thicket and (rarely) heath. These vegetation formations generally occur in the gullies and drainage lines of hills and granite mountains and, in lowland areas, in overgrown swamps, lake margins and beside streams.	Naturemap database closest record is over 5.5km south of the site.
Bettongia penicillata subsp. *ogilbyi*	Threatened	Endangered	Open forest and woodland with low understory of woody scrub. Woodlands	Species or species habitat known to occur within area (PMST). Naturemap database closest record

Woylie			and adjacent heaths with a dense understorey of shrubs. Tall eucalypt forest and woodland, dense myrtaceous shrubland, kwongan or mallee heath.	is over 5.4km north of the site, collected in 2010.
Calyptorhynchus baudinii Baudin's Cockatoo	Threatened	Endangered	Dense Jarrah, Karri and Marri forests. Species nest in large hollows in these species.	Breeding known to occur within area (PMST). Naturemap database closest record is approximately 1.2km south of the site, collected in 2000.
Calyptorhynchus latirostris Carnaby's Cockatoo	Threatened	Endangered	Dense Jarrah, Karri and Marri forests. Species nest in large hollows in these species.	Species or species habitat known to occur within area (PMST). Naturemap database closest record is approximately 2.4km west of the site, collected in 2006.
Myrmecobius fasciatus Numbat	Threatened	Endangered	Eucalyptus forest and woodlands with abundant hollow logs and branches.	Naturemap database closest record is approximately 1.1km southeast of the site, collected in 1993.
Calyptorhynchus banksii subsp. naso Forest Red-tailed Black Cockatoo	Threatened	Vulnerable	Dense Jarrah, Karri and Marri forests. Species nest in large hollows in these species.	Species or species habitat known to occur within area (PMST). Naturemap database closest record is approximately 3.3km southeast of the site, collected in 2016.
Dasyurus geoffroii Chuditch	Threatened	Vulnerable	Variety, most dense in riparian jarrah forests. Require large, unfragmented habitats.	Species or species habitat known to occur within the area (PMST). Naturemap database closest record is approximately 2.5km northeast of the site, collected in 2016.
Leipoa ocellata	Threatened	Vulnerable		

Malleefowl			Semi-arid to arid shrublands and low woodlands dominated by mallee and/or acacia.	Naturemap database closest record is approximately 2.2km west of the site, collected in 1976.
Macrotis lagotis Bilby	Threatened	Vulnerable	Open tussock grassland on uplands and hills, Acacia aneura (mulga) woodland/shrubland growing on ridges and rises, and hummock grassland in plains and alluvial areas.	Naturemap database closest record is approximately 8.1km east of the site, collected in 1926.
Psophodes nigrogularis subsp. nigrogularis Western Whipbird	Threatened	Vulnerable	Occurs in heath-like thicket associations on coastal dunes and in low, dense mallee woodland or shrubland with understorey of dense, stunted shrubs.Preferred habitat is thicket, 2-3m high of varied floristic composition.	Species or species habitat likely to occur within area (PMST). Naturemap database closest record is approximately 5.7km north of the site, collected in 1902.
Setonix brachyurus Quokka	Threatened	Vulnerable	Mainly dense riparian vegetation, other areas with dense vegetated understort with close proximity to freshwater.	Naturemap database closest record is approximately 3.1km west of the site, collected in 1933.
Potorous platyops Broad-faced Potoroo	Extinct		Unknow.	Presumed extinct.
Falco peregrinus Peregrine Falcon Australian Peregrine Falcon	Specially Protected		Wide variety. Prefers coastal and inland cliffs or open woodlands near water.	Naturemap database closest record is approximately 4.1km east of the site, collected in 2006. Species may visit the Site on occasion.

Phascogale tapoatafa subsp. wambenger South-western Brush-tailed Phascogale	Specially Protected	Highly arboreal, prefers open forest with sparse groundcover.	Naturemap database closest record is approximately 1.6km northeast of the site, collected in 2010. Species may visit the Site on occasion, however there are larger areas of more suitable habitat in proximity to the Site.
Tyto novaehollandiae subsp. *novaehollandiae* Masked Owl	P3	Tall open eucalypt forest and woodlands. Preferred roosts large hollows in standing trees.	Naturemap database closest record is approximately 5km southeast of the site, collected in 2004. Species may visit the Site on occasion, however there are larger areas of more suitable habitat in proximity to the Site. Hollows within large Corymbia calophylla trees may provide roosting habitat.
Hydromys chrysogaster Rakali	P4	Found near permanent fresh or braskish waters.	Naturemap database closest record is approximately 1.6km southwest of the site, collected in 2016. Species may occur within the wet areas of the Site and adjacent Darch Brook.
Isoodon fusciventer Quenda	P4	Forest, woodland, shrub and heath, usually in sandy soils with dense healthy vegetation in lower stratum.	Naturemap database closest record is approximately 2.3km north of the site, collected in 2015. Species likely to occur within the thicker areas of Vegetation Community B.
Notamacropus irma Western Brush Wallaby	P4	Favours open, seasonal damp areas with low grasses and open scrubby brush.	Naturemap database closest record is approximately 2.6km northeast of the site, collected in 1999.

The NatureMap Database identified 12 Threatened species, one Extinct species, three Specifically Protected species and four Priority listed species within the 10 km radius of the Site. The Protected Matters Search Tool identified eight threatened species, within a 10 km radius of the Site. One of which is a Critically endangered species, four Endangered species and three Vulnerable species.

Analysis of the results of the database searches show that conservation significant mammal species likely to be within or utilising the Site include *Pseudocheirus occidentalis* (Western Ringtail Possum), Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale) and *Isoodon fusciventer* (Quenda).

The three Black Cockatoo species, *Calyptorhynchus banksii* subsp. *naso* (Forest Red-tailed Black Cockatoo), *Calyptohrynchus baudinii* (Baudin's Cockatoo) and *Calyptorhynchus latirostris* (Carnaby's Cockatoo) or species habitat are also likely to occur within the Site.

Other fauna of conservation significance may use the site infrequently or as part of a larger patch, such as birds and fauna that rely on the wetland. Impacts to these species are considered negligible due to the small area of vegetation to be removed.

4.2 Field Survey

With these species in mind, a field study of the site was conducted. The approach adopted for this survey was:

- A Satellite Image of the Site was acquired.
- A daytime visual inspection of the property and adjoining vegetation for any signs of fauna (e.g. scats, diggings, dreys, nests, burrows, feeding signs) was conducted.
- Hollow bearing trees or trees suitable for Black Cockatoos were recorded.
- Direct observations of fauna and signs of fauna were recorded using a Trimble Global Positioning System (GPS) and ArcPad© (Version 8- ESRI).
- Two dawn and two dusk surveys were conducted to determine Black Cockatoo, Western Ringtail Possum and Phascogale activity. A 40 w LightForce hand-held spotlight was used with white light to observe nocturnal mammals. Observations were recorded using GPS and ArcPad©.
- Field observations were analysed and mapped with ArcGis (ArcMap V10.3©).

The Site was inspected via a walked transect and the trees were inspected via a physical inspection for hollows or signs of fauna usage.

All trees with large hollows were inspected for any signs of use by cockatoos. These include wear around the hollow, chewing, scarring and scratch marks on the trunks or branches. Old or recent evidence of cockatoo's feeding or roosting sites (feathers, droppings etc.) were also searched for.

This type of survey has minimal impact on the fauna within the property and provides sufficient data on the presence and relative abundance and distribution of taxa. During the field surveys, the habitat at the site was assessed to determine its potential suitability to host any of the anticipated threatened or rare species. This approach is consistent with a Level 1 survey under the EPA's Technical Guidance: Sampling methods for Terrestrial vertebrate fauna (2016) which specifies a minimum requirement of a desktop study to gather information on the subject site and a reconnaissance survey to verify the accuracy of the background study and delineate fauna and faunal assemblages.

The survey's protocol is also consistent with the requirements outlined in the Development Planning Guidelines for Western Ringtail Possums (CALM 2003, now DBCA).

The draft referral guideline for the three threatened black cockatoo species (Department of Environment and Energy, 2017) outline requirements for appropriate level of surveys for these species. This survey's intensity and design comply with these guidelines.

4.3 Results

Dawn and dusk surveys were conducted for any sign of Black Cockatoos, Western Ringtail Possums, Phascogales and any other conservation listed species, as described in Table 4. Surveys were conducted by [redacted] from Ecosystem Solutions.

Table 4 Fauna survey times and observations

Survey Type	Date and Time	Sunrise / Sunset Time	Observations
Dawn	6 October 2021 4.50am -7.00am	5.50 am	No animals observed, Black Cockatoo species heard to the northeast of the site at approximate location shown in Figure 5.
Dawn	7 October 2021 4.45am -7.00am	5.48 am	No animals observed, Black Cockatoo species heard to the northeast of the site at approximate location shown in Figure 5.
Dusk/Nocturnal	7 October 2021 5:30 pm to 9:30 pm	Sunset 6:26 pm Last light 6:52 pm	Two Western Ringtail Possums and one Quenda were observed during this survey. This location of these is shown in Figure 5. No Black Cockatoos were observed, however they were heard to the north of the Site, with approximate location shown in Figure 5.
Dusk/Nocturnal	12 October 2021 5:30 am to 8:45 am	Sunset 6:30 pm Last light 6:55 pm	One Western Ringtail Possum was observed during this survey. No Phascogales, Quenda or other significant fauna were observed during this survey. Although not observed during the survey, Black Cockatoos were heard calling in proximity to the Site.

During the day survey on 30 September 2021, the canopy of the vegetation within the Site was thoroughly inspected. No dreys were observed. Quenda diggings were noted to the south of the

Site.

Four trees on the Site had a diameter at breast height (DBH) over 500 mm, representing trees that may be suitable to support nesting of Black Cockatoo species (Figure 5, Appendix E). One of these trees had observable hollows., and two others that were just outside of the proposed clearing area had potential hollows. No animals were observed utlising these trees during the dawn or dusk/nocturnal surveys.

All three species of Black cockatoos can forage over extensive areas (up to 15-20 kms from their nesting sites (Saunders, 1980)) and given that there are large areas of habitat within their range, and the proposed area for clearing is small, it could be assumed that Black Cockatoo species are not relying on the Site for habitat or food source.

Three Western Ringtail Possums and one Quenda were observed during the two surveys on 7 and 12 October. The location of the Western Ringtail Possums, Quenda and Quenda diggings are shown in Figure 5.

While no other animals of significance were observed, either directly or through signs, the lack of this data should not be taken directly as an indication that those species are absent from the Site. No trapping or seasonal sampling was conducted.

Table 3 above summarises the likely presence of the conservation significant species identified in the desktop searches. Table 7 and Table 8 discuss the likely presence and impact on Western Ringtail Possums and Black Cockatoos.

Figure 5 Conservation Significant Fauna Locations at Brookfield Sewer

Figure 6 Significant Trees surveyed at Brookfield Sewer

5 Survey Constraints

Survey limitations are summarised in Table 5 and 6 below:

Table 5 Summary of flora survey limitations

Constraint	Impact	Comment
Availability of contextual information at a regional and local scale	Nil	Broad scale vegetation and soil mapping data were available. DBCA, NatureMap and PMST database extracts for conservation significant flora and ecological communities were obtained.
Competency / experience of the survey team	Nil	The ecologists leading the field surveys have conducted numerous flora surveys across the south west of Western Australia and have over 20 years' experience. The ecologist completing the flora identifications has over 10 years experience identifying Western Australian flora, including for numerous surveys across the south west.
Proportion of flora recorded and/or collected, any identification issues	Minor	A focus was placed on identifying any potential conservation significant flora species, with these specimens all identified to species level. Specimens that were not potentially conservation significant species have been identified to genus level, or species where this is easily ascertained.
Was the appropriate area fully surveyed (effort and extent)	Nil	Three relevés were conducted across the Site, with the entire Site surveyed on foot for Conservation Significant vegetation communities and flora species
Access restrictions within the survey area	Nil	All parts of the Site were accessible by foot.
Survey timing, rainfall, season of survey	Nil	The survey was conducted in Spring, the appropriate season for surveying flora in the south west.
Disturbance that may have affected the results of the survey, such as fire, flood or clearing	Nil	There were no disturbances that constrained the survey of the Site.

Table 6 Summary of fauna survey limitations

Constraint	Impact	Comment
Availability of data and information	Nil	DBCA, NatureMap and PMST database extracts for conservation significant fauna were obtained. The Site is within a well surveyed area, where Ecosystem Solutions has had previous experience.
Competency / experience of the survey team, including experience in the bioregion surveyed	Nil	The ecologists leading the field surveys have conducted numerous fauna surveys across the south west of Western Australia and have over 20 years' experience.
Scope of the survey, e.g. where faunal groups were excluded from the survey	Minor	This survey focussed on birds, mammals and other vertebrate species. Invertebrates were not included in the scope of this survey.
Timing, weather and season	Nil	The surveys were conducted in September and October, the optimum time for bird and mammal surveys in the south west.
Disturbance that may have affected results, e.g. fire, flood	Nil	There were no disturbances that constrained the survey of the Site.
The proportion of fauna identified, recorded or collected	Nil	Yes, all conservation significant fauna species observed during the surveys have been identified.
Adequacy of the survey intensity and proportion of survey achieved, e.g. the extent to which the area was surveyed	Nil	The whole of the Site was surveyed on foot for Conservation Significant fauna species, during daytime, dawn and dusk / nocturnal surveys.
Access problems		All parts of the Site were accessible by foot.

Field surveys were confined to one day flora/fauna survey, two dawn fauna surveys and two dusk / nocturnal fauna spotlight survey. These were conducted to assess for Black Cockatoo, Western Ringtail Possum and Phascogale activity, along with any other conservation significant fauna. All surveys were conducted using an experienced ecologist, with a head torch and a single hand-held spotlight used for the nocturnal fauna surveys.

The site was traversed by foot in a systematic way, with a focus placed on the area of impact.

All large trees of suitable size were examined from the ground for the presence of hollows. Guidelines for the survey techniques for Black Cockatoo species (DSEWPC, 2011) state that all trees with a DBH of over 500 m should be inspected. It should be noted however, that all the prerequisites that determine the suitability of a hollow for use by cockatoos are difficult to assess. In addition to entrance size, the depth, floor, and orientation of the hollow are important factors. The presence of suitable hollows, even in breeding areas, does not make them available for breeding as hollows must be spatially, structurally, and temporally correct (Johnstone and Johnston, 2004). The listing of potential nesting hollows is therefore likely to be an over estimation of those suitable.

Western Ringtail Possums are arboreal nocturnal species (DBCA, 2017). They use up to 2-7 rest sites and up to 20 throughout the year. Rest sites can be within a tree hollow or drey, built in various tree canopies. In suburban areas, they may also rest in roof spaces and other dark cavities. Their home range is less than 5 ha. There are constraints in surveying Western Ringtail Possums due to the time they may arise from their rest site. Their home range may overlap the survey area, with a rest site being used outside the Site during the survey times.

There are constraints in monitoring flora which include some annual species that do not appear every season, with the survey limited to identifying only those flora that appear during the survey times. The survey was completed in September, which is the optimal flowering time for many species. However, not all species flower every year, limiting the ability to detect flora species.

6 Significance

Under the EPBC Act, an action that has, will have, or is likely to have, a significant impact on a matter of national environmental significance, requires approval from the Minister. A significant impact is defined as an impact which is important or of consequence, having regard for its context or intensity (Commonwealth of Australia, 2009).

Matters of environmental significance include listed threatened species and ecological communities. For this proposal, there is a limited potential for impact on threatened species. Significant Impact Guidelines 1.1 (Commonwealth of Australia, 2009) lists significant impact criteria for the assessment for activities which may impact on threatened species.

Table 7 and Table 8 discuss the referral triggers and the likely presence and impact on Black Cockatoos and Western Ringtail Possums.

Table 7 Significant Impact Criteria for Key Protected Species

Significant Impact Criterion	Discussion		Meets Criterion
	Black Cockatoo Species	Western Ringtail Possum	
Lead to a long-term decrease in the size of an important population[1] of a species	There is a potential that Black Cockatoos are utilising the trees for foraging due to the species of trees present on Site. There is a potential that the significant trees with observed or potential hollows could be utilized for breeding. No direct evidence of foraging, nesting or roosting were observed at the time of survey. It is unlikely that the species is solely reliant on the site for habitat or food resources. The extent of works is considered small and negligible to the population. Therefore, the long-term decrease of an important population of the species is highly unlikely.	A population of Western Ringtail Possums reside on the Site with three individuals sighted within remnant vegetation that is proposed to be cleared. During the clearing works, an approved DBCA fauna handler will be engaged to relocate any captured fauna within 200m of a capture point. This will reduce the likelihood of a long-term decline in population.	No

[1] *An 'important population' is a population that is necessary for a species' long-term survival and recovery.*

Reduce the area of occupancy of an important population	There is a small reduction in area occurring with the removal of the scattered trees. Any population using the Site is not relying on it for survival.	There is a small reduction in area occurring, with the removal of vegetation within the Site totally approximately 0.72 ha. There is vegetation adjacent to the Site that will remain. The population within this Site is not relying on this vegetation for survival.	No
Fragment an existing important population into two or more populations	Will not fragment current population.	Will not fragment current population.	No
Adversely affect habitat critical to the survival of a species	Will not affect critical habitat, as there is additional, better-quality habitat that will remain in close proximity to the Site.	Will not affect critical habitat, as there is additional, better-quality habitat that will remain in close proximity to the Site.	No
Disrupt the breeding cycle of an important population	Will not affect critical habitat as there were no cockatoos observed within the Site.	Vegetation adjacent to the Site will remain, breeding cycles will not be disrupted. The presence of an approved DBCA fauna handler during any clearing works will decrease the likelihood of disruption to any WRP within the Site.	No
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	A slight decrease in trees above 500 mm DBH will occur, however this is likely to only be two trees, possibly four.	A slight decrease in foraging habitat will occur, with approximately 0.72 ha of vegetation to be removed. The majority of this vegetation is degraded, with more suitable habitat remaining adjacent to the Site ensuring that species decline will not occur.	No

Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	The Site already contains invasive species. It is unlikely that further invasive species will become established due to the removal of vegetation.	The Site already contains invasive species. It is unlikely that further invasive species will become established due to the removal of vegetation.	No
Introduce disease that may cause the species to decline	Highly unlikely to occur.	Highly unlikely to occur.	No
Interfere substantially with the recovery of the species.	The clearing of this vegetation will not impact on the recovery of the species.	The clearing of this vegetation will not impact on the recovery of the species.	No

Referral guidelines for the three threatened Black Cockatoo species (Commonwealth of Australia. 2011) uses a decision tree and a set of criteria to determine whether actions significantly impact on Black Cockatoos. These are set out in Table 8, based on the details of the development and the data obtained from the surveys. Notes on the flow chart follow.

Table 8 Assessment of Significant Impact to Black Cockatoo

Question	Answer
1. Could the impacts of your action occur within the modelled distribution of the Black Cockatoos?	Yes - Action occurs within the distribution area of all three species.
2. Could the impacts of your action affect any Black Cockatoo habitat or individuals?	Yes, however only four significant trees with a DBH greater than 500 were recorded within the Site.
3. Have you surveyed for Black Cockatoos using the recommended methods?	Yes
4. Is Black Cockatoo habitat present?	Yes, but proposed impact is minimal. No signs of foraging, nesting or roosting activities were found within the proposed area of clearing.
5. Is your impact mitigation best practice so that it may reduce the significance of your impacts on Black Cockatoos?	Yes, there is no significant impact anticipated due to lack of evidence of animals foraging, roosting or nesting within the Site.
6. Could your action require a referral to the federal environmental Minister for significant impact on Black Cockatoos?	No, as there are no direct signs of any of the three cockatoo species present within the Site. It is unlikely that the species is dependent on the Site.

The summary of these responses are:

- The proposed clearing is within the area of modelled distribution of Black Cockatoo and Western Ringtail Possum species.
- The Site has been surveyed using the recommended methods from relevant guidelines.
- Black Cockatoo Species were not observed within the Site. No signs of foraging, nesting or roosting were evident at the time of survey. Black Cockatoos were heard to the north of the Site.
- Three Western Ringtail Possums were observed within the Site.
- The area to be cleared is considered small and negligible, being approximately 0.72 ha.

Using the flow chart and criteria it is determined that there is a low risk of actions resulting in an impact upon Black Cockatoos and Western Ringtail Possums within the Site.

It is recommended that a referral pursuant to the *EPBC Act* is not required for clearing of the Site, as actions involved do not constitute a significant impact on any of the threatened species present.

7 Summary and Recommendations

- The Site is a relatively degraded portion of vegetation within Lot 9014, Brookfield Estate, Margaret River, comprising 0.72 ha.
- There were no Threatened or Priority flora identified within the Site.
- The majority of the Site is classified as Degraded, with smaller areas of Good and Very Good within the wet areas of the Site (Figure 3). Disturbance factors include historic clearing, with much of the Site parkland cleared.
- The Brookfield Sewer extent of works is within the area of modelled distribution of Black Cockatoo and Western Ringtail Possum species. The Site has been surveyed using the recommended methods from relevant guidelines.
- A total of four Trees with a DBH over 500 mm were observed within or immediately adjacent to the Site, one with observed hollows and two with potential hollows (Appendix E). No Black Cockatoos or signs of foraging, nesting or roosting were evident at the time of survey, however they were heard to the north of the Site.
- Three Western Ringtail Possums (WRP) were observed over the surveys, along with one Quenda and Quenda diggings (Figure 5).
- A Fauna Spotter should be used to monitor any vegetation removal, to ensure no fauna, particularly Western Ringtail Possum are present, at the time of any vegetation clearing.
- While no other animals of significance were observed, either directly or through signs, the lack of this data should not be taken directly as an indication that those species are absent from the Site. No trapping or seasonal sampling was conducted.
- A referral under the EPBC Act is not considered required as this action is unlikely to significantly impact on the species or local populations.

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Appendix A NatureMap Extract

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 30/09/2021

Kingdom	Plantae
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 05' 30" E,33° 57' 56" S
Buffer	10km
Group By	Conservation Status

Conservation Status	Species	Records
Priority 1	2	3
Priority 2	2	3
Priority 3	6	30
Priority 4	3	5
Rare or likely to become extinct	3	32
TOTAL	**16**	**73**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	13619	*Caladenia excelsa*		T	
2.	18037	*Caladenia lodgeana*		T	
3.	13635	*Drakaea micrantha*		T	
Priority 1					
4.	17271	*Synaphea macrophylla*		P1	
6.	18501	*Synaphea sp. Redgate Road (J. Scott 16)*		P1	
Priority 2					
6.	4586	*Amperea micrantha*		P2	
7.	17481	*Xyris maxima*		P2	
Priority 3					
8.	3386	*Acacia inops*		P3	
9.	20504	*Gastrolobium formosum*		P3	
10.	14631	*Juncus meianthus*		P3	
11.	12077	*Pimelea ciliata subsp. longituba*		P3	
12.	4179	*Pultenaea pinifolia*		P3	
13.	12590	*Stylidium lowrieanum (Lowrie's Triggerplant)*		P3	
Priority 4					
14.	16888	*Eucalyptus marginata x megacarpa*		P4	
15.	1945	*Franklandia triaristata (Lanoline Bush)*		P4	
16.	17744	*Gahnia sclerioides*		P4	

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap
Mapping Western Australia's biodiversity

NatureMap Species Report

Created By Guest user on 12/10/2021

Kingdom	Animalia
Conservation Status	Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only	Yes
Core Datasets Only	Yes
Method	'By Circle'
Centre	115° 05' 30" E,33° 57' 56" S
Buffer	10km
Group By	Conservation Status

Conservation Status	Species	Records
Other specially protected fauna	3	28
Presumed extinct	1	1
Priority 1	1	1
Priority 3	3	8
Priority 4	4	77
Protected under international agreement	5	22
Rare or likely to become extinct	22	1005
TOTAL	**39**	**1142**

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Rare or likely to become extinct					
1.	24209	*Arctocephalus tropicalis (Subantarctic fur-seal)*		T	
2.	24356	*Atrichornis clamosus (Noisy Scrub-bird, tjimiluk)*		T	
3.	34110	*Austroassiminea letha (Cape Leeuwin Freshwater Snail)*		T	
4.	24049	*Balaenoptera musculus subsp. intermedia (Antarctic Blue Whale)*		T	
5.	24162	*Bettongia penicillata subsp. ogilbyi (Woylie, Brush-tailed Bettong)*		T	
6.	24731	*Calyptorhynchus banksii subsp. naso (Forest Red-tailed Black Cockatoo)*		T	
7.	24733	*Calyptorhynchus baudinii (Baudin's Cockatoo, White-tailed Long-billed Black Cockatoo)*		T	
8.	24734	*Calyptorhynchus latirostris (Carnaby's Cockatoo, White-tailed Short-billed Black Cockatoo)*		T	
9.	48400	*Calyptorhynchus sp. (white-tailed black cockatoo)*		T	
10.	25335	*Caretta caretta (Loggerhead Turtle)*		T	
11.	33940	*Cherax tenuimanus (Margaret River hairy marron, Margaret River Marron)*		T	
12.	24092	*Dasyurus geoffroii (Chuditch, Western Quoll)*		T	
13.	34026	*Galaxiella munda (mud minnow, western dwarf galaxias)*		T	
14.	25403	*Geocrinia alba (White-bellied Frog)*		T	
15.	24557	*Leipoa ocellata (Malleefowl)*		T	
16.	24168	*Macrotis lagotis (Bilby, Dalgyte, Ninu)*		T	
17.	24146	*Myrmecobius fasciatus (Numbat, Walpurti)*		T	
18.	34033	*Nannatherina balstoni (Balston's Pygmy Perch)*		T	
19.	24166	*Pseudocheirus occidentalis (Western Ringtail Possum, ngwayir)*		T	
20.	24388	*Psophodes nigrogularis subsp. nigrogularis (Western Whipbird (western heath))*		T	
21.	24145	*Setonix brachyurus (Quokka)*		T	
22.	34113	*Westralunio carteri (Carter's Freshwater Mussel)*		T	
Presumed extinct					
23.	24164	*Potorous platyops (Broad-faced Potoroo)*		X	
Protected under international agreement					
24.	41323	*Actitis hypoleucos (Common Sandpiper)*		IA	
25.	24780	*Calidris alba (Sanderling)*		IA	
26.	24786	*Calidris ruficollis (Red-necked Stint)*		IA	
27.	48591	*Pandion cristatus (Osprey, Eastern Osprey)*		IA	
28.	48597	*Thalasseus bergii (Crested Tern)*		IA	
Other specially protected fauna					
29.	25624	*Falco peregrinus (Peregrine Falcon)*		S	
30.	24475	*Falco peregrinus subsp. macropus (Australian Peregrine Falcon)*		S	
31.	48070	*Phascogale tapoatafa subsp. wambenger (South-western Brush-tailed Phascogale, Wambenger)*		S	

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.

Department of Biodiversity, Conservation and Attractions

WESTERN AUSTRALIAN MUSEUM

NatureMap
Mapping Western Australia's biodiversity

	Name ID	Species Name	Naturalised	Conservation Code	[1]Endemic To Query Area
Priority 1					
32.	33980	*Kawaniphila pachomai (Grey Vernal Katydid (southwest), cricket)*		P1	
Priority 3					
33.	34030	*Geotria australis (Pouched Lamprey)*		P3	
34.	33995	*Trichosternus relictus (a ground beetle (Margaret River), beetle)*		P3	
35.	24855	*Tyto novaehollandiae subsp. novaehollandiae (Masked Owl (southwest))*		P3	
Priority 4					
36.	24215	*Hydromys chrysogaster (Water-rat, Rakali)*		P4	
37.	48588	*Isoodon fusciventer (Quenda, southwestern brown bandicoot)*		P4	
38.	48022	*Notamacropus irma (Western Brush Wallaby)*		P4	
39.	48135	*Thinornis rubricollis (Hooded Plover, Hooded Dotterel)*		P4	

Conservation Codes
T - Rare or likely to become extinct
X - Presumed extinct
IA - Protected under international agreement
S - Other specially protected fauna
1 - Priority 1
2 - Priority 2
3 - Priority 3
4 - Priority 4
5 - Priority 5

[1] For NatureMap's purposes, species flagged as endemic are those whose records are wholely contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

Appendix B Protected Matters Search Tool Extract

Australian Government
Department of Agriculture, Water and the Environment

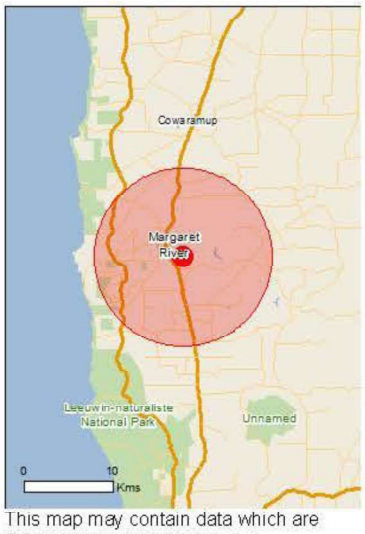
EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about Environment Assessments and the EPBC Act including significance guidelines, forms and application process details.

Report created: 30/09/21 18:37:28



Coordinates
Buffer: 10.0Km

Summary

Matters of National Environmental Significance

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

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance:	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	28
Listed Migratory Species:	11

Other Matters Protected by the EPBC Act

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

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

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

Commonwealth Land:	1
Commonwealth Heritage Places:	None
Listed Marine Species:	16
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

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

State and Territory Reserves:	7
Regional Forest Agreements:	1
Invasive Species:	24
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Botaurus poiciloptilus Australasian Bittern [1001]	Endangered	Species or species habitat may occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calyptorhynchus banksii naso Forest Red-tailed Black-Cockatoo, Karrak [67034]	Vulnerable	Species or species habitat known to occur within area
Calyptorhynchus baudinii Baudin's Cockatoo, Long-billed Black-Cockatoo [769]	Endangered	Breeding known to occur within area
Calyptorhynchus latirostris Carnaby's Cockatoo, Short-billed Black-Cockatoo [59523]	Endangered	Species or species habitat known to occur within area
Limosa lapponica menzbieri Northern Siberian Bar-tailed Godwit, Russkoye Bar-tailed Godwit [86432]	Critically Endangered	Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Sternula nereis nereis Australian Fairy Tern [82950]	Vulnerable	Species or species habitat may occur within area
Crustaceans		
Cherax tenuimanus Hairy Marron, Margaret River Hairy Marron, Margaret River Marron [78931]	Critically Endangered	Species or species habitat may occur within area
Fish		
Nannatherina balstoni Balston's Pygmy Perch [66698]	Vulnerable	Species or species habitat likely to occur within area
Frogs		

Name	Status	Type of Presence
Geocrinia alba White-bellied Frog, Creek Frog [26181]	Critically Endangered	Species or species habitat known to occur within area
Mammals		
Bettongia penicillata ogilbyi Woylie [66844]	Endangered	Species or species habitat known to occur within area
Dasyurus geoffroii Chuditch, Western Quoll [330]	Vulnerable	Species or species habitat known to occur within area
Pseudocheirus occidentalis Western Ringtail Possum, Ngwayir, Womp, Woder, Ngoor, Ngoolangit [25911]	Critically Endangered	Species or species habitat known to occur within area
Setonix brachyurus Quokka [229]	Vulnerable	Species or species habitat likely to occur within area
Other		
Westralunio carteri Carter's Freshwater Mussel, Freshwater Mussel [86266]	Vulnerable	Species or species habitat known to occur within area
Plants		
Banksia nivea subsp. uliginosa Swamp Honeypot [82766]	Endangered	Species or species habitat likely to occur within area
Banksia squarrosa subsp. argillacea Whicher Range Dryandra [82769]	Vulnerable	Species or species habitat may occur within area
Caladenia excelsa Giant Spider-orchid [56717]	Endangered	Species or species habitat likely to occur within area
Caladenia hoffmanii Hoffman's Spider-orchid [56719]	Endangered	Species or species habitat may occur within area
Caladenia huegelii King Spider-orchid, Grand Spider-orchid, Rusty Spider-orchid [7309]	Endangered	Species or species habitat may occur within area
Caladenia lodgeana Lodge's Spider-orchid [68664]	Critically Endangered	Species or species habitat known to occur within area
Calectasia cyanea Blue Tinsel Lily [7669]	Critically Endangered	Species or species habitat may occur within area
Drakaea micrantha Dwarf Hammer-orchid [56755]	Vulnerable	Species or species habitat likely to occur within area
Gastrolobium papilio Butterfly-leaved Gastrolobium [78415]	Endangered	Species or species habitat may occur within area
Lambertia echinata subsp. occidentalis Western Prickly Honeysuckle [64528]	Endangered	Species or species habitat may occur within area

Listed Migratory Species [Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Migratory Marine Birds		

Name	Threatened	Type of Presence
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Migratory Terrestrial Species		
Motacilla cinerea		
Grey Wagtail [642]		Species or species habitat may occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat may occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat may occur within area
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pandion haliaetus		
Osprey [952]		Breeding known to occur within area
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Other Matters Protected by the EPBC Act

Commonwealth Land	[Resource Information]

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

Name
Commonwealth Land -

Listed Marine Species	[Resource Information]

* Species is listed under a different scientific name on the EPBC Act - Threatened Species list.

Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Species or species habitat likely to occur within area
Calidris canutus Red Knot, Knot [855]	Endangered	Species or species habitat may occur within area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat likely to occur within area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area
Haliaeetus leucogaster White-bellied Sea-Eagle [943]		Species or species habitat likely to occur within area
Limosa lapponica Bar-tailed Godwit [844]		Species or species habitat may occur within area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area
Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat may occur within area
Pachyptila turtur Fairy Prion [1066]		Species or species habitat known to occur within area
Pandion haliaetus Osprey [952]		Breeding known to occur within area
Thinornis rubricollis Hooded Plover [59510]		Species or species habitat known to occur within area
Tringa nebularia Common Greenshank, Greenshank [832]		Species or species habitat likely to occur within area

Extra Information

State and Territory Reserves [Resource Information]

Name	State
Bramley	WA
Leeuwin-Naturaliste	WA
NTWA Bushland covenant (0003)	WA
NTWA Bushland covenant (0065A)	WA
NTWA Bushland covenant (0065B)	WA
NTWA Bushland covenant (0144)	WA
NTWA Bushland covenant (0147)	WA

Regional Forest Agreements [Resource Information]

Note that all areas with completed RFAs have been included.

Name	State
South West WA RFA	Western Australia

Invasive Species [Resource Information]

Weeds reported here are the 20 species of national significance (WoNS), along with other introduced plants that are considered by the States and Territories to pose a particularly significant threat to biodiversity. The following feral animals are reported: Goat, Red Fox, Cat, Rabbit, Pig, Water Buffalo and Cane Toad. Maps from Landscape Health Project, National Land and Water Resouces Audit, 2001.

Name	Status	Type of Presence
Birds		
Anas platyrhynchos Mallard [974]		Species or species habitat likely to occur within area
Columba livia Rock Pigeon, Rock Dove, Domestic Pigeon [803]		Species or species habitat likely to occur within area
Streptopelia chinensis Spotted Turtle-Dove [780]		Species or species habitat likely to occur within area
Streptopelia senegalensis Laughing Turtle-dove, Laughing Dove [781]		Species or species habitat likely to occur within area
Sturnus vulgaris Common Starling [389]		Species or species habitat likely to occur within area
Mammals		
Bos taurus Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris Domestic Dog [82654]		Species or species habitat likely to occur within area
Felis catus Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Feral deer Feral deer species in Australia [85733]		Species or species habitat likely to occur within area
Mus musculus House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area

Name	Status	Type of Presence
Rattus rattus Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Sus scrofa Pig [6]		Species or species habitat likely to occur within area
Vulpes vulpes Red Fox, Fox [18]		Species or species habitat likely to occur within area
Plants		
Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]		Species or species habitat likely to occur within area
Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]		Species or species habitat may occur within area
Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]		Species or species habitat likely to occur within area
Genista linifolia Flax-leaved Broom, Mediterranean Broom, Flax Broom [2800]		Species or species habitat likely to occur within area
Genista monspessulana Montpellier Broom, Cape Broom, Canary Broom, Common Broom, French Broom, Soft Broom [20126]		Species or species habitat likely to occur within area
Genista sp. X Genista monspessulana Broom [67538]		Species or species habitat may occur within area
Lycium ferocissimum African Boxthorn, Boxthorn [19235]		Species or species habitat likely to occur within area
Pinus radiata Radiata Pine Monterey Pine, Insignis Pine, Wilding Pine [20780]		Species or species habitat may occur within area
Rubus fruticosus aggregate Blackberry, European Blackberry [68406]		Species or species habitat likely to occur within area
Tamarix aphylla Athel Pine, Athel Tree, Tamarisk, Athel Tamarisk, Athel Tamarix, Desert Tamarisk, Flowering Cypress, Salt Cedar [16018]		Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

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

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

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

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

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

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

Coordinates

-33.96528 115.09167

Acknowledgements

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

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

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

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

Appendix C Conservation Codes for Western Australian Flora and Fauna

CONSERVATION CODE	CATEGORY
Threatened Ecological Community (TEC)	An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat. A TEC is one which is found to fit into one of the following categories: Presumed Totally Destroyed; Critically Endangered; Endangered, or Vulnerable. Possible TECs that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists, under Priority 1, 2 and 3. These are ranked in order of priority for survey and/or definition of the community type and evaluation of its conservation status.
Threatened species (T)	Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under Section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the *Biodiversity Conservation Act 2016* (BC Act). ***Threated 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 Threated Flora. The Assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below
Critically endangered species (CR)	Threatened species considered to be *"facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the criteria set out in the ministerial guidelines".* Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for critically endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for critically endangered flora.

CONSERVATION CODE	CATEGORY
Threatened Ecological Community (TEC)	An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat. A TEC is one which is found to fit into one of the following categories: Presumed Totally Destroyed; Critically Endangered; Endangered, or Vulnerable. Possible TECs that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists, under Priority 1, 2 and 3. These are ranked in order of priority for survey and/or definition of the community type and evaluation of its conservation status.
Endangered species (EN)	Threatened species considered to be *"facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines"*. Listed as endangered under Section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for endangered fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for endangered flora.
Vulnerable species (VU)	Threatened species considered to *be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines"*. Listed as endangered under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018* for vulnerable fauna or the *Wildlife Conservation (Rare Flora) Notice 2018* for vulnerable flora.
Extinct species (EX)	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.

CONSERVATION CODE	CATEGORY
Threatened Ecological Community (TEC)	An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat. A TEC is one which is found to fit into one of the following categories: Presumed Totally Destroyed; Critically Endangered; Endangered, or Vulnerable. Possible TECs that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists, under Priority 1, 2 and 3. These are ranked in order of priority for survey and/or definition of the community type and evaluation of its conservation status.
Extinct in the wild species (EW)	Species that *"is known only to survive in cultivation, captivity or as a naturalised population well outside its part 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 threated fauna or 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.

CONSERVATION CODE	CATEGORY
Threatened Ecological Community (TEC)	An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat. A TEC is one which is found to fit into one of the following categories: Presumed Totally Destroyed; Critically Endangered; Endangered, or Vulnerable. Possible TECs that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists, under Priority 1, 2 and 3. These are ranked in order of priority for survey and/or definition of the community type and evaluation of its conservation status.
Migratory species (MI)	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (Section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and the Republic of Korea (ROKAMBA), and fauna subject to the *Convention on the Conservation of Migratory Species of Wild Animals* (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements of treaties, excluding species that are listed as Threated species. Published as migratory birds protected under an international agreement under schedule 5 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*
Species of special conservation interest (conservation dependent fauna) (CD)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018.*

CONSERVATION CODE	CATEGORY
Threatened Ecological Community (TEC)	An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat. A TEC is one which is found to fit into one of the following categories: Presumed Totally Destroyed; Critically Endangered; Endangered, or Vulnerable. Possible TECs that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists, under Priority 1, 2 and 3. These are ranked in order of priority for survey and/or definition of the community type and evaluation of its conservation status.
Other specially protected species (OS)	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the *Wildlife Conservation (Specially Protected Fauna) Notice 2018*.
Priority species (P)	Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora. Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring. Assessment of Priority codes in 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.
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.

CONSERVATION CODE	CATEGORY
Threatened Ecological Community (TEC)	An ecological community is a naturally occurring biological assemblage that occurs in a particular type of habitat. A TEC is one which is found to fit into one of the following categories: Presumed Totally Destroyed; Critically Endangered; Endangered, or Vulnerable. Possible TECs that do not meet survey criteria are added to the Department of Parks and Wildlife's Priority Ecological Community Lists, under Priority 1, 2 and 3. These are ranked in order of priority for survey and/or definition of the community type and evaluation of its conservation status.
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 know threatening processes. Such species are in urgent need of further survey.
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 suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
Priority 4 - Rare, Near Threatened and other species in need of monitoring	(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands. (b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent. (c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.

Appendix D Relevé Field Sheet and Vegetation Structural Information

STRUCTURAL VEGETATION, FLORA – Relevé										SITE_ID: R01
Date: 30/09/2021										Structural comm. type
										Veg Comm B
Recorder: DC	Tall closed scrub									
Location: Brookfield sewer, W extent of Site										

Condition: **Good**	
Aspect: N NE E SE **S** SW W NW	Slope: **Flat** Gentle Mod Steep
Geology: **Lat**	Rock: **0**
Soil Colour: **Dark Brown**	Soil Type: **Clay Loam**
Litter (% cover & depth): **20%**	Bare Ground (% cover): **30%**
Hydrology: **Wet all year**	Topographic position: **Creekline**

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	NA	NA
Tree (T3)	< 10	NA	NA
Shrub (S1)	> 2	>70%	*Taxandria linearifolia, Mirbelia dilatata, Agonis flexuosa*
Shrub (S2)	1-2	30-70%	*Taxandria linearifolia, Mirbelia dilatata, Agonis flexuosa, Acacia myrtifolia*
Shrub (S3)	0-1	2%	*Taxandria linearifolia, Acacia divergens*
Sedge/Rush (VR)		2-10%	**Juncus microcephalus*
Herb (H)		<2%	**Plantago* sp., *Drosera glanduligera*, Bulb weeds
Grass (G)		>70%	Sterile introduced grasses,
Other (climbers) (C)		NA	NA

Cover Codes: D >70% M 30-70% S 10-30% V 2-10% VV <2% E <5% Emergent 0% None

* = Introduced/planted

Surrounding plants: Corymbia calophylla, Agonis flexuosa, Dampiera pedunculata

STRUCTURAL VEGETATION, FLORA – Relevé										SITE_ID: R02
Date: 30/09/2021										Structural comm. type
										Veg Comm A
Recorder: DC	Open woodland over low open forest									
Location: Brookfield Sewer - central										

Condition: **Degraded** (no native understorey)	
Aspect: N NE E SE S SW W NW	Slope: **Flat** Gentle Mod Steep
Geology: **Laterite**	Rock: **<2**
Soil Colour: **Dark Brown**	Soil Type: **Clay Loam**
Litter (% cover & depth): **90%**	Bare Ground (% cover): **Track – 2%**
Hydrology: **Good drainage**	Topographic position: **Edge of creekline**

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	2-10%	*Corymbia calophylla*
Tree (T3)	< 10	30-70%	*Agonis flexuosa, Corymbia calophylla*
Shrub (S1)	> 2	2-10%	*Agonis flexuosa, Hovea elliptica, Hakea amplexicaulis, Taxandria linearifolia, Acacia myrtifolia, Mirbelia dilatata*
Shrub (S2)	1-2	10-30%	*Acacia myrtifolia, Taxandria linearifolia, Agonis flexuosa, Corymbia calophylla*
Shrub (S3)	0-1	2-10%	*Taxandria linearifolia, Acacia myrtifolia, Hibbertia hypericoides, Hovea chorizemifolia, Agrostocrinum hirsutum, Styphelia discolor, Caesia micrantha, Xanthorrhoea gracilis*
Sedge/Rush (VR)		30-70%	*Loxocarya cinerea, Lepidosperma sp. fine, Lepidosperma sp. flat, Lomandra sp. sterile*
Herb (H)		<2%	*Stylidium sp. sterile, Hypochaeris sp.*
Grass (G)		10-30%	*Microlaena stipoides, Tetrarrhena laevis,* Sterile emergent annual grasses.
Other (climbers) (C)			

Cover Codes: D >70% M 30-70% S 10-30% V 2-10% VV <2% E <5% Emergent 0% None

* = Introduced/planted

Surrounding plants:

STRUCTURAL VEGETATION, FLORA – Relevé										SITE_ID: R03
Date: 30/09/2021										Structural comm. type
										Veg Comm B
Recorder: DC	Scattered trees over tall closed scrub									
Location: Brookfield sewer – western extent										

Condition: Very Good	
Aspect: N NE E SE S SW W NW	Slope: Flat Gentle Mod Steep
Geology: Laterite	Rock: 0
Soil Colour: Dark Brown	Soil Type: Clay Loam
Litter (% cover & depth): 0-10%	Bare Ground (% cover): N/A
Hydrology: Wet all year	Topographic position: Creekline

Layer	Height (m)	Cover	Plant Species (Dominant 3 first)
Tree (T2)	10-30	<2%	*Corymbia calophylla*
Tree (T3)	< 10	<2%	*Corymbia calophylla*
Shrub (S1)	> 2	>70%	*Melaleuca viminea, Taxandria linearifolia*
Shrub (S2)	1-2	10-30%	*Melaleuca viminea, Taxandria linearifolia*
Shrub (S3)	0-1	<2%	*Melaleuca viminea, Taxandria linearifolia, Eutaxia* sp. (juvenile & sterile), *Lobelia* sp., *Pteridium esculentum*
Sedge/Rush (VR)		30-70%	*Leptocarpus sp, Rush sp., *Cyperaceae sp., Juncus microcephalus Lepidosperma sp.*
Herb (H)		<2%	Water herb sterile, **Plantago* sp.
Grass (G)		NA	
Other (climbers) (C)		NA	

Cover Codes: D >70% M 30-70% S 10-30% V 2-10% VV <2% E <5% Emergent 0% None

* = Introduced/planted

Surrounding plants: *Machaerina articulata, Agonis flexuosa, Acacia myrtifolia*

Figure 7 R01

Figure 8 R01

Figure 9 R02

Figure 10 R02

Figure 11 R03

Figure 12 R03

Table 9 Structural Classification (from Keighery 1994, adapted from Muir 1977 and Aplin 1979).

Stratum	Canopy Cover				
	70%-100%	30%-70%	10%-30%	2%-10%	<2%
Trees > 30m	Tall Closed Forest	Tall Open Forest	Tall Woodland	Tall Open Woodland	Scattered Tall Trees
Trees 10-30m	Closed Forest	Open Forest	Woodland	Open Woodland	Scattered Trees
Trees < 10m	Low Closed Forest	Low Open Forest	Low Woodland	Low Open Woodland	Scattered Low Trees
Shrubs >2m	Tall Closed Scrub	Tall Open Scrub	Tall Shrubland	Tall Open Shrubland	Scattered Tall Shrubs
Shrubs 1-2m	Closed Heath	Open Heath	Shrubland	Open Shrubland	Scattered Shrubs
Shrubs <1m	Low Closed Heath	Low Open Heath	Low Shrubland	Low Open Shrubland	Scattered Low Shrubs
Hummock Grasses	Closed Hummock Grassland	Mid-Dense Hummock Grasslands	Hummock Grassland	Open Hummock Grassland	Scattered Hummock Grassland
Grasses, Sedges & Herbs	Closed Tussock Grassland/ Sedgeland/ Herbland	Tussock Grassland/ Sedgeland/ Herbland	Open Tussock Grassland/ Sedgeland/ Herbland	Very Open Tussock Grassland/ Sedgeland/ Herbland	Scattered Tussock Grassland/ Sedgeland/ Herbland

Appendix E Significant Trees

WTP No.	DBH (cm)	Species	Height (m)	Notes
160	51	*Corymbia calophylla*	13 m	No Hollow Observed
161	132	*Corymbia calophylla*	25 m	Potential Hollow – edge of Site
162	126	*Corymbia calophylla*	16 m	Potential Hollow – edge of Site
163	>100	*Corymbia calophylla*	25 m	Multiple Hollows