City of Joondalup

Burns Beach Café Development Revegetation Plan



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Acknowledgement of Traditional Custodians

The City of Joondalup acknowledges the traditional custodians of this land, the Whadjuk people of the Noongar nation. We recognise the culture of the Noongar people and the unique contribution they make to the Joondalup region and Australia. We pay our respects to their elders past, present and emerging, as well as all Aboriginal and Torres Strait Islander peoples.

Joondalup-ak ngala kaditj Noongar moort nidja Wadjak boodjar-ak kalyakool moondang-ak kaaradj-midi. Ngala Noongar Moort wer baalabang moorditj kaadidjiny koota-djinanginy. Ngala Noongar wer Torres Strait Moort-al dandjoo koorliny kwaba-djinanginy. Koora, yeyi wer kalyakool, ngalak Noongar wer Torres Strait Birdiya wer moort koota-djinanginy.

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Acronyms

Acronym/ Abbreviation	Definition
ASS	Acid Sulfate Soils
BC Act	*Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
The Project	Burns Beach Café Development
CBD	Central Business District
The City	City of Joondalup
CPS	Clearing Permit System
DBCA	Department of Biodiversity, Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DPIRD	Department of Primary Industries and Regional Development
DOT	Department of Transport
DPLH	Department of Planning, Lands and Heritage
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FCT	Floristic Community Type
GPS	Global Positioning System
ha	Hectare
IBRA	Interim Biogeographic Regionalisation for Australia
NIASA	Nursery Industry Accreditation Scheme Australia
PEC	Priority Ecological Community
RiWI	*Rights in Water and Irrigation Act 1914*
SMART	Specific, Measurable, Achievable, Relevant and Time-bound.
m^2	Square metre
SWA	Swan Coastal Plain bioregion
SWA02	Perth subregion
TEC	Threatened Ecological Community
UXO	Unexploded Ordnance
WA	Western Australia

1 Introduction

1.1 Purpose

The Burns Beach Café Development Revegetation Plan outlines revegetation works that will be completed within the Burns Beach Foreshore Reserve to offset clearing of native vegetation for the Burns Beach Café Development (the project).

1.2 Project Background

The City of Joondalup (the City) is proposing to develop the project at the Burns Beach Foreshore Reserve, located in the City's suburb of Burns Beach, approximately 30 km north of the Perth Central Business District (CBD) in Western Australia (WA). The project will consist of a café/restaurant building and redevelopment of the coastal node within a 0.34 ha Clearing Area.

As there are few parks along this stretch of coastline, the Burns Beach foreshore node is well used, and the local community have been highly supportive of upgrades to the facilities, as demonstrated in the project's community consultation results. The project is essential to establishing a connection between Burns Beach Foreshore Park and the beach reserve, ensuring both spaces function as an integrated regional recreation destination. Currently, this connection is significantly hindered by an existing car park and dunal vegetation, which restricts movement and reduces the park's usability.

The project will deliver long-term community and economic benefits including the following:

- A new playground, turf areas, landscaped native garden beds, and upgraded public amenities, enhancing recreational opportunities
- Demolition of outdated facilities and construction of modern infrastructure, improving safety and usability
- Relocation of the car park, reducing congestion and improving pedestrian safety
- A café/restaurant, which will be leased to a commercial operator to offset ongoing maintenance costs and contribute to the local economy.

This Revegetation Plan applies to the proposed offsets for the project and will form part of the City's application for a clearing permit.

The City's coastal zone includes where the café development is proposed, foreshore reserves, and remnant vegetation of conservation significance. Burns Beach Foreshore Reserve is one of the major conservation areas within the City and is managed for conservation purposes under the Iluka - Burns Beach Foreshore Reserve Management Plan.

The City of Joondalup encourages natural bushland regeneration through weed management and conservation fencing, with revegetation typically undertaken as required using local provenance species. Weed control and revegetation is conducted in the foreshore area, which has reduced weed abundance and increased biodiversity. Weed monitoring is conducted by the City every six months to identify priority weeds and establish their extent and distribution.

1.3 Qualifications and Experience

The Burns Beach Café Development Revegetation Plan for Burns Beach Foreshore Reserve was developed by the following City of Joondalup and Eco Logical Australia staff members:

- Danielle Bowler, Environmental Development Coordinator, Postgraduate Certificate in Policy Studies specialising in Ecologically Sustainable Development, 19 years environmental experience
- Georgia Davis, Environmental Approvals Officer, Bachelor of Science, 5 years environmental experience
- Libby Payne, Principal Environmental Consultant, Bachelor of Science – Environmental Biology, 14 years environmental experience
- Rebecca Hide, Associate Environmental Consultant, Bachelor of Conservation Biology and Management (First Class Honours), 18 years environmental experience
- Liv Sinclair, Environmental Consultant, Bachelor of Science – Environmental Science, 2 years environmental experience
- Brooke Fennell, Environmental Consultant, Bachelor of Science – Conservation and Wildlife Biology and Freshwater and Marine Science, 4 years environmental experience.

The City engages a variety of suitably qualified environmental consultants to assist with revegetation works and monitoring of revegetation offsets. Environmental management and monitoring of the Burns Beach Foreshore Reserve offset sites will be conducted by suitably qualified environmental consultants. The contractors engaged for the environmental works and monitoring detailed in this plan will be contracted based on the requirements of the Burns Beach Café Development Clearing Permit.

1.4 Native Vegetation Clearing Details

The clearing permit application for the project (CPS 11089/1) involves clearing of 0.34 ha of native vegetation (Figure 1). Clearing is required to develop the connection between Burns Beach Foreshore Park and the beach reserve.

The proposed clearing will occur within one lot along the Burns Beach Foreshore Reserve:

- Lot 11485 on Deposited Plan 217974 of the Iluka–Burns Beach Foreshore area

Lot 11485 is Crown Land managed by the City of Joondalup as its Primary Interest Holder under Management Order H346227 and is not within a Bush Forever Site or Environmentally Sensitive Area.

The native vegetation to be cleared for the Project includes:

- Coastal shrublands on shallow sands Priority Ecological Community (FCT 29a) – 0.34 ha (3,400m^2).



Figure 1 - Burns Beach Café Development Clearing Area

Clearing Area

Lot 11485 on Deposited Plan 217974

Cadastre

N

0 10 20 40

Metres

Datum/Projection:
GDA2020 MGA Zone 50

25PER11205-KR Date: 11/07/2025

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1.5 Revegetation

Revegetation offsets for the project are to occur within the Burns Beach Foreshore Reserve within Lot 11485 on Deposited Plan 217974 (Figure 2). The revegetation site is bisected by a coastal path, dividing it into northern and southern sections. The total size of the revegetation site is 0.70 ha (7,000m^2).

The total area of revegetation is approximately twice as large as the total area to be cleared for the project (0.34 ha), in accordance with the 2:1 revegetation offset ratio recommended by the Department of Water and Environmental Regulation (DWER). This recommendation was derived from the WA Environmental Offsets Calculator (DWER 2021) and ensures that at least 100% of the direct offset requirements for significant residual environmental impacts of the project can be satisfied. The revegetation site is of the same floristic community type as the Clearing Area, FCT 29a Coastal shrublands on shallow sands (Priority 3), therefore it is considered suitable as an offset for the project. The revegetation of this site will adequately address the impacts of the proposed clearing by providing additional protections for the offset area and improved conditions of an analogous vegetation community within the Burns Beach Foreshore Reserve.

Photographs of the revegetation site have been provided in **Attachment 1.**



Figure 2 - Burns Beach Revegetation Site

Burns Beach Revegetation Site

Northern (0.44 ha)

Southern (0.26 ha)

0 5 10 20

Metres

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2 Background of Revegetation Site

2.1 Planning Context

The proposed revegetation site occurs within the Burns Beach Foreshore Reserve within the Local Government Area (Lot 11485 on Deposited Plan 217974). The title is listed as Crown land for Recreational purposes administered by Department of Planning, Lands and Heritage (DPLH). The majority of the Burns Beach Foreshore Reserve is recognised for regional environmental significance by being designated Bush Forever Site 322 that will continue to be managed under the Iluka - Burns Beach Foreshore Reserve Management Plan.

Lot 11485 on Deposited Plan 217974 does not fall within a Bush Forever Site or Environmentally Sensitive Area. The City is the primary interest holder for the management, care and control of the above parcel of land in accordance with management order H346227. The City is authorised to conduct rehabilitation and revegetation works within this area.

2.2 Existing Environment

2.2.1 Climate

The revegetation site is located within the south-west of Western Australia, which experiences hot, dry summers and cool, wet winters. Based on data from the Bureau of Meteorology (BoM) Perth Metro weather station (1993 – 2025), the revegetation site receives an annual mean rainfall of 717 mm (BoM 2025) with approximately 80% falling between May and September. The best time to establish plants in the revegetation sites is late autumn to early winter to coincide with seasonal rainfall. Mean maximum temperatures range from 18.5°C in July to 31.7°C in February, whilst mean minimum temperatures range from 7.8°C in August to 18.4°C in February (1993 – 2025).

2.2.2 Biogeographical Regions

The Interim Biogeographic Regionalisation for Australia (IBRA) currently classifies 89 bioregions across Australia, based on a range of biotic and abiotic factors such as climate, vegetation, fauna, geology, and landform (Thackway and Cresswell 1995; DCCEEW 2024). These bioregions are further refined into 419 subregions representing more localised and homogenous geomorphological units in each bioregion (DCCEEW 2024). IBRA divides WA into 26 biogeographic regions and 53 subregions based on dominant landscape characteristics of climate, lithology, geology, landform, and vegetation.

The revegetation site is located within the Swan Coastal Plain bioregions (SWA) and the Perth subregion (SWA02). The Swan Coastal Plain is a low-lying coastal plain, mainly covered with woodlands dominated by Banksia or Tuart on sandy soils, *Casuarina equisetifolia* on outwash plains, and paperbark in swampy areas (Mitchell et al. 2002). The Perth subregion is underlain by colluvial and aeolian sands, alluvial river flats, and coastal limestone, with three phases of marine sand dune development providing relief. Vegetation generally comprises heath and/or Tuart woodlands on limestone, Banksia, and Jarrah-Banksia woodlands on Quaternary marine dunes of various ages, and Marri on colluvial and alluvials.

2.2.3 Geomorphology

Land Systems mapping, prepared by the Department of Primary Industries and Regional Development (DPIRD), provides a comprehensive and standardised description of landscapes, soils and vegetation of WA at a regional scale (DPIRD 2022). These surveys describe the biophysical characteristics of each region and subsequently divide each region into land systems; land systems being defined as repeating patterns of topography, soils and vegetation. The revegetation site is located on the youngest formation, the Quindalup South

System. This system is described as '*coastal dunes of the Swan Coastal Plain with calcareous deep sands and yellow sands. Coastal scrub'*.

2.2.4 Hydrology and Drainage

The revegetation site occurs within the Swan Coastal Plain subcatchment (UFI 613) of the Swan Coastal Catchment. It does not intersect any significant surface water bodies or wetlands.

The revegetation site overlies the Perth Groundwater Area (Gnangara Groundwater System) which is proclaimed under the *Rights in Water and Irrigation Act 1914* (RiWI Act). The revegetation site does not overlie a Public Drinking Water Source Area (DWER 2024). The Iluka-Burns Beach Foreshore Reserve Management Plan details the depth to groundwater across the two reserves to be 0 - 21.5 m above sea level (CoJ 2024).

2.2.5 Floristic Community and Vegetation

Vegetation within the Perth metropolitan area has been described by Heddle et al. (1980) as System 6 vegetation complexes. Regional scale mapping indicates that the revegetation sites are located within the Cottesloe – Central and South Vegetation Complex.

A Detailed and Targeted flora survey and vegetation condition assessment was conducted in Spring 2020 and covered both the northern and southern extents of the revegetation site. A subsequent Honeymyrtle Shrubland TEC assessment and Black Cockatoo habitat assessment was conducted in Spring 2024, with the extent of this survey only intersecting the southern portion of the revegetation site. Both surveys were conducted in accordance with the *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment 2016* (EPA 2016).

The vegetation types within the revegetation site comprise mostly SgSa (0.57 ha, 81%) with a small area of ArAcSg (0.13 ha, 18%) mapped within the southern portion of the revegetation site. The description and spatial extent of these vegetation types within the revegetation site is presented in Table 1 and Figure 3. Both of these vegetation communities are considered representative of the Coastal shrublands on shallow sands Priority Ecological Community (PEC; Priority 3), which aligns with FCT 29a (Figure 4). This is the same FCT noted to be associated with the clearing works of the project.

Vegetation condition within the revegetation site was classed as 'Good', based on the Keighery (1994) vegetation scale, as outlined in the *Environmental Protection Authority Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment 2016* (Figure 5).

Table 1: Burns Beach Foreshore Reserve Revegetation Site Vegetation Types

Vegetation Types	Description	Extent (ha) in Revegetation Site	Proportion (%) Revegetation Site
SgSa	*Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid sparse shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragona decumbens*, *Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum low open sedgeland*	0.57	81
ArAcSg	*Acacia rostellifera, Acacia cyclops, Spyridium globulosum* tall shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse *chenopod shrubland and Acanthocarpus preissii* low sparse shrubland	0.13	18

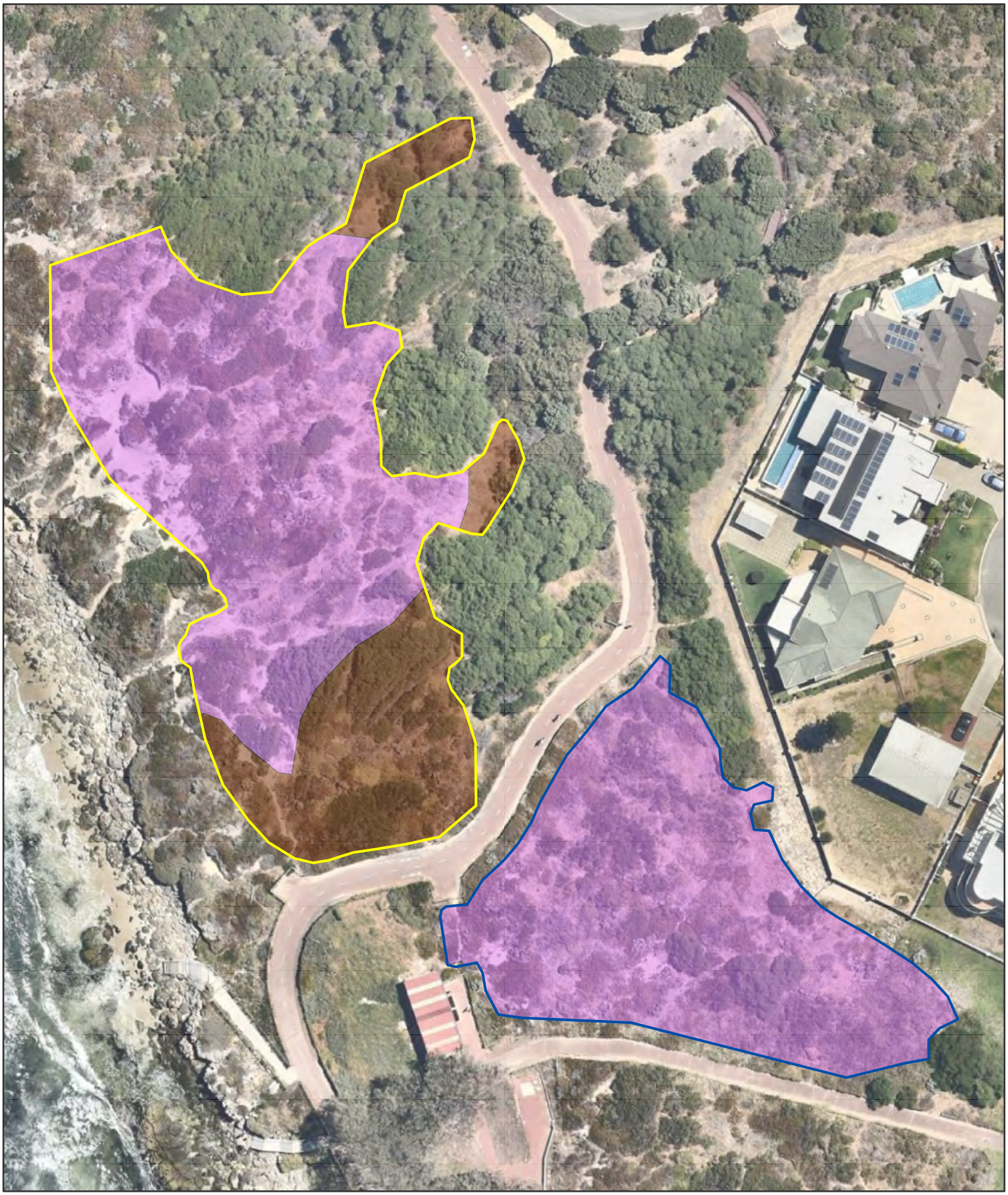


Figure 3 - Vegetation Type

Burns Beach Revegetation Site

- Northern
- Southern

Vegetation Community

- ArAcSg
- SgSa

0 5 10 20

Metres

Datum/Projection:
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Figure 4 - Conservation Significant Ecological Communities

Burns Beach Revegetation Site

Northern

Southern

Conservation significant vegetation communities

FCT 29a: 'Coastal shrublands on shallow sands' (Priority 3)

0 5 10 20

Metres

Datum/Projection:
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Figure 5 - Vegetation Condition

Burns Beach Revegetation Site

- Northern
- Southern

Vegetation Condition

- Good

0 5 10 20

Metres

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2.2.6 Existing Evidence of Fauna

A Detailed fauna survey was conducted within the revegetation site from 9 - 13 November 2020 in accordance with the Environmental Protection Authority *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment 2020* (EPA 2020).

A total of 37 vertebrate fauna species were recorded across the Burns Beach Foreshore Reserve fauna survey area during the fauna survey (ELA 2021), consisting of 13 reptile, 27 bird and seven mammal species (Table 2). Of these 37 species, 31 were native fauna.

One conservation significant fauna species was observed during the ecological surveys: Quenda (*Isoodon fusciventer*; listed as Priority 4 by DBCA; ELA 2021). Six Quenda individuals were trapped in cage traps and one individual was recorded via motion sensor camera.

Table 2: List of species identified during the Burns Beach Foreshore Reserve fauna survey

Type	Species	Common name
Bird	**Dacelo novaeguineae*	Laughing Kookaburra
Bird	*Artamus cinereus*	Black-faced Woodswallow
Bird	*Cacatua sanguinea*	Little Corella
Bird	*Eolophus roseicapilla*	Galah
Bird	*Coracina novaehollandiae*	Black-faced Cuckooshrike
Bird	**Spilopelia senegalensis*	Laughing Dove
Bird	*Ocyphaps lophotes*	Crested Pigeon
Bird	*Barnardius zonarius*	Australian Ringneck
Bird	*Corvus bennetti*	Little Crow
Bird	*Corvus coronoides*	Australian Raven
Bird	*Cracticus nigrogularis*	Pied Butcherbird
Bird	*Cracticus tibicen*	Australian Magpie
Bird	*Larus novaehollandiae*	Silver Gull
Bird	*Malurus lamberti*	Variegated Fairywren
Bird	*Malurus leucopterus*	White-winged Fairywren
Bird	*Anthochaera carunculata*	Red Wattlebird
Bird	*Lichenostomus virescens*	Singing Honeyeater
Bird	*Lichmera indistincta*	Brown Honeyeater
Bird	*Phylidonyris niger*	White-cheeked Honeyeater
Bird	*Phylidonyris novaehollandiae*	New Holland Honeyeater
Bird	*Grallina cyanoleuca*	Magpie-lark
Bird	*Microcarbo melanoleucos*	Little Pied Cormorant
Bird	*Rhipidura leucophrys*	Willie Wagtail
Bird	*Threskiornis molucca*	Australian White Ibis
Mammal	**Vulpes vulpes*	Red Fox
Mammal	**Felis catus*	Cat
Mammal	*Austronomus australis*	White-striped Free-tailed Bat
Mammal	**Mus musculus*	House Mouse
Mammal	*Isoodon fusciventer*	Quenda
Mammal	*Chalinolobus gouldii*	Gould's Wattled Bat
Reptile	*Pogona minor* subsp. *minor*	Western Bearded Dragon

Type	Species	Common name
Reptile	*Notechis scutatus*	Tiger snake
Reptile	*Pseudonaja affinis* subsp. *affinis*	Dugite
Reptile	*Simoselaps calonotus*	Black-striped Snake
Reptile	*Cryptoblepharus buchananii*	Fence Skink
Reptile	*Ctenotus fallens*	West-coast Laterite Ctenotus
Reptile	*Lerista elegans*	Elegant Slider

Note: * refers to a pest species

2.2.7 Previous works

The City supports ongoing revegetation works in degraded coastal areas through regularly providing native plants to the Friends of North Ocean Reef / Iluka Foreshore each year, as well as implementing the Adopt a Coastline interactive bushland management program with schools. The City is committed to conserving its natural areas to ensure the long-term protection of the environment for future generations.

Native plants are often grown in the City's nursery from seed stock collected on site and used for revegetation works in degraded areas. The City will continue to engage the community and City staff to undergo coastal revegetation works.

2.3 Site disturbances

Unmanaged access

The movement of people, domestic animals and/or vehicles over the revegetated area may result in erosion, damage to plants and directly limit revegetation outcomes. Therefore, restricting access to the revegetation sites may be required during restoration and over the long term. There are existing signs of unmanaged access at the revegetation site including informal access tracks and rubbish dumping. Revegetating these areas and using temporary fencing and signage as required should manage this condition moving forward.

Vegetation condition

The Burns Beach Foreshore Reserve revegetation site contains vegetation of good condition which could be restored to very good and / or excellent condition.

2.4 Physical site factors

Erosion and dust generation

Surface water is likely to drain freely across the site due to the permeable sands present. Therefore, water erosion from surface runoff would occur infrequently, if at all, and only in response to intense events. Wind erosion and sand drift have the potential to impact revegetation due to ground disturbance low vegetation cover and the prevailing coastal winds. Although revegetation will stabilise the site and reduce the potential for dust and erosion, management actions will be undertaken prior to planting and as required during ongoing monitoring of the sites.

Unexploded Ordnance

The Burns Beach Foreshore Reserve revegetation site falls within an unexploded ordnance (UXO) area of 'other potential' and was used by allied aircraft for gunnery and bombing practice during WWII. No specific UXO contaminated site has been identified in the area and no UXO has been recovered from the site, however a possibility still exists that UXO may be found on site. It is considered that the possible risks from UXO within this area are minimal, however a level of risk remains. The City's 'Finding Unexploded Ordnance Items' process will be implemented during the revegetation works, if required.

2.5 Biological site conditions

Weeds

Weeds can degrade native vegetation by competing for space and resources. An increase in weed presence could therefore limit revegetation outcomes. There is the potential for the cover and/or diversity of weeds to be increased during the Burns Beach Café Development Plan through the ground disturbance and by introducing new weeds on vehicles or equipment. Good hygiene practices and weed management are required to limit weed introduction and control weeds within the site.

Non-native Fauna

Non-native herbivorous fauna can directly limit the outcomes of revegetation by damaging or destroying plants. It is possible that herbivores like rabbits could pose a risk to site revegetation. Rabbit and other non-herbivorous fauna management will be required if impacts are recorded, particularly in initial periods when plants are small.

Plant pathogens

Soil borne water moulds *Phytophthora* spp. or other pathogens (Pythium spp.) may occur in the revegetation sites and surrounding area. Pathogen sampling was conducted within the Burns Beach Foreshore Reserve revegetation sites in 2017, and no suspected pathogens were identified (CoJ 2018).

A large range of native species are susceptible to pathogens which are spread through movement of contaminated soil and mud, especially by vehicles, equipment, and footwear.

There is no practical large-scale cure for Phytophthora and Pythium pathogens and therefore containment is the primary option available for management. While pathogens are not expected to be a critical issue for vegetation within the site, good hygiene practices will always be applied to limit the potential spread or introduction of plant pathogens. The City's Pathogen Hygiene Procedure will be implemented during the course of the project, as shown in **Attachment 3**.

2.6 Management

The City manages the Burns Beach Foreshore Reserve according to the relevant management plan developed by the City. The Iluka - Burns Beach Foreshore Reserve Management Plan can be found on the City's webpage.

The City regularly conducts works within its bushland reserves including weed control, seed collection, revegetation, erosion control, and feral pest management. These works are conducted either by City personnel or by contractors. In addition to this ongoing management of the City's reserves, the revegetation sites will be regularly monitored to ensure compliance with the City's completion criteria. Additional measures to ensure the success of the revegetation will be conducted as needed including weed control, watering, erosion control, and infill planting.

The City also supports its many local Friends' groups which operate within the City's reserves and assist with rehabilitation of native vegetation and general conservation activities.

3 Revegetation Commitments

3.1 Goal

The overarching goal for revegetation is to stabilise, revegetate and improve the condition of the vegetation within the revegetation sites.

3.2 Objectives

The following objectives are proposed to guide the revegetation and ensure that the overarching goal has been met:

- Landforms within revegetated areas are stable and not actively eroding such that native shrub and herb species can be established.
- Revegetated areas have a minimum of 2 plants per m^2.
- Revegetated areas have a minimum diversity of at least 7 appropriate locally native species.
- Weed cover does not exceed 10% of revegetated areas.
- Burns Beach Foreshore Reserve revegetation site improves from good condition to very good and/or excellent condition.

3.3 Targets and Completion Criteria

Assessment of the revegetation areas will include statistical analysis of the survival rate, plant density, species diversity, and weed load. The completion criteria meet the SMART principles by being: specific and providing exact numbers for species diversity, density, and weed control; measurable by being qualities that can be assessed during floristic surveys and site inspections; achievable by being based upon previous targets set by DWER for revegetation sites; relevant by their ability to improve the condition and diversity of the revegetation sites; and time-bound by the criteria requiring the City to meet these targets within 3 years. The revegetation completion targets and criteria are outlined in Table 3.

Table 3: Revegetation completion targets and criteria for the Burns Beach Foreshore Reserve revegetation site

Measure	Completion targets	Completion criteria	Monitoring
Native diversity	Minimum of 60% of native species returned	A minimum of 7 native species per 10 x 10 quadrat	Native diversity will be counted annually in years 2 and 3. Monitoring will continue until completion criteria is met.
Weed density	Weed cover at the site is 10% or less (minor non-competitive weeds)	Weed cover is to be 10% or less of minor non-competitive weeds	Weed cover percentage will be assessed annually in years 2 and 3. Monitoring will continue until completion criteria is met.
Native density	Survival rate of 2 plant / m^2	A survival rate of 2 plant / m^2 is to be achieved after 3 years. All planted species that have not survived will be replanted within 12 months and monitored for a further 2 years.	The number of surviving plants will be counted annually in years 2 and 3. Further monitoring will be conducted if replanting is required.

Measure	Completion targets	Completion criteria	Monitoring
Watering	Watering of tubestock over summer months	Watering to be conducted 5 times over the summer months each year for 3 years	Watering of tubestock to be conducted 5 times in years 1, 2 and 3. A regular water schedule will be implemented by the City until completion criteria is met.
Weed control	Quarterly weed control events with the first event to be undertaken prior to planting	Weed control events to be conducted quarterly each year for 3 years	Quarterly weed control events to be conducted in years 1, 2 and 3. Weed control will continue until completion criteria is met.

The revegetation sites will be monitored annually against the completion targets and criteria, and a vegetation condition assessment will be undertaken. Remedial actions will be undertaken as required, and monitoring will continue until completion criteria has been met.

3.4 Reference Sites

Floristic surveys are regularly scheduled in the City's coastal reserves to provide accurate data regarding floristic communities and vegetation conditions. These flora surveys provide the City with quadrat data as part of the vegetation analysis which are used by the City as reference sites for developing revegetation species lists and to guide long term monitoring.

The reference sites use by the City are identifiable by GPS coordinates for use in future surveys and monitoring and include vegetation of excellent condition. The reference quadrats are of the same vegetation communities as the areas being revegetated to ensure the species used in rehabilitation works are suitable. A map of the reference quadrats is presented in Figure 6. The floristic data from the survey from which the reference quadrats have been sourced can be found in **Attachment 2**.

Reference sites from the Iluka-Burns Beach Foreshore Reserve flora survey and Vegetation Condition Assessment (ELA 2021) along with species from the existing vegetation communities within the revegetation site, were used to develop the species list and will be used as a guide for the long-term rehabilitation at the site. Additional infill planting and revegetation may be required and include alternative species identified from within the reference quadrats.

The following quadrats from the ELA (2021) survey have been chosen as reference sites:

- ELA06 (Excellent Condition) - Vegetation Community ArAcSg
- ELA08 (Excellent Condition) - Vegetation Community SgSa
- ELA11 (Excellent Condition) - Vegetation Community SgSa
- ELA12 (Excellent Condition) - Vegetation Community SgSa.



Figure 6 - Revegetation Reference Quadrats

Burns Beach Revegetation Site

- Northern
- Southern
- Revegetation Reference Quadrats

Vegetation Condition

- Excellent
- Very Good
- Good
- Completely Degraded
- Open Beach/Rocks
- Track

0 100 200 400
Metres

Datum/Projection:
GDA2020 MGA Zone 50

25PER11205-KR Date: 7/07/2025

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3.5 Revegetation Species

The City will engage a contractor to propagate and grow revegetation species as listed below, using local provenance seed collected from the revegetation where possible. The City will also consider the collection of cuttings and seeds from the native vegetation clearing to grow local provenance species in the City's nursery for its revegetation projects. The City adopts a local provenance approach for revegetation projects within the City and works closely with the local Friends Groups in revegetation efforts.

Reference sites in excellent condition have been used to develop revegetation species lists representative of the current and adjacent ecological communities. These include species from the Coastal shrublands on shallow sands Priority Ecological Community (Priority 3) found within and in proximity to the revegetation site. There is an agreement in place with the local residents that no Acacia species are to be planted in the southern extent of the revegetation site. Therefore, separate species lists have been prepared for the northern and southern extents. The species lists for the northern and southern extents of the revegetation site are provided in Table 4 and Table 5, respectively.

Table 4: Burns Beach Foreshore Reserve Revegetation Site (Northern Extent) Species List

Scientific Name	Number of plants*
Acacia cyclops	150
Acacia saligna	100
Acanthocarpus preissii	150
Ficinia nodosa	150
Lepidosperma gladiatum	250
Myoporum insulare	250
Olearia axillaris	275
Rhaghodia baccata	275
Scaevola crassifolia	275
Spinifex longifolius	600
Spyridium globulosum	250
Threlkeldia diffusa	250
Total	**2,975**

Table 5: Burns Beach Foreshore Reserve Revegetation Site (Southern Extent) Species List

Scientific Name	Number of plants*
Acanthocarpus preissii	150
Ficinia nodosa	150
Lepidosperma gladiatum	250
Myoporum insulare	250
Olearia axillaris	275
Rhaghodia baccata	275
Scaevola crassifolia	275
Spinifex longifolius	600
Spyridium globulosum	250
Threlkeldia diffusa	250
Total	**2,725**

3.6 Revegetation Techniques

The revegetation of the City's coastal reserves can be separated into distinct categories depending on the timing and tasks conducted. During the revegetation process the City will keep records relating to any works conducted including what their outcome was, their method, and their timing.

3.6.1 Site Preparations

Prior to the revegetation works commencing, the City will ensure the site is adequately prepared. Preparations may include the clearing of non-native vegetation, chemical weed control, pest management techniques, and erosion control such as coir matting and sand trap fencing. Around the revegetation areas seed collection may be conducted to facilitate the propagation of local provenance tubestock to be used in the revegetation works.

3.6.2 Plantings

Tubestock seedlings will be planted in winter as it is an effective method for revegetating the sites with the most favourable weather conditions. Tubestock will be planted once the winter rains have started, and the ground is sufficiently moist. Species will be planted in a mixed pattern so that diversity is maintained across the revegetation sites. Tree guards may be used across the revegetation sites to prevent damage from grazing and improve the survival rate of planted tubestock. Tubestock will be installed using a deep planting method. Supplementary plantings will be undertaken in years 2 and 3 if the native diversity and density criteria is not met.

3.6.3 Pathogen and Weed Hygiene

Pathogen and weed hygiene protocols will be adhered to prior to entering and leaving the site, including implementation of the City's Pathogen Hygiene Procedure as shown in **Attachment 3.** Seedlings will be obtained from either a Nursery Industry Accreditation Scheme Australia (NIASA) certified nursery, or from the City's nursery with the implementation of our pathogen hygiene procedures to ensure the plants are obtained from dieback free sources.

3.6.4 Weed Control

Weed control will occur at the revegetation sites prior to planting to reduce competition pressures for the planted tubestock. Following the winter planting, quarterly weed control events will be scheduled including hand weeding and spot spraying with additional weed control conducted as required.

Weed control will be conducted by suitably qualified City personnel or contactors. The City shall be given advanced notice of chemical application events to ensure residents in the surrounding area are notified. A Chemical Application Report must be completed for each event through the City's online spray register. Application conditions such as rain and wind conditions will be outlined in the tender awarded to the successful applicant.

3.6.5 Pest Management

Rabbit control methods such as fumigation will be conducted at the revegetation sites prior to revegetation works, if required, to prevent damage to revegetation works and to improve the condition of the existing vegetation.

3.6.6 Watering

Tubestock will be watered 5 times over summer months as required.

3.6.7 Site Protections

The revegetation site is to have temporary fencing installed to prevent pedestrian access to the dunes along the beach and beach access pathway. The revegetation site will be separated from pedestrian movement by conservation fencing. This fencing will prevent pedestrian access to the area. In the case of disruptions to the revegetation sites, additional fencing measures will be employed. Temporary signage will also be installed indicating that the sites contain revegetation and are not to be disturbed. Temporary fencing will be inspected every 6 months and repairs undertaken as required.

3.6.8 Remedial Action

Annual monitoring will be conducted by an environmental specialist within the revegetation areas to ensure the completion criteria are met. If monitoring survey results indicate the revegetation sites are not predicted to meet the requirements of the completion criteria, additional plantings will be conducted until the species diversity and plant density are met. Remedial actions will also be conducted if weed coverage is greater than 10%, prompting weed control activities to be continued in accordance with the methods described in Section 3.6.4. If the revegetation site begins to experience degradation from erosion, additional erosion controls, such as coir matting and sand trap fencing will be implemented. If pest numbers increase and begin to degrade the site pest controls will be put in place in accordance with Section 3.6.5.

4 Revegetation Schedule

The proposed schedule for revegetation works within the Burns Beach Foreshore Reserve is detailed in Table 6. Seed collection will be conducted within the City's Foreshore Reserves, as required, throughout the revegetation process to ensure the availability of local provenance seed for propagation.

Table 6: Burns Beach Foreshore Reserve Revegetation works schedule

Year	Timing	Responsible	Task
Year 0	After permit granted	Contractor	Clearing completed
	July	City Staff	Order revegetation tubestock for planting
Year 1	Mar - May	Contractor	Weed and erosion control, at revegetation sites prior to planting
	Jun - Aug	Contractor	Plant tubestock seedlings at revegetation sites
	After planting is completed	Contractor	Install temporary fencing if required and signage around revegetation sites
	Every six months after fencing is installed	City Staff	Inspect fencing and signage and make repairs if required
	Quarterly after planting	City Staff / Contractor	Weed control at revegetation sites after planting
	Sept - Nov	Contractor	Inspect revegetation survival rates and determine if infill planting required in following year to meet targets and assessment criteria
	Sept - Nov	City Staff	Order plants for supplementary planting in following year (if required)
	Summer	City Staff / Contractor	Water revegetation plants over summer – five times
Year 2	Every six months	City Staff	Inspect fencing and signage and make repairs if required
	Quarterly	City Staff / Contractor	Weed control at revegetation sites

Year	Timing	Responsible	Task
	Jun - Aug	Contractor	Infill planting (if required)
	Sept - Nov	Contractor	Monitoring and assessment against targets and completion criteria
	Sept - Nov	City Staff	Order plants for supplementary planting in following year (if required)
	Summer	City Staff / Contractor	Water revegetation plants over summer – five times
Year 3	Every six months	City Staff	Inspect fencing and signage and make repairs if required
	Quarterly	City Staff / Contractor	Weed control at revegetation sites
	Jun - Aug	Contractor	Infill planting (if required)
	Sept - Nov	Contractor	Monitoring and assessment against targets and completion criteria – Determine if further management / monitoring required
	Sept - Nov	City Staff	Order plants for supplementary planting in following year (if required)
	Summer	City Staff / Contractor	Water revegetation plants over summer – five times

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Attachment 1: Burns Beach Foreshore Reserve Revegetation Site Photos

Burns Beach Foreshore Reserve Revegetation Site (Northern)



Plate 1: Burns Beach Foreshore Reserve Revegetation Site (Northern) facing northwest. Location contains degraded and invasive vegetation and cleared areas.



Plate 2: Burns Beach Foreshore Reserve Revegetation Site (Northern) facing south. Location contains degraded and invasive vegetation and rubbish dumping.



Plate 3: Burns Beach Foreshore Reserve Revegetation Site (Northern) facing north. Location contains informal tracks.



Plate 4: Burns Beach Foreshore Reserve Revegetation Site (Northern) facing north. Location contains degraded vegetation and cleared areas.

Burns Beach Foreshore Reserve Revegetation Site (Southern)



Plate 5: Burns Beach Foreshore Reserve Revegetation Site (Southern) facing south. Location contains degraded and invasive vegetation.



Plate 6: Burns Beach Foreshore Reserve Revegetation Site (Southern) facing southwest. Location contains degraded and invasive vegetation.



Plate 7: Burns Beach Foreshore Reserve Revegetation Site (Southern) facing east. Location contains degraded and invasive vegetation and cleared areas.



Plate 8: Burns Beach Foreshore Reserve Revegetation Site (Southern) facing northeast. Location contains invasive vegetation.

Attachment 2: Flora Surveys for Burns Beach Foreshore Reserve

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Please See Attached Documents

Iluka-Burns Beach Foreshore Reserve flora survey, vegetation condition assessment and fauna survey

City of Joondalup

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DOCUMENT TRACKING

Project Name	Iluka-Burns Beach Foreshore Reserve flora survey, vegetation condition assessment and fauna survey
Project Number	16745
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Reviewed by	Jeff Cargill
Approved by	**Jeff Cargill**
Status	**Final**
Version Number	**v3**
Last saved on	**17 June 2021**

This report should be cited as 'Eco Logical Australia 2021. *Iluka-Burns Beach Foreshore Reserve flora survey, vegetation condition assessment and fauna survey*. Prepared for City of Joondalup.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from City of Joondalup.

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Template 2.8.1

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Abbreviations

Abbreviation	Description
BAM Act	State *Biosecurity and Agriculture Management Act 2007*
BC Act	State *Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
Burns Beach	Burns Beach Foreshore Reserve
CLUSTER	Hierarchical Clustering
CR	Critically Endangered
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation
DotEE	Department of the Environment and Energy
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia
EN	Endangered
EPA	Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Act 1999*
FCT	Floristic Community Type
ha	hectare
IBRA	Interim Biogeographical Regionalisation for Australia
Iluka	Iluka Foreshore Reserve
km	kilometre
KPI	Key Performance Indicator
m	metre
MDS	Multi-Dimensional Scaling
P	Priority
PEC	Priority Ecological Community
PRIMER	Plymouth Routines in Multivariate Ecological Research v6
SIMPER	Similarity Percentages
TEC	Threatened Ecological Community
the City	City of Joondalup
TSSC	Threatened Species Scientific Committee
VU	Vulnerable
WA	Western Australia
WAH	Western Australian Herbarium

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Abbreviation	Description
WAM	Western Australian Museum
WAOL	Western Australian Organism List
WoNS	Weed of National Significance

Executive Summary

Eco Logical Australia was engaged by the City of Joondalup to undertake a Detailed and Targeted flora survey, vegetation condition assessment and Detailed fauna survey of the Iluka and Burns Beach Foreshore Reserves, areas of approximately 31.3 hectares and 29.3 hectares, respectively, located in the City's suburbs of Iluka and Burns Beach, approximately 30 kilometres north of Perth, Western Australia. This assessment will be used to inform the development of an Iluka-Burns Beach Foreshore Reserve Management Plan.

In addition, the City plans to develop a section of the Burns Beach survey area for a proposed restaurant (herein referred to as the restaurant development area). The restaurant development area is approximately 0.5 hectares and is located in the southern portion of the Burns Beach survey area.

The Detailed and Targeted flora survey and vegetation condition assessment was conducted in spring from 22nd to 25th September and 30th September to 2nd October 2020 in accordance with the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* 2016. The Detailed fauna survey was conducted in spring from 9th to 13th November 2020 in accordance with the Environmental Protection Authority *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* 2020.

As part of the Detailed flora survey, vegetation communities were described through the establishment of 28 10 x 10 metre quadrats (14 in each survey area). A Targeted flora survey was conducted to record occurrences of any conservation significant flora species and/or communities listed under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, the State *Biodiversity Conservation Act 2016* or by the Department of Biodiversity, Conservation and Attractions. Opportunistic flora species were also recorded across the survey areas.

As part of the vegetation condition assessment, a weed survey was conducted to record weed species within the survey areas, including State, Federal (Weed of National Significance, Declared Pests listed under the State *Biosecurity and Agriculture Management Act 2007*), City of Joondalup pest plant and/or priority weeds in the City of Joondalup (priority species list provided by the City).

A total of 121 flora species (74 native and 47 introduced) were recorded within the Iluka survey area within quadrats and from opportunistic collections. A total of 106 flora species (63 native and 43 introduced) were recorded within the Burns Beach survey area within quadrats and from opportunistic collections. One flora species listed as Endangered under the EPBC Act and the BC Act was recorded within the Iluka survey area, namely *Marianthus paralius*. Two Priority flora species were recorded in the Iluka survey area; *Hibbertia leptotheca*, listed as Priority 3 by the Department of Biodiversity, Conservation and Attractions and as a Bush Forever significant species, and *Jacksonia sericea*, listed as Priority 4 by the Department of Biodiversity, Conservation and Attractions and as a Bush Forever significant species. A further eight Bush Forever significant species were recorded within the survey areas; *Agonis flexuosa, Callitris preissii, Grevillea preissii* subsp. *preissii* and *Melaleuca lanceolata* within Burns Beach and *Diplopeltis huegelii*, *Grevillea preissii* subsp. *preissii*, *Lechenaultia linarioides*, *Melaleuca cardiophylla,* and *Trymalium ledifolium* within Iluka Foreshore.

A total of seven and five vegetation communities were delineated and mapped within the Iluka and Burns Beach survey areas, respectively, with a minimum of three quadrats established within each

vegetation community, as specified in the Environmental Protection Authority *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016; **Table 1**).

Table 1: Overview of vegetation communities within the survey area

Vegetation community	Description	Burns Beach	Iluka Foreshore	Number of quadrats established
McAr	*Melaleuca cardiophylla, Acacia rostellifera* mid shrubland over *Rhagodia baccata*, *Threlkeldia diffusa* low sparse chenopod shrubland and **Ehrharta calycina* low sparse tussock grassland		X	3
FpApSc	*Frankenia pauciflora, Acanthocarpus preissii, Scaevola crassifolia* low open shrubland	X	X	3
SgMhAr	*Spyridium globulosum, Melaleuca huegelii, Acacia rostellifera* tall open shrubland over *Grevillea preissii* subsp. *preissii* mid sparse shrubland and *Rhagodia baccata, Threlkeldia diffusa* mid open chenopod shrubland over **Briza maxima, *Ehrharta calycina* low open tussock grassland and *Lomandra maritima* low sparse forbland		X	5
BsArSg	*Banksia sessilis, Acacia rostellifera, Spyridium globulosum* mid open shrubland over *Hibbertia hypericoides*, *Banksia dallanneyi* low open shrubland and *Lomandra maritima* low sparse forbland	X	X	4
SgEsOa	*Spyridium globulosum, Exocarpos sparteus, Olearia axillaris* tall sparse shrubland over *Acrotriche cordata, Scaevola crassifolia, Leucopogon parviflorus* mid sparse shrubland over *Acanthocarpus preissii* low sparse shrubland and **Trachyandra divaricata, Conostylis candicans* subsp. *calicola* low sparse forbland	X	X	3
ArAcSg	*Acacia rostellifera, Acacia cyclops, Spyridium globulosum* tall shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse chenopod shrubland and *Acanthocarpus preissii* low sparse shrubland	X	X	4
SgSa	*Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid sparse shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragona decumbens, Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum* low open sedgeland	X	X	6

Vegetation within the Iluka survey area comprised 29 hectares (92.7%), with the remaining 2.3 hectares (7.3%) comprising tracks and open beach/rocks. Vegetation within the Burns Beach survey area comprised 25.3 hectares (86.3%), with the remaining 4 hectares (13.7%) comprising tracks, areas of dunal blowout and open beach/rocks.

One vegetation community was delineated and mapped within the restaurant development area, namely SgSa: *Spyridium globulosum, Santalum acuminatum* tall sparse shrubland. This vegetation community comprised 0.4 hectares (84%), with the remaining 0.1 hectares (16%) comprising tracks.

Results of the multivariate analysis showed that quadrats within the BsArSg vegetation community had a close affiliation with Floristic Community Type 24: Northern Spearwood shrublands and woodlands, which is listed the Department of Biodiversity, Conservation and Attractions as a Priority 3 ecological community. Floristic Community Type 24 is described as 'heaths or heaths with scattered *Eucalyptus*

gomphocephala (Tuart), with heathlands in this group typically including *Banksia sessilis*, *Calothamnus quadrifidus*, and *Schoenus grandiflorus*'. Within the survey area, vegetation community BsArSg has components analogous to this PEC, including the presence of *Banksia sessilis* and *Calothamnus quadrifidus* heathland. A total of 4.6 hectares (14.7%) of the Iluka survey area and 0.4 hectares (1.4%) of the Burns Beach survey area is considered as likely representing the Floristic Community Type 24 Priority Ecological Community.

Quadrats within vegetation communities ArAcSg, FpApSc, McAr, SgEsOa, SgMhAr, SgSa showed close affiliation with Floristic Community Type 29a: Coastal shrublands on shallow sands, which is listed by the Department of Biodiversity, Conservation and Attractions as a Priority 3 ecological community. Floristic Community Type 29a is described as mostly heaths on shallow sands over limestone close to the coast. Within the survey area, vegetation communities ArAcSg, FpApSc, McAr, SgEsOa, SgMhAr, SgSa have components analogous to the 'Coastal shrublands on shallow sands' Priority Ecological Community, including the presence of heaths on shallow sands over limestone close to the coast, *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris*. A total of 24.4 hectares (77.9%) of the Iluka survey area and 26.2 ha (89.4%) of the Burns Beach survey area is considered as likely representing the Floristic Community Type 29a Priority Ecological Community, including a total of 0.4 hectares (84%) ha of the restaurant development area.

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community'. A small stand of *Banksia attenuata* was recorded in the Iluka survey area at ELA19. This stand was recorded in the BsArSg vegetation community, comprising of an area of less than 0.5 hectares in size, and did not constitute a woodland structure or warrant delineation of a separate vegetation community. Therefore, the BsArSg vegetation community does not represent the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community.

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community approved conservation advice in order to determine the presence of the Threatened Ecological Community within the survey areas. Whilst a number of vegetation communities were identified as representing Floristic Community Type 24 and 29a, indicating the potential presence of the Threatened Ecological Community, no tuarts were recorded in either of the survey areas and so vegetation within the survey area is not considered to represent the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community.

Vegetation condition within the Iluka and Burns Beach survey areas ranged from Excellent to Completely Degraded, based on the Keighery (1994) vegetation scale, as outlined in the Environmental Protection Authority *Technical Guidance*: *Flora and Vegetation Surveys for Environmental Impact Assessment* 2016. Disturbances across both survey areas included weeds, minor rubbish dumping and the presence of informal tracks (walk trails and vehicle tracks). Of note are a number of illegal vehicle tracks throughout the northern sections of the Burns Beach survey area, fragmenting the vegetation throughout the area and preventing these areas from naturally revegetating.

A total of five fauna habitats were identified within the Iluka survey area and four fauna habitats within the Burns Beach survey area. These habitats cover a total of 29 hectares (92.6%) of the Iluka survey area

and 26.6 hectares (90.8%) of the Burns Beach survey area, with tracks and open beach/rocks accounting for the remaining areas.

A total of 47 vertebrate fauna species were recorded within the Iluka survey area, including 13 reptile, 27 bird and seven mammal species. A total of 37 vertebrate fauna species were recorded within the Burns Beach survey area, including seven reptile, 24 bird and six mammal species. No amphibians were recorded in the survey areas. A total of 13 and 12 invertebrate taxa were recorded within the Iluka and Burns Beach survey areas, respectively. Feral fauna species recorded within both survey areas comprised of Red Fox *(*Vulpes Vulpes*), Cat (**Felis catus*) and House Mouse (**Mus musculus*). European Rabbit (**Oryctolagus cuniculus*) was recorded within the Iluka survey area only.

Two conservation significant fauna species were observed during the field survey; including Carnaby's Cockatoo (*Calyptorhynchus latirostris*; listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* and the State *Biodiversity Conservation Act 2016*) and Quenda (*Isoodon fusciventer*; listed as Priority 4 by the Department of Biodiversity, Conservation and Attractions). Quenda were recorded as occurring within both the Iluka and Burns Beach survey areas; however, Carnaby's Cockatoo was observed at the Iluka survey area only.

No fungi species were recorded in either of the survey areas during the field survey.

Recommendations to conserve native flora, vegetation, fauna and environmental values within the survey areas are as follows:

- Continue long-term monitoring of weed populations within the survey areas. Implement weed control, particularly for the Declared Pest and WoNS species **Asparagus asparagoides* (Bridal Creeper) and the Declared Pest species **Moraea flaccida* (One-leaf Cape Tulip), for City of Joondalup priority weeds. Concentrate weed control activities along track edges and boundaries between remnant bushland and cleared areas.
- Continue to monitor populations of *Hibbertia leptotheca* (P3) and *Jacksonia sericea* (P4).
- Ensure that unauthorised access is restricted to defined tracks/paths only to prevent habitat degradation and weed spread i.e. unauthorised walking/vehicle tracks within the survey areas e.g. installation of fencing or formal signage, particularly in areas of access to the northern sections of Burns Beach.
- Continue regular monitoring of Quenda to ensure ongoing health and sustainability of the population.
- Feral animal control must be maintained, particularly in regard to foxes, cats and rabbits.
- It is recommended to continue monitoring for pathogens and to maintain correct hygiene practices.

1. Introduction

1.1 Project background

Eco Logical Australia (ELA) was engaged by the City of Joondalup (the City) to undertake a Detailed and Targeted flora survey and vegetation condition assessment and a Detailed fauna survey of the Iluka Foreshore Reserve (herein referred to as the Iluka survey area) and the Burns Beach Foreshore Reserve (herein referred to as the Burns Beach survey area), areas of approximately 31.3 hectares (ha) and 29.3 ha respectively, located in the City's suburbs of Iluka and Burns Beach, approximately 30 kilometres (km) north of Perth, Western Australia (WA; **Figure 1**).

Iluka and Burns Beach Foreshore Reserves are listed as Bush Forever sites (site 325 and 322, respectively) and are considered as major conservation areas within the City, due to high biodiversity values. Neither of the reserves possess an existing Management Plan, however limited ecological data is available on these sites in the City's Coastal Foreshore Management Plan 2014-2024 (Natural Area 2014). This assessment will be used to inform the development of an Iluka-Burns Beach Foreshore Reserve Management Plan.

In addition, the City plans to develop a section of the Burns Beach survey area for a proposed restaurant (herein referred to as the restaurant development area). The restaurant development area is approximately 0.5 ha and is located in the southern portion of the Burns Beach survey area (**Figure 1**). More specifically, the objectives of this assessment include:

- An assessment of flora and vegetation communities in accordance with the Environmental Protection Authority (EPA) *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016);
- Undertake a vegetation condition assessment using the Keighery (1994) vegetation condition scale;
- A Targeted survey of State, Federal and/or Department of Biodiversity, Conservation and Attractions (DBCA) conservation significant flora, including Bush Forever significant flora and/or vegetation;
- An assessment to verify if the vegetation meets the requirements specified in the Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act) 'Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community', using the four-stage assessment process itemised in the Approved Conservation Advice (Threatened Species Scientific Committee [TSSC] 2016);
- An assessment to verify if the vegetation meets the requirement specified in the Department of Environment and Energy (DotEE) 'Approved Conservation Advice (incorporating listing advice) for the Tuart (*Eucalyptus gomphocephala*) woodlands and forests of the Swan Coastal Plain ecological community' using the assessment process outlines in the Conservation Advice (DotEE 2019);
- Record all weed species encountered including State, Federal (Weed of National Significance [WoNS], Declared Pests under the *Biosecurity and Agriculture Management Act 2007* [BAM Act]) and/or priority weeds in the City of Joondalup (priority species list provided by the City). Weed mapping must be completed in accordance with Department of Environment and Conservation

(DEC) Standard Operation Procedure: Techniques for mapping weed distribution and cover in bushland and wetlands (DEC 2011);

- An assessment of fauna in accordance with the requirements of the EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020);
- Establish the occurrence, distribution and population of vertebrate fauna species surveyed;
- To establish the presence, record any declared Threatened, specially protected, priority State or Federal listed (e.g. State *Biodiversity Conservation Act 2016* [BC Act], EPBC Act), or internationally listed fauna including their conservation status;
- A basic habitat assessment (condition/ability to sustain the population) for all observed native fauna, as well as specific information relating to the Carnaby's Cockatoo (*Calyptorhynchus latirostris*) and the Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*);
- Record locations where feral fauna and evidence of feral fauna (e.g. beehives, dens, scats) have been identified; and
- Record opportunistic sightings of fungi and invertebrates.

Figure 1-1: Survey area locations



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development

0 125 250 500
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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2. Environmental setting

2.1 Regional context

Broad environmental values for the region relevant to the survey areas are presented in **Table 2**.

Table 2: Environmental values of the region

Existing environmental attributes	Survey area
Interim Biogeographical Regionalisation for Australia (IBRA) Bioregion (DAWE 2020)	Swan Coastal Plain (SWA)
IBRA Subregion	Perth (SWA02) – commonly characterised by Tuart and heath on limestone soils and Banksia-Jarrah-Marri woodland on sandy soils. The subregional area is 1,333,901 ha (Mitchell *et al*. 2002).
Geology, landform and soils (DPIRD 2018)	Quindalup Dune System, the youngest of the aeolian dune systems associated with the Swan Coastal Plain. It is characterised by unconsolidated white calcareous sands that form a series of dunes and beach-ridge plains. To the east of the Quindalup Dune System lie the older Spearwood dunes. The survey areas are situated on soil unit B24 which includes undulating dune landscape underlain by aeolianite which is frequently exposed.
FCTs inferred within the survey areas (Government of Western Australia 2000)	**Supergroup 4**: Uplands centred on Spearwood and Quindalup Dunes • **FCT24**: Northern Spearwood shrublands and woodlands • **FCT 27**: Species-poor mallees and shrublands on limestone • **FCT28:** Spearwood *Banksia attenuata* or *B. attenuata* — Eucalyptus Woodlands • **FCT 29a**: Coastal shrublands on shallow sands • **FCT 29b**: Acacia shrublands on taller dunes
Bush Forever (Government of Western Australia 2000)	Burns Beach Foreshore Reserve – Bush Forever site 322 Link from Burns Beach Bushland to Neerabup National Park – Bush Forever site 323 Coastal Strip from Burns Beach to Hillary's – Bush Forever site 325
Beard's (1975) vegetation mapping	Jurien 129: Bare areas; dune sand (94.75% remaining in the Perth sub-region; Government of Western Australia 2019). Jurien 949: Low woodland; banksia (56.45% remaining in the Perth sub-region; Government of Western Australia 2019). Jurien 1007: Mosaic: Shrublands; *Acacia lasiocarpa* & *Melaleuca acerosa* heath / Shrublands; *Acacia rostellifera* & *Acacia cyclops* thicket (68.68% remaining in the Perth sub-region; Government of Western Australia 2019).

3. Methodology

3.1 Literature review

The following documents were reviewed to identify to identify species and communities' assemblages recorded within or in the vicinity of the survey area (current and historic):

- AECOM. 2018. *Tamala Park Reserve – Biological Report*. City of Wanneroo.
- Knowles, D and F. 2015-2018. *Macroinvertebrate and Herpetofauna Inventory Surveys*. Prepared in collaboration with Friends of North Ocean Reef – Iluka Foreshore and City of Joondalup.
- Natural Area Consulting Management Services (Natural Area). 2017. *Targeted Flora and Vegetation Survey – Part Lot 11485, 44 Ocean Parade, Burns Beach*. Prepared for the City of Joondalup.
- City of Joondalup. 2014. *Burns Beach Structure Plan No. 10*. Provided by the City of Joondalup.
- Peet. 2014. *Vegetation Plan Burns Beach*. Development Planning Strategies, Subiaco WA.
- GHD. 2013. *Department of Planning Proposed Dual Use Coastal Path between Mindarie and Burns Beach Environmental Study and Topographical Survey Report*. May 2013.
- City of Joondalup. 2009. *Burns Beach Park Natural Area Initial Field Assessment*.
- Cardno BSD Pty Ltd. 2006. *Foreshore Management Plan Burns Beach*. March 2006.
- Beaumaris Land Sales. 2001. *Iluka Flora & Vegetation Survey and Fauna Habitat Assessment*. Final report No: 2000/184.
- Government of Western Australia. 2000. *Bush Forever site description: Burns Beach Bushland*.
- Keighery G. J. and Keighery. B. J. 1992. *Flora of Burns Beach Coastal Reserve*.
- Foulds, W. 1982. *Conservation Area Ocean Reef / Burn's Beach South*. Provided by the City of Joondalup.

3.2 Field survey

3.2.1 Survey team and timing

The Detailed and Targeted flora survey and vegetation condition assessment was conducted by Jeff Cargill (Senior Botanist) and Jeni Morris (Ecologist) from 24th to 25th September and 30th September to 2nd October 2020. The Detailed fauna survey was conducted by Jeni Morris (Ecologist) and Briana Wingfield (Ecologist) from 9th to 13th November 2020. The survey team's relevant qualifications, experience and licences are provided in **Table 3** below.

Rainfall data from the nearby Wanneroo weather station (station number 9105, located approximately 10 km south-east of the survey areas) recorded a total of 4 millimetres (mm) during the flora survey (Bureau of Meteorology [BoM] 2020). In the three months prior to the flora field survey (June – August), a total of 322.1 mm of rainfall was recorded (BoM 2020). This is less than the long-term average for the same time period (446 mm). Despite lower than average rainfall, conditions at the time of survey were considered suitable with the majority of flora species in various reproductive stages (e.g. flowering, fruiting), allowing for positive identification of individuals.

In the three months prior to the fauna field survey (August – October), a total of 184.2 mm of rainfall was recorded. This is less than the long-term average for the same time period (252.9 mm). A total of 29.8 mm of rainfall was recorded during the fauna survey, with 19 mm recorded on one day (BoM 2020).

Table 3: Survey team

Name	Qualification	Relevant experience	Licenses
Dr. Jeffry Cargill	BSc. Hons. PhD Environmental Sciences	Jeff has extensive experience in botanical and ecological studies throughout Western Australia including baseline vegetation studies (Reconnaissance and Detailed surveys), Targeted threatened and priority flora surveys, fauna and black cockatoo surveys, MNES surveys and rehabilitation and vegetation monitoring programs.	Flora collection: FB62000138 DRF licence: TFL 48-1920
Jeni Morris	BSc. Conservation and Wildlife Biology	Jeni has completed several flora and vegetation surveys on the Swan Coastal Plain and within the City of Joondalup including at Hepburn Heights, Warwick Open Space, Craigie Bushland Reserve and Yellagonga Regional Park.	Flora collection: FB62000070 DRF licence: TFL 13-1920 Fauna license: 08-004213-1
Briana Wingfield	BSc. Conservation and Wildlife Biology and Environmental Science (Hons)	Briana has over eight years' experience conducting fauna surveys across Western Australia, including Basic fauna surveys and Targeted black cockatoo habitat assessments.	Fauna license: 08-004213-1

3.3 Flora and vegetation survey

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

Stainless steel fence droppers were used to mark the north-west corner of each quadrat. Dominant vegetation communities were described, with respect to dominant species, structure and overall condition. The survey involved the use of 10 x 10 m quadrats as recommended for the Swan Coastal Plain bioregion (EPA 2016). Opportunistic sampling of species not recorded within the quadrats was undertaken to supplement the existing list of species recorded from within the survey area.

A total of 28 quadrats were surveyed across the survey areas; 14 in Iluka survey area and 14 in Burns Beach survey area (**Figure 2-1** and **Figure 2-2**). The following data was recorded within each quadrat:

- Site details (site name, site number, observers, date and location);
- Environmental information including landform, soil type and colour, bare ground and leaf litter cover, rock outcropping and time since last fire event; and
- Biological information including vegetation structure, vegetation condition in accordance with Keighery (1994), degree of disturbance, species present and species percentage cover.

A Targeted survey was completed within both survey areas to identify any conservation significant flora or communities potentially occurring, including:

- Threatened flora or Threatened Ecological Communities (TECs) listed under the EPBC Act;
- Threatened (Declared Rare) Flora listed under the latest WA Wildlife Conservation (Rare Flora) Notice under the State *Biodiversity Conservation Act 2016* (BC Act);
- Priority Ecological Communities (PECs) endorsed by the Western Australian Minister for the Environment;

- Priority (P) flora recognised by DBCA; and
- Bush Forever significant flora (Government of Western Australia 2000).

The survey methodology involved personnel walking transects across the survey area, with transects spaced (on average) 5-20 metres (m) apart depending on factors such as habitat type, disturbance (e.g. tracks) and landform (**Figure 2-1** and **Figure 2-2**). Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number. For conservation significant flora species identified in the field, the following was recorded:

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

3.4 Weed survey and mapping

As part of the vegetation condition assessment, the Iluka and Burns Beach survey areas were surveyed and mapped for State, Federal and/or Priority weeds as specified by the City of Joondalup, including all WoNS and Declared Pests listed under the BAM Act. The City of Joondalup priority weed list for Iluka and Burns Beach Foreshore Reserves is provided in **Table 4**.

For each priority weed species, including WoNS and/or Declared Pest species encountered, a GPS location coordinate was recorded using points for individual plants or polygons for populations. Weed data was collected in accordance to the DBCA (previously Department of Environment and Conservation [DEC]) Standard Operating Procedure 22.1 *Techniques for mapping weed distribution and cover in bushland and wetlands* (DEC 2011).

Table 4: City of Joondalup priority weed species

Species	Common name
**Arctotis* sp.	Arctotis
**Asparagus asparagoides*	Bridal Creeper
**Avena fatua*	Wild Oats
**Carpobrotus edulis*	Pigface
**Chamelaucium uncinatum*	Geraldton Wax
**Conyza* sp.	Fleabane
**Cynodon dactylon*	Couch grass
**Dimorphotheca ecklonis*	Veldt Daisy
**Ehrharta calycina*	Perennial Veldt

Species	Common name
**Ehrharta longiflora*	Annual Veldt
**Euphorbia paralias*	Sea Spurge
**Euphorbia terracina*	Geraldton Carnation Weed
**Fumaria* sp.	Fumitory
**Gazania linearis*	Gazania
**Ipomoea indica*	Morning Glory
**Lactuca serriola*	Prickle Lettuce
**Moraea flaccida*	One-leaf Cape Tulip
**Oxalis pes-caprae*	Soursob
**Pelargonium capitatum*	Rose Pelargonium
**Pennisetum clandestinum*	Kikuyu grass
**Raphanus* sp.	Wild Radish
**Ricinus communis*	Castor Oil Plant
**Schinus terebinthifolia*	Japanese Pepper
**Tetragonia decumbens*	Sea Spinach
**Thinopyrum distichum*	Sea Wheatgrass
**Trachyandra divaricata*	Onion Weed
**Tropaeolum* sp.	Nasturtium
**Urospermum picroides*	False Hawkbit
**Yucca* sp.	Yucca

3.5 Flora data analysis

As vegetation across Burns Beach and Iluka Foreshore is contiguous, vegetation community analysis (as outlined below) was undertaken across both survey areas. Results of this analysis are presented separately for each survey area in Section 4 below.

3.5.1 Flora species accumulation curve

A flora species accumulation curve was undertaken to indicate adequacy of the survey effort (Clarke and Gorley 2006). As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness. When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered adequate.

3.5.2 Vegetation communities

Plymouth Routines in Multivariate Ecological Research v6 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke and Gorley 2006). A presence/absence transformation was applied to the dataset to align with Gibson *et al.* (1994). Specimens not identified to species level and singletons (species recorded at a

single quadrat and not forming a dominant structural component) were excluded from the data set prior to analysis. Computation of similarity matrices was based on the Bray-Curtis similarity measure. Data were analysed using a series of multivariate analysis routines including Hierarchical Clustering (CLUSTER) and Similarity Percentages (SIMPER). Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

A Threatened and Priority Ecological Community (TEC/PEC) Occurrence Report Form was completed and submitted for all TECs and PECs identified within the survey area.

3.5.2.1 Floristic Community Type (FCT) analysis

Species within the Gibson *et al*. (1994) data set were updated to align with current names as specified by FloraBase (DBCA and Western Australian Herbarium [WAH] 2019). Using current records, a number of species in the Gibson *et al*. (1994) data set were shown to be significant range extensions from the Swan Coastal Plain, where appropriate such cases were removed. In addition, excluded and misapplied names were removed from the data set and infra-specific names were reduced. The merged dataset was analysed using a combination of pre-treatments such as the inclusion and/or removal of introduced species and singletons. The removal of singletons from the merged dataset, an accepted pre-treatment for such analysis, produced the best results (e.g. stronger correlations; Clarke and Gorley 2006). Inclusion of such data (i.e. singletons) merely served to confound the dataset by introducing stochastic and 'site' artefact data. Data were analysed using a combination of multivariate analysis routines including Bray-Curtis Similarity Matrices, Cluster Analysis (Linkage and Flexible Beta) and Multi-Dimensional Scaling (MDS).

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). To identify the presence of FCT's appropriate multivariate analyses comparing current data to that of Gibson *et al*. (1994) species by quadrat data, and inferences based on dominant species and geomorphology were used. Given the nature of the data (e.g. spatial and temporal differences), results and subsequent extrapolations, assigned FCT's within the survey area were inferred and not absolute, i.e. a vegetation code assigned to an FCT was inferred to comprise, to varying degrees, floristic aspects of that FCT as defined by Gibson *et al*. (1994). These FCTs were subsequently compared with vegetation communities delineated by ELA and Syrinx Environmental (2014).

3.5.2.2 Assessment of diagnostics to assess presence of TECs

The 'Banksia Woodlands of the Swan Coastal Plain' TEC is listed as Endangered under the EPBC Act (TSSC 2016). For information to assist in referral, environmental assessment and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice and Recovery Plan on the DotEE Species Profile and Threats Database (TSSC 2016). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key diagnostic characteristics, condition thresholds and additional considerations (TSSC 2016).

In order to determine whether the 'Banksia Woodlands of the Swan Coastal Plain' TEC is present in the survey area key diagnostic characteristics must be met under Section 2 of the Conservation Advice (TSSC 2016). The four-stage assessment identified by DotEE to ascertain the presence of the Banksia woodlands endangered ecological community within the site was undertaken by ELA following the field survey.

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

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

3.6 Flora identification and nomenclature

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

3.7 Fauna survey

A Detailed fauna survey was conducted in accordance with the EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020).

3.7.1 Habitat assessment trapping-site selection

Aerial maps of the survey areas were examined prior to the survey to select indicative locations for fauna trapping sites, to ensure that sites were placed in each fauna habitat type. Trap placement to ensure traps were concealed from public view was also taken into consideration.

Trapping sites (transects) were located to sample the habitat (vegetation - soil association) in areas expected to support a relatively high diversity of terrestrial fauna assemblages based on knowledge of faunal habitat preference of the Swan Coastal Plain. Trapping sites were chosen in order to represent all vegetation communities present within the survey area. Habitat characteristics were described primarily on flora and vegetation communities identified during the flora and vegetation survey.

The locations of the fauna trapping sites are provided in **Figure 2-1** and **Figure 2-2** and **Appendix B**, with photos presented in **Appendix C**.

3.7.2 Animal ethics

The Detailed fauna survey was conducted as per EPA (2020), DBCA fauna taking (scientific or other purposes) licence (outlined in **Table 3**) and the following Standard Operating Procedures (SOP):

- *Aluminium box traps for capture of terrestrial vertebrates* (DEC 2018a);
- *Cage traps for live capture of terrestrial vertebrates* (DEC 2018b);

- *Dry pitfall trapping for vertebrates* (DEC 2018c);
- *Funnel trapping for terrestrial fauna* (DEC 2018d);
- *Animal handling and restraint using soft containment* (DEC 2017);

Under these regulations, a set of methods and conditions were adhered to in order to minimise harm or stress to fauna. Animal ethics considerations focus on the following:

- Minimising the duration of time that fauna are in traps;
- Minimising trapped fauna exposure to harmful environmental conditions (i.e. heat and cold);
- Minimising the risk of introducing or spreading known fauna pathogens between populations;
- Appropriate and minimal animal handling; and
- Appropriate release conditions.

All vertebrate fauna captured during the fauna survey were identified in the field and released at the point of capture.

3.7.3 Sampling methods

The fauna survey was undertaken using a variety of sampling techniques, both systematic and opportunistic. Systematic sampling refers to data methodically collected over a fixed time period in a discrete habitat type or location, using an equal or standardised sampling effort across multiple sample locations. This approach provides a range of detection methods that cover the full suite of vertebrate fauna assemblages. Opportunistic sampling includes data collected non-systematically from both fixed sampling sites and as opportunistic records from chance encounters with fauna. This method generally accounts for the majority of bird species and a significant proportion of other fauna groups recorded, including invertebrate species.

3.7.3.1 Trapping

A total of four full trapping sites were established over four nights; two in the Burns Beach survey area (trapping sites 1 and 2) and two in the Iluka survey area (trapping sites 3 and 4; **Figure 2-1** and **Figure 2-2**). At each trapping site, the following were established (trap nights presented in **Table 5**):

- Ten 20 litre pit traps set approximately 20 m intervals and set with flywire mesh drift fence;
- Ten funnel traps set approximately 20 m intervals and set with flywire mesh drift fence;
- Twenty small aluminium box traps set approximately 10-20 m intervals;
- Two cage traps set approximately 10-20 m intervals;
- One Song Meter SM2 ultrasonic recorder; and
- One motion camera.

An additional trapping site (trapping site 5) of seven small aluminium box traps was established in the Iluka survey area in the limestone cliffs habitat (**Figure 2-1** and **Figure 2-2**). All small aluminium box traps, cage traps and motion camera traps were set with universal bait made from a mixture of rolled oats, peanut butter and sardines.

3.7.3.2 Spotlighting

Nocturnal survey involves the use of head torches to detect active nocturnal fauna by eye shine or movement. Searching was conducted by traversing the walk tracks whilst spotlighting into adjacent

bushland within the study areas. The nocturnal survey occurred over a period of approximately two hours between 18:30 and 20:30 hours on 12th November 2020.

3.7.3.3 Observation

Bird surveys were undertaken during peak activity periods, namely after dawn. Birds were identified by visual detection and by call within an approximately 20 m radius of each trapping site. Birds are less active in wet, windy and extremely hot conditions, for example conditions experienced during this survey.

Opportunistic observations were made at all times during the five-day field survey, during both daylight hours and during the spotlighting session. Calls, tracks, diggings, scats, dens, burrows and other signs of fauna activity were recorded where observed.

Active searches involved the use of hand rakes to search within microhabitats for inactive reptiles. Search locations included beneath leaf litter, logs and other ground debris.

3.7.3.4 Acoustic surveys – ultrasonic calls

A SM2 recorder was established at each trapping site in representative habitat. Specialist software is able to visualise ultrasonic bat echolocation calls recorded on the SM2 into corresponding graphical representation for analysis. Most bat species have a unique call which appears as a 'fingerprint' graph output. Bat calls were analysed by comparing recorded calls with reference calls by Bob Bullen at Bat Call WA, who specialises in bat survey and identification.

3.7.3.5 Camera traps

A camera trap was established at each trapping site in representative habitat. A camera trap is a digital camera that captures an image or video using an infrared sensor when an animal moves into a detection zone. Bait stations filled with universal bait was used to attract fauna to the camera traps.

3.8 Fauna identification and nomenclature

Nomenclature used for the vertebrate fauna species within this report follows the Checklist of the Terrestrial Vertebrate Fauna of Western Australia (Western Australian Museum [WAM] 2020). Where the common names were not stated for certain species, the following references were consulted:

- Amphibians: Tyler and Doughty (2009);
- Reptiles: Wilson and Swan (2013);
- Birds: Morcombe (2003); and
- Mammals: Menkhorst and Knight (2011).

Figure 2-1: Survey effort and survey sampling locations - Burns Beach



Legend

Survey Area
- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development
- Quadrat
- GPS Tracks

Fauna Trapping Sites
- Trapping site 1
- Trapping site 2

Fauna Trapping Sample Type
- Small aluminium box trap
- Pitfall trap
- Pitfall and funnel traps
- Cage trap
- Camera trap
- SM2 ultrasonic recorder

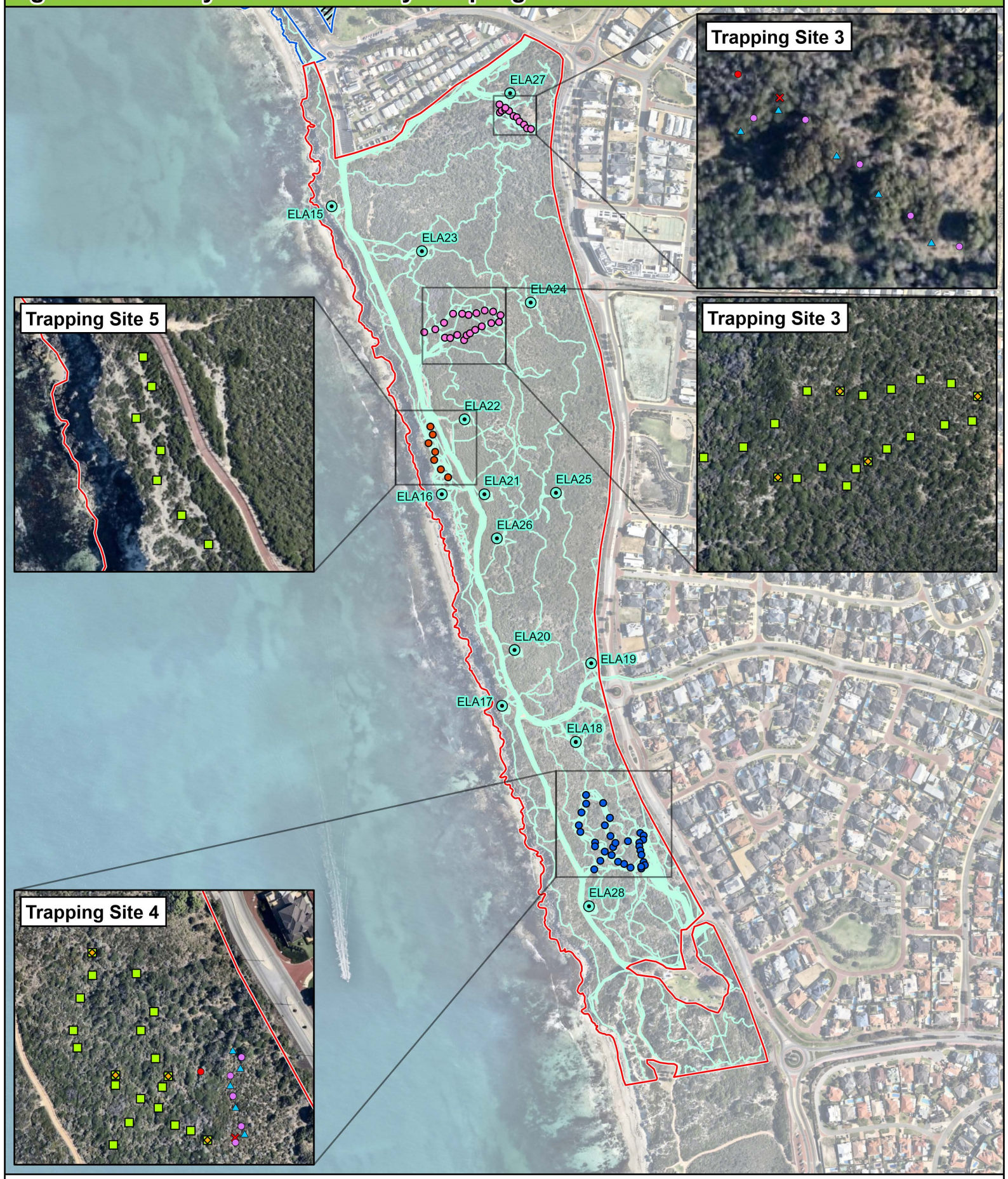
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Figure 2-2: Survey effort and survey sampling locations - Iluka Foreshore



Legend

Survey Area
- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development
- Quadrat
- GPS Tracks

Fauna Trapping Sites
- Trapping site 3
- Trapping site 4
- Trapping site 5

Fauna Trapping Sample Type
- Small aluminium box trap
- Pitfall trap
- Pitfall and funnel traps
- Cage trap
- Camera trap
- SM2 ultrasonic recorder

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Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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Table 5: Trapping nights

Trap line	Pit traps	Funnel traps	Small aluminium box traps	Cage traps	Spotlighting	Observation (e.g. bird surveys, active searching, opportunistic)	Acoustic surveys – ultrasonic calls	Camera traps
ELA01	160	160	320	8	Yes	Yes	1	4
ELA02	160	160	320	8	Yes	Yes	1	4
ELA03	160	160	240[2]	6	Yes	Yes	1	4
ELA04	160	160	240[2]	6	Yes	Yes	1	4
ELA05[1]	-	-	21[2]	-	-	Yes	-	-
Total	**640**	**640**	**1,141**	**28**	**-**	**-**	**4**	**28**

[1] Site ELA05 was in the limestone cliffs habitat, therefore only small aluminium box traps were established

[2] Due to high rainfall on the first day of the fauna survey, these sites were unable to be established; therefore, only three trap nights were undertaken.

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3.9 Limitations

The EPA *Technical Guide – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) and EPA *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020) recommends including discussion of the constraints and limitations of the survey methods used. Constraints and limitations for the Detailed and Targeted flora survey, vegetation condition assessment and Detailed fauna survey for the survey areas are summarised in **Table 6**. One potential constraint was identified.

Table 6: Survey limitations

Constraint	Limitations
Sources of information	**Not a constraint:** The Swan Coastal Plain has been well surveyed, with increasing survey work occurring due to the ongoing urban development of the Perth metropolitan area. A number of flora and fauna surveys have been undertaken in the survey area which have been utilised for the purposes of this survey. Gibson *et al.* 1994 was a primary source for determination of methods, analysis and results for assessing FCTs. Broad-scale vegetation mapping at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. The information which was available was sufficient and as such sources of information were not considered a major limitation.
Scope of work	**Not a constraint:** The survey requirement for a Detailed and Targeted flora survey and vegetation condition assessment in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) was adequately met. The survey requirement for a Detailed fauna survey in accordance with the EPA *Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) was adequately met.
Completeness of survey	**Not a constraint:** The area was surveyed to the satisfaction of the scope and a Detailed and Targeted flora survey and vegetation condition assessment and Detailed fauna survey as per relevant guidelines.
Intensity of survey	**Not a constraint:** Survey effort was considered adequate to meet objectives of the scope. The area was surveyed for conservation significant flora species and vegetation communities by field staff undertaking transects across the survey area spaced 5-20 m apart on average. This method provided an accurate assessment of habitat characteristics and likelihood of conservation significant species. The number of quadrats established was sufficient to determine the vegetation communities present and to identify any vegetation of conservation significance. Adequacy of the current sampling effort was tested via a species accumulation curve; approximately 90% of the flora potentially present within the survey area was recorded. Fauna trapping sites were established in each of the vegetation communities present.
Timing, weather, season, cycle	**Potential constraint:** The survey area is located in the Swan Coastal Plain bioregion of Western Australia. Recommended survey timing for this region is in spring (September – November; EPA 2016). The flora survey was undertaken in September / October and the fauna survey was undertaken in November. Many flora species were flowering at the time of the flora survey or had sufficient material (fruit) available to identify the dominant and target species. Approximately 29.8 mm of rainfall fell during the fauna survey, with 19 mm on one day. This delayed the establishment of three aluminium box trap lines and may have impacted the species diversity and abundance trapped during the fauna survey.

Constraint	Limitations
Disturbances	**Not a constraint:** Disturbances within the survey area included the presence of weeds, unauthorised access (walk trails and bike tracks) and edge effects. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Resources	**Not a constraint:** The personnel conducting this field survey were both suitably qualified to identify specimens, having previously undertaken flora and vegetation assessments on the Swan Coastal Plain, including in several reserves for the City of Joondalup.
Accessibility	**Not a constraint:** All relevant areas of the survey area were easily accessed and able to be surveyed.

4. Results

4.1.1 Previous surveys

A summary of the previous flora and vegetation and fauna surveys undertaken is provided in **Table 7**.

Table 7: Summary of previous surveys

Survey	Summary	Conservation significant species or communities
Tamala Park Reserve – Biological Report (AECOM 2018)	A biological assessment was successfully completed for a defined Survey Area of Tamala Park between Burns Beach and Mindarie and is bound by the Indian Ocean to the west and Marmion Avenue to the east. The field surveys were undertaken in September, October and November 2018. Eleven vegetation communities were mapped within the Survey Area; two woodlands, seven shrublands and one thicket. Four major fauna habitats were recorded in the Survey Area with the most valuable being the Woodland Over Mid to Low Shrubland due to their lower representation within the Survey Area.	Three Department of Biodiversity, Conservation and Attractions (DBCA) listed PECs were recorded within the Survey Area. No Threatened or Priority flora and fauna species were recorded.
Targeted Flora and Vegetation Survey – Part Lot 11485, 44 Ocean Parade, Burns Beach (Natural Area 2017)	The survey recorded 43 species, of which 17 were native and 26 non-native (weed) species, of which none were conservation significant. Vegetation types are representative of modified remnant vegetation that has been the subject to disturbance. Vegetation condition at the site ranged from completely degraded to good, with the majority being rated completely degraded.	The flora survey at Burns Beach found no declared rare flora and no threatened ecological communities.
Macroinvertebrate and Herpetofauna Inventory Surveys (Knowles and Knowles 2015-2018)	The sample history in this report spans from September 2015 to May 2018. Records of over 550 macroinvertebrates and herpetofauna species were gathered over this time.	No Threatened or Priority macroinvertebrates and herpetofauna species were recorded.
Coastal Foreshore Management Plan 2014-2024 (Natural Area 2014)	Four vegetation communities were described in the original plan by Ecoscape in 2002 and vegetation condition was assessed by Syrinx Environmental Pty Ltd in 2010 (48.2% in Good condition). A level 1 fauna survey and Graceful Sun Moth survey was undertaken by Western Wildlife in 2008.	One Threatened flora species, *Marianthus paralius*, and one P3 species, *Hibbertia spicata* subsp. *leptotheca*, under the (then) State *Wildlife Conservation Act 1950* are found in the coastal foreshore reserve.
Department of Planning Proposed Dual Use Coastal Path between Mindarie and Burns Beach Environmental	The Reconnaissance survey found 187 taxa from 41 families, including 47 introduced species. The survey identified eight vegetation types. A level 1 survey identified 28 fauna species, comprising 21 birds and three mammals. No fauna species of conservation significance were recorded.	At the time of the field survey, the moss *Fabronia hampeana* (P2) was the only conservation significant taxon recorded. Since the time of the field survey, *Jacksonia sericea* and Gastrolobium tomentosum have also been listed as Priority 4 species by DBCA.

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Survey	Summary	Conservation significant species or communities
Study and Topographical Survey Report (GHD 2013)		
Iluka Flora and Vegetation Survey and Fauna Assessment (ATA Environmental 2001)	The flora and vegetation survey was undertaken in October and December 2000, whilst the fauna habitat assessment was undertaken in November 2000. Six native vegetation associations were recorded from the study area. Three fauna habitats were defined from the study area; *Banksia* woodland, mixed heath and *Dryandra* heath.	No Declared Rare Flora species or TECs occurred in the study area. Possible signs of Quenda (diggings) were recorded in the study area.

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4.2 Flora and vegetation survey

4.2.1 Flora overview

A total of 121 flora species (74 native and 47 introduced) were recorded across 14 quadrats established in the Iluka survey area and from opportunistic collections. Average flora species richness per quadrat in Iluka survey area was 28.93 species, ranging from a low of 17 species at ELA20 to a high of 42 species at ELA24. Families with the highest number of species included Poaceae (15 species), Fabaceae (14 species) and Asteraceae (10 species). *Acacia*, *Conostylis*, *Hibbertia* and *Melaleuca* were the best represented genera throughout the Iluka survey area with 4, 4, 4 and 3 taxa recorded, respectively.

A total of 106 flora species (63 native and 43 introduced) were recorded across 14 quadrats established in Burns Beach survey area and from opportunistic collections. Average flora species richness per quadrat in Burns Beach survey area was 25.62 species, ranging from a low of 17 species at ELA02 to a high of 40 species at ELA13. Families with the highest number of species included Poaceae (16 species), Fabaceae (14 species) and Asteraceae (6 species). *Acacia*, *Conostylis* and *Melaleuca* were the best represented genera throughout the Burns Beach survey area with 5, 3 and 3 taxa recorded, respectively.

The flora species list is presented in **Appendix D**, flora species matrix in **Appendix E** and quadrat site data in **Appendix F**.

4.2.2 Accumulated species – site surveyed (species-area curve)

A species accumulation curve (**Figure 3**) was used to evaluate the adequacy of sampling (Clarke and Gorley 2006). Only species data recorded from defined quadrats were used; no opportunistic flora collections were included. The asymptotic value was determined using Michaelis Menten modelling. Using this analysis, the incidence-based coverage estimator of species richness was calculated to be 143.1. Based on this value, and the total species recorded within quadrats, approximately 90% of the flora species potentially present within the survey areas were recorded. This result, in addition to opportunistic collections, indicates that the majority of flora potentially present within the survey areas were recorded.

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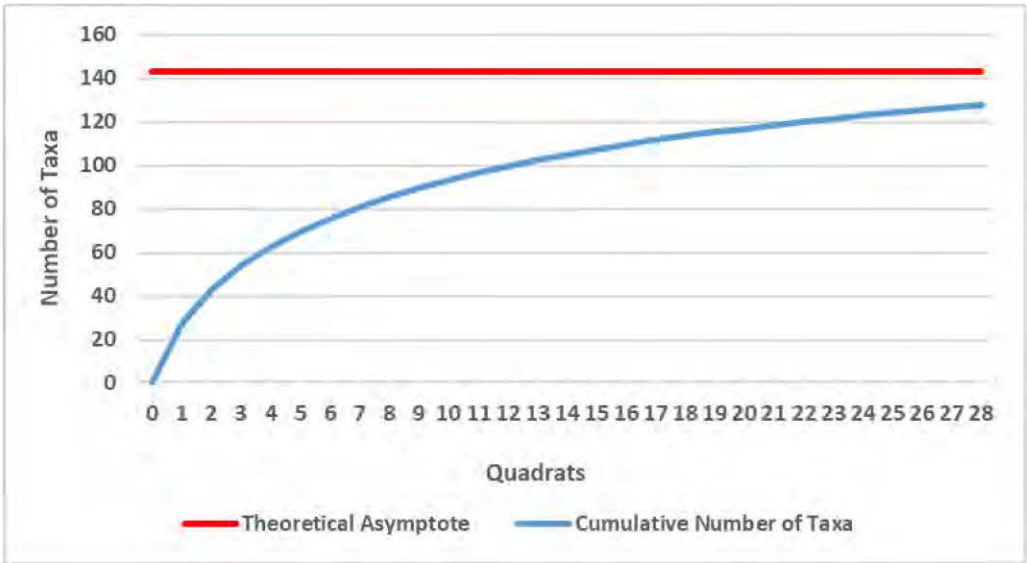


Figure 3: Average randomised species accumulation curve

Note: Only species recorded from quadrats were used to calculate the species accumulation curve and theoretical maximum number of species (asymptotic value).

4.2.3 Conservation significant flora

One flora species listed as Endangered under the EPBC Act and BC Act was recorded within the Iluka survey area, namely *Marianthus paralius* (WA Herbarium ACC/8941/E). [redacted] No Threatened flora species listed under the EPBC Act or BC Act were recorded within the Burns Beach survey area (including the restaurant development area).

Two Priority flora species (listed by DBCA) were recorded in the Iluka survey area; *Hibbertia leptotheca* (P3) and *Jacksonia sericea* (P4; **Figure 4-1** and **Figure 4-2**). *Hibbertia leptotheca* was found from eight locations near the coast in FpApSc (low limestone heath) vegetation community, whilst *J. sericea* was found in <2% cover in the BsArSg (low coastal heath) vegetation community. Both species are also listed in Bush Forever as a significant flora species of the Perth metropolitan area due to it being endemic to the Swan Coastal Plain (Government of WA 2000). No Priority flora species were recorded within the Burns Beach survey area (including the restaurant development area).

A further eight Bush Forever significant flora species were recorded from within the Iluka and Burns Beach survey areas, as outlined in **Table 8** and presented in **Figure 4-1** and **Figure 4-2** below. *Agonis flexuosa, Callitris preissii, Grevillea preissii* subsp. *preissii, Lechenaultia linarioides* and *Trymalium ledifolium* were all found from quadrats, whilst *Diplopeltis huegelii* and *Melaleuca lanceolata* were found opportunistically from one and two-point locations, respectively. *Melaleuca cardiophylla* was recorded within quadrats and as a dominant species in the McAr vegetation community. *Melaleuca lanceolata* was recorded in the restaurant development area.

Coordinate locations of conservation and Bush Forever significant flora are provided in **Appendix G**. Photos of conservation and Bush Forever significant flora are provided in **Appendix H**.

Table 8: Bush Forever significant flora species recorded within the survey areas

Species name	Burns Beach	Iluka
Agonis flexuosa	X	
Callitris preissii	X	
Diplopeltis huegelii		X
Grevillea preissii subsp. *preissii*	X	X
Lechenaultia linarioides		X
Melaleuca cardiophylla		X
Melaleuca lanceolata	X	
Trymalium ledifolium		X

Figure 4-1: Conservation significant and Bush Forever flora species recorded within Burns Beach survey area



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development

Conservation significant flora species

- *Agonis flexuosa* (BF)
- *Callitris preissii* (BF)
- *Grevillea preissii* subsp. *preissii* (BF)
- *Melaleuca lanceolata* (BF)

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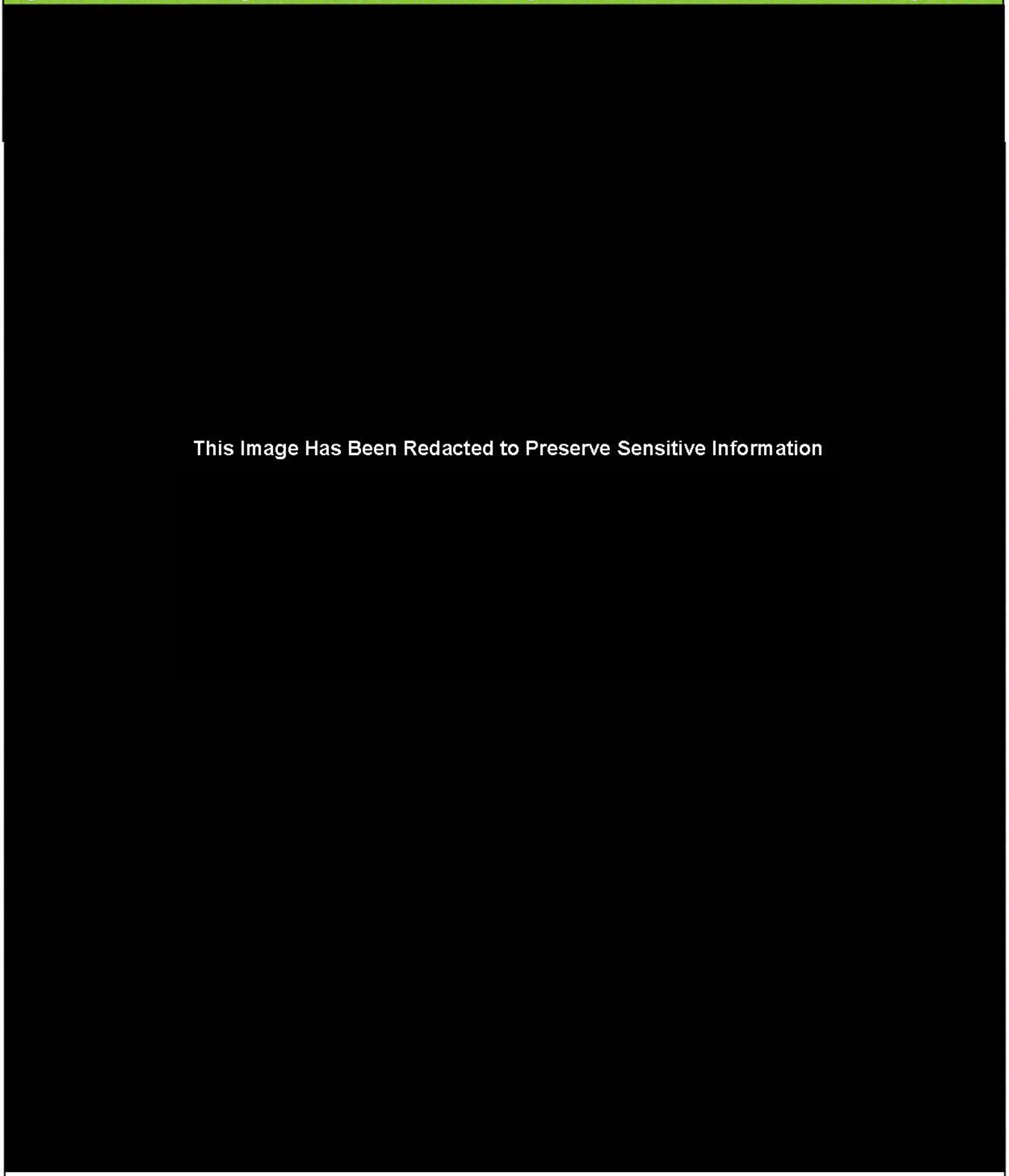
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Figure 4-2: Conservation significant and Bush Forever flora species recorded within Iluka Foreshore survey area



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- *Jacksonia sericea* (P4; BF) (<2%)
- *Melaleuca cardiophylla* (BF) (20-40%)

Conservation significant flora species

- *Marianthus paralius* (EN)
- *Hibbertia leptotheca* (P3; BF)
- *Jacksonia sericea* (P4; BF)
- *Diplopeltis huegelii* (BF)
- *Grevillea preissii* subsp. *preissii* (BF)
- *Lechenaultia linarioides* (BF)
- *Melaleuca cardiophylla* (BF)
- *Trymalium ledifolium* (BF)

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4.2.4 Introduced flora

A total of 47 introduced (weed) species were recorded within the Iluka survey area, representing 38.8% of the total flora species recorded. Of these, 22 species are listed as City of Joondalup priority weeds for the Iluka survey area. **Asparagus asparagoides* (Bridal Creeper) and **Moraea flaccida* (One-leaf Cape Tulip) are listed as Declared Pests s22(2) under the BAM Act. Declared Pests with a legal status of s22(2) "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia" (DPIRD 2020). **Asparagus asparagoides* (Bridal Creeper) is also listed as a WoNS (**Table 9**).

A total of 43 introduced (weed) species were recorded within the Burns Beach survey area, representing 40.6% of the total flora species recorded. Of these, 21 species are listed as City of Joondalup priority weeds for the Burn Beach survey area and **Asparagus asparagoides* (Bridal Creeper) is listed as a Declared Pest under the BAM Act and as a WoNS (**Table 9**).

Weed mapping within the survey areas is presented in **Appendix I**.

Table 9: City of Joondalup Priority weed species, Declared Pests or WoNS recorded within the survey areas

Species name	Common name	Ranking	Burns Beach	Iluka
**Arctotis* sp.	Arctotis	City of Joondalup Priority weed	X	
**Asparagus asparagoides*	Bridal creeper	WoNS and Declared Pest - s22(2), City of Joondalup Priority weed	X	X
**Avena fatua*	Wild Oats	City of Joondalup Priority weed	X	X
**Carpobrotus edulis*	Pigface	City of Joondalup Priority weed	X	X
**Chamelaucium uncinatum*	Geraldton Wax	City of Joondalup Priority weed		X
**Cynodon dactylon*	Couch grass	City of Joondalup Priority weed	X	
**Dimorphotheca ecklonis*	Veldt Daisy	City of Joondalup Priority weed	X	X
**Ehrharta calycina*	Perennial Veldt Grass	City of Joondalup Priority weed	X	X
**Ehrharta longiflora*	Annual Veldt Grass	City of Joondalup Priority weed	X	X
**Euphorbia paralias*	Sea Spurge	City of Joondalup Priority weed	X	X
**Euphorbia terracina*	Geraldton Carnation Weed	City of Joondalup Priority weed	X	X
**Fumaria capreolata*	Fumitory	City of Joondalup Priority weed	X	X

Species name	Common name	Ranking	Burns Beach	Iluka
**Gazania linearis*	Gazania	City of Joondalup Priority weed	X	X
**Lactuca serriola*	Prickle Lettuce	City of Joondalup Priority weed	X	X
**Moraea flaccida*	One-leaf Cape Tulip	Declared Pest - s22(2)		X
**Oxalis pes-caprae*	Soursob	City of Joondalup Priority weed	X	X
**Pelargonium capitatum*	Rose Pelargonium	City of Joondalup Priority weed	X	X
**Pennisetum clandestinum*	Kikuyu grass	City of Joondalup Priority weed	X	X
**Raphanus raphanistrum*	Wild Radish	City of Joondalup Priority weed	X	X
**Ricinus communis*	Castor Oil Plant	City of Joondalup Priority weed	X	X
**Schinus terebinthifolia*	Japanese Pepper	City of Joondalup Priority weed	X	X
**Tetragonia decumbens*	Sea Spinach	City of Joondalup Priority weed	X	X
**Trachyandra divaricata*	Dune Onion Weed	City of Joondalup Priority weed	X	X
**Tropaeolum* sp.	Nasturtium	City of Joondalup Priority weed		X

4.2.5 Vegetation communities

A total of seven and five vegetation communities were delineated and mapped within the Iluka and Burns Beach survey areas, respectively (**Appendix J**). Descriptions of all communities are presented in **Table 10** and mapping is presented in **Figure 5-1** and **Figure 5-2**.

Vegetation within the Iluka survey area comprised 29 ha (92.6%), with the remaining 2.3 ha (7.4%) comprising tracks and open beach/rocks. Vegetation within the Burns Beach survey area comprised 26.6 ha (90.8%), with the remaining 2.7 ha (9.2%) comprising tracks, areas of dunal blowout and open beach/rocks.

One vegetation community was delineated and mapped within the restaurant development area, namely SgSa: *Spyridium globulosum, Santalum acuminatum* tall sparse shrubland. This vegetation community comprised 0.4 hectares (84%), with the remaining 0.1 hectares (16%) comprising tracks.

Table 10: Vegetation communities recorded within the survey areas

Vegetation community	Vegetation description	Associated species	Quadrats	Extent within the Burns Beach survey area*	Extent within the restaurant development area	Extent within the Iluka survey area
McAr	*Melaleuca cardiophylla, Acacia rostellifera* mid shrubland over *Rhagodia baccata*, *Threlkeldia diffusa* low sparse chenopod shrubland and **Ehrharta calycina* low sparse tussock grassland.	**Carpobrotus edulis, *Catapodium rigidum, *Crassula glomerata, Daucus glochidiatus, *Ehrharta longiflora, *Galium murale, Leucopogon parviflorus, *Lysimachia arvensis, *Melilotus indicus, Parietaria cardiostegia, Plantago exilis, Rhodanthe corymbosa, Senecio pinnatifolius* var. *latilobus* and **Stellaria media*.	ELA20, ELA21 & ELA22	N/A	N/A	3.3 ha (10.5%)
FpApSc	*Frankenia pauciflora, Acanthocarpus preissii, Scaevola crassifolia* low open shrubland.	*Acrotriche cordata, *Catapodium rigidum, *Crassula glomerata, Eremophila glabra* subsp. *albicans, Hardenbergia comptoniana, *Hordeum leporinum, *Lysimachia arvensis, *Medicago polymorpha, Melaleuca huegelii, Olearia axillaris, Olax benthamiana, Rhagodia baccata, Senecio pinnatifolius* var. *latilobus, Spyridium globulosum, *Stellaria media* and *Templetonia retusa, Threlkeldia diffusa.*	ELA15, ELA16 & ELA17	0.1 ha (0.3%)	N/A	3.6 ha (11.5%)
SgMhAr	*Spyridium globulosum, Melaleuca huegelii, Acacia rostellifera* tall open shrubland over *Grevillea preissii* subsp. *preissii* mid sparse shrubland and *Rhagodia baccata, Threlkeldia diffusa* mid open chenopod shrubland over **Briza maxima, *Ehrharta calycina* low open tussock grassland and *Lomandra maritima* low sparse forbland.	*Acacia cyclops, Calandrinia tholiformis, *Catapodium rigidum, Conostylis setigera, Crassula colorata, *Crassula glomerata, Daucus glochidiatus, Desmocladus flexuosus, Dianella revoluta, *Ehrharta longiflora, *Galium murale, Hardenbergia comptoniana, Leucopogon parviflorus, *Lysimachia arvensis, *Melilotus indicus, Olearia axillaris, Parietaria cardiostegia, Rhodanthe corymbosa, Santalum acuminatum* and **Stellaria media.*	ELA23, ELA24, ELA25, ELA26 & ELA28	N/A	N/A	15.2 ha (48.6%)
BsArSg	*Banksia sessilis, Acacia rostellifera, Spyridium globulosum* mid open shrubland over *Hibbertia hypericoides*, *Banksia dallanneyi* low	*Acacia cyclops, Acanthocarpus preissii, Austrostipa flavescens, Banksia attenuata, *Briza maxima, Calothamnus quadrifidus, Conostylis setigera, Corynotheca micrantha, *Ehrharta calycina, *Euphorbia	ELA13, ELA18, ELA19 & ELA27	0.4 ha (1.4%)	N/A	4.6 ha (14.7%)

Vegetation community	Vegetation description	Associated species	Quadrats	Extent within the Burns Beach survey area*	Extent within the restaurant development area	Extent within the Iluka survey area
	open shrubland and *Lomandra maritima* low sparse forbland.	*terracina, *Gladiolus caryophyllaceus, Hardenbergia comptoniana, *Pelargonium capitatum, *Petrorhagia dubia, Phyllanthus calycinus, Rhagodia baccata, Threlkeldia diffusa* and **Trachyandra divaricata.*				
SgEsOa	*Spyridium globulosum, Exocarpos sparteus, Olearia axillaris* tall sparse shrubland over *Acrotriche cordata, Scaevola crassifolia, Leucopogon parviflorus* mid sparse shrubland over *Acanthocarpus preissii* low sparse shrubland and **Trachyandra divaricata, Conostylis candicans* subsp. *calicola* low sparse forbland.	*Acacia saligna, Atriplex cinerea, *Carpobrotus edulis, Cassytha flava, *Crassula glomerata, Daucus glochidiatus, *Dischisma arenarium, *Ehrharta longiflora, Gastrolobium nervosum, Hardenbergia comptoniana, Hemiandra glabra, *Pelargonium capitatum, Rhagodia baccata, Senecio pinnatifolius* var. *latilobus, *Stellaria media* and *Threlkeldia diffusa.*	ELA07, ELA09 & ELA10	13.4 ha (46.1%)	N/A	1.2 ha (3.8%)
ArAcSg	*Acacia rostellifera, Acacia cyclops, Spyridium globulosum* tall shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse chenopod shrubland and *Acanthocarpus preissii* low sparse shrubland.	**Asparagus asparagoides, *Avena barbata, *Bromus diandrus, Callitris preissii, *Crassula glomerata, Daucus glochidiatus, *Ehrharta calycina, Eucalyptus utilis, *Euphorbia terracina, Hardenbergia comptoniana, Kunzea glabrescens, *Lactuca serriola, Lepidosperma gladiatum, *Lysimachia arvensis, Melaleuca lanceolata, *Pelargonium capitatum, *Sonchus oleraceus, *Stellaria media* and **Trachyandra divaricata*.	ELA02, ELA03, ELA04, ELA06	1.9 ha (6.5%)	N/A	0.7 ha (2.2%)
SgSa	*Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid sparse shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragona decumbens, Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum* low open sedgeland.	*Acacia cyclops, Acacia rostellifera, Acanthocarpus preissii, *Bromus diandrus, Calandrinia brevipedata, *Carpobrotus edulis, Cassytha flava, Conostylis candicans* subsp. *calcicola, *Crassula glomerata, Daucus glochidiatus, *Ehrharta calycina, *Ehrharta longiflora, Hardenbergia comptoniana, *Lagurus ovatus, Lomandra maritima, *Lysimachia arvensis, Melaleuca systena, *Pelargonium capitatum, Senecio pinnatifolius* var. *latilobus, Spinifex*	ELA01, ELA05, ELA08, ELA11, ELA12 & ELA14	10.7 ha (36.5%)	0.4 ha (84%)	0.4 ha (1.3%)

Vegetation community	Vegetation description	Associated species	Quadrats	Extent within the Burns Beach survey area*	Extent within the restaurant development area	Extent within the Iluka survey area
		longifolius, Threlkeldia diffusa, and **Trachyandra divaricata.*				
			Open beach / rocks	1 ha (3.4%)	N/A	1.2 ha (3.8%)
			Dunal blow out	0.6 ha (2%)	N/A	N/A
			Tracks	1.1 ha (3.8%)	0.1 ha (16%)	1.1 ha (3.5%)
			Total	**29.3 ha**	**0.5 ha**	**31.3 ha**

*Inclusive of restaurant development area

4.2.6 Conservation significant ecological communities

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). Results of this analysis are shown in **Table 11**.

Results of the multivariate analysis showed that quadrats within the BsArSg vegetation community, comprising ELA13, ELA18, ELA19 and ELA27, had a close affiliation with FCT 24. FCT 24: 'Northern Spearwood shrublands and woodlands' is listed by DBCA as a Priority 3 ecological community (DBCA 2017). FCT24 is described as heaths or heaths with scattered *Eucalyptus gomphocephala* (Tuart), with heathlands in this group typically including *Banksia sessilis*, *Calothamnus quadrifidus*, and *Schoenus grandiflorus*. The BsArSg vegetation community, comprising a total of 4.6 ha (14.7%) of the Iluka survey area and 0.4 ha (1.4%) of the Burns Beach survey area, has components analogous to the 'Northern Spearwood shrublands and woodlands' PEC, including the presence of *Banksia sessilis* and *Calothamnus quadrifidus* heathland, and is considered as likely representing this community (**Figure 6**).

FCT24 is a known component of the Banksia Woodlands of the Swan Coastal Plain TEC, listed as EN under the EPBC Act (TSSC 2016) and is listed within the Approved Conservation Advice (incorporating listing advice) for the Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain TEC as a FCT that includes Tuart (DotEE 2019), indicating the potential presence of these TECs within the BsArSg vegetation community. An assessment against these TECs is presented below.

Quadrats within the remaining vegetation communities showed close affiliation with FCT 29a. FCT 29a: 'Coastal shrublands on shallow sands' is listed by DBCA as a Priority 3 ecological community. FCT 29a is described as mostly heaths on shallow sands over limestone close to the coast. Important species include *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris*. Vegetation communities ArAcSg, FpApSc, McAr, SgEsOa, SgMhAr, SgSa, comprising a total of 24.4 ha (77.91%) of the Iluka survey area and 26.2 ha (89.4%) of the Burns Beach survey area. These communities have, to varying extents, components analogous to the 'Coastal shrublands on shallow sands' PEC; including the presence of heaths on shallow sands over limestone close to the coast and dominance of key species such as *Spyridium globulosum*, *Rhagodia baccata* and *Olearia axillaris*.(**Figure 6**). A total of 0.4 ha (84%) of the restaurant development area is considered as representing the 'Coastal shrublands on shallow sands' PEC (**Figure 6**).

FCT 29a is listed within the Approved Conservation Advice (incorporating listing advice) for the Tuart *(Eucalyptus gomphocephala)* woodlands and forests of the Swan Coastal Plain TEC as a FCT that includes Tuart (DotEE 2019), indicating the potential presence of these TECs within the survey areas. An assessment against the Tuart TEC diagnostic is presented below.

A graphical representation of relationships between ELA vegetation communities and Floristic Community Types (FCTs) defined by Gibson et al. (1994) is shown in **Appendix K**.

Table 11: Relationships between ELA vegetation communities and FCTs defined by Gibson *et. al.* (1994)

Inferred FCT affiliation	ELA vegetation community	ELA quadrat number	Survey area	Closest affiliated site(s) (Gibson *et al.* 1994)
24	BsArSg	ELA13	Burns Beach	BURN-2 (29a)
		ELA18	Iluka	BOLD-3 (24), BOLD-4 (24), TRIG-5 (24), BOLD-1 (24), BOLD-2 (24)
		ELA19	Iluka	TRIG-1 (29a), BOLD-3 (24), BOLD-4 (24), TRIG-5 (24), BOLD-1 (24), BOLD-2 (24), PWALT-1 (10b)
		ELA27	Iluka	CHIDPT-1 (24), NAVB-3 (24), BOLD-1 (24), BOLD-2 (24), TRIG-5 (24), BOLD-3 (24), BOLD-4 (24), PWALT-1 (10b)
29a	ArAcSg	ELA02	Burns Beach	PRES-1 (29a)
		ELA03	Burns Beach	WOODP-1 (30a), TRIG-2 (29a)
		ELA04	Burns Beach	TRIG-2 (29a), WOODP-2 (30a)
		ELA06	Burns Beach	TRIG-2 (29a), BURN-2 (29a)
	FpApSc	ELA15	Iluka	TRIG-2 (29a), BURN-2 (29a), PRES-1 (29a)
		ELA16	Iluka	BURN-1 (29a), PRES-1 (29a), BURN-2 (29a), TRIG-2 (29a), NAVB-2 (29a)
		ELA17	Iluka	TRIG-2 (29a), BURN-2 (29a)
	McAr	ELA20	Iluka	PRES-1 (29a)
		ELA21	Iluka	TRIG-2 (29a), GARDEN-2 (29a)
		ELA22	Iluka	TRIG-2 (29a), GARDEN-2 (29a), GARDEN-2 (29a)
	SgEsOa	ELA07	Burns Beach	TRIG-2 (29a), BURN-2 (29a), GARDEN-2 (29a)
		ELA09	Burns Beach	TRIG-2 (29a), BURN-2 (29a)
		ELA10	Burns Beach	BURN-1 (29a), SEAB-8 (29a), TRIG-2 (29a), BURN-2 (29a), GARDEN-2 (29a)
	SgMhAr	ELA23	Iluka	NAVB-2 (29a), PRES-1 (29a)
		ELA24	Iluka	NAVB-2 (29a), SEAB-4 (29a), SEAB-5 (29a), BURN-1 (29a), SEAB-8 (29a)
		ELA25	Iluka	TRIG-2 (29a), BURN-2 (29a), MTHENRY-1 (30c), MTHENRY-2 (30c)
		ELA26	Iluka	PRES-1 (29a), BURN-2 (29a)
		ELA28	Iluka	TRIG-2 (29a), NAVB-2 (29a), SEAB-4 (29a), SEAB-5 (29a), BURN-1 (29a), SEAB-8 (29a)
	SgSa	ELA01	Burns Beach	TRIG-2 (29a), BURN-2 (29a), PRES-1 (29a)
		ELA05	Burns Beach	TRIG-2 (29a), BURN-2 (29a)
		ELA08	Burns Beach	BURN-1 (29a), TRIG-2 (29a), BURN-2 (29a)
		ELA11	Burns Beach	TRIG-2 (29a), BURN-2 (29a)
		ELA12	Burns Beach	PRES-1 (29a), NAVB-1 (16)
		ELA14	Burns Beach	BURN-2 (29a), PRES-1 (29a)

4.2.6.1 Banksia Woodlands of the Swan Coastal Plain TEC diagnostic

Vegetation communities were assessed against key diagnostic characteristics outlined in the Banksia Woodlands of the Swan Coastal Plain TEC approved conservation advice (TSSC 2016), in order to determine the presence of this TEC within the survey areas.

The BsArSg vegetation community consists of a *Banksia sessilis* shrubland over low heath. A small stand of *Banksia attenuata* was recorded in the Iluka survey area at ELA19 as part of the BsArSg vegetation community. This stand comprised of an area of less than 0.5 hectares in size and did not constitute a woodland structure or warrant delineation of a separate vegetation community. Therefore, the BsArSg vegetation community does not represent the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community. The full four-stage assessment against the key diagnostic characteristics for this TEC are presented in **Appendix L**.

4.2.6.2 Tuart (Eucalyptus gomphocephala) woodlands and forests of the Swan Coastal Plain TEC diagnostic

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain TEC' approved conservation advice (DotEE 2019) in order to determine the presence of the TEC within the survey areas. Whilst vegetation showed close affiliation with FCT 24 and 29a, indicating the potential presence of the TEC, no Tuarts were recorded in either of the survey areas. Therefore, no diagnostic assessment was undertaken.

4.2.7 Vegetation condition

Vegetation within the Iluka and Burns Beach survey areas ranged from Excellent to Completely Degraded, based on Keighery (1994) vegetation scale provided in the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (2016). Majority of Iluka and Burns Beach survey areas were classed as being in Excellent condition. Disturbances across both survey areas included weeds, minor rubbish dumping and the presence of informal tracks (walk trails and vehicle tracks). Of note are a number of illegal vehicle tracks throughout the northern sections of the Burns Beach survey area, fragmenting the vegetation throughout the area and preventing these areas from naturally revegetating.

Vegetation condition is presented in **Table 12** and **Figure 7.1** and **Figure 7.2**. Vegetation condition per vegetation community is presented in **Table 13**, **Table 14** and **Figure 8-1** and **Figure 8-2**.

Table 12: Vegetation condition within the survey areas

Vegetation condition	Extent within the Burns Beach survey area	Extent within the restaurant development area	Extent within the Iluka survey area
Pristine	N/A	N/A	N/A
Excellent	19.1 ha (65.2%)	N/A	21.9 ha (70%)
Very Good	2 ha (6.8%)	N/A	3.4 ha (10.9%)
Good	4.2 ha (14.3%)	0.44 ha (81.5%)	3.7 ha (11.8%)
Degraded	N/A	N/A	N/A
Completely Degraded	1.9 ha (6.5%)	N/A	N/A
Open beach / rocks	1 ha (3.4%)	N/A	1.2 ha (3.8%)
Tracks	1.1 ha (3.8%)	0.1 ha (18.5%)	1.1 ha (3.5%)
Total	**29.3 ha**	**0.54 ha**	**31.3 ha**

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Table 13: Vegetation condition per vegetation community within the Burns Beach survey area

Vegetation community	Condition % (ha)						
	Pristine	Excellent	Very Good	Good	Degraded	Completely Degraded	Total % (ha)
BsArSg	N/A	N/A	N/A	0.4	N/A	N/A	**0.4 ha (1.5%)**
SgEsOa	N/A	11.8	0.6	N/A	N/A	1	**13.4 ha (50.4%)**
ArAcSg	N/A	0.3	N/A	1.6	N/A	N/A	**1.9 ha (7.1%)**
SgSa	N/A	6.8	1.5	2.1	N/A	0.3	**10.7 ha (40.2%)**
FpApSc	N/A	0.1	N/A	N/A	N/A	N/A	**0.1 ha (0.4%)**
Total ha (%)	**N/A**	**19 ha (71.7%)**	**2.1 ha (7.5%)**	**4.1 ha (15.8%)**	**N/A**	**1.3 (4.9%)**	**26.5 ha (100%)**

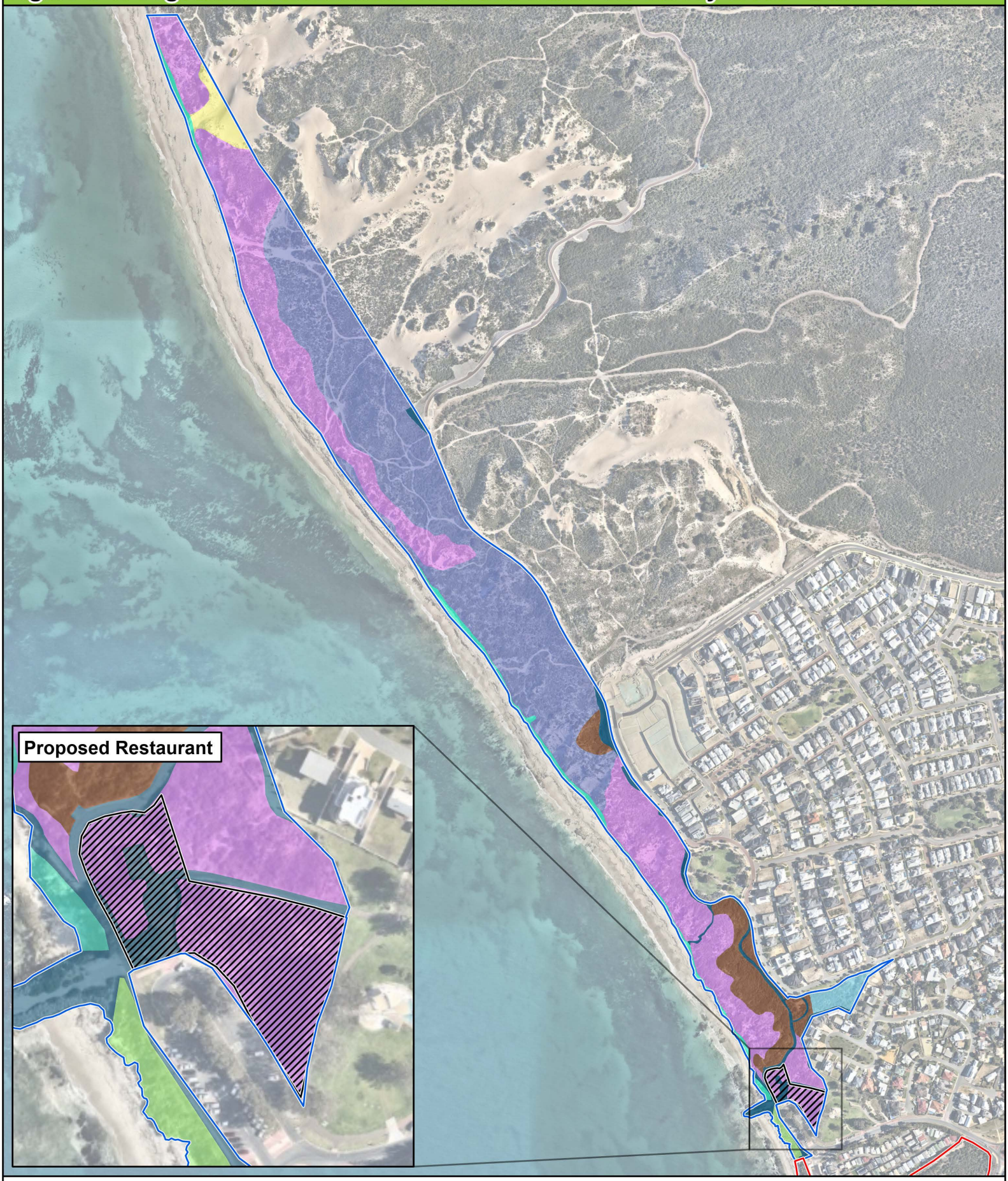
Table 14: Vegetation condition per vegetation community within the Iluka survey area

Vegetation community	Condition % (ha)						
	Pristine	Excellent	Very Good	Good	Degraded	Completely Degraded	Total % (ha)
ArAcSg	N/A	N/A	N/A	0.6	N/A	N/A	**0.6 ha (2.1%)**
BsArSg	N/A	1.5	N/A	3.1	N/A	N/A	**4.6 ha (15.9%)**
FpApSc	N/A	3.6	N/A	N/A	N/A	N/A	**3.6 ha (12.4%)**
McAr	N/A	3.3	0.02	N/A	N/A	N/A	**3.3 ha (11.4%)**
SgEsOa	N/A	1.2	N/A	N/A	N/A	N/A	**1.2 ha (4.1%)**
SgMhAr	N/A	11.9	3.4	N/A	N/A	N/A	**15.2 ha (52.4%)**
SgSa	N/A	0.4	N/A	N/A	N/A	N/A	**0.4 ha (1.4%)**
Total ha (%)	**N/A**	**21.9 ha (69.9%)**	**3.4 ha (10.8%)**	**3.7 ha (11.8%)**	**N/A**	**N/A**	**29 ha (92.6%)**

4.2.8 Fungi

No fungi were recorded in either of the survey areas during the field survey.

Figure 5-1: Vegetation communities recorded within the survey areas - Burns Beach



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development
- Dunal blowout
- Open Beach/Rocks
- Track/Building

Vegetation Community

- BsArSg
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

0 50 100 200
Metres
Datum/Projection:
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Figure 5-2: Vegetation communities recorded within the survey areas - Iluka Foreshore



Legend

Survey Area

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Open Beach/Rocks
- Track

Vegetation Community

- BsArSg
- McAr
- SgMhAr
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

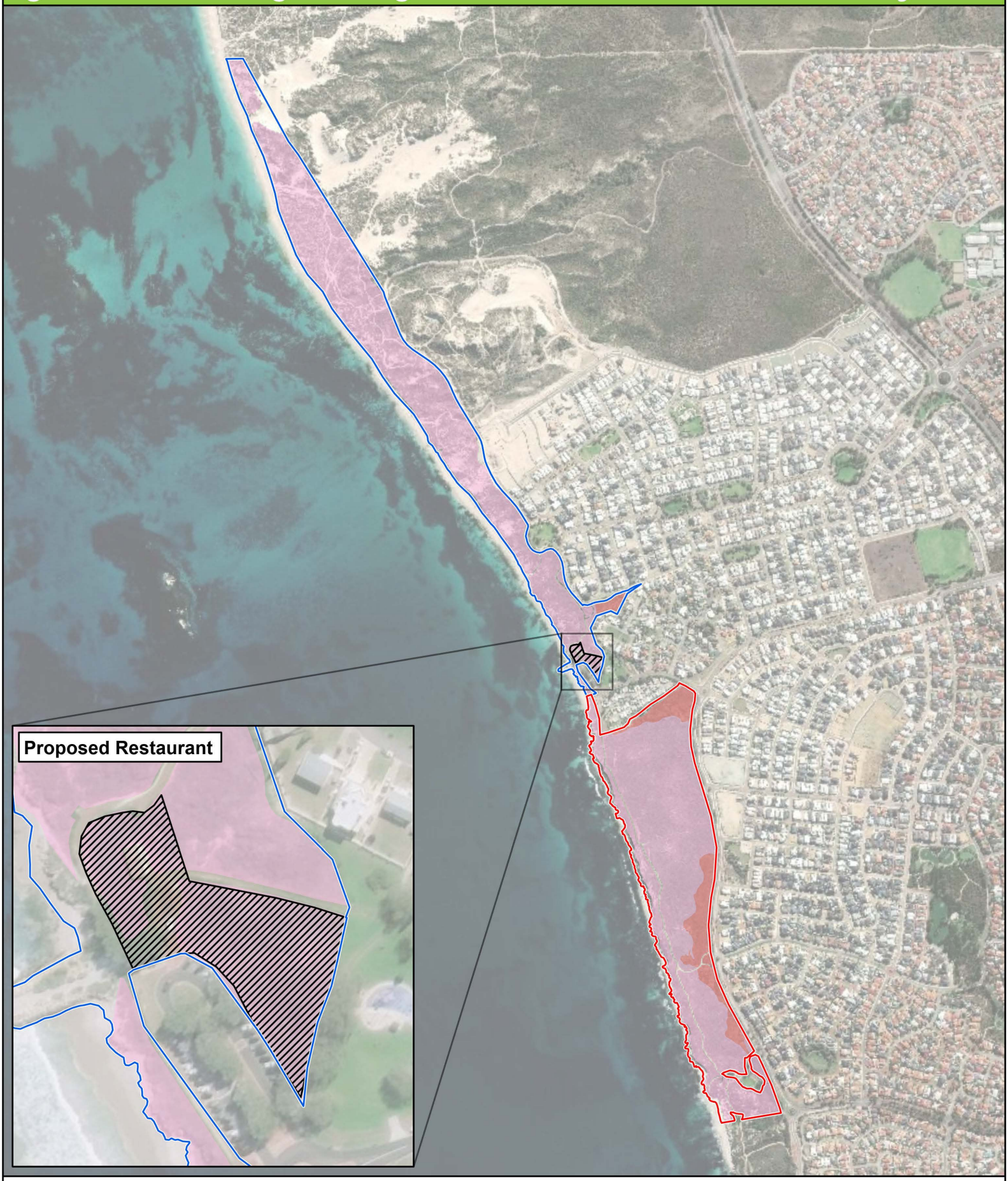
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Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 6: Conservation significant vegetation communities recorded within the survey areas



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development

Conservation significant vegetation communities

- FCT 24: 'Northern Spearwood shrublands and woodlands' (P3)
- FCT29a: 'Coastal shrublands on shallow sands' (P3)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 7-1: Vegetation condition recorded within the survey areas - Burns Beach



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development
- Open Beach/Rocks
- Track

Vegetation Condition

- Excellent
- Very Good
- Good
- Completely Degraded

0 50 100 200
Metres

Datum/Projection:
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Figure 7-2: Vegetation condition recorded within the survey areas - Iluka Foreshore



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Open Beach/Rocks
- Track

Vegetation Condition

- Excellent
- Very Good
- Good

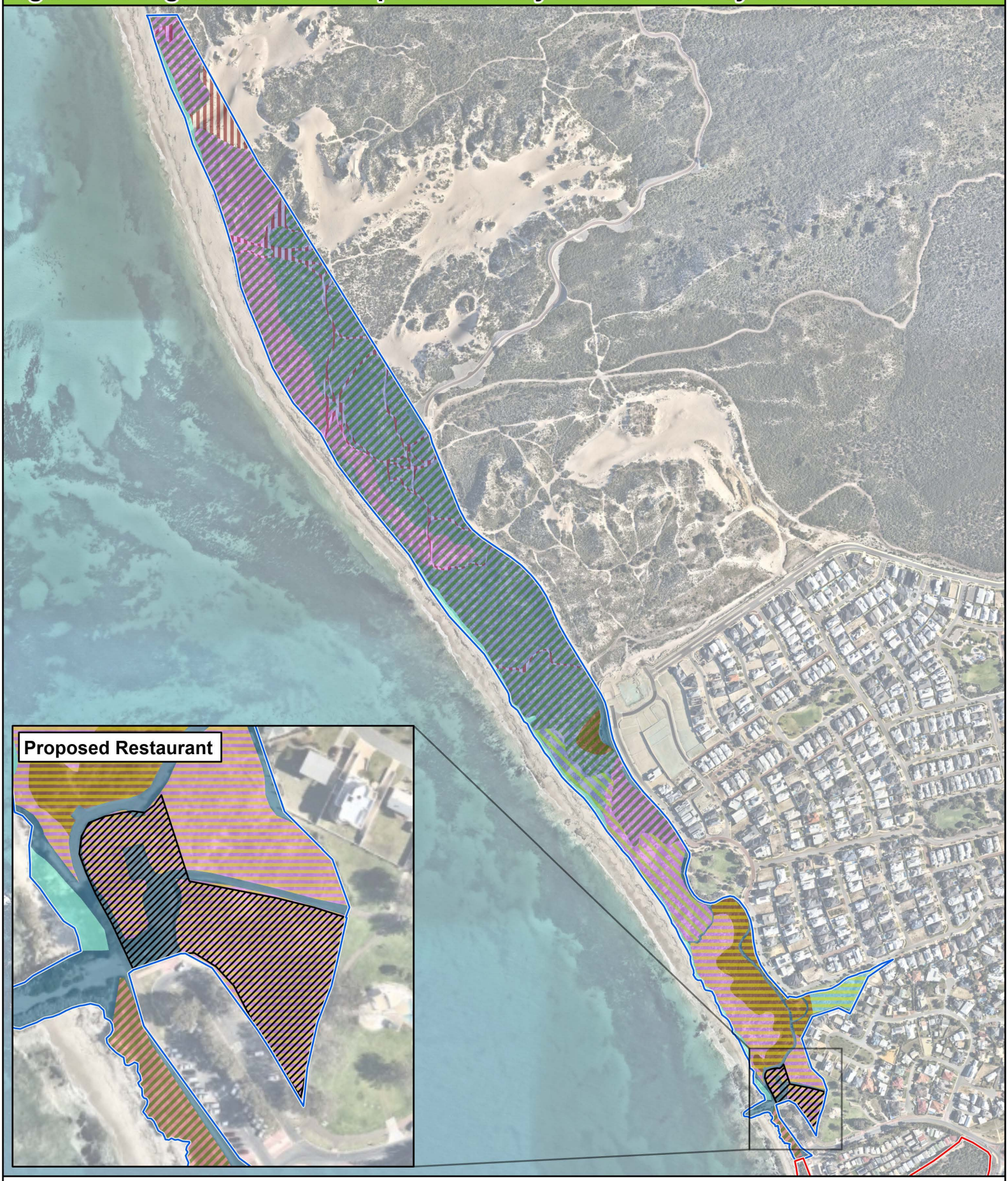
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Figure 8-1: Vegetation condition per community within the survey areas - Burns Beach



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development
- Open Beach/Rocks
- Track

Vegetation Community

- BsArSg
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

Vegetation Condition

- Excellent
- Very Good
- Good
- Completely Degraded

0 50 100 200
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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Figure 8-2: Vegetation condition per community within the survey areas - Iluka Foreshore



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Open Beach/Rocks
- Track

Vegetation Community

- BsArSg
- McAr
- SgMhAr
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

Vegetation Condition

- Excellent
- Very Good
- Good

0 50 100 200
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

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4.3 Fauna

Trapping sites were chosen in order to represent vegetation communities present within the survey area. Location of trap sites per vegetation community is presented in **Figure 9-1** and **Figure 9-2**.

4.3.1 Fauna habitats

A total of five fauna habitats were identified within the Iluka survey area (**Table 15**; **Figure 10-1** and **Figure 10-2**). These habitats cover a total of 29 ha (92.6%), with the remaining 2.3 ha (7.4%) comprising tracks and open beach/rocks. The most commonly occurring fauna habitat was *Melaleuca* shrubland over heath.

A total of four fauna habitats were identified within the Burns Beach survey area (**Table 15**; **Figure 10-1** and **Figure 10-2**). These habitats cover a total of 26.5 ha (90.8%), with the remaining 2.7 ha (9.2%) comprising tracks, areas of dunal blowout and open beach/rocks. The most commonly occurring fauna habitat was dunes and swales. One fauna habitat was identified in the restaurant development area, dunes and swales.

Table 15: Fauna habitats in the survey areas

Fauna habitats	Extent within the Burns Beach survey area	Extent within the restaurant development area	Extent within the Iluka survey area
Dunes and swales	24.1 ha (82.3%)	0.4 ha (84%)	1.6 ha (5.2%)
Tall *Acacia* shrubland	1.9 ha (6.7%)	N/A	0.6 ha (2%)
Low *Banksia* shrubland over low heath	0.4 ha (1.4%)	N/A	4.6 ha (14.7%)
Low limestone coastal heath	0.1 ha (0.5%)	N/A	3.6 ha (11.5%)
Melaleuca shrubland over heath	N/A	N/A	18.5 ha (59.1%)
Open beach / rocks	1.6 ha (5.4%)	N/A	1.2 ha (3.8%)
Tracks	1.1 ha (3.8%)	0.1 ha (16%)	1.1 ha (3.7%)
Total	**29.3 ha**	**0.5 ha**	**31.3 ha**

4.3.2 Fauna species

A total of 47 vertebrate fauna species were recorded within the Iluka survey area, including 13 reptile, 27 bird and seven mammal species. In addition, 13 invertebrate taxa representing eight orders were recorded.

A total of 37 vertebrate fauna species were recorded within the Burns Beach survey area, including seven reptile, 24 bird and six mammal species. In addition, 12 invertebrate taxa representing six orders were recorded.

The vertebrate fauna list is provided in **Appendix M**. A selection of fauna photos taken during the field survey is included in **Appendix N** and raw trapping data are provided in **Appendix O**. A full list of invertebrate taxa opportunistically recorded is provided in **Appendix P**.

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4.3.2.1 Mammals

Seven mammal species were recorded in the Iluka survey area, comprising three native species and four introduced species. Six mammal species were recorded in the Burns Beach survey area, comprising three native species and three introduced species. Introduced (feral) fauna are discussed further in Section 4.3.4.

Quenda (*Isoodon fusciventer*), listed as P4 by DBCA, were recorded in both survey areas (**Appendix Q**). At trapping site 2 in the Burns Beach survey area, six[1] individuals were trapped in cage traps over four trapping nights. An individual was also recorded on motion camera. Trapping site 3 and 4 in the Iluka survey area recorded one individual each. Of the eight trapped individuals, all but one were males, with the female having one unfurred pouch young. The majority of the Quenda observed appeared to be in good condition. Two males were missing the majority of their tail, an injury most likely the result of mating.

The SM2 recorded two bat species, White-striped Free-tailed Bat (*Austronomus australis*) and Gould's Wattled Bat (*Chalinolobus gouldii*).

4.3.2.2 Birds

A total of 27 bird species recorded at Iluka survey area and 24 bird species were recorded at Burns Beach survey area, during the bird census and opportunistically. Birds recorded during the survey include a range of nectar feeders such as Red Wattlebird (*Anthochaera carunculata*), insectivores such as Variegated Fairywren (*Malurus lamberti*) and larger omnivorous species such as Australian Magpie (*Cracticus tibicen*), Black-faced Cuckoo-shrike (*Coracina novaehollandiae*) and Pied Butcherbird (*Cracticus nigrogularis*). Honeyeaters were the most commonly observed birds across the survey areas.

One conservation listed species was recorded in the Iluka survey area; Carnaby's Cockatoo (*Calyptorhynchus latirostris*; **Appendix Q**). This species was observed flying over the survey area during the flora survey.

The remaining bird species are widespread throughout the south-west of WA and are considered locally common on the northern Swan Coastal Plain.

4.3.2.3 Reptiles

Thirteen reptile species were recorded at the Iluka survey area, comprising four snakes, one gecko, seven skinks and one blind snake. Reptile captures were greater at pitfall traps (72%) compared to funnel traps (28%).

Seven reptile species were recorded at the Burns Beach survey area, comprising one dragon, three snakes, and three skinks. Reptile captures were greater at pitfall traps (82%) compared to funnel traps (18%).

The most commonly occurring species trapped across the survey areas was West-coast Laterite Ctenotus (*Ctenotus fallens*). This species favours low coastal vegetation on sandy soils. Skinks were the most

[1] Microchipping was not undertaken for this field survey, therefore recaptures were unable to be determined

commonly observed reptiles across both survey areas. The majority of the reptile specimens were considered to be in good physical condition.

4.3.2.4 Amphibians

No amphibians were recorded during the Detailed fauna survey. Despite the rainfall received during the survey (Section 3.2.1) amphibians were not caught in traps, nor were they heard or observed opportunistically.

4.3.2.5 Invertebrates

A total of 14 invertebrate taxa were recorded across the survey area, with 13 occurring in the Iluka survey area and 12 occurring in the Burns Beach survey area (**Table 16**). Invertebrate species were collected opportunistically or as bycatch during the fauna survey. A list of invertebrate species compared with those recorded during the 2015-2018 study undertaken in collaboration with the Friends of North Ocean Reef to Iluka Foreshore (Knowles and Knowles 2015-2018) is presented in **Appendix P**. One introduced invertebrate species, Portuguese Millipede (**Ommatoiulus moreletii*), occurred in the majority of the pitfall and funnel traps at trapping site 3 (**Appendix R**).

Table 16: Invertebrate species recorded opportunistically or as bycatch during the fauna survey

Family	Genus	Species	Field name	Burns Beach	Iluka Foreshore
Araneidae	Gen.	sp.	Orb weaver sp. 1	X	X
Calliphoridae	Gen.	sp.	Fly sp. 1	X	X
Culicidae	Gen.	sp.	Mosquito sp. 1	X	X
Formicidae	*Iridomyrmex*	sp.	Meat ant sp. 1	X	X
Formicidae	*Myrmecia*	sp.	Bull ant sp. 1	X	X
Ixodidae	*Amblyomma*	*triguttatum*	Common Kangaroo Tick	X	X
Julidae	*^Ommatoiulus*	*moreletii*	Portuguese Millipede		X
Lycosidae	Gen.	sp.	Wolf spider sp.1	X	X
Megachilidae	*Megachile*	sp.	Native bee sp. 1	X	X
Nymphalidae	Gen.	sp.	Butterfly sp. 1	X	X
Phasmatidae	*Acanthomima*	sp.	Stick insect sp. 1		X
Pyrgomorphidae	Gen.	sp.	Grasshopper sp. 1	X	X
Salticidae	Gen.	sp.	Jumping spider sp. 1	X	
Tettigoniidae	Gen.	sp.	Cricket sp. 1	X	X

4.3.3 Conservation significant fauna

Two conservation significant fauna species were observed during the field survey, including Carnaby's Cockatoo (*Calyptorhynchus latirostris;* listed as Endangered under the EPBC Act and BC Act) and Quenda (*Isoodon fusciventer*; listed as P4 by DBCA). Quenda were trapped across Iluka and Burns Beach survey areas; however, Carnaby's Cockatoo was observed only at the Iluka survey area (**Figure 11**). A photo of a trapped Quenda is included in **Appendix N** and coordinate locations of trapping sites are provided in **Appendix Q**.

4.3.4 Feral fauna

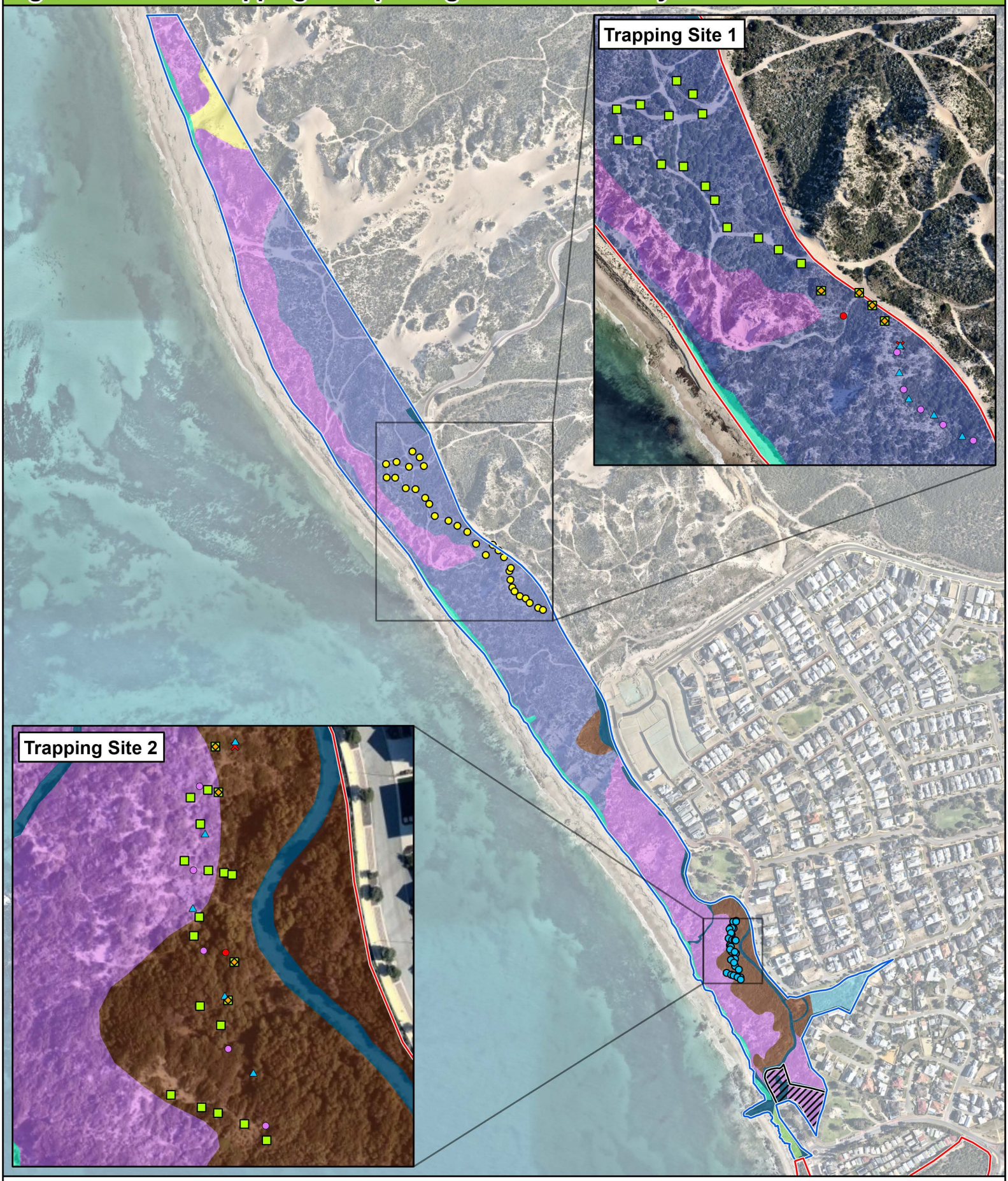
A total of seven introduced (feral) fauna species were recorded across the survey area, five of which were recorded within the Iluka survey area and six of which were recorded within the Burns Beach survey area (**Table 17**; **Figure 12**). Red Fox and Cat were recorded on motion cameras, whilst House Mouse was trapped in small aluminium box traps and Portuguese Millipede within pitfall traps. European Rabbit scats were directly observed within the Iluka survey area. Laughing Kookaburra and Laughing Dove were both heard and observed directly within the survey area. All vertebrate introduced (feral) fauna species recorded within the survey area are listed as 'Naturalised exotic' under the WAM Checklist of the Terrestrial Vertebrate Fauna of Western Australia (WAM 2020). The Portuguese Millipede (**Ommatoiulus moreletii*) is listed as Permitted – s11 under the Western Australian organism List (WAOL; DPIRD 2020).

A selection of feral fauna photos taken during the field survey is included in **Appendix N** and coordinates are provided in **Appendix R**.

Table 17: Feral fauna species occurring within the survey area

Type	Species	Common name	Burns Beach	Iluka Foreshore
Bird	**Dacelo novaeguineae*	Laughing Kookaburra	X	
Bird	**Spilopelia senegalensis*	Laughing Dove	X	X
Invertebrate	**Ommatoiulus moreletii*	Portuguese Millipede		X
Mammal	**Felis catus*	Cat	X	X
Mammal	**Mus musculus*	House Mouse	X	X
Mammal	**Oryctolagus cuniculus*	European Rabbit		X
Mammal	**Vulpes vulpes*	Red Fox	X	X

Figure 9-1: Fauna trapping sites per vegetation community - Burns Beach



Legend

Survey Area
- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development
- Open Beach/Rocks
- Track/Building

Vegetation Community
- BsArSg
- SgSa
- ArAcSg
- FpApSc
- SgEsOa
- Dunal blowout

Fauna Trapping Sites
- Trapping site 1
- Trapping site 2

Fauna Trapping Sample Type
- Small aluminium box trap
- Pitfall trap
- Pitfall and funnel traps
- Cage trap
- Camera trap
- SM2 ultrasonic recorder

0 50 100 200
Metres

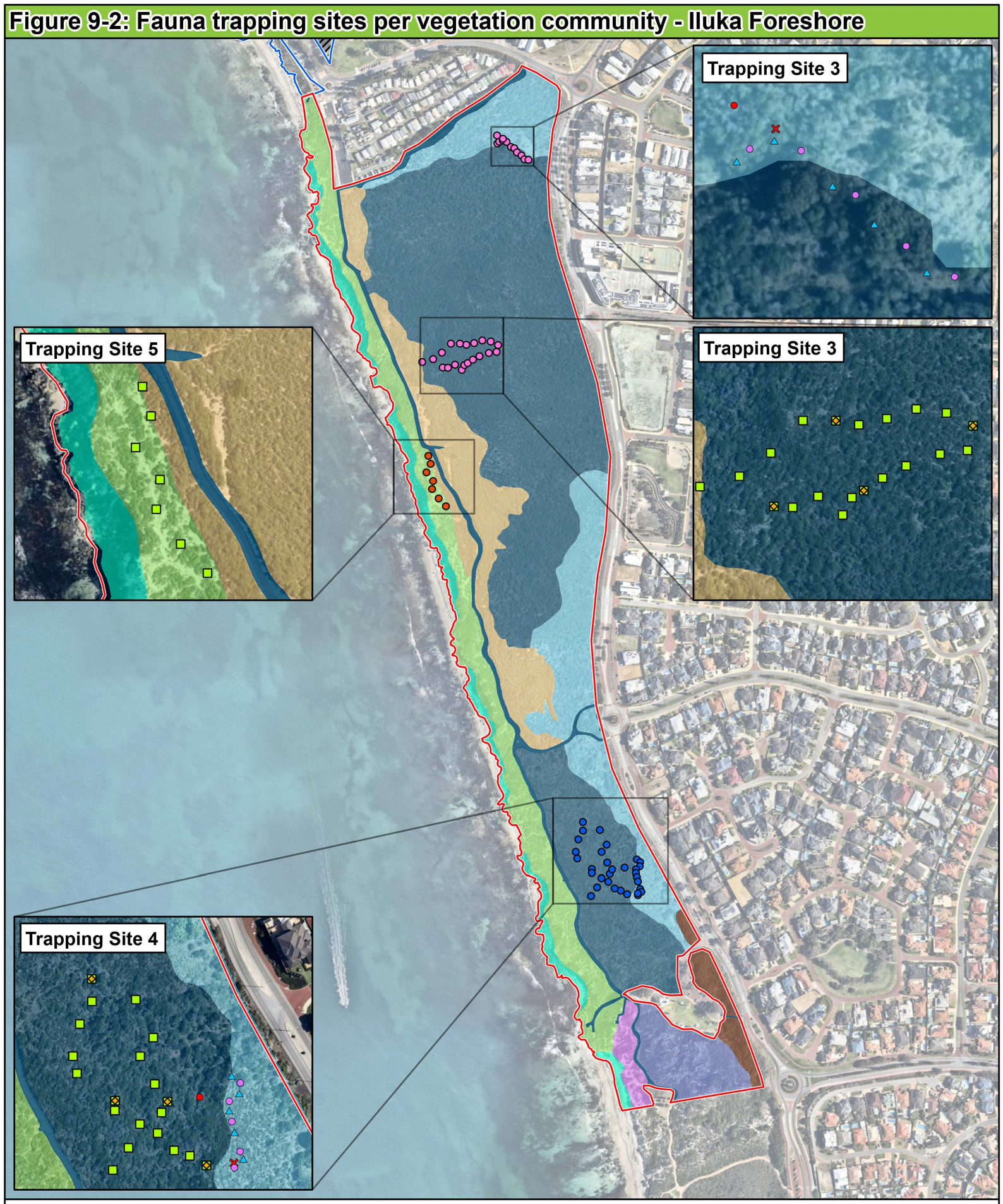
Datum/Projection:
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Figure 9-2: Fauna trapping sites per vegetation community - Iluka Foreshore



Legend

Survey Area
- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development
- Open Beach/Rocks
- Track/Building

Vegetation Community
- BsArSg
- McAr
- SgMhAr
- SgSa
- ArAcSg
- FpApSc
- SgEsOa

Fauna Trapping Sites
- Trapping site 3
- Trapping site 4
- Trapping site 5

Fauna Trapping Sample Type
- Small aluminium box trap
- Pitfall trap
- Pitfall and funnel traps
- Cage trap
- Camera trap
- SM2 ultrasonic recorder

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Figure 10-1: Fauna habitats recorded within the survey areas - Burns Beach



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development
- Track

Fauna Habitat

- Dunes and swales
- Low Banksia shrubland over low heath
- Low limestone coastal heath
- Open Beach/Rocks
- Tall Acacia shrubland

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Figure 10-2: Fauna habitats recorded within the survey areas- Iluka Foreshore



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Track

Fauna Habitat

- Dunes and swales
- Low Banksia shrubland over low heath
- Low limestone coastal heath
- Melaleuca shrubland over heath
- Open Beach/Rocks
- Tall Acacia shrubland

0 50 100 200
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Figure 11: Conservation significant fauna species recorded within the survey areas



Legend

- Burns Beach Survey Area
- Iluka Foreshore Survey Area
- Proposed Restaurant Development

Conservation significant fauna species

- *Calyptorhynchus latirostris* (Carnaby's Black Cockatoo) (EN under EPBC and BC Act)
- *Isoodon fusciventer* (Quenda) (P4)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Figure 12: Feral fauna observations within the survey area



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Proposed Restaurant Development

Feral fauna

- Laughing Kookaburra (**Dacelo novaeguineae*)
- Cat (**Felis catus*)
- House mouse (**Mus musculus*)
- Fox (**Vulpes vulpes*)
- Portuguese millipede (**Ommatoiulus moreletii*)
- Rabbit (**Oryctolagus cuniculus*)
- Laughing Dove (**Spilopelia senegalensis*)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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5. Discussion and recommendations

5.1 Flora

A total of 121 taxa (74 native and 47 introduced taxa) were recorded across 14 quadrats established in the Iluka survey area and from opportunistic collections. A total of 106 taxa (63 native and 43 introduced taxa) were recorded across 14 quadrats established in the Burns Beach survey area and from opportunistic collections. Average species richness per quadrat in Iluka and Burns Beach survey areas were 28.9 species and 25.6 species, respectively. A species accumulation curve determined that approximately 90% of the flora species potentially present within the survey areas were recorded from quadrats. This result, in addition to opportunistic collections, indicates that the majority of flora potentially present within the survey areas were recorded.

One flora species listed as Endangered under the EPBC Act and BC Act was recorded within the Iluka survey area, namely *Marianthus paralius* (WA Herbarium ACC/8941/E). *Marianthus paralius* is an almost prostrate, woody shrub with distinctive bright green foliage and red flowers from September to November (TSSC 2018; DBCA and WAH 2020). [redacted] At a regional scale, this species is known from 10 records over a range of approximately 60 km from Seabird in the north to Iluka in the South (DBCA 2007-2020). [redacted]

No Threatened flora species listed under the EPBC Act or BC Act were recorded within the Burns Beach survey area (including the restaurant development area). Two DBCA listed flora species were recorded in the Iluka survey area; *Hibbertia leptotheca* (P3) and *Jacksonia sericea* (P4).

Hibbertia leptotheca, listed as P3 by DBCA, was recorded within the Iluka survey area in the FpApSc (low limestone heath) vegetation community. Priority 3 species, such as *Hibbertia leptotheca*, are defined as 'poorly known species that are known from several locations, and the species does not appear to be under imminent threat'. *Hibbertia leptotheca* is also listed in Bush Forever as a significant flora species of the Perth metropolitan area due to it being endemic to the Swan Coastal Plain (Government of Western Australia 2000). *Hibbertia leptotheca* is a spreading shrub 0.2-0.5 m high with yellow flowers which usually flower from July to October (DBCA and WAH 2020). At a regional scale, this species is known from 65 records, over a range of approximately 250 km, from Lancelin in the north to Bunbury in the south (DBCA 2007-2020). Within the Iluka survey area, this species was recorded from eight-point records within 85 m.

Jacksonia sericea, listed as P4 by DBCA, was recorded within the Iluka survey area in the BsArSg (low coastal heath) vegetation community. Priority 4 species, such as *Jacksonia sericea*, are defined as 'rare, near threatened and other species in need of monitoring'. *Jacksonia sericea* is also listed in Bush Forever as a significant flora species of the Perth metropolitan area due to it being endemic to the Swan Coastal Plain (Government of Western Australia 2000). *Jacksonia sericea* is a low, spreading shrub to 0.6 m high with small, orange pea flowers which usually flower in December, or January to February (DBCA and WAH 2020). At a regional scale, this species is known from 88 records, over a range of approximately

107 km, from Carabooda in the north to Furnissdale in the south (DBCA 2007-2020). Within the Iluka survey area, this species was recorded at one location in <5% cover.

A further eight Bush Forever significant flora species were recorded from within the survey areas; *Agonis flexuosa, Callitris preissii, Diplopeltis huegelii, Grevillea preissii* subsp. *preissii, Lechenaultia linarioides, Melaleuca cardiophylla, Melaleuca lanceolata* and *Trymalium ledifolium*. These species are listed as Bush Forever significant species of the Perth Metropolitan Region due to their being endemic to the Swan Coastal Plain. These species are common occur across the Swan Coastal Plain and in the southwest of WA. *Agonis flexuosa* is known from 422 records over a range of approximately 2000 km, from Derby in the north to the whole southwest of WA (DBCA 2007-2020). *Callitris preissii* is known from 626 records over a range of approximately 1300 km, from Shark Bay to Esperance. *Diplopeltis huegelii* is known from 57 records over a range of approximately 1000 km, from Shark Bay in the north to Albany in the south. *Grevillea preissii* subsp. *preissii* is known from 171 records over a range of approximately 450 km, from Lancelin in the north to Mandurah in the south. *Lechenaultia linarioides* is known from 326 records over a range of approximately 950 km, from Carnarvon in the north to Bunbury in the south. *Melaleuca cardiophylla* is known from 307 records over a range of approximately 1500 km, from Exmouth in the north to Esperance in the south. *Melaleuca lanceolata* is known from 515 records over a range of approximately 2000 km, from Shark Bay in the north Eucla in the east. *Trymalium ledifolium* is known from 108 records over a range of approximately 800 km, from Geraldton in the north to Esperance in the south.

Weed species in the Iluka and Burns Beach survey areas comprised 38.8% (47 species) and 40.6% (43 species), respectively, of the total flora taxa recorded. **Asparagus asparagoides* (Bridal Creeper; recorded in both survey areas) is listed as a Declared Pest under the BAM Act and WoNS. **Moraea flaccida* (One-leaf Cape Tulip; recorded in Iluka survey area) is a Declared Pest under the BAM Act. These species have a legal status of S22(2) and "must satisfy any applicable import requirements when imported and may be subject to an import permit if they are potential carriers of high-risk organisms. They may also be subject to control and keeping requirements once within Western Australia" (DPIRD 2020).

5.2 Vegetation

A total of seven and five vegetation communities were delineated and mapped within the Iluka and Burns Beach survey areas, respectively (**Table 18**).

Table 18: Overview of vegetation communities within the survey area

Vegetation community	Description	Burns Beach	Iluka Foreshore	Number of quadrats established
McAr	*Melaleuca cardiophylla, Acacia rostellifera* mid shrubland over *Rhagodia baccata*, *Threlkeldia diffusa* low sparse chenopod shrubland and **Ehrharta calycina* low sparse tussock grassland		X	3
FpApSc	*Frankenia pauciflora, Acanthocarpus preissii, Scaevola crassifolia* low open shrubland	X	X	3
SgMhAr	*Spyridium globulosum, Melaleuca huegelii, Acacia rostellifera* tall open shrubland over *Grevillea preissii* subsp. *preissii* mid sparse shrubland and *Rhagodia baccata, Threlkeldia diffusa* mid open		X	5

Vegetation community	Description	Burns Beach	Iluka Foreshore	Number of quadrats established
	chenopod shrubland over **Briza maxima, *Ehrharta calycina* low open tussock grassland and *Lomandra maritima* low sparse forbland			
BsArSg	*Banksia sessilis, Acacia rostellifera, Spyridium globulosum* mid open shrubland over *Hibbertia hypericoides*, *Banksia dallanneyi* low open shrubland and *Lomandra maritima* low sparse forbland	X	X	4
SgEsOa	*Spyridium globulosum, Exocarpos sparteus, Olearia axillaris* tall sparse shrubland over *Acrotriche cordata, Scaevola crassifolia, Leucopogon parviflorus* mid sparse shrubland over *Acanthocarpus preissii* low sparse shrubland and **Trachyandra divaricata, Conostylis candicans* subsp. *calicola* low sparse forbland	X	X	3
ArAcSg	*Acacia rostellifera, Acacia cyclops, Spyridium globulosum* tall shrubland over *Rhagodia baccata, Threlkeldia diffusa* low sparse chenopod shrubland and *Acanthocarpus preissii* low sparse shrubland	X	X	4
SgSa	*Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid sparse shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragona decumbens, Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum* low open sedgeland	X	X	6

To identify TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). Results of the multivariate analysis showed that quadrats within the BsArSg vegetation community, comprising ELA13, ELA18, ELA19 and ELA27, had a close affiliation with Floristic Community Type 24. Floristic Community Type 24: 'Northern Spearwood shrublands and woodlands' is listed by the Department of Biodiversity, Conservation and Attractions as a Priority 3 ecological community. Floristic Community Type 24 is described as heaths or heaths with scattered *Eucalyptus gomphocephala* (Tuart), with heathlands in this group typically including *Banksia sessilis*, *Calothamnus quadrifidus*, and *Schoenus grandiflorus*. The BsArSg vegetation community, comprising a total of 4.6 ha (14.7%) of the Iluka survey area and 0.4 ha (1.4%) of the Burns Beach survey area, has components analogous to the 'Northern Spearwood shrublands and woodlands' Priority Ecological Community, including the presence of *Banksia sessilis* and *Calothamnus quadrifidus* heathland, and is considered as likely representing this Priority Ecological Community. The inferred presence of FCT 24 is also noted in Bush Forever for Burns Beach Foreshore Reserve.

Quadrats within the remaining vegetation communities showed close affiliation with Floristic Community Type 29a. Floristic Community Type 29a: 'Coastal shrublands on shallow sands' is listed by the Department of Biodiversity, Conservation and Attractions as a Priority 3 ecological community. Floristic Community Type 29a is described as mostly heaths on shallow sands over limestone close to the coast. Important species include *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris*. Vegetation communities ArAcSg, FpApSc, McAr, SgEsOa, SgMhAr, SgSa, comprising a total of 24.4 ha (77.91%) of the Iluka survey area and 26.2 ha (89.4%) of the Burns Beach survey area, have components analogous to the 'Coastal shrublands on shallow sands' Priority Ecological Community, including the

presence of heaths on shallow sands over limestone close to the coast, *Spyridium globulosum*, *Rhagodia baccata*, and *Olearia axillaris* and is considered as likely representing this community. A total of 0.4 ha (84%) ha of the restaurant development area is considered as representing the 'Coastal shrublands on shallow sands' Priority Ecological Community. The inferred presence of FCT 29a is also noted in Bush Forever for Burns Beach Foreshore Reserve and Coastal Strip from Burns Beach to Hillary's.

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Approved Conservation Advice (incorporating listing advice) for the Banksia Woodlands of the Swan Coastal Plain ecological community'. A small stand of *Banksia attenuata* was recorded in the Iluka survey area at ELA19. This stand was recorded in the BsArSg vegetation community, comprising of an area of less than 0.5 hectares in size, and did not constitute a woodland structure or warrant delineation of a separate vegetation community. Therefore, the BsArSg vegetation community does not represent the Banksia Woodlands of the Swan Coastal Plain Threatened Ecological Community.

Vegetation communities were assessed against key diagnostic characteristics outlined in the 'Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community approved conservation advice in order to determine the presence of the Threatened Ecological Community within the survey areas. Whilst a number of vegetation communities were identified as representing Floristic Community Type 24 and 29a, indicating the potential presence of the Threatened Ecological Community, no Tuarts were recorded in either of the survey areas and so vegetation within the survey area is not considered to represent the Tuart (*Eucalyptus gomphocephala*) Woodlands and Forests of the Swan Coastal Plain Threatened Ecological Community.

Vegetation condition recorded within the survey areas ranged from Excellent to Completely Degraded. The majority of Iluka and Burns Beach survey areas were classed as being in Excellent condition. Disturbances across both survey areas included weeds, minor rubbish dumping and the presence of informal tracks (walk trails and vehicle tracks). Of note are a number of illegal vehicle tracks throughout the northern sections of the Burns Beach survey area, fragmenting the vegetation throughout the area and preventing these areas from naturally revegetating.

5.3 Fauna

A total of five fauna habitats were recorded across the survey area, five within the Iluka survey area (dunes and swales, Tall *Acacia* shrubland, Low *Banksia* shrubland over low heath, Low limestone coastal heath and *Melaleuca* shrubland over heath) and four within the Burns Beach survey area (Dunes and swales, Tall *Acacia* shrubland, Low *Banksia* shrubland over low heath and Low limestone coastal heath). These habitats cover a total of 29 ha (92.6%) of the Iluka survey area and 26.5 ha (90.8%) of the Burns Beach survey area, with tracks and open beach/rocks accounting for the remaining areas. The survey areas provide a significant patch of remnant fauna habitat within a highly modified and urbanised landscape. The vegetation communities, and habitats it contains, support a relatively diverse and species-rich assemblage of native birds, mammals and reptiles. The survey areas provide a valuable linkage to adjacent bushland to the south and east (e.g. Neerabup National Park and Bush Forever site 323).

A total of 47 vertebrate fauna species were recorded within the Iluka survey area, including 13 reptile, 27 bird and seven mammal species. A total of 37 vertebrate fauna species were recorded within Burns Beach survey area, including seven reptile, 24 bird and six mammal species. No amphibians were

recorded in the survey areas. The survey areas appear to support diverse range of vertebrate fauna species, and with more favourable conditions (e.g. less rainfall during the fauna survey), more species may have been recorded. Habitat loss, fragmentation and degradation are likely to be the biggest threats to vertebrate fauna on the Swan Coastal Plain.

A total of 14 invertebrate taxa were recorded across the survey area, with 13 occurring in the Iluka survey area and 12 occurring in the Burns Beach survey area. Invertebrate species were collected opportunistically or as bycatch during the fauna survey. One introduced invertebrate species, Portuguese Millipede (**Ommatoiulus moreletii*), occurred in the majority of the pitfall and funnel traps at trapping site 3. The survey areas appear to support a rich invertebrate diversity, which is reflected by the fairly diverse reptile assemblage present. A macroinvertebrate inventory survey conducted between 2015 and 2018 within the bounds of the Iluka Coastal Foreshore Reserve, between St. Lucia Road in the north and Resolute Way in the south, recorded a total of 548 macroinvertebrate species over this four-year period in one of the most comprehensive macrofaunal biodiversity inventories for any coastal habitat mosaic ever assembled in Western Australia (Knowles and Knowles 2015-2018). It is likely that a targeted invertebrate survey would uncover a much higher number of invertebrate taxa within the Burns Beach and Iluka survey areas.

A total of seven introduced (feral) fauna species were recorded across the survey area, five of which were recorded within the Iluka survey area and six of which were recorded within the Burns Beach survey area. Red Fox (**Vulpes vulpes*) and Cat (**Felis catus*) were recorded on motion cameras, whilst House Mouse (**Mus musculus*) was trapped in small aluminium box traps, and Portuguese Millipede (**Ommatoiulus moreletii*) within pitfall traps. European Rabbit (**Oryctolagus cuniculus*) scats were observed directly within the Iluka survey area. Red Fox and Cat are direct predators to native mammals and reptiles. These species were recorded within both the Iluka Foreshore and Burns Beach survey areas. Of note was an image captured from a motion camera of a cat wearing a pet collar with a tag at trapping site 4 (379084m E; 6487639m N), indicating use of the area by domestic animals. House Mouse and European Rabbit have the potential to introduce and spread disease to native mammal populations and likely compete for food resources with other native fauna species. Laughing Kookaburra and Laughing Dove were both heard and observed directly within the survey area. All vertebrate introduced (feral) fauna species recorded within the survey area are listed as 'Naturalised exotic' under the WAM Checklist of the Terrestrial Vertebrate Fauna of Western Australia (WAM 2020). The Portuguese Millipede (**Ommatoiulus moreletii*) is listed as Permitted – s11 under the Western Australian organism List (WAOL; DPIRD 2020).

Two conservation significant fauna species were observed during the field survey; including Carnaby's Cockatoo (*Calyptorhynchus latirostris;* Endangered under the EPBC Act and BC Act) and Quenda (*Isoodon fusciventer*; P4 by DBCA). Quenda were trapped across the Iluka and Burns Beach survey areas, however Carnaby's Cockatoo was observed only at the Iluka survey area. The survey areas fall within the non-breeding range of the Carnaby's Cockatoo (SEWPaC 2012). *Banksia* spp. present in the vegetation community BsArSg could provide foraging habitat for the Carnaby's Cockatoo. Burns Beach survey area trapped six Quenda individuals, and Iluka survey area trapped two individuals. The majority of these were male, and the Iluka survey area recorded one female with pouch young. This indicates successful breeding and recruitment of the Quenda population, despite the threat of predation from red fox and cats.

To ensure the persistence of Quenda and other small vertebrate fauna within the survey areas, predator control must be maintained. Regular monitoring of the Quenda population, including assessment of health and population estimates, is also recommended.

5.4 Recommendations

Based on results of the current survey, the following recommendations have been made to assist in the conservation of native flora, vegetation, fauna and environmental values present within Iluka and Burns Beach Foreshore Reserves:

- Continue long-term monitoring of weed populations within the survey areas. Implement weed control, particularly for the Declared Pest and WoNS species **Asparagus asparagoides* (Bridal Creeper) and the Declared Pest species **Moraea flaccida* (One-leaf Cape Tulip), for City of Joondalup priority weeds. Concentrate weed control activities along track edges and boundaries between remnant bushland and cleared areas.
- Continue to monitor populations of *Hibbertia leptotheca* (P3) and *Jacksonia sericea* (P4).
- Ensure that unauthorised access is restricted to defined tracks/paths only to prevent habitat degradation and weed spread i.e. unauthorised walking/vehicle tracks within the survey areas e.g. installation of fencing or formal signage, particularly in areas of access to the northern sections of Burns Beach.
- Continue regular monitoring of Quenda to ensure ongoing health and sustainability of the population.
- Feral animal control must be maintained, particularly in regard to foxes, cats and rabbits.
- It is recommended to continue monitoring for pathogens and to maintain correct hygiene practices.

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Appendix A Framework for conservation significant flora and fauna ranking

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

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

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

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

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

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

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

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

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

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

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

Vulnerable species	VU	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Extinct species

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

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

Specially protected species

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

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

Categories are detailed below.

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

Priority species (P)

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

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

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

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

Appendix B Fauna trap locations

Trap names	Easting	Northing	Sampling method
BURNS BEACH			
Trapping site 1			
TS1 P1	378128	6489766	Pitfall trap
TS1 P2, F1-2	378126	6489760	Pitfall and funnel traps
TS1 P3	378127	6489744	Pitfall trap
TS1 P4, F3-4	378131	6489731	Pitfall and funnel traps
TS1 P5	378135	6489723	Pitfall trap
TS1 P6, F5-6	378144	6489715	Pitfall and funnel traps
TS1 P7	378155	6489711	Pitfall trap
TS1 P8, F7-8	378162	6489703	Pitfall and funnel traps
TS1 P9	378178	6489694	Pitfall trap
TS1 P10, F9-10	378186	6489690	Pitfall and funnel traps
TS1 C1	378116	6489785	Cage trap
TS1 C2	378106	6489798	Cage trap
TS1 C3	378095	6489808	Cage trap
TS1 C4	378065	6489809	Cage trap
TS1 E1	378116	6489785	Small aluminium box trap
TS1 E2	378106	6489798	Small aluminium box trap
TS1 E3	378095	6489808	Small aluminium box trap
TS1 E4	378065	6489809	Small aluminium box trap
TS1 E5	378049	6489831	Small aluminium box trap
TS1 E6	378032	6489842	Small aluminium box trap
TS1 E7	378015	6489851	Small aluminium box trap
TS1 E8	377991	6489860	Small aluminium box trap
TS1 E9	377981	6489882	Small aluminium box trap
TS1 E10	377973	6489893	Small aluminium box trap
TS1 E11	377956	6489908	Small aluminium box trap
TS1 E12	377938	6489910	Small aluminium box trap
TS1 E13	377919	6489929	Small aluminium box trap
TS1 E14	377903	6489930	Small aluminium box trap
TS1 E15	377902	6489954	Small aluminium box trap
TS1 E16	377921	6489958	Small aluminium box trap
TS1 E17	377944	6489949	Small aluminium box trap

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Trap names	Easting	Northing	Sampling method
TS1 E18	377971	6489950	Small aluminium box trap
TS1 E19	377963	6489966	Small aluminium box trap
TS1 E20	377950	6489977	Small aluminium box trap
TS1 CAM	378083	6489789	Camera trap
TS1 SM2	378128	6489766	SM2 ultrasonic recorder
Trapping site 2			
TS2 P1	378536	6489128	Pitfall trap
TS2 P2, F1-2	378526	6489116	Pitfall and funnel traps
TS2 P3	378528	6489103	Pitfall trap
TS2 P4, F3-4	378525	6489094	Pitfall and funnel traps
TS2 P5	378525	6489084	Pitfall trap
TS2 P6, F5-6	378527	6489072	Pitfall and funnel traps
TS2 P7	378533	6489060	Pitfall trap
TS2 P8, F7-8	378534	6489046	Pitfall and funnel traps
TS2 P9	378541	6489040	Pitfall trap
TS2 P10, F9-10	378544	6489025	Pitfall and funnel traps
TS2 C1	378531	6489126	Cage trap
TS2 C2	378531	6489114	Cage trap
TS2 C3	378536	6489069	Cage trap
TS2 C4	378534	6489059	Cage trap
TS2 E1	378531	6489126	Small aluminium box trap
TS2 E2	378531	6489114	Small aluminium box trap
TS2 E3	378529	6489115	Small aluminium box trap
TS2 E4	378524	6489113	Small aluminium box trap
TS2 E5	378527	6489106	Small aluminium box trap
TS2 E6	378522	6489096	Small aluminium box trap
TS2 E7	378529	6489094	Small aluminium box trap
TS2 E8	378533	6489093	Small aluminium box trap
TS2 E9	378535	6489092	Small aluminium box trap
TS2 E10	378526	6489081	Small aluminium box trap
TS2 E11	378525	6489076	Small aluminium box trap
TS2 E12	378536	6489069	Small aluminium box trap
TS2 E13	378534	6489059	Small aluminium box trap
TS2 E14	378527	6489057	Small aluminium box trap
TS2 E15	378532	6489052	Small aluminium box trap

Trap names	Easting	Northing	Sampling method
TS2 E16	378519	6489034	Small aluminium box trap
TS2 E17	378527	6489030	Small aluminium box trap
TS2 E18	378531	6489029	Small aluminium box trap
TS2 E19	378538	6489026	Small aluminium box trap
TS2 E20	378544	6489022	Small aluminium box trap
TS2 CAM	378533	6489072	Camera trap
TS2 SM2	378536	6489127	SM2 ultrasonic recorder
ILUKA			
Trapping site 3			
TS3 P1	378910	6488630	Pitfall trap
TS3 P2, F1-2	378913	6488632	Pitfall and funnel traps
TS3 P3	378917	6488634	Pitfall trap
TS3 P4, F3-4	378923	6488632	Pitfall and funnel traps
TS3 P5	378929	6488625	Pitfall trap
TS3 P6, F5-6	378933	6488623	Pitfall and funnel traps
TS3 P7	378937	6488617	Pitfall trap
TS3 P8, F7-8	378943	6488613	Pitfall and funnel traps
TS3 P9	378947	6488608	Pitfall trap
TS3 P10, F9-10	378952	6488607	Pitfall and funnel traps
TS3 C1	378835	6488323	Cage trap
TS3 C2	378869	6488329	Cage trap
TS3 C3	378911	6488354	Cage trap
TS3 C4	378859	6488356	Cage trap
TS3 E1	378835	6488323	Small aluminium box trap
TS3 E2	378842	6488323	Small aluminium box trap
TS3 E3	378852	6488327	Small aluminium box trap
TS3 E4	378861	6488320	Small aluminium box trap
TS3 E5	378865	6488326	Small aluminium box trap
TS3 E6	378869	6488329	Small aluminium box trap
TS3 E7	378877	6488334	Small aluminium box trap
TS3 E8	378885	6488339	Small aluminium box trap
TS3 E9	378898	6488343	Small aluminium box trap
TS3 E10	378909	6488344	Small aluminium box trap
TS3 E11	378911	6488354	Small aluminium box trap
TS3 E12	378901	6488359	Small aluminium box trap

Trap names	Easting	Northing	Sampling method
TS3 E13	378889	6488360	Small aluminium box trap
TS3 E14	378878	6488356	Small aluminium box trap
TS3 E15	378867	6488354	Small aluminium box trap
TS3 E16	378859	6488356	Small aluminium box trap
TS3 E17	378846	6488356	Small aluminium box trap
TS3 E18	378834	6488343	Small aluminium box trap
TS3 E19	378822	6488335	Small aluminium box trap
TS3 E20	378809	6488331	Small aluminium box trap
TS3 CAM	378909	6488641	Camera trap
TS3 SM2	378918	6488636	SM2 ultrasonic recorder
Trapping site 4			
TS4 P1	379101	6487650	Pitfall trap
TS4 P2, F1-2	379105	6487646	Pitfall and funnel traps
TS4 P3	379105	6487641	Pitfall trap
TS4 P4, F3-4	379100	6487636	Pitfall and funnel traps
TS4 P5	379100	6487631	Pitfall trap
TS4 P6, F5-6	379101	6487626	Pitfall and funnel traps
TS4 P7	379102	6487620	Pitfall trap
TS4 P8, F7-8	379105	6487610	Pitfall and funnel traps
TS4 P9	379107	6487606	Pitfall trap
TS4 P10, F9-10	379102	6487601	Pitfall and funnel traps
TS4 C1	379088	6487603	Cage trap
TS4 C2	379067	6487636	Cage trap
TS4 C3	379027	6487701	Cage trap
TS4 C4	379039	6487637	Cage trap
TS4 E1	379088	6487603	Small aluminium box trap
TS4 E2	379079	6487608	Small aluminium box trap
TS4 E3	379071	6487611	Small aluminium box trap
TS4 E4	379062	6487620	Small aluminium box trap
TS4 E5	379064	6487631	Small aluminium box trap
TS4 E6	379067	6487636	Small aluminium box trap
TS4 E7	379060	6487646	Small aluminium box trap
TS4 E8	379053	6487660	Small aluminium box trap
TS4 E9	379059	6487670	Small aluminium box trap
TS4 E10	379050	6487690	Small aluminium box trap

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Trap names	Easting	Northing	Sampling method
TS4 E11	379027	6487701	Small aluminium box trap
TS4 E12	379027	6487689	Small aluminium box trap
TS4 E13	379021	6487677	Small aluminium box trap
TS4 E14	379017	6487660	Small aluminium box trap
TS4 E15	379019	6487651	Small aluminium box trap
TS4 E16	379039	6487637	Small aluminium box trap
TS4 E17	379039	6487632	Small aluminium box trap
TS4 E18	379052	6487624	Small aluminium box trap
TS4 E19	379046	6487612	Small aluminium box trap
TS4 E20	379038	6487600	Small aluminium box trap
TS4 CAM	379084	6487639	Camera trap
TS4 SM2	379102	6487604	SM2 ultrasonic recorder
Trapping site 5			
TS5 E1	378840	6488133	Small aluminium box trap
TS5 E2	378830	6488144	Small aluminium box trap
TS5 E3	378821	6488157	Small aluminium box trap
TS5 E4	378822	6488168	Small aluminium box trap
TS5 E5	378813	6488180	Small aluminium box trap
TS5 E6	378817	6488191	Small aluminium box trap
TS5 E7	378816	6488202	Small aluminium box trap

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Appendix C Fauna trapping site photos

Trapping site	Photo
BURNS BEACH	
TS1	
TS2	

Trapping site	Photo
ILUKA	
TS3	
TS4	

Trapping site	Photo
TS5	

Appendix D Flora species list

Family	Species	Common name	Conservation status		Previous studies										
			EPBC Act	BC Act / DBCA	Foulds 1982	Keighery 1992	Government of Western Australia 2000	Beaumaris Land Sales 2001	City of Joondalup 2009	GHD 2013	City of Joondalup 2014	Natural Area 2017	AECOM 2018	ELA 2021 Burns Beach	ELA 2021 Iluka
Aizoaceae	**Aizoon pubescens*									X					
Aizoaceae	**Carpobrotus aequilaterus*									X					
Aizoaceae	**Carpobrotus edulis*	Hottentot Fig			X	X		X	X	X		X	X	X	X
Aizoaceae	**Tetragonia decumbens*	Sea Spinach				X			X	X				X	X
Aizoaceae	*Carpobrotus sp.*					X									
Aizoaceae	*Carpobrotus virescens*	Coastal Pigface				X				X		X	X		
Aizoaceae	*Sarcozona bicarinata*			P3											
Amaranthaceae	*Ptilotus sp.*									X					
Amaranthaceae	*Ptilotus polystachyus*	Prince of Wales Feather						X		X					
Anacardiaceae	**Schinus terebinthifolia*	Japanese Pepper												X	X
Anarthriaceae	*Lyginia barbata*							X							
Apiaceae	*Daucus glochidiatus*	Australian Carrot			X	X							X	X	X
Apiaceae	*Xanthosia huegelii*							X							
Araliaceae	*Hydrocotyle diantha*				X										
Araliaceae	*Hydrocotyle intertexta*				X										
Araliaceae	*Trachymene pilosa*	Native Parsnip			X	X				X			X	X	X
Arecaceae	**Washingtonia filifera*									X					
Asparagaceae	**Agave americana*									X					
Asparagaceae	**Asparagus asparagoides*	Bridal Creeper											X	X	
Asparagaceae	**Lachenalia reflexa*	Cape Cowslip/Yellow Soldier													X
Asparagaceae	*Acanthocarpus preissii*				X	X			X	X		X	X	X	X
Asparagaceae	*Dichopogon capillipes*									X					
Asparagaceae	*Lomandra hermaphrodita*									X					
Asparagaceae	*Lomandra maritima*					X	X			X	X		X	X	X
Asparagaceae	*Lomandra preissii*												X		
Asparagaceae	*Lomandra caespitosa*	Tufted Mat Rush						X							
Asparagaceae	*Sowerbaea laxiflora*									X					
Asparagaceae	*Thysanotus dichotomus*	Branching Fringe Lily											X		
Asparagaceae	*Thysanotus manglesianus*	Fringed Lily								X			X		X
Asparagaceae	*Thysanotus patersonii*				X	X		X					X		
Asparagaceae	*Thysanotus multiflorus*	Many-flowered Fringe Lily						X							
Asphodelaceae	**Trachyandra divaricata*	Dune Onion Weed						X	X				X	X	X
Asteraceae	**Arctotheca calendula*	Cape Weed			X			X		X		X	X		X
Asteraceae	**Arctotheca populifolia*									X					

Family	Species	Common name	Conservation status		Previous studies										
			EPBC Act	BC Act / DBCA	Foulds 1982	Keighery 1992	Government of Western Australia 2000	Beaumaris Land Sales 2001	City of Joondalup 2009	GHD 2013	City of Joondalup 2014	Natural Area 2017	AECOM 2018	ELA 2021 Burns Beach	ELA 2021 Iluka
Asteraceae	**Arctotis stoechadifolia*	African daisy							X			X		X	
Asteraceae	**Carduus pycnocephalus*	Slender Thistle											X		
Asteraceae	**Centaurea melitensis*	Maltese Cockspur								X			X		
Asteraceae	**Erigeron bonariensis*									X					
Asteraceae	**Erigeron sumatrensis*									X					
Asteraceae	**Gazania linearis*	Gazania							X			X		X	
Asteraceae	**Hypochaeris glabra*	Smooth Cats Ear			X			X					X		X
Asteraceae	**Lactuca saligna*									X					
Asteraceae	**Lactuca serriola*	Prickly Lettuce										X		X	X
Asteraceae	**Osteospermum ecklonis*	Cape Marguerite												X	X
Asteraceae	**Sonchus oleraceus*	Common Sowthistle			X	X							X	X	X
Asteraceae	**Sonchus sp.*								X						
Asteraceae	**Urospermum picroides*									X					
Asteraceae	*Actitis megalocarpa*						X								
Asteraceae	*Asteraceae sp.*				X								X		
Asteraceae	*Asteridea pulverulenta*				X					X					
Asteraceae	*Brachyscome sp.*					X									
Asteraceae	*Cotula turbinata*									X					
Asteraceae	*Lagenophora huegelii*				X			X		X					
Asteraceae	*Leucophyta brownii*						X		X	X					
Asteraceae	*Millotia myosotidifolia*				X					X					
Asteraceae	*Olearia axillaris*	Coastal Daisybush			X	X	X	X	X	X	X	X	X	X	X
Asteraceae	*Pithocarpa cordata*												X		
Asteraceae	*Pithocarpa cordata*									X					
Asteraceae	*Podolepis gracilis*									X					
Asteraceae	*Quinetia urvillei*							X							
Asteraceae	*Rhodanthe citrina*									X			X		
Asteraceae	*Senecio hispidulus*	Hispid Fireweed								X			X		
Asteraceae	*Senecio pinnatifolius*									X			X		
Asteraceae	*Waitzia nitida*									X					
Asteraceae	*Waitzia suaveolens*	Fragrant Waitzia						X							
Asteraceae	**Sonchus asper*	Rough Sowthistle								X			X		
Asteraceae	*Gnephosis angianthoides*									X					
Asteraceae	*Hyalosperma cotula*									X					
Asteraceae	**Ursinia anthemoides*	Ursinia			X			X							X
Asteraceae	**Vellereophyton dealbatum*	White Cudweed											X		

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Family	Species	Common name	Conservation status		Previous studies										
			EPBC Act	BC Act / DBCA	Foulds 1982	Keighery 1992	Government of Western Australia 2000	Beaumaris Land Sales 2001	City of Joondalup 2009	GHD 2013	City of Joondalup 2014	Natural Area 2017	AECOM 2018	ELA 2021 Burns Beach	ELA 2021 Iluka
Asteraceae	*Podotheca gnaphalioides*	Golden Longheads								X			X		X
Asteraceae	*Rhodanthe corymbosa*					X									X
Asteraceae	*Senecio pinnatifolius var. latilobus*													X	X
Asteraceae	*Senecio sp.*								X						
Brassicaceae	**Brassica barrelieri*									X					
Brassicaceae	**Brassica tournefortii*	Mediterranean Turnip								X		X	X	X	X
Brassicaceae	**Cakile maritima*	Sea Rocket								X		X	X	X	X
Brassicaceae	**Raphanus raphanistrum*	Wild Radish												X	X
Brassicaceae	*Stenopetalum gracile*									X					
Brassicaceae	**Heliophila pusilla*				X	X		X					X		
Campanulaceae	*Lobelia heterophylla*	Wing-seeded Lobelia											X		
Campanulaceae	*Wahlenbergia capensis*	Cape Bluebell											X		
Campanulaceae	*Wahlenbergia gracilenta*				X										
Campanulaceae	*Wahlenbergia preissii*							X		X					
Caryophyllaceae	**Cerastium glomeratum*	Sticky Mouse-ear Chickweed			X										
Caryophyllaceae	**Petrorhagia dubia*	Hairy Pink			X			X					X	X	X
Caryophyllaceae	**Polycarpon tetraphyllum*	Fourleaf Allseed													X
Caryophyllaceae	**Silene gallica*	Windmill Pink				X									
Caryophyllaceae	**Stellaria media*	Chickweed			X									X	X
Casuarinaceae	*Allocasuarina lehmanniana*						X			X					
Casuarinaceae	*Allocasuarina fraseriana*	Sheoak						X		X	X				
Casuarinaceae	*Allocasuarina humilis*	Dwarf Sheoak			X	X		X		X					
Chenopodiaceae	*Atriplex cinerea*	Grey Saltbush										X		X	
Chenopodiaceae	*Atriplex isatidea*	Coast Saltbush								X			X		
Chenopodiaceae	*Enchylaena tomentosa*	Barrier Saltbush				X				X			X		
Chenopodiaceae	*Rhagodia baccata*	Berry Saltbush			X	X			X	X		X	X	X	X
Chenopodiaceae	*Salicornia quinqueflora*					X									
Chenopodiaceae	*Threlkeldia diffusa*	Coast Bonefruit				X			X	X		X		X	X
Colchicaceae	*Burchardia congesta*							X		X			X		
Colchicaceae	*Wurmbea dioica*				X										
Convolvulaceae	**Cuscuta epithymum*	Lesser Dodder												X	
Convolvulaceae	**Cuscuta planiflora*	Small-seeded Dodder											X		
Crassulaceae	**Crassula glomerata*					X			X			X		X	X
Crassulaceae	*Crassula colorata*	Dense Stonecrop			X	X		X					X	X	X
Crassulaceae	*Crassula extrorsa*									X					
Cupressaceae	*Callitris preissii*	Rottnest Island Pine								X				X	

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Cyperaceae	**Leptospermum laevigatum*									X					
Cyperaceae	*Chaetospora curvifolia*							X							
Cyperaceae	*Ficinia nodosa*	Knotted Club Rush				X			X	X		X	X	X	X
Cyperaceae	*Isolepis marginata*	Coarse Club-rush			X			X					X	X	
Cyperaceae	*Lepidosperma angustatum*					X				X					
Cyperaceae	*Lepidosperma calcicola*													X	X
Cyperaceae	*Lepidosperma costale*									X					
Cyperaceae	*Lepidosperma empetriformis*									X					
Cyperaceae	*Lepidosperma gladiatum*	Coast Sword-sedge				X			X	X		X	X	X	X
Cyperaceae	*Lepidosperma longitudinale*	Pithy Sword-sedge											X		
Cyperaceae	*Lepidosperma squamatum*												X		
Cyperaceae	*Lepidosperma angustatum*							X							
Cyperaceae	*Mesomelaena pseudostygia*							X					X		
Cyperaceae	*Schoenoplectiella lateriflora*							X							
Cyperaceae	*Schoenus clandestinus*												X		
Cyperaceae	*Schoenus grandiflorus*	Large Flowered Bogrush				X									X
Cyperaceae	*Schoenus lanatus*				X										
Dasypogonaceae	*Calectasia narragara*									X					
Dilleniaceae	*Hibbertia cuneiformis*	Cutleaf Hibbertia												X	X
Dilleniaceae	*Hibbertia huegelii*									X					
Dilleniaceae	*Hibbertia hypericoides*	Yellow Buttercups			X	X	X	X		X			X	X	X
Dilleniaceae	*Hibbertia leptotheca*		P3			X	X								X
Dilleniaceae	*Hibbertia polystachya*				X										
Dilleniaceae	*Hibbertia racemosa*	Stalked Guinea Flower			X	X	X								X
Dilleniaceae	*Hibbertia subvaginata*									X					
Droseraceae	*Drosera pallida*									X			X		
Droseraceae	*Drosera erythrorhiza*	Red Ink Sundew						X		X					
Droseraceae	*Drosera macrantha*				X					X					
Ericaceae	*Acrotriche cordata*	Coast Ground Berry				X				X			X	X	X
Ericaceae	*Leucopogon insularis*												X		
Ericaceae	*Leucopogon parviflorus*	Coast Beard-heath			X	X				X			X	X	X
Ericaceae	*Leucopogon polymorphus*									X					
Ericaceae	*Leucopogon sprengelioides*							X							
Ericaceae	*Lysinema ciliatum*	Curry Flower			X			X							
Ericaceae	*Styphelia pallida*				X	X									
Ericaceae	*Styphelia racemulosa*				X										

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Ericaceae	*Styphelia xerophylla*									X					
Ericaceae	*Conostephium pendulum*	Pearl Flower				X		X		X			X		
Euphorbiaceae	**Euphorbia paralias*	Sea Splurge								X			X	X	
Euphorbiaceae	**Euphorbia peplus*	Petty Spurge											X		X
Euphorbiaceae	**Euphorbia sp.*							X							
Euphorbiaceae	**Euphorbia terracina*	Geraldton Carnation Weed								X			X	X	X
Euphorbiaceae	**Ricinus communis*	Castor Oil Plant						X						X	X
Fabaceae	**Medicago polymorpha*	Burr Medic				X			X	X		X		X	X
Fabaceae	**Melilotus indicus*	Annual Yellow Sweetclover			X									X	X
Fabaceae	**Trifolium campestre*	Hop Clover			X									X	
Fabaceae	**Trifolium dubium*	Suckling Clover								X			X		
Fabaceae	**Trifolium tomentosum*									X					
Fabaceae	**Vicia sativa*	Common Vetch													X
Fabaceae	*Acacia cochlearis*	Rigid Wattle				X				X			X	X	
Fabaceae	*Acacia cyclops*	Coastal Wattle			X	X	X			X		X	X	X	X
Fabaceae	*Acacia lasiocarpa var. lasiocarpa*				X		X							X	
Fabaceae	*Acacia rostellifera*	Summer-scented Wattle				X	X	X		X	X	X	X	X	X
Fabaceae	*Acacia saligna*	Orange Wattle				X		X		X		X	X	X	X
Fabaceae	*Acacia truncata*				X	X									X
Fabaceae	*Acacia pulchella*	Prickly Moses			X	X		X		X			X		
Fabaceae	*Acacia xanthina*						X			X					
Fabaceae	*Bossiaea eriocarpa*	Common Brown Pea			X	X		X		X				X	X
Fabaceae	*Chorizema aciculare*				X										
Fabaceae	*Daviesia capitatum*									X					
Fabaceae	*Daviesia decurrens*									X					
Fabaceae	*Daviesia divaricata*	Marno			X			X							
Fabaceae	*Daviesia incrassata*				X										
Fabaceae	*Daviesia triflora*							X							
Fabaceae	*Gastrolobium capitatum*				X										
Fabaceae	*Gastrolobium nervosum*					X	X	X		X				X	X
Fabaceae	*Gastrolobium tomentosum*		P4							X					
Fabaceae	*Gompholobium aristatum*					X									
Fabaceae	*Gompholobium tomentosum*	Hairy Yellow Pea			X			X					X	X	X
Fabaceae	*Hardenbergia comptoniana*	Native Wisteria			X	X		X	X	X		X	X	X	X
Fabaceae	*Hovea pungens*	Devil's Pins			X			X							
Fabaceae	*Hovea stricta*				X										

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Fabaceae	*Hovea trisperma*	Common Hovea						X							
Fabaceae	*Isotropis cuneifolia*	Granny Bonnets						X		X					
Fabaceae	*Jacksonia furcellata*	Grey Stinkwood			X			X		X					
Fabaceae	*Jacksonia sternbergiana*	Stinkwood						X		X					
Fabaceae	*Kennedia coccinea*					X									
Fabaceae	*Kennedia prostrata*	Scarlet Runner			X	X				X			X	X	X
Fabaceae	*Sphaerolobium medium*				X										
Fabaceae	*Sphaerolobium sp.*							X							
Fabaceae	*Templetonia retusa*	Cockies Tongues			X	X				X			X	X	X
Fabaceae	*Jacksonia calcicola*						X								
Fabaceae	*Jacksonia sericea*	Waldjumi		P4		X				X					X
Fabroniaceae	*Fabronia hampeana*			P2						X					
Frankeniaceae	*Frankenia pauciflora*	Seaheath				X			X						X
Geraniaceae	**Erodium botrys*	Long Storksbill								X			X		
Geraniaceae	**Erodium cicutarium*	Common Stork's-bill			X										
Geraniaceae	**Geranium molle*	Dove's-foot Crane's-bill			X										
Geraniaceae	**Pelargonium capitatum*	Rose Pelargonium			X	X	X	X	X	X	X	X	X	X	X
Geraniaceae	*Pelargonium littorale*				X										
Goodeniaceae	*Dampiera linearis*	Common Dampiera			X			X							
Goodeniaceae	*Lechenaultia linarioides*	Yellow Leschenaultia			X		X								X
Goodeniaceae	*Scaevola anchusifolia*									X					
Goodeniaceae	*Scaevola canescens*					X				X					
Goodeniaceae	*Scaevola crassifolia*	Thick-leaved Fan-flower				X	X		X	X	X	X	X	X	X
Goodeniaceae	*Scaevola nitida*				X		X			X			X		
Goodeniaceae	*Scaevola repens*														X
Goodeniaceae	*Scaevola thesioides*												X		
Gyrostemonaceae	*Codonocarpus cotinifolius*												X		
Haemodoraceae	*Anigozanthos humilis*	Catspaw			X			X							X
Haemodoraceae	*Conostylis aculeata*	Prickly Conostylis			X	X		X		X			X		
Haemodoraceae	*Conostylis aculeata subsp. preissii*													X	X
Haemodoraceae	*Conostylis aurea*												X		
Haemodoraceae	*Conostylis candicans subsp. calcicola*													X	
Haemodoraceae	*Conostylis candicans subsp. candicans*									X					X
Haemodoraceae	*Conostylis pauciflora subsp. euryrhipis*			P4			X								
Haemodoraceae	*Conostylis setigera*	Bristly Cottonhead						X		X			X	X	X
Hemerocallidaceae	*Caesia micrantha*	Pale Grass-lily						X							

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Hemerocallidaceae	*Corynotheca micrantha*	Sand Lily			X			X					X		X
Hemerocallidaceae	*Dianella revoluta*	Blueberry Lily				X				X			X		X
Hemerocallidaceae	*Dianella revoluta var. divaricata*	Flax Lily						X							
Hemerocallidaceae	*Tricoryne elatior*	Yellow Autumn Lily			X	X								X	X
Iridaceae	**Gladiolus caryophyllaceus*	Wild Gladiolus			X			X					X		X
Iridaceae	**Moraea flaccida*	One-leaf Cape Tulip			X								X		X
Iridaceae	**Romulea rosea*	Guildford Grass			X	X							X		X
Iridaceae	**Watsonia meriana var. bulbillifera*	Bugle Lily											X		
Iridaceae	*Orthrosanthus laxus*	Morning Iris						X		X					
Lamiaceae	*Hemiandra glabra*									X				X	
Lamiaceae	*Hemiandra pungens*					X			X	X			X		
Lamiaceae	*Westringia dampieri*											X			
Lauraceae	*Cassytha flava*	Dodder Laurel								X				X	X
Lauraceae	*Cassytha pomiformis*									X					
Lauraceae	*Cassytha sp.*														X
Lauraceae	*Cassytha racemosa*	Dodder Laurel			X	X		X		X			X		
Loranthaceae	*Nuytsia floribunda*	Christmas Tree						X		X			X		
Malvaceae	*Alyogyne huegelii*					X									
Malvaceae	*Thomasia cognata*				X	X									
Malvaceae	*Thomasia triphylla*														X
Montiaceae	*Calandrinia brevipedata*	Short-stalked Purslane												X	X
Montiaceae	*Calandrinia calyptrata*				X										
Montiaceae	*Calandrinia granulifera*					X									
Montiaceae	*Calandrinia liniflora*				X								X		
Montiaceae	*Calandrinia tholiformis*													X	X
Montiaceae	*Calandrinia corrigioloides*	Strap Purslane						X							
Myrtaceae	**Chamelaucium uncinatum*	Geraldton Wax								X					X
Myrtaceae	*Agonis flexuosa*	Peppermint												X	
Myrtaceae	*Calothamnus quadrifidus*	One-sided Bottlebrush				X	X	X		X			X	X	X
Myrtaceae	*Calothamnus sanguineus*				X										
Myrtaceae	*Calytrix fraseri*	Pink Summer Calytrix						X							
Myrtaceae	*Eremaea pauciflora*							X							
Myrtaceae	*Eucalyptus utilis*	Coastal Moort												X	
Myrtaceae	*Eucalyptus decipiens*	Redheart			X			X		X	X				
Myrtaceae	*Eucalyptus foecunda*	Narrow-leaved Red Mallee			X			X		X					
Myrtaceae	*Eucalyptus gomphocephala*						X			X	X		X		

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Myrtaceae	*Eucalyptus marginata*										X				
Myrtaceae	*Eucalyptus todtiana*	Pricklybark						X					X		
Myrtaceae	*Kunzea glabrescens*	Spearwood												X	
Myrtaceae	*Melaleuca cardiophylla*	Tangling Melaleuca				X	X			X			X		X
Myrtaceae	*Melaleuca huegelii*	Chenille Honeymyrtle			X	X	X		X	X	X		X	X	X
Myrtaceae	*Melaleuca lanceolata*	Rottnest Teatree												X	X
Myrtaceae	*Melaleuca systena*				X	X	X	X		X	X		X	X	X
Nitrariaceae	*Nitraria billardierei*					X			X						
Olacaceae	*Olax benthamiana*					X									X
Onagraceae	**Oenothera drummondii*	Beach Evening Primrose								X		X		X	
Onagraceae	**Oenothera stricta*									X					
Orchidaceae	*Caladenia flava*				X					X					
Orchidaceae	*Caladenia latifolia*				X					X					
Orchidaceae	*Caladenia longicauda*	Common White Spider Orchid						X							
Orchidaceae	*Elythranthera brunonis*									X					
Orchidaceae	*Eriochilus dilatatus*				X										
Orchidaceae	*Pheladenia deformis*				X										
Orchidaceae	*Pterostylis aspera*									X					
Orchidaceae	*Pterostylis sp. (nana complex)*													X	
Orchidaceae	*Thelymitra campanulata*									X					
Orobanchaceae	**Bellardia trixago*	Mediterranean Lineseed			X					X					
Orobanchaceae	**Parentucellia latifolia*				X										
Oxalidaceae	**Oxalis pes-caprae*	Soursob												X	X
Papaveraceae	**Fumaria bastardii*									X					
Papaveraceae	**Fumaria capreolata*	Whiteflower Fumitory								X			X	X	X
Papaveraceae	**Fumaria muralis*									X					
Phyllanthaceae	*Phyllanthus calycinus*	False Boronia			X	X		X		X			X	X	X
Phyllanthaceae	*Poranthera microphylla*				X										
Pittosporaceae	*Marianthus paralius*		EN	EN							X				X
Plantaginaceae	**Plantago lanceolata*									X					
Plantaginaceae	*Plantago exilis*					X									X
Poaceae	**Aira caryophyllea subsp. caryophyllea*	Silvery Hairgrass													X
Poaceae	**Aira caryophyllea*	Silvery Hairgrass						X					X		
Poaceae	**Avena barbata*	Bearded Oat								X		X	X	X	X
Poaceae	**Avena fatua*	Wild Oat										X		X	X
Poaceae	**Briza maxima*	Blowfly Grass						X					X	X	X

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Poaceae	**Briza minor*	Shivery Grass			X					X			X		X
Poaceae	**Bromus catharticus*									X					
Poaceae	**Bromus diandrus*	Great Brome						X		X		X	X	X	X
Poaceae	**Bromus rubens*	Red Brome			X										
Poaceae	**Catapodium rigidum*	Rigid Fescue			X	X								X	X
Poaceae	**Cenchrus clandestinus*	Kikuyu Grass							X			X		X	X
Poaceae	**Cynodon dactylon*	Couch										X		X	
Poaceae	**Digitaria ciliaris*									X					
Poaceae	**Ehrharta calycina*	Perennial Veldt Grass								X			X	X	X
Poaceae	**Ehrharta longiflora*	Annual Veldt Grass				X		X	X			X	X	X	X
Poaceae	**Eragrostis curvula*									X					
Poaceae	**Lagurus ovatus*	Hare's Tail Grass				X				X		X	X	X	X
Poaceae	**Pentameris airoides*	False Hairgrass								X			X		
Poaceae	**Rostraria cristata*	MediterraneanHairgrass			X										
Poaceae	**Thinopyrum distichum*									X					
Poaceae	**Vulpia bromoides*	Squirrel-tail Fescue				X									
Poaceae	**Vulpia myuros*	Rat's Tail Fescue				X				X				X	X
Poaceae	*Amphipogon turbinatus*									X			X		
Poaceae	*Austrostipa elegantisssima*												X		
Poaceae	*Austrostipa flavescens*					X		X		X					X
Poaceae	*Austrostipa variabilis*									X					
Poaceae	*Bromus arenarius*				X	X				X					
Poaceae	*Poa drummondiana*				X										
Poaceae	*Poa porphyroclados*							X							
Poaceae	*Poaceae sp.*													X	X
Poaceae	*Rytidosperma occidentale*									X					
Poaceae	*Spinifex hirsutus*	Hairy Spinifex					X			X				X	
Poaceae	*Sporobolus virginicus*					X			X						
Poaceae	*Tetrarrhena laevis*	Forest Ricegrass												X	
Poaceae	**Hordeum leporinum*	Barley Grass								X				X	X
Poaceae	**Lolium perenne*	Perennial Ryegrass											X		
Poaceae	**Lolium rigidum*	Rigid Ryegrass										X			
Poaceae	**Ammophila arenaria*									X					
Poaceae	*Spinifex longifolius*	Beach Spinifex					X		X	X		X		X	
Polygalaceae	*Comesperma confertum*				X					X					
Polygalaceae	*Comesperma integerrimum*												X		X

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Polygalaceae	*Comesperma virgatum*									X					
Primulaceae	**Lysimachia arvensis*	Pimpernel			X			X		X			X	X	X
Proteaceae	*Adenanthos sp.*				X										
Proteaceae	*Banksia attenuata*	Slender Banksia					X	X		X	X		X		X
Proteaceae	*Banksia dallanneyi*	Couch Honeypot									X			X	X
Proteaceae	*Banksia lindleyana*									X					
Proteaceae	*Banksia menziesii*	Firewood Banksia				X	X	X		X			X		
Proteaceae	*Banksia nivea*				X	X									
Proteaceae	*Banksia sessilis*	Parrot Bush			X	X		X			X			X	X
Proteaceae	*Banksia sessilis var. cygnorum*						X			X			X		
Proteaceae	*Banksia dallanneyi subsp. agricola*							X							
Proteaceae	*Conospermum triplinervium*						X								
Proteaceae	*Grevillea crithmifolia*													X	X
Proteaceae	*Grevillea preissii subsp. preissii*						X			X				X	X
Proteaceae	*Grevillea thelemanniana*	Spider Net Grevillea	CR	CR	X	X		X							
Proteaceae	*Grevillea vestita*							X							
Proteaceae	*Hakea costata*	Ribbed Hakea			X			X							
Proteaceae	*Hakea lissocarpha*	Honey Bush				X		X		X			X		
Proteaceae	*Hakea prostrata*	Harsh Hakea			X	X		X							
Proteaceae	*Hakea ruscifolia*	Candle Hakea						X							
Proteaceae	*Hakea trifurcata*	Two-leaf Hakea			X		X	X		X					
Proteaceae	*Persoonia saccata*	Snottygobble						X							
Proteaceae	*Petrophile sp.*									X					
Proteaceae	*Petrophile brevifolia*					X				X					
Proteaceae	*Petrophile linearis*	Pixie Mops						X							
Proteaceae	*Petrophile macrostachya*					X		X							
Proteaceae	*Petrophile media*							X							
Proteaceae	*Petrophile serruriae*				X		X	X							
Proteaceae	*Stirlingia latifolia*	Blueboy						X							
Proteaceae	*Synaphea petiolaris*	Synaphea						X							
Ranunculaceae	*Clematis linearifolia*				X					X			X		X
Restionaceae	*Alexgeorgea nitens*							X							
Restionaceae	*Desmocladus asper*									X			X		
Restionaceae	*Desmocladus flexuosus*				X	X		X		X				X	X
Restionaceae	*Loxocarya cinerea*					X									
Rhamnaceae	*Cryptandra arbutiflora*									X					

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Rhamnaceae	*Cryptandra mutila*				X					X					
Rhamnaceae	*Trymalium ledifolium*				X					X					X
Rhamnaceae	*Trymalium ledifolium subsp. ledifolium*						X								
Rhamnaceae	*Spyridium globulosum*	Basket Bush			X	X	X	X	X	X	X	X	X	X	X
Rosaceae	**Aphanes arvensis*									X					
Rubiaceae	**Galium murale*	Small Goosegrass													X
Rubiaceae	*Opercularia vaginata*	Dog Weed			X			X							
Rutaceae	*Diplolaena dampieri*									X					
Rutaceae	*Philotheca spicata*				X										
Santalaceae	*Exocarpos sp.*				X								X		
Santalaceae	*Exocarpos sparteus*	Broom Ballart				X				X				X	
Santalaceae	*Leptomeria empetriformis*						X								
Santalaceae	*Santalum acuminatum*	Quandong				X				X				X	X
Sapindaceae	*Diplopeltis huegelii*				X										X
Sapindaceae	*Diplopeltis huegelii subsp. huegelii*						X								
Scrophulariaceae	**Dischisma arenarium*													X	
Scrophulariaceae	*Eremophila glabra*				X	X									
Scrophulariaceae	*Eremophila glabra subsp. albicans*														X
Scrophulariaceae	*Myoporum insulare*	Blueberry Tree				X	X		X	X		X	X	X	
Solanaceae	**Solanum linnaeanum*									X					
Solanaceae	**Solanum nigrum*	Black Berry Nightshade				X		X					X	X	
Solanaceae	*Anthocercis ilicifolia*									X					
Stylidiaceae	*Levenhookia pusilla*												X		
Stylidiaceae	*Stylidium brunonianum*	Pink Fountain Triggerplant			X			X							
Stylidiaceae	*Stylidium guttatum*				X										
Stylidiaceae	*Stylidium junceum*	Reed Triggerplant			X			X							
Stylidiaceae	*Stylidium maritimum*		P3				X								
Stylidiaceae	*Stylidium repens*	Matted Triggerplant						X							
Stylidiaceae	*Stylidium schoenoides*	Cow Kicks						X							
Thymelaeaceae	*Pimelea argentea*									X			X		
Thymelaeaceae	*Pimelea calcicola*		P3				X								
Thymelaeaceae	*Pimelea ferruginea*				X										
Thymelaeaceae	*Pimelea leucantha*									X			X		
Thymelaeaceae	*Pimelea sulphurea*	Yellow Banjine				X		X							
Thymelaeaceae	*Pimelea sylvestris*				X										
Thymelaeaceae	*Pimelea villifera*						X								

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Family	Species	Common name	Conservation status		Previous studies										
			EPBC Act	BC Act / DBCA	Foulds 1982	Keighery 1992	Government of Western Australia 2000	Beaumaris Land Sales 2001	City of Joondalup 2009	GHD 2013	City of Joondalup 2014	Natural Area 2017	AECOM 2018	ELA 2021 Burns Beach	ELA 2021 Iluka
Tropaeolaceae	**Tropaeolum sp.*														X
Urticaceae	*Parietaria cardiostegia*														X
Urticaceae	*Parietaria debilis*	Pellitory			X									X	
Violaceae	*Hybanthus angustifolium*									X					
Violaceae	*Hybanthus calycinus*	Wild Violet			X			X		X			X	X	X
Xanthorrhoeaceae	*Xanthorrhoea preissii*	Grass Tree				X		X		X			X		
Zamiaceae	*Macrozamia fraseri*							X		X			X		
Zamiaceae	*Macrozamia riedlei*												X		
		Total			**118**	**95**	**41**	**109**	**29**	**186**	**15**	**36**	**122**	**105**	**121**

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Appendix E Flora species matrix

Family	Species name	Burns Beach														Iluka													
		ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	ELA 23	ELA 24	ELA 25	ELA 26	ELA 27	ELA 28
Aizoaceae	**Carpobrotus edulis*	0	0	0	0	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1	0	0	1	0	1
Aizoaceae	**Tetragonia decumbens*	1	1	0	0	1	0	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Apiaceae	*Daucus glochidiatus*	1	1	1	1	0	0	1	1	1	1	1	1	0	1	1	1	0	0	0	1	1	1	1	1	1	1	0	0
Araliaceae	*Trachymene pilosa*	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	1	1	1	0	0
Asparagaceae	**Asparagus asparagoides*	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asparagaceae	**Lachenalia reflexa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Asparagaceae	*Acanthocarpus preissii*	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	1	1
Asparagaceae	*Lomandra maritima*	0	0	0	1	0	0	0	1	0	0	1	0	1	0	0	0	0	1	1	0	0	0	1	1	1	0	0	1
Asparagaceae	*Thysanotus manglesianus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1
Asphodelaceae	**Trachyandra divaricata*	1	0	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Asteraceae	**Arctotheca calendula*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Asteraceae	**Gazania linearis*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	**Hypochaeris glabra*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Asteraceae	**Lactuca serriola*	0	0	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	**Osteospermum ecklonis* (DC) Norl.	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	**Sonchus oleraceus*	1	1	1	1	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	0	1	1	1	1	1	0
Asteraceae	*Olearia axillaris*	1	0	0	0	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	0	0	1	1	0	0	0	1
Asteraceae	**Ursinia anthemoides*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Asteraceae	*Podotheca gnaphalioides*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Asteraceae	*Rhodanthe corymbosa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	1	1	0	1	0	0
Asteraceae	*Senecio pinnatifolius* var. *latilobus*	1	0	0	0	1	0	1	1	1	1	0	1	0	0	1	1	1	1	1	0	1	1	0	0	0	0	0	1
Brassicaceae	**Brassica tournefortii*	1	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Brassicaceae	**Raphanus raphanistrum*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Caryophyllaceae	**Petrorhagia dubia*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Caryophyllaceae	**Polycarpon tetraphyllum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1	0	0	0	0
Caryophyllaceae	**Stellaria media*	0	0	1	1	0	1	1	0	1	0	0	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0
Chenopodiaceae	*Atriplex cinerea*	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chenopodiaceae	*Rhagodia baccata*	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1
Chenopodiaceae	*Threlkeldia diffusa*	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	0	1	1	1
Convolvulaceae	**Cuscuta epithymum*	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Crassulaceae	**Crassula glomerata*	1	0	1	0	1	1	1	1	1	1	1	1	0	1	1	1	1	0	0	1	1	1	1	1	1	1	0	1

Family	Species name	Burns Beach														Iluka													
		ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	ELA 23	ELA 24	ELA 25	ELA 26	ELA 27	ELA 28
Crassulaceae	*Crassula colorata*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	0
Cupressaceae	*Callitris preissii*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	*Ficinia nodosa*	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Cyperaceae	*Isolepis marginata*	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cyperaceae	*Lepidosperma calcicola*	0	0	0	0	0	0	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Cyperaceae	*Lepidosperma gladiatum*	1	1	0	1	1	1	0	1	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Dilleniaceae	*Hibbertia hypericoides*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0
Dilleniaceae	*Hibbertia leptotheca* (P3)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Ericaceae	*Acrotriche cordata*	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Ericaceae	*Leucopogon parviflorus*	0	0	0	0	0	0	1	1	0	1	0	0	0	0	0	1	0	0	0	1	1	1	1	1	1	0	0	0
Euphorbiaceae	**Euphorbia paralias*	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Euphorbiaceae	**Euphorbia peplus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0
Euphorbiaceae	**Euphorbia terracina*	1	1	1	0	0	1	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	1	1	1	1
Fabaceae	**Medicago polymorpha*	1	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0
Fabaceae	**Melilotus indicus*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	1	1	1	1	1	0	0	1
Fabaceae	**Trifolium campestre*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae	**Vicia sativa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Fabaceae	*Acacia cochlearis*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae	*Acacia cyclops*	0	1	1	1	0	1	1	1	0	0	0	0	1	0	0	0	0	1	0	0	0	0	1	0	1	0	0	0
Fabaceae	*Acacia lasiocarpa* var. *lasiocarpa*	0	0	0	0	1	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae	*Acacia rostellifera*	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1	1	1
Fabaceae	*Acacia saligna*	0	0	0	0	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Fabaceae	*Acacia truncata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Fabaceae	*Bossiaea eriocarpa*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Fabaceae	*Gastrolobium nervosum*	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
Fabaceae	*Gompholobium tomentosum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Fabaceae	*Hardenbergia comptoniana*	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	0	1	1	1	1	1	1	1
Fabaceae	*Templetonia retusa*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	1	1	1	0	0	0	1
Fabaceae	*Jacksonia sericea* (P4)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0
Frankeniaceae	*Frankenia pauciflora*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Geraniaceae	**Pelargonium capitatum*	1	0	0	1	1	1	1	1	1	1	1	1	1	1	0	0	0	1	1	0	0	0	0	0	0	0	1	1
Goodeniaceae	*Lechenaultia linarioides*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Goodeniaceae	*Scaevola crassifolia*	1	1	0	0	1	0	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0
Goodeniaceae	*Scaevola repens*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0

Family	Species name	Burns Beach														Iluka													
		ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	ELA 23	ELA 24	ELA 25	ELA 26	ELA 27	ELA 28
Haemodoraceae	*Conostylis aculeata* subsp. *preissii*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Haemodoraceae	*Conostylis candicans* subsp. *calcicola*	0	0	0	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Haemodoraceae	*Conostylis candicans* subsp. *candicans*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Haemodoraceae	*Conostylis setigera*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	1	0
Hemerocallidaceae	*Corynotheca micrantha*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Hemerocallidaceae	*Dianella revoluta*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
Iridaceae	**Gladiolus caryophyllaceus*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	0	1	0	1	0
Iridaceae	**Moraea flaccida*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Iridaceae	**Romulea rosea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0
Lamiaceae	*Hemiandra glabra*	0	0	0	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lauraceae	*Cassytha flava*	0	0	0	0	0	1	1	1	1	1	0	1	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0
Lauraceae	*Cassytha* sp.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Malvaceae	*Thomasia triphylla*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0
Montiaceae	*Calandrinia brevipedata*	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	
Montiaceae	*Calandrinia tholiformis*	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	1	0	0
Myrtaceae	*Agonis flexuosa*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Calothamnus quadrifidus*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	0	0	1	0
Myrtaceae	*Eucalyptus utilis*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Kunzea glabrescens*	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Myrtaceae	*Melaleuca cardiophylla*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	1	1	1	0	0	0	1	0	0
Myrtaceae	*Melaleuca huegelii*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	1	0	0	0	0	0	1	1	0	1	0	1
Myrtaceae	*Melaleuca systena*	0	0	0	0	0	1	0	1	1	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0
Olacaceae	*Olax benthamiana*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Onagraceae	**Oenothera drummondii*	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Orchidaceae	*Pterostylis* sp. (nana complex)	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oxalidaceae	**Oxalis pes-caprae*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
Papaveraceae	**Fumaria capreolata*	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Phyllanthaceae	*Phyllanthus calycinus*	0	0	0	0	0	0	0	1	0	0	1	0	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Plantaginaceae	*Plantago exilis*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0
Poaceae	**Aira caryophyllea* subsp. *caryophyllea*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Poaceae	**Avena barbata*	0	1	0	1	0	1	0	0	0	1	0	0	1	0	1	0	0	0	1	0	0	0	0	1	0	0	1	0

Family	Species name	Burns Beach														Iluka													
		ELA 01	ELA 02	ELA 03	ELA 04	ELA 05	ELA 06	ELA 07	ELA 08	ELA 09	ELA 10	ELA 11	ELA 12	ELA 13	ELA 14	ELA 15	ELA 16	ELA 17	ELA 18	ELA 19	ELA 20	ELA 21	ELA 22	ELA 23	ELA 24	ELA 25	ELA 26	ELA 27	ELA 28
Poaceae	*Briza maxima	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	1	1	1	0
Poaceae	*Briza minima	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0
Poaceae	*Bromus diandrus	1	1	0	0	0	0	0	0	0	0	1	0	1	1	0	0	0	1	0	0	0	0	1	1	0	1	0	1
Poaceae	*Catapodium rigidum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	1	1	1	1	1	1	1	0	0
Poaceae	*Ehrharta calycina	1	0	0	0	0	0	0	0	0	1	1	1	1	1	0	0	0	1	1	1	1	1	1	1	1	1	1	0
Poaceae	*Ehrharta longiflora	1	1	1	1	0	1	1	1	1	1	1	1	0	1	1	0	0	0	0	0	1	1	1	1	1	1	0	1
Poaceae	*Lagurus ovatus	0	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0
Poaceae	*Vulpia myuros	1	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Poaceae	*Austrostipa flavescens*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Poaceae	*Poaceae* sp.	0	0	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	0
Poaceae	*Tetrarrhena laevis*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Poaceae	*Hordeum leporinum	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Poaceae	*Spinifex longifolius*	1	0	0	0	1	0	0	0	0	0	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Polygalaceae	*Comesperma integerrimum*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Primulaceae	*Lysimachia arvensis*	0	0	0	1	0	1	0	1	0	1	0	0	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1
Proteaceae	*Banksia attenuata*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Proteaceae	*Banksia dallanneyi*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	1	0
Proteaceae	*Banksia sessilis*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	0	1	0	1	0
Proteaceae	*Grevillea crithmifolia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Proteaceae	*Grevillea preissii* subsp. *preissii*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0
Restionaceae	*Desmocladus flexuosus*	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1	1	0	0	0	0	1	1	0	0	0
Rhamnaceae	*Trymalium ledifolium*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
Rhamnaceae	*Spyridium globulosum*	1	1	1	1	1	1	1	1	1	1	1	0	1	1	0	1	1	1	1	0	0	0	1	1	1	1	1	1
Rubiaceae	*Galium murale	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	1
Santalaceae	*Exocarpos sparteus*	0	0	0	0	0	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Santalaceae	*Santalum acuminatum*	0	0	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0
Scrophulariaceae	*Dischisma arenarium	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Scrophulariaceae	*Eremophila glabra* subsp. *albicans*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0	0	0	1	0	0	0	0	0
Scrophulariaceae	*Myoporum insulare*	1	0	0	0	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solanaceae	*Solanum nigrum	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Urticaceae	*Parietaria cardiostegia*	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	0	1	0	0
Urticaceae	*Parietaria debilis*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Total	**25**	**17**	**20**	**20**	**23**	**25**	**31**	**35**	**22**	**30**	**27**	**21**	**40**	**23**	**26**	**32**	**22**	**31**	**39**	**17**	**18**	**24**	**37**	**42**	**32**	**29**	**33**	**23**

Appendix F Quadrat data

Site name	Date	Site type	Observer
Burns Beach ELA01	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune slope	West	10
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378554		6488957	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	10	M	Shrub <5m
Myoporum insulare	4	M	Shrub <5m
**Tetragonia decumbens*	0.5	M	Shrub <5m
Olearia axillaris	1	M	Shrub <3m
Scaevola crassifolia	2	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	0.3	M	Shrub <2m
**Ehrharta longiflora*	0.5	G	Grass
Lepidosperma gladiatum	0.5	G	Grass
**Bromus diandrus*	0.2	G	Grass
Spinifex longifolius	0.2	G	Grass
**Ehrharta calycina*	0.1	G	Grass
**Trachyandra divaricata*	3	G	Herb
**Pelargonium capitatum*	0.8	G	Herb
**Medicago polymorpha*	0.2	G	Herb
**Euphorbia paralias*	0.1	G	Herb
**Euphorbia terracina*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Senecio pinnatifolius var. latilobus	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Vulpia myuros*	0.08	G	Herb
**Brassica tournefortii*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Crassula glomerata*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA02	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	ArAcSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Tall Acacia scrub over weeds	Dune slope into swale	North-east	3
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378583		6488980	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acacia rostellifera	40	M	Shrub <5m
Acacia cyclops	5	M	Shrub <5m
Spyridium globulosum	2	M	Shrub <5m
Kunzea glabrescens	0.5	M	Shrub <5m
Rhagodia baccata	1	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m
Scaevola crassifolia	0.05	M	Shrub <2m
**Tetragonia decumbens*	0.1	M	Shrub <0.5m
**Bromus diandrus*	10	G	Grass

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Ehrharta longiflora*	6	G	Grass
**Avena barbata*	2	G	Grass
Lepidosperma gladiatum	0.2	G	Grass
Threlkeldia diffusa	0.5	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
Daucus glochidiatus	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA03	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds and rubbish	Old (>-10 years)	ArAcSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Tall Acacia/Callitris shrub over weeds	Dune slope into swale	East	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378615		6488946	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Eucalyptus utilis	10	U	Tree <15m
Agonis flexuosa	2	U	Tree <10m
Callitris preissii	2.5	M	Shrub <10m
Acacia cyclops	8	M	Shrub <5m
Acacia rostellifera	5	M	Shrub <5m
Spyridium globulosum	3	M	Shrub <5m
Acanthocarpus preissii	0.5	M	Shrub <2m
Rhagodia baccata	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Ehrharta longiflora*	30	G	Grass
**Fumaria capreolata*	0.5	G	Herb
Daucus glochidiatus	0.5	G	Herb
**Euphorbia terracina*	0.2	G	Herb
Threlkeldia diffusa	0.2	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
**Stellaria media*	0.1	G	Herb
**Trachyandra divaricata*	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
Pterostylis sp. (nana complex)	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber
**Asparagus asparagoides*	0.05	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA04	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds and rubbish	Old (>-10 years)	ArAcSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Tall Acacia scrub over weeds	Dune slope into swale	East	0.2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378530		6489054	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acacia rostellifera	20	M	Shrub <5m
Acacia cyclops	15	M	Shrub <5m
Kunzea glabrescens	0.5	M	Shrub <5m
Spyridium globulosum	0.5	M	Shrub <5m
Rhagodia baccata	0.5	M	Shrub <2m
Acanthocarpus preissii	0.2	M	Shrub <2m
**Ehrharta longiflora*	20	G	Grass
**Avena barbata*	0.5	G	Grass
Lepidosperma gladiatum	0.5	G	Grass

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Lactuca serriola*	0.2	G	Herb
**Pelargonium capitatum*	0.2	G	Herb
**Sonchus oleraceus*	0.2	G	Herb
**Trachyandra divaricata*	0.2	G	Herb
Threlkeldia diffusa	0.2	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Lomandra maritima	0.1	G	Herb
**Stellaria media*	0.05	G	Herb
**Asparagus asparagoides*	0.1	G	Climber
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA05	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Very good	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune crest	South-west	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378370		6489278	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	0.2	M	Shrub <7m
Myoporum insulare	0.5	M	Shrub <5m
Acacia lasiocarpa var. *lasiocarpa*	0.2	M	Shrub <5m
Acacia rostellifera	0.2	M	Shrub <5m
Acacia saligna	0.1	M	Shrub <5m
Spyridium globulosum	0.1	M	Shrub <5m
Olearia axillaris	0.5	M	Shrub <3m
Scaevola crassifolia	40	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	0.1	M	Shrub <2m
**Tetragonia decumbens*	0.5	M	Shrub <0.5m
Spinifex longifolius	2	G	Grass
Lepidosperma gladiatum	0.5	G	Grass
**Hordeum leporinum*	0.1	G	Grass
**Lagurus ovatus*	0.1	G	Grass
**Pelargonium capitatum*	0.8	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Trachyandra divaricata*	0.2	G	Herb
Ficinia nodosa	0.2	G	Herb
Threlkeldia diffusa	0.2	G	Herb
Senecio pinnatifolius var. *latilobus*	0.05	G	Herb
**Crassula glomerata*	0.01	G	Herb
Hardenbergia comptoniana	0.01	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA06	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	ArAcSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Acacia over *Spyridium* and mixed shrubs	Dune swale	East	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378272		6489449	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	10	M	Shrub <5m
Acacia rostellifera	3	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Acacia saligna	0.2	M	Shrub <5m
Melaleuca systena	0.2	M	Shrub <5m
Myoporum insulare	0.2	M	Shrub <5m
Exocarpos sparteus	0.1	M	Shrub <5m
Olearia axillaris	0.2	M	Shrub <3m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	1	M	Shrub <2m
Acanthocarpus preissii	0.6	M	Shrub <2m
Lepidosperma gladiatum	25	G	Grass
**Ehrharta longiflora*	2	G	Grass
**Avena barbata*	0.1	G	Grass
**Pelargonium capitatum*	0.5	G	Herb
**Trachyandra divaricata*	0.5	G	Herb
Threlkeldia diffusa	0.5	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
Cassytha flava	0.2	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
**Stellaria media*	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
Isolepis marginata	0.05	G	Herb
Hardenbergia comptoniana	0.5	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA07	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgEsOa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune crest	South-west	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378126		6489677	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acacia lasiocarpa var. *lasiocarpa*	2.5	M	Shrub <5m
Spyridium globulosum	1	M	Shrub <5m
Acacia saligna	0.5	M	Shrub <5m
Exocarpos sparteus	0.5	M	Shrub <5m
Leucopogon parviflorus	0.5	M	Shrub <5m
Acacia cyclops	0.2	M	Shrub <5m
Myoporum insulare	0.1	M	Shrub <5m
Olearia axillaris	1	M	Shrub <3m
Scaevola crassifolia	5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	2	M	Shrub <2m
Hemiandra glabra	0.2	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Acrotriche cordata	0.1	M	Shrub <2m
Atriplex cinerea	0.1	M	Shrub <2m
**Ehrharta longiflora*	0.2	G	Grass
**Briza maxima*	0.1	G	Grass
**Lagurus ovatus*	0.1	G	Grass
**Trachyandra divaricata*	0.5	G	Herb
Threlkeldia diffusa	0.3	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Pelargonium capitatum*	0.1	G	Herb
**Vulpia myuros*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Conostylis candicans subsp. *calcicola*	0.1	G	Herb
**Crassula glomerata*	0.02	G	Herb
**Dischisma arenarium*	0.02	G	Herb
Daucus glochidiatus	0.02	G	Herb
Senecio pinnatifolius var. *latilobus*	0.02	G	Herb
**Stellaria media*	0.01	G	Herb
Calandrinia tholiformis	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA08	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Acacia over *Spyridium* and mixed shrubs	Dune swale	North-west	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378007		6489825	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	0.5	M	Shrub <7m
Spyridium globulosum	10	M	Shrub <5m
Exocarpos sparteus	0.8	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Melaleuca systena	0.3	M	Shrub <5m
Leucopogon parviflorus	0.2	M	Shrub <5m
Olearia axillaris	0.2	M	Shrub <3m
Scaevola crassifolia	0.8	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	0.3	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Phyllanthus calycinus	0.1	M	Shrub <2m
**Tetragonia decumbens*	0.4	M	Shrub <0.5m
Lepidosperma gladiatum	25	G	Grass
**Ehrharta longiflora*	2	G	Grass
Lepidosperma calcicola	0.5	G	Grass
**Lagurus ovatus*	0.1	G	Grass
**Trachyandra divaricata*	1.5	G	Herb
**Carpobrotus edulis*	0.5	G	Herb
**Pelargonium capitatum*	0.5	G	Herb
Conostylis candicans subsp. *calcicola*	0.5	G	Herb
Daucus glochidiatus	0.5	G	Herb
Poaceae sp.	0.5	G	Herb
Lomandra maritima	0.2	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Conostylis aculeata subsp. *preissii*	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Vulpia myuros*	0.05	G	Herb
Parietaria debilis	0.05	G	Herb
**Sonchus oleraceus*	0.02	G	Herb
Calandrinia tholiformis	0.02	G	Herb
**Crassula glomerata*	0.01	G	Herb
Hardenbergia comptoniana	0.08	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA09	24/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgEsOa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune crest	West	8
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
377876		6490025	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	20	M	Shrub <5m
Melaleuca systena	0.5	M	Shrub <5m
Exocarpos sparteus	0.4	M	Shrub <5m
Olearia axillaris	2	M	Shrub <3m
Scaevola crassifolia	5	M	Shrub <2m
Acanthocarpus preissii	1.5	M	Shrub <2m
Hemiandra glabra	0.2	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Atriplex cinerea	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Gastrolobium nervosum	0.2	M	Shrub <0.5m
**Ehrharta longiflora*	1.5	G	Grass
**Carpobrotus edulis*	0.5	G	Herb
**Trachyandra divaricata*	0.4	G	Herb
Poaceae sp.	0.3	G	Herb
**Pelargonium capitatum*	0.2	G	Herb
Conostylis candicans subsp. *calcicola*	0.2	G	Herb
**Stellaria media*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA10	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds and vehicle tracks	Old (>-10 years)	SgEsOa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Open low heath	Open swale	N/A	0
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
377770		6490154	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Exocarpos sparteus	0.5	M	Shrub <5m
Spyridium globulosum	0.5	M	Shrub <5m
Leucopogon parviflorus	0.2	M	Shrub <5m
Acacia saligna	0.1	M	Shrub <5m
Olearia axillaris	2	M	Shrub <3m
Acrotriche cordata	2.5	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m
Scaevola crassifolia	0.2	M	Shrub <2m
Rhagodia baccata	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Gastrolobium nervosum	0.1	M	Shrub <0.5m
**Ehrharta longiflora*	0.3	G	Grass
**Avena barbata*	0.1	G	Grass
**Ehrharta calycina*	0.05	G	Grass
**Pelargonium capitatum*	1.5	G	Herb
**Trachyandra divaricata*	1	G	Herb
Conostylis candicans subsp. *calcicola*	0.2	G	Herb
**Brassica tournefortii*	0.1	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Cuscuta epithymum*	0.05	G	Herb
**Lysimachia arvensis*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Trachymene pilosa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
**Dischisma arenarium*	0.02	G	Herb
Daucus glochidiatus	0.02	G	Herb
Isolepis marginata	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA11	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Dune swale heath	Dune swale	South-west	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
377648		6499434	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	0.5	M	Shrub <7m
Spyridium globulosum	4	M	Shrub <5m
Melaleuca systena	1	M	Shrub <5m
Exocarpos sparteus	0.5	M	Shrub <5m
Olearia axillaris	3	M	Shrub <3m
Acanthocarpus preissii	2.5	M	Shrub <2m
Rhagodia baccata	0.4	M	Shrub <2m
Scaevola crassifolia	0.2	M	Shrub <2m
Phyllanthus calycinus	0.08	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Tetragonia decumbens*	0.2	M	Shrub <0.5m
Lepidosperma gladiatum	8	G	Grass
**Ehrharta calycina*	0.1	G	Grass
**Ehrharta longiflora*	0.1	G	Grass
Spinifex longifolius	0.1	G	Grass
**Bromus diandrus*	0.05	G	Grass
**Trachyandra divaricata*	0.5	G	Herb
Lomandra maritima	0.5	G	Herb
**Pelargonium capitatum*	0.3	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
Daucus glochidiatus	0.2	G	Herb
Conostylis candicans subsp. *calcicola*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Cuscuta epithymum*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Calandrinia brevipedata	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA12	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Dune swale heath	Dune rise and swale	East	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
377545		6490624	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Olearia axillaris	4	M	Shrub <3m
Scaevola crassifolia	5	M	Shrub <2m
Acanthocarpus preissii	0.4	M	Shrub <2m
Hemiandra glabra	0.3	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
**Tetragonia decumbens*	0.5	M	Shrub <0.5m
Lepidosperma gladiatum	20	G	Grass
**Ehrharta calycina*	0.4	G	Grass
**Ehrharta longiflora*	0.1	G	Grass

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spinifex longifolius	0.1	G	Grass
**Pelargonium capitatum*	3	G	Herb
**Trachyandra divaricata*	0.8	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
Daucus glochidiatus	0.2	G	Herb
Senecio pinnatifolius var. *latilobus*	0.2	G	Herb
Cassytha flava	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Crassula glomerata*	0.01	G	Herb
**Sonchus oleraceus*	0.01	G	Herb
Calandrinia brevipedata	0.01	G	Herb
Crassula colorata	0.01	G	Herb

Site name	Date	Site type	Observer
Burns Beach ELA13	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	BsArSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Exposed limestone slope	West	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine sand	Limestone	2-10
Easting		**Northing**	
378691		6488995	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	0.5	U	Shrub <10m
Melaleuca huegelii	5	M	Shrub <5m
Acacia cochlearis	2	M	Shrub <5m
Spyridium globulosum	2	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Acacia lasiocarpa var. *lasiocarpa*	0.1	M	Shrub <5m
Templetonia retusa	0.1	M	Shrub <5m
Hibbertia hypericoides	0.5	M	Shrub <3m
Calothamnus quadrifidus	2.5	M	Shrub <2m

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	0.5	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Grevillea preissii subsp. *preissii*	0.1	M	Shrub <2m
Scaevola crassifolia	0.1	M	Shrub <2m
Phyllanthus calycinus	0.02	M	Shrub <2m
Banksia dallanneyi	0.1	M	Shrub <1m
**Bromus diandrus*	0.2	G	Grass
**Ehrharta calycina*	0.2	G	Grass
Lepidosperma calcicola	0.2	G	Grass
**Avena barbata*	0.1	G	Grass
Tetrarrhena laevis	0.02	G	Grass
**Pelargonium capitatum*	0.5	G	Herb
**Trachyandra divaricata*	0.5	G	Herb
**Osteospermum ecklonis* (DC.) Norl.	0.2	G	Herb
Lomandra maritima	0.2	G	Herb
**Brassica tournefortii*	0.1	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Oxalis pes-caprae*	0.1	G	Herb
**Raphanus raphanistrum*	0.1	G	Herb
**Trifolium campestre*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Gazania linearis*	0.05	G	Herb
**Lactuca serriola*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Desmocladus flexuosus	0.05	G	Herb
**Medicago polymorpha*	0.02	G	Herb
**Solanum nigrum*	0.02	G	Herb
**Melilotus indicus*	0.01	G	Herb
**Petrorhagia dubia*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

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Site name	Date	Site type	Observer
Burns Beach ELA14	25/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds and rubbish	Old (>-10 years)	SgSa
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low coastal heath	Dune slope	North-west	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	N/A	0
Easting		**Northing**	
378644		6488819	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Spyridium globulosum	8	M	Shrub <5m
Myoporum insulare	4	M	Shrub <5m
Olearia axillaris	1.5	M	Shrub <3m
Scaevola crassifolia	10	M	Shrub <2m
Rhagodia baccata	0.1	M	Shrub <2m
**Tetragonia decumbens*	0.5	M	Shrub <0.5m
Lepidosperma gladiatum	5	G	Grass
**Bromus diandrus*	1.5	G	Grass
**Ehrharta longiflora*	0.5	G	Grass

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Ehrharta calycina*	0.1	G	Grass
Spinifex longifolius	0.1	G	Grass
**Pelargonium capitatum*	2	G	Herb
**Trachyandra divaricata*	0.5	G	Herb
Daucus glochidiatus	0.2	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Lactuca serriola*	0.05	G	Herb
**Oenothera drummondii*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
**Crassula glomerata*	0.01	G	Herb
**Lysimachia arvensis*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA15	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	FpApSc
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low limestone coastal heath	Limestone cliff	West	2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine sand	Limestone	>50
Easting		**Northing**	
378681		6488502	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Olax benthamiana	0.1	M	Shrub <7m
Melaleuca huegelii	10	M	Shrub <5m
Templetonia retusa	0.5	M	Shrub <5m
Olearia axillaris	0.4	M	Shrub <3m
Eremophila glabra subsp. *albicans*	0.5	M	Shrub <2m
Acanthocarpus preissii	0.1	M	Shrub <2m
Acrotriche cordata	0.1	M	Shrub <2m
Rhagodia baccata	0.4	M	Shrub <2m
Scaevola crassifolia	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Frankenia pauciflora	1.5	M	Shrub <1m
**Avena barbata*	0.1	G	Grass
**Catapodium rigidum*	0.1	G	Grass
**Ehrharta longiflora*	0.2	G	Grass
**Hordeum leporinum*	0.2	G	Grass
**Crassula glomerata*	0.05	G	Herb
**Lysimachia arvensis*	0.05	G	Herb
**Medicago polymorpha*	0.5	G	Herb
**Melilotus indicus*	0.2	G	Herb
**Polycarpon tetraphyllum*	0.05	G	Herb
**Romulea rosea*	0.2	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Daucus glochidiatus	0.05	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
Threlkeldia diffusa	0.2	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA16	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	FpApSc
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low limestone coastal heath	Limestone cliff	West	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/white	Fine skeletal sand	Limestone	>50
Easting		**Northing**	
378831		6488110	

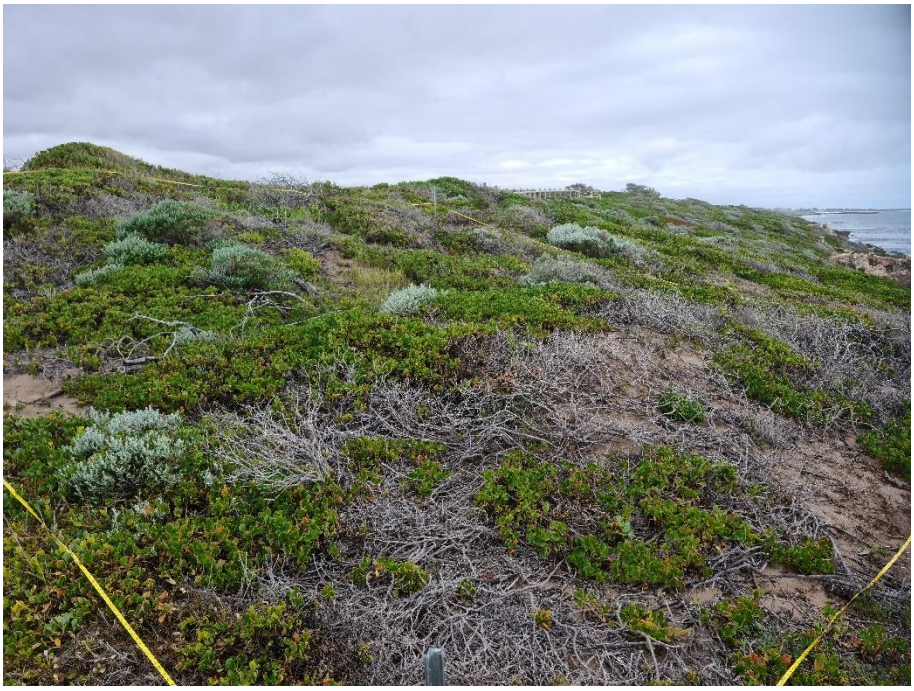


Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Olax benthamiana	0.3	M	Shrub <7m
Melaleuca cardiophylla	20	M	Shrub <5m
Melaleuca huegelii	0.5	M	Shrub <5m
Templetonia retusa	0.5	M	Shrub <5m
Spyridium globulosum	0.3	M	Shrub <5m
Leucopogon parviflorus	0.2	M	Shrub <5m
Hibbertia leptotheca	0.4	M	Shrub <3m
Olearia axillaris	0.1	M	Shrub <3m
Scaevola crassifolia	1.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	0.5	M	Shrub <2m
Eremophila glabra subsp. *albicans*	0.5	M	Shrub <2m
Rhagodia baccata	0.3	M	Shrub <2m
Acrotriche cordata	0.1	M	Shrub <2m
Thomasia triphylla	0.1	M	Shrub <2m
Frankenia pauciflora	0.5	M	Shrub <1m
Gastrolobium nervosum	0.2	M	Shrub <0.5m
**Catapodium rigidum*	0.2	G	Grass
**Hordeum leporinum*	0.2	G	Grass
**Carpobrotus edulis*	0.5	G	Herb
**Medicago polymorpha*	0.2	G	Herb
**Melilotus indicus*	0.2	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Romulea rosea*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Rhodanthe corymbosa	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Podotheca gnaphalioides	0.05	G	Herb
**Sonchus oleraceus*	0.02	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA17	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	FpApSc
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low limestone coastal heath	Limestone cliff	West	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey	Fine shallow sand	Limestone	<2
Easting		**Northing**	
378913		6487822	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	0.5	M	Shrub <5m
Templetonia retusa	0.5	M	Shrub <5m
Spyridium globulosum	0.4	M	Shrub <5m
Olearia axillaris	0.2	M	Shrub <3m
Scaevola crassifolia	15	M	Shrub <2m
Acanthocarpus preissii	0.5	M	Shrub <2m
Eremophila glabra subsp. *albicans*	0.2	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Frankenia pauciflora	1	M	Shrub <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Catapodium rigidum*	0.5	G	Grass
**Hordeum leporinum*	0.1	G	Grass
**Medicago polymorpha*	0.5	G	Herb
Threlkeldia diffusa	0.5	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Polycarpon tetraphyllum*	0.1	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Senecio pinnatifolius var. *latilobus*	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Lysimachia arvensis*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA18	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	High amount of weeds	Old (>-10 years)	BsArSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Dune swale heath	Dune swale	North	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine sand	Limestone	<2
Easting		**Northing**	
379013		6487773	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	8	M	Shrub <10m
Spyridium globulosum	2	M	Shrub <5m
Acacia rostellifera	1.5	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Melaleuca systena	0.1	M	Shrub <5m
Olearia axillaris	1	M	Shrub <3m
Hibbertia hypericoides	0.2	M	Shrub <3m
Jacksonia calcicola	0.1	M	Shrub <3m
Rhagodia baccata	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Acanthocarpus preissii	0.2	M	Shrub <2m
Phyllanthus calycinus	0.1	M	Shrub <2m
Banksia dallanneyi	0.5	M	Shrub <1m
**Ehrharta calycina*	2.5	G	Grass
**Bromus diandrus*	2	G	Grass
**Briza maxima*	1.5	G	Grass
Austrostipa flavescens	0.05	G	Grass
**Carpobrotus edulis*	0.5	G	Herb
**Pelargonium capitatum*	0.5	G	Herb
Conostylis aculeata subsp. *preissii*	0.5	G	Herb
Lomandra maritima	0.5	G	Herb
**Hypochaeris glabra*	0.2	G	Herb
**Vulpia myuros*	0.2	G	Herb
Senecio pinnatifolius var. *latilobus*	0.2	G	Herb
**Petrorhagia dubia*	0.1	G	Herb
Desmocladus flexuosus	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Euphorbia terracina*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
**Gladiolus caryophyllaceus*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA19	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	BsArSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Banksia shrubland over low heath	Dune rise	West	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine sand	Limestone	<2
Easting		**Northing**	
379034		6487880	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	15	M	Shrub <10m
Banksia attenuata	0.8	M	Shrub <10m
Spyridium globulosum	1.5	M	Shrub <5m
Acacia rostellifera	1	M	Shrub <5m
Hibbertia hypericoides	0.5	M	Shrub <3m
Olearia axillaris	0.5	M	Shrub <3m
Jacksonia calcicola	0.1	M	Shrub <3m
Scaevola crassifolia	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Calothamnus quadrifidus	0.4	M	Shrub <2m
Grevillea crithmifolia	0.4	M	Shrub <2m
Rhagodia baccata	0.2	M	Shrub <2m
Acanthocarpus preissii	0.05	M	Shrub <2m
Banksia dallanneyi	0.5	M	Shrub <1m
Gompholobium tomentosum	0.2	M	Shrub <1m
**Ehrharta calycina*	5	G	Grass
**Briza maxima*	3	G	Grass
**Avena barbata*	0.5	G	Grass
Austrostipa flavescens	0.1	G	Grass
Conostylis setigera	2	G	Herb
**Pelargonium capitatum*	0.5	G	Herb
**Ursinia anthemoides*	0.4	G	Herb
Corynotheca micrantha	0.3	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Lysimachia arvensis*	0.2	G	Herb
Desmocladus flexuosus	0.2	G	Herb
**Brassica tournefortii*	0.1	G	Herb
**Hypochaeris glabra*	0.1	G	Herb
**Sonchus oleraceus*	0.1	G	Herb
**Trachyandra divaricata*	0.1	G	Herb
Ficinia nodosa	0.1	G	Herb
Lomandra maritima	0.1	G	Herb
**Euphorbia terracina*	0.05	G	Herb
**Moraea flaccida*	0.05	G	Herb
Conostylis candicans subsp. *candicans*	0.05	G	Herb
**Arctotheca calendula*	0.02	G	Herb
**Gladiolus caryophyllaceus*	0.02	G	Herb
**Petrorhagia dubia*	0.02	G	Herb
Senecio pinnatifolius var. *latilobus*	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA20	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	McAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Melaleuca cardiophylla heath	Limestone hill	North-west	5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey	Fine skeletal sand	Limestone	>50
Easting		**Northing**	
378930		6487898	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca cardiophylla	60	M	Shrub <5m
Acacia rostellifera	0.2	M	Shrub <5m
Leucopogon parviflorus	0.05	M	Shrub <5m
Rhagodia baccata	0.05	M	Shrub <2m
**Ehrharta calycina*	0.5	G	Grass
**Catapodium rigidum*	0.1	G	Grass
**Galium murale*	0.1	G	Grass
Rhodanthe corymbosa	0.2	G	Herb

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Lysimachia arvensis*	0.1	G	Herb
**Melilotus indicus*	0.1	G	Herb
**Stellaria media*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Plantago exilis	0.05	G	Herb
Threlkeldia diffusa	0.05	G	Herb
Trachymene pilosa	0.05	G	Herb
**Crassula glomerata*	0.01	G	Herb

Site name	Date	Site type	Observer
Iluka ELA21	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	McAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Melaleuca cardiophylla heath	Limestone rise	South-west	2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine skeletal sand	Limestone	20-50
Easting		**Northing**	
378889		6488110	

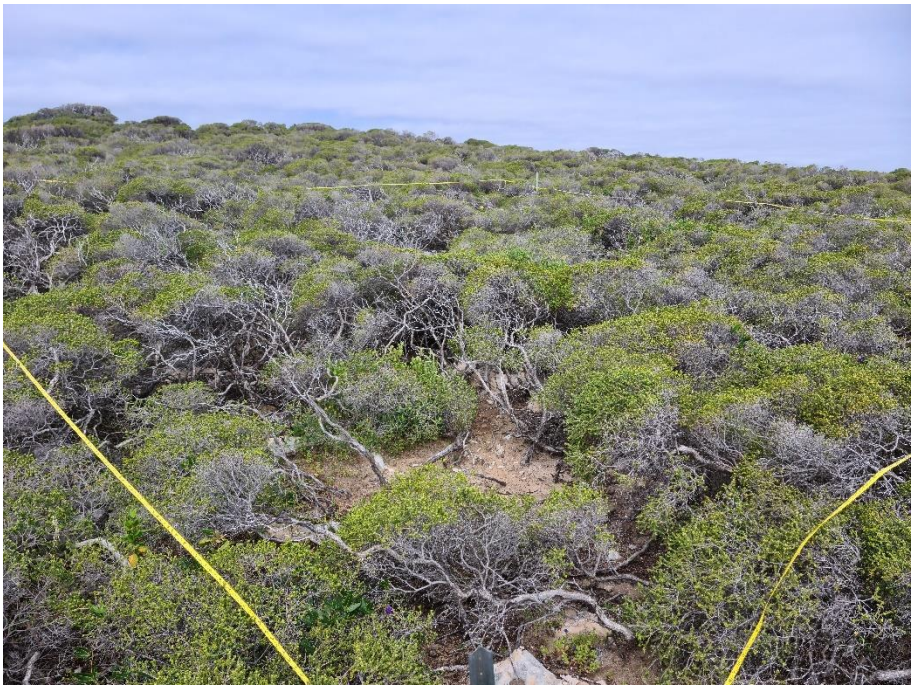


Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca cardiophylla	80	M	Shrub <5m
Acacia rostellifera	0.1	M	Shrub <5m
Leucopogon parviflorus	0.1	M	Shrub <5m
Rhagodia baccata	0.2	M	Shrub <2m
**Galium murale*	0.5	G	Grass
**Catapodium rigidum*	0.1	G	Grass
**Ehrharta calycina*	0.05	G	Grass
**Ehrharta longiflora*	0.02	G	Grass

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Parietaria cardiostegia	0.5	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Melilotus indicus*	0.1	G	Herb
Daucus glochidiatus	0.08	G	Herb
**Carpobrotus edulis*	0.05	G	Herb
**Crassula glomerata*	0.05	G	Herb
Plantago exilis	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
Senecio pinnatifolius var. *latilobus*	0.02	G	Herb
**Stellaria media*	0.01	G	Herb

Site name	Date	Site type	Observer
Iluka ELA22	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	McAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Melaleuca cardiophylla heath	Limestone rise	North-west	2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine skeletal sand	Limestone	>50
Easting		**Northing**	
378862		6488212	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca cardiophylla	60	M	Shrub <5m
Acacia rostellifera	0.3	M	Shrub <5m
Templetonia retusa	0.1	M	Shrub <5m
Leucopogon parviflorus	0.05	M	Shrub <5m
Rhagodia baccata	0.5	M	Shrub <2m
Thomasia triphylla	0.1	M	Shrub <2m
**Catapodium rigidum*	0.2	G	Grass
**Ehrharta longiflora*	0.2	G	Grass

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Galium murale*	0.2	G	Grass
**Ehrharta calycina*	0.1	G	Grass
Trachymene pilosa	0.3	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Melilotus indicus*	0.1	G	Herb
Daucus glochidiatus	0.1	G	Herb
Parietaria cardiostegia	0.1	G	Herb
Plantago exilis	0.08	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
Senecio pinnatifolius var. *latilobus*	0.05	G	Herb
Threlkeldia diffusa	0.05	G	Herb
Calandrinia tholiformis	0.02	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA23	30/09/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low limestone heath	Limestone rise	West	1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Brown	Fine shallow sand	Limestone	10-20
Easting		**Northing**	
378806		6488840	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	15	M	Shrub <5m
Spyridium globulosum	15	M	Shrub <5m
Acacia cyclops	2	M	Shrub <5m
Acacia truncata	0.5	M	Shrub <5m
Acacia rostellifera	0.1	M	Shrub <5m
Leucopogon parviflorus	0.05	M	Shrub <5m
Templetonia retusa	0.05	M	Shrub <5m
Olearia axillaris	0.5	M	Shrub <3m
Eremophila glabra subsp. *albicans*	0.2	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Rhagodia baccata	0.2	M	Shrub <2m
Grevillea preissii subsp. *preissii*	0.1	M	Shrub <2m
**Ehrharta calycina*	1	G	Grass
**Briza maxima*	0.5	G	Grass
**Ehrharta longiflora*	0.2	G	Grass
**Bromus diandrus*	0.1	G	Grass
**Briza minor*	0.05	G	Grass
**Catapodium rigidum*	0.05	G	Grass
**Galium murale*	0.03	G	Grass
**Lysimachia arvensis*	0.2	G	Herb
**Melilotus indicus*	0.2	G	Herb
Lomandra maritima	0.2	G	Herb
Parietaria cardiostegia	0.2	G	Herb
**Carpobrotus edulis*	0.1	G	Herb
Cassytha flava	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Dianella revoluta	0.1	G	Herb
Poaceae sp.	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Gladiolus caryophyllaceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Daucus glochidiatus	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
Crassula colorata	0.02	G	Herb
**Sonchus oleraceus*	0.01	G	Herb
Calandrinia tholiformis	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA24	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Mid Acacia/Melaleuca shrubland	Limestone slope	East	1.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine shallow sand	Limestone	20-50
Easting		**Northing**	
378952		6488371	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	5	M	Shrub <7m
Spyridium globulosum	30	M	Shrub <5m
Melaleuca huegelii	5	M	Shrub <5m
Acacia rostellifera	0.5	M	Shrub <5m
Leucopogon parviflorus	0.1	M	Shrub <5m
Templetonia retusa	0.1	M	Shrub <5m
Olearia axillaris	0.05	M	Shrub <3m
Rhagodia baccata	2	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Grevillea preissii subsp. *preissii*	0.2	M	Shrub <2m
**Galium murale*	0.5	G	Grass
**Lagurus ovatus*	0.5	G	Grass
**Briza maxima*	0.3	G	Grass
**Bromus diandrus*	0.2	G	Grass
**Catapodium rigidum*	0.1	G	Grass
**Ehrharta longiflora*	0.1	G	Grass
Lepidosperma calcicola	0.1	G	Grass
**Avena barbata*	0.05	G	Grass
**Ehrharta calycina*	0.01	G	Grass
Desmocladus flexuosus	0.5	G	Herb
Rhodanthe corymbosa	0.4	G	Herb
**Fumaria capreolata*	0.2	G	Herb
Daucus glochidiatus	0.2	G	Herb
Lomandra maritima	0.2	G	Herb
Trachymene pilosa	0.2	G	Herb
**Lysimachia arvensis*	0.1	G	Herb
**Melilotus indicus*	0.1	G	Herb
Parietaria cardiostegia	0.1	G	Herb
Dianella revoluta	0.08	G	Herb
**Aira caryophyllea* subsp. *caryophyllea*	0.05	G	Herb
**Euphorbia terracina*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Conostylis setigera	0.05	G	Herb
Poaceae sp.	0.05	G	Herb
Threlkeldia diffusa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
**Polycarpon tetraphyllum*	0.01	G	Herb
Calandrinia tholiformis	0.01	G	Herb
Crassula colorata	0.01	G	Herb
Thysanotus manglesianus	0.01	G	Herb
Comesperma integerrimum	0.2	G	Climber
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA25	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Excellent	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low Acacia/*Spyridium* shrubland	Limestone rise	East	0.5
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine shallow sand	Limestone	10-20
Easting		**Northing**	
378986		6488112	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	0.2	M	Shrub <10m
Spyridium globulosum	30	M	Shrub <5m
Melaleuca systena	1.5	M	Shrub <5m
Acacia cyclops	0.5	M	Shrub <5m
Leucopogon parviflorus	0.1	M	Shrub <5m
Hibbertia hypericoides	0.5	M	Shrub <3m
Trymalium ledifolium	0.08	M	Shrub <3m
Rhagodia baccata	0.5	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Grevillea preissii subsp. *preissii*	0.2	M	Shrub <2m
Scaevola repens	0.05	M	Shrub <2m
Bossiaea eriocarpa	0.1	M	Shrub <1m
**Briza maxima*	1.5	G	Grass
**Ehrharta longiflora*	0.5	G	Grass
**Ehrharta calycina*	0.2	G	Grass
**Galium murale*	0.1	G	Grass
**Catapodium rigidum*	0.02	G	Grass
Lomandra maritima	4	G	Herb
**Lysimachia arvensis*	0.2	G	Herb
Desmocladus flexuosus	0.2	G	Herb
Daucus glochidiatus	0.15	G	Herb
**Melilotus indicus*	0.1	G	Herb
Dianella revoluta	0.1	G	Herb
Trachymene pilosa	0.1	G	Herb
**Euphorbia terracina*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Stellaria media*	0.05	G	Herb
Conostylis setigera	0.05	G	Herb
Thysanotus manglesianus	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
**Gladiolus caryophyllaceus*	0.02	G	Herb
Crassula colorata	0.01	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA26	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Very good	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Acacia/Melaleuca shrubland	Limestone slope	West	0.2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/brown	Fine shallow sand	Limestone	10-20
Easting		**Northing**	
378554		6488957	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Santalum acuminatum	5	M	Shrub <7m
Spyridium globulosum	25	M	Shrub <5m
Melaleuca cardiophylla	10	M	Shrub <5m
Acacia rostellifera	3	M	Shrub <5m
Melaleuca huegelii	2	M	Shrub <5m
Rhagodia baccata	1	M	Shrub <2m
**Ehrharta longiflora*	15	G	Grass
**Ehrharta calycina*	5	G	Grass
**Briza maxima*	0.5	G	Grass

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Galium murale*	0.2	G	Grass
**Bromus diandrus*	0.1	G	Grass
Lepidosperma gladiatum	0.1	G	Grass
**Catapodium rigidum*	0.01	G	Grass
**Lysimachia arvensis*	3	G	Herb
Daucus glochidiatus	0.5	G	Herb
Threlkeldia diffusa	0.5	G	Herb
Trachymene pilosa	0.5	G	Herb
**Carpobrotus edulis*	0.2	G	Herb
**Euphorbia terracina*	0.2	G	Herb
**Euphorbia peplus*	0.1	G	Herb
**Stellaria media*	0.1	G	Herb
Calandrinia brevipedata	0.1	G	Herb
Parietaria cardiostegia	0.1	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
Crassula colorata	0.05	G	Herb
Rhodanthe corymbosa	0.05	G	Herb
**Crassula glomerata*	0.02	G	Herb
Calandrinia tholiformis	0.02	G	Herb
Hardenbergia comptoniana	0.2	G	Climber

Site name	Date	Site type	Observer
Iluka ELA27	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>-10 years)	BsArSg
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Tall Acacia shrubs over weeds	Dune swale	North	0.1
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey	Fine sand	Limestone	<2
Easting		**Northing**	
378924		6488656	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia sessilis	0.5	M	Shrub <10m
Acacia rostellifera	20	M	Shrub <5m
Spyridium globulosum	5	M	Shrub <5m
Acacia saligna	1	M	Shrub <5m
Hibbertia hypericoides	0.2	M	Shrub <3m
Calothamnus quadrifidus	0.5	M	Shrub <2m
Acanthocarpus preissii	0.2	M	Shrub <2m
Lechenaultia linarioides	0.1	M	Shrub <2m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Banksia dallanneyi	0.5	M	Shrub <1m
**Ehrharta calycina*	10	G	Grass
**Briza maxima*	8	G	Grass
**Lagurus ovatus*	5	G	Grass
**Avena barbata*	0.4	G	Grass
Austrostipa flavescens	0.05	G	Grass
**Oxalis pes-caprae*	2	G	Herb
**Pelargonium capitatum*	1.5	G	Herb
**Lachenalia reflexa*	0.5	G	Herb
**Fumaria capreolata*	0.2	G	Herb
**Lysimachia arvensis*	0.2	G	Herb
**Brassica tournefortii*	0.1	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Gladiolus caryophyllaceus*	0.1	G	Herb
**Hypochaeris glabra*	0.1	G	Herb
**Medicago polymorpha*	0.1	G	Herb
**Romulea rosea*	0.1	G	Herb
**Vicia sativa*	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Corynotheca micrantha	0.1	G	Herb
Threlkeldia diffusa	0.1	G	Herb
**Moraea flaccida*	0.05	G	Herb
**Sonchus oleraceus*	0.05	G	Herb
**Petrorhagia dubia*	0.02	G	Herb
Hardenbergia comptoniana	0.1	G	Climber

Site name	Date	Site type	Observer
Iluka ELA28	1/10/2020	Quadrat 10 x 10m	JC
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Very good	Weeds	Old (>-10 years)	SgMhAr
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Low swale heath	Dune swale	North-east	0.2
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey	Fine sand	Limestone	2-10
Easting		**Northing**	
379031		6487550	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Melaleuca huegelii	10	M	Shrub <5m
Spyridium globulosum	8	M	Shrub <5m
Acacia rostellifera	2	M	Shrub <5m
Leucopogon parviflorus	0.1	M	Shrub <5m
Templetonia retusa	0.1	M	Shrub <5m
Olearia axillaris	0.5	M	Shrub <3m
Rhagodia baccata	5	M	Shrub <2m
Acanthocarpus preissii	0.2	M	Shrub <2m
**Ehrharta calycina*	10	G	Grass

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Ehrharta longiflora*	2	G	Grass
Lepidosperma gladiatum	0.2	G	Grass
**Bromus diandrus*	0.1	G	Grass
**Galium murale*	0.1	G	Grass
**Carpobrotus edulis*	0.2	G	Herb
Threlkeldia diffusa	0.2	G	Herb
**Euphorbia terracina*	0.1	G	Herb
**Pelargonium capitatum*	0.1	G	Herb
Conostylis setigera	0.1	G	Herb
Lomandra maritima	0.1	G	Herb
**Crassula glomerata*	0.05	G	Herb
**Melilotus indicus*	0.05	G	Herb
Cassytha sp.	0.05	G	Herb
Senecio pinnatifolius var. *latilobus*	0.05	G	Herb
Thysanotus manglesianus	0.02	G	Herb
**Lysimachia arvensis*	0.01	G	Herb
Hardenbergia comptoniana	0.2	G	Climber

Appendix G Conservation and Bush Forever significant flora locations within the survey area

Species	Number of individuals	Listing	Easting	Northing
Marianthus paralius	7	Endangered under EPBC Act and BC Act	[redacted]	[redacted]
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378834	6488121
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378842	6488110
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378838	6488101
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378847	6488099
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378848	6488088
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378860	6488092
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378866	6488082
Hibbertia leptotheca	1	Priority 3 / Bush Forever	378868	6488044
Jacksonia sericea	<5 % cover	Priority 4 / Bush Forever	379006	6487990
Agonis flexuosa	1	Bush Forever	378615	6488946
Callitris preissii	1	Bush Forever	378615	6488946
Lechenaultia linarioides	1	Bush Forever	378924	6488656
Grevillea preissii subsp. *preissii*	1	Bush Forever	378687	6488986
Grevillea preissii subsp. *preissii*	1	Bush Forever	378669	6488993
Grevillea preissii subsp. *preissii*	1	Bush Forever	378803	6488445
Grevillea preissii subsp. *preissii*	1	Bush Forever	378823	6488444
Grevillea preissii subsp. *preissii*	1	Bush Forever	378856	6488432
Grevillea preissii subsp. *preissii*	1	Bush Forever	378941	6488246
Grevillea preissii subsp. *preissii*	1	Bush Forever	378934	6488203
Grevillea preissii subsp. *preissii*	1	Bush Forever	378691	6488995
Grevillea preissii subsp. *preissii*	1	Bush Forever	378952	6488371
Grevillea preissii subsp. *preissii*	1	Bush Forever	378986	6488112
Grevillea preissii subsp. *preissii*	1	Bush Forever	378906	6488050
Trymalium ledifolium	1	Bush Forever	378937	6488220
Trymalium ledifolium	1	Bush Forever	378906	6488050
Diplopeltis huegelii	1	Bush Forever	378939	6488379
Melaleuca cardiophylla	1	Bush Forever	378831	6488110
Melaleuca cardiophylla	1	Bush Forever	378930	6487898
Melaleuca cardiophylla	1	Bush Forever	378889	6488110
Melaleuca cardiophylla	1	Bush Forever	378862	6488212
Melaleuca cardiophylla	1	Bush Forever	378906	6488050

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Species	Number of individuals	Listing	Easting	Northing
Melaleuca lanceolata	1	Bush Forever	378648	6488973
Melaleuca lanceolata	1	Bush Forever	378653	6488820.372

Appendix H Conservation and Bush Forever significant flora photos

Species name	Conservation status	Photo
Marianthus paralius	EN	 
Hibbertia leptotheca	P3	

Species name	Conservation status	Photo
Jacksonia sericea	P4	
Diplopeltis huegelii	Bush Forever significant flora	

Species name	Conservation status	Photo
Grevillea preissii subsp. *preissii*	Bush Forever significant flora	
Lechenaultia linarioides	Bush Forever significant flora	

Species name	Conservation status	Photo
Melaleuca cardiophylla	Bush Forever significant flora	
Trymalium ledifolium	Bush Forever significant flora	

Appendix I Priority weed mapping

*Arctotis sp. (Arctotis)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Arctotis (*Arctotis sp.*)
- Arctotis (*Arctotis sp.*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Asparagus asparagoides (Bridal Creeper)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Bridal Creeper (*Asparagus asparagoides*)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Avena fatua (Wild Oats)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Wild Oats (*Avena fatua*)
- Wild Oats (*Avena fatua*) (<5%)
- Wild Oats (*Avena fatua*) (6-75%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Carpobrotus edulis (Pigface)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Pigface (*Carpobrotus edulis*)
- Pigface (*Carpobrotus edulis*) (<5%)
- Pigface (*Carpobrotus edulis*) (6-75%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Cynodon dactylon (Couch grass)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Couch grass (*Cynodon dactylon*)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Dimorphotheca ecklonis (Veldt Daisy)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Veldt Daisy (*Dimorphotheca ecklonis*)
- Veldt Daisy (*Dimorphotheca ecklonis*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Ehrharta calycina (Perennial Veldt)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Perennial Veldt (*Ehrharta calycina*)
- Perennial Veldt (*Ehrharta calycina*) (<5%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Ehrharta longiflora (Annual Veldt)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Annual Veldt (*Ehrharta longiflora*)
- Annual Veldt (*Ehrharta longiflora*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Euphorbia paralias (Sea Spurge)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Sea Spurge (*Euphorbia paralias*)
- Sea Spurge (*Euphorbia paralias*) (<5%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Euphorbia terracina (Geraldton Carnation Weed)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Geraldton Carnation Weed (*Euphorbia terracina*)
- Geraldton Carnation Weed (*Euphorbia terracina*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Fumaria sp. (Fumitory)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Fumitory (*Fumaria sp.*)
- Fumitory (*Fumaria sp.*) (<5%)
- Fumitory (*Fumaria sp.*) (6-75%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Gazania linearis (Gazania)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore
- Gazania (*Gazania linearis*)
- Gazania (*Gazania linearis*) (<5%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Lactua serriola (Prickle Lettuce)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Prickle Lettuce (*Lactua serriola*)

0 75 150 300

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Oxalis pes-caprae (Soursob)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Soursob (*Oxalis pes-caprae*)
- Soursob (*Oxalis pes-caprae*) (<5%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Pelargonium capitatum (Rose Pelargonium)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Rose Pelargonium (*Pelargonium capitatum*)
- Rose Pelargonium (*Pelargonium capitatum*) (<5%)
- Rose Pelargonium (*Pelargonium capitatum*) (6-75%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Pennisetum clandestinium (Kikuyu grass)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

Kikuyu grass (*Pennisetum clandestinium*) (6-75%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Raphanus sp. (Wild Radish)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Wild Radish (*Raphanus sp.*)
- Wild Radish (*Raphanus sp.*) (<5%)
- Wild Radish (*Raphanus sp.*) (6-75%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Ricinus communis (Castor Oil Plant)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Castor Oil Plant (*Ricinus communis*)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Schinus terebinthifolia (Japanese Pepper)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Japanese Pepper (*Schinus terebinthifolia*)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Tetragonia decumbens (Sea Spinach)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Sea Spinach (*Tetragonia decumbens*) (<5%)
- Sea Spinach (*Tetragonia decumbens*) (6-75%)

0 75 150 300
Metres
Datum/Projection:
GDA 1994 MGA Zone 50

N

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Trachyandra divaricata (Onion Weed)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Onion Weed (*Trachyandra divaricata*)
- Onion Weed (*Trachyandra divaricata*) (<5%)

0 75 150 300
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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A TETRA TECH COMPANY

20PER16745-GM Date: 25/02/2021

*Asparagus asparagoides (Bridal Creeper)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Bridal Creeper (*Asparagus asparagoides*)
- Bridal Creeper (*Asparagus asparagoides*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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20PER16745-GM Date: 25/02/2021

Avena fatua (Wild Oats)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Wild Oats (*Avena fatua*)
- Wild Oats (*Avena fatua*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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20PER16745-GM Date: 25/02/2021

*Carpobrotus edulis (Pigface)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Pigface (*Carpobrotus edulis*)
- Pigface (*Carpobrotus edulis*) (<5%)
- Pigface (*Carpobrotus edulis*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Chamelaucium uncinatum (Geraldton Wax)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Geraldton Wax (*Chamelaucium uncinatum*)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Dimorphotheca ecklonis (Veldt Daisy)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Veldt Daisy (*Dimorphotheca ecklonis*)
- Veldt Daisy (*Dimorphotheca ecklonis*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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20PER16745-GM Date: 25/02/2021

*Ehrharta calycina (Perennial Veldt)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Perennial Veldt (*Ehrharta calycina*)
- Perennial Veldt (*Ehrharta calycina*) (<5%)
- Perennial Veldt (*Ehrharta calycina*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Ehrharta longiflora (Annual Veldt)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Annual Veldt (*Ehrharta longiflora*)
- Annual Veldt (*Ehrharta longiflora*) (<5%)
- Annual Veldt (*Ehrharta longiflora*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Euphorbia paralias (Sea Spurge)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Sea Spurge (*Euphorbia paralias*)
- Sea Spurge (*Euphorbia paralias*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Euphorbia terracina (Geraldton Carnation Weed)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Geraldton Carnation Weed (*Euphorbia terracina*)
- Geraldton Carnation Weed (*Euphorbia terracina*) (<5%)
- Geraldton Carnation Weed (*Euphorbia terracina*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Fumaria sp. (Fumitory)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Fumitory (*Fumaria sp.*)
- Fumitory (*Fumaria sp.*) (<5%)
- Fumitory (*Fumaria sp.*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Gazania linearis (Gazania)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Gazania (*Gazania linearis*)
- Gazania (*Gazania linearis*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Lactua serriola (Prickle Lettuce)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Prickle Lettuce (*Lactua serriola*)
- Prickle Lettuce (*Lactua serriola*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Moraea flaccida (One-leaf Cape Tulip)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- One-leaf Cape Tulip (*Moraea flaccida*)
- One-leaf Cape Tulip (*Moraea flaccida*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Oxalis pes-caprae (Soursob)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Soursob (*Oxalis pes-caprae*)
- Soursob (*Oxalis pes-caprae*) (<5%)
- Soursob (*Oxalis pes-caprae*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Pelargonium capitatum (Rose Pelargonium)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Rose Pelargonium (*Pelargonium capitatum*)
- Rose Pelargonium (*Pelargonium capitatum*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Pennisetum clandestinium (Kikuyu grass)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Kikuyu grass (*Pennisetum clandestinium*)
- Kikuyu grass (*Pennisetum clandestinium*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Raphanus sp. (Wild Radish)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Wild Radish (*Raphanus sp.*)
- Wild Radish (*Raphanus sp.*) (<5%)
- Wild Radish (*Raphanus sp.*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Ricinus communis (Castor Oil Plant)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Castor Oil Plant (*Ricinus communis*)
- Castor Oil Plant (*Ricinus communis*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Schinus terebinthifolia (Japanese Pepper)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Japanese Pepper (*Schinus terebinthifolia*)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Tetragonia decumbens (Sea Spinach)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Sea Spinach (*Tetragonia decumbens*)
- Sea Spinach (*Tetragonia decumbens*) (<5%)
- Sea Spinach (*Tetragonia decumbens*) (6-75%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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Trachyandra divaricata (Onion Weed)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

- Onion Weed (*Trachyandra divaricata*)
- Onion Weed (*Trachyandra divaricata*) (<5%)

0 25 50 100
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

N

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*Tropaeolum sp. (Nasturtium)



Legend

Survey Area

- Burns Beach
- Iluka Foreshore

Nasturtium (*Tropaeolum sp.*) (<5%)

0 25 50 100
Metres

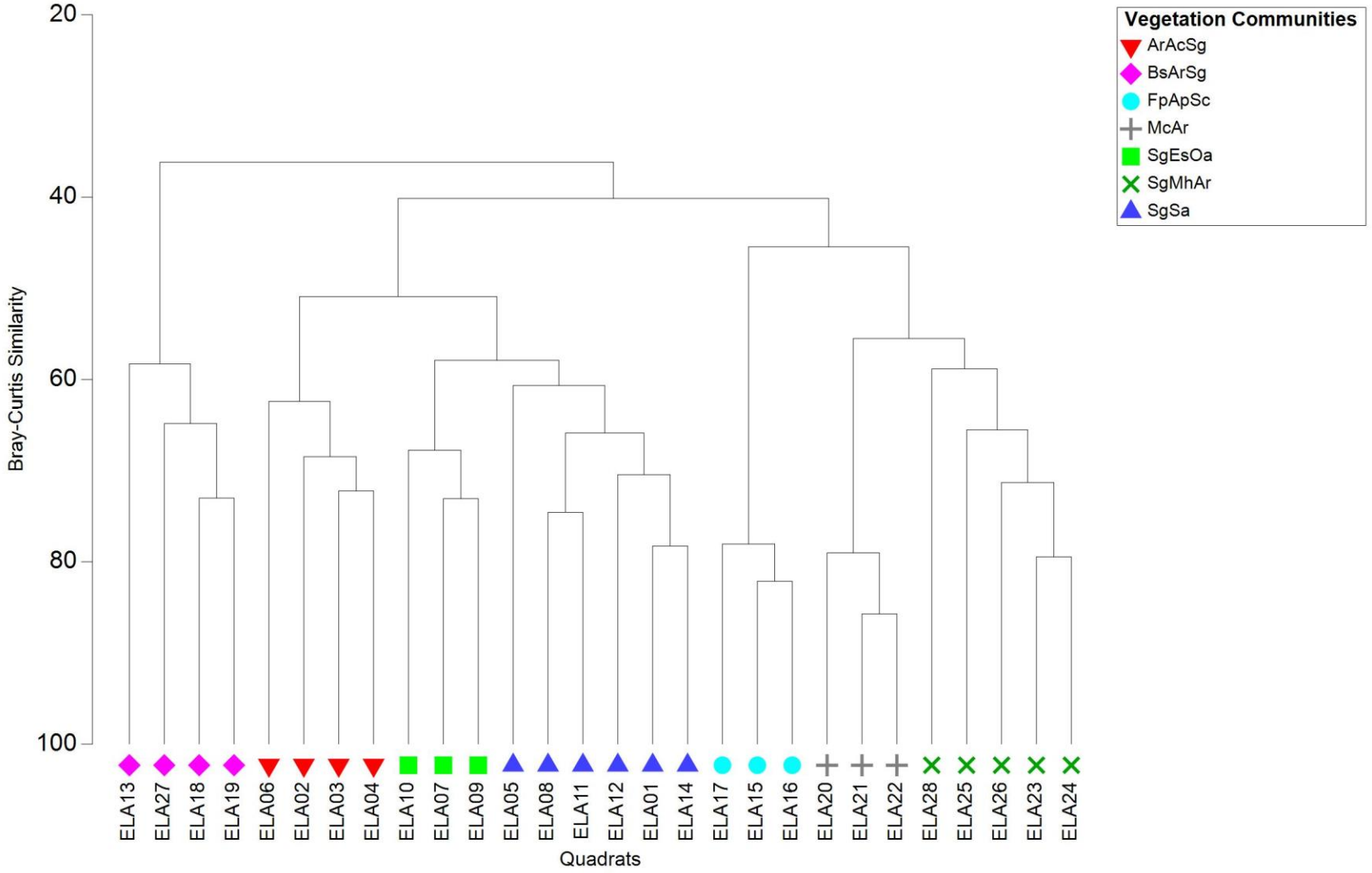
Datum/Projection:
GDA 1994 MGA Zone 50

N

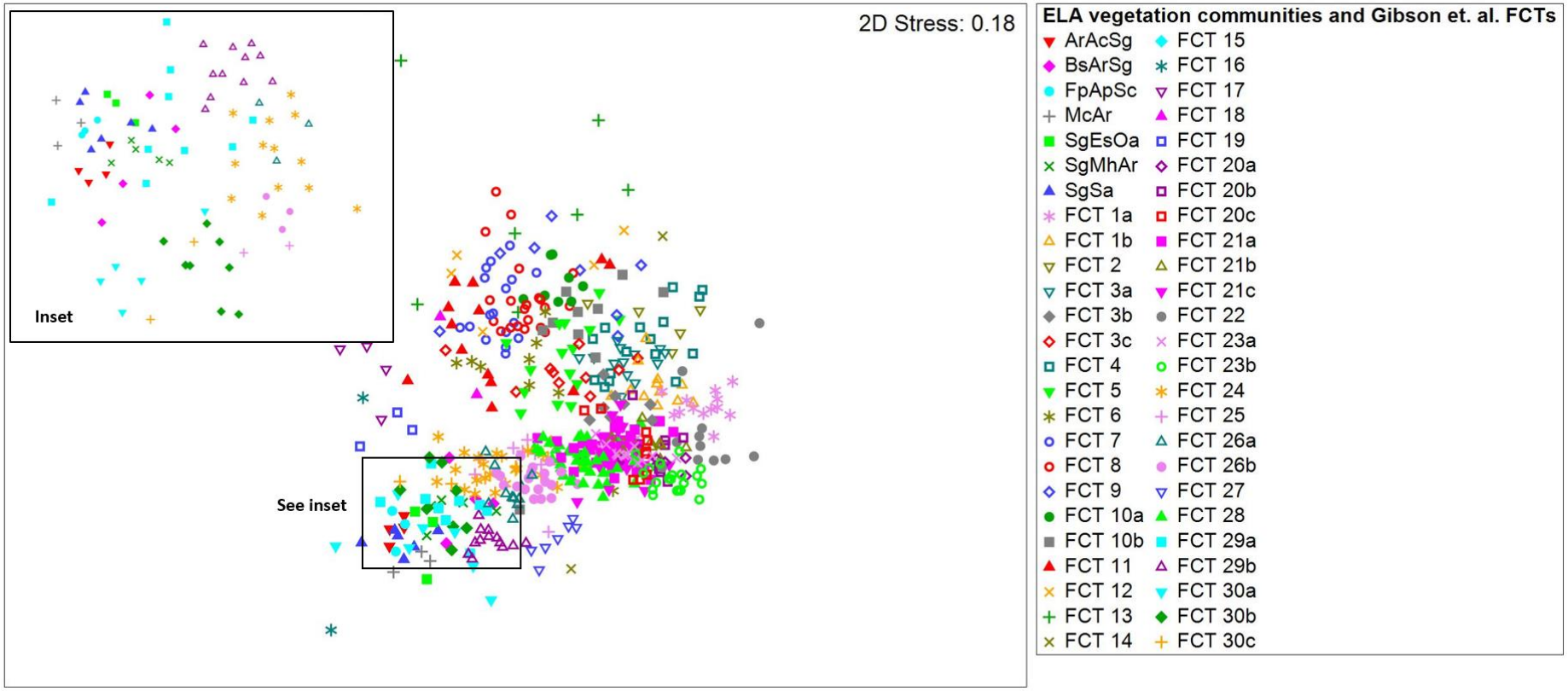
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Appendix J Hierarchical clustering dendrogram



Appendix K MDS: Relationships between ELA vegetation communities and Floristic Community Types (FCTs) defined by Gibson et al. (1994)



Appendix L Banksia Woodlands TEC assessment

Step	Key diagnostic characteristics	Outcome
1	**Location and physical environment** The Banksia Woodlands ecological community primarily occurs in the Swan Coastal Plain IBRA bioregion	The Iluka and Burns Beach survey areas are located on the Swan Coastal Plain
	Soil and landform The *Banksia* Woodlands typically occurs on well drained, low nutrient soils on sandplain landforms, particularly deep Bassendean and Spearwood sands and occasionally on Quindalup sands	The Iluka and Burns Beach survey areas are located on the Quindalup Dune system
	Structure The structure of the Banksia Woodlands is a low woodland to forest with these features: • A distinctive upper sclerophyllous layer of low trees* (occasionally large shrubs more than 2 m tall), typically dominated or co-dominated by one or more of the *Banksia* species identified under composition • Emergent trees of medium or tall (>10 m) height *Eucalyptus* or *Allocasuarina* species may sometimes be present above the Banksia canopy • An often highly species-rich understorey that consists of: o A layer of sclerophyllous shrubs of various heights; and, o A herbaceous ground layer of cord rushes, sedges and perennial and ephemeral forbs, that sometimes includes grasses. The development of a ground layer may vary depending on the density of the shrub layer and disturbance history.	The BsArSg vegetation community consists of a *Banksia sessilis* shrubland over low heath. A small stand of *Banksia attenuata* was recorded in the Iluka survey area at ELA19 as part of the BsArSg vegetation community (Appendix F). This stand comprised of an area of less than 0.5 hectares in size and did not constitute a woodland structure or warrant delineation of a separate vegetation community.

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Step	Key diagnostic characteristics	Outcome

	Composition
	• The canopy is most commonly dominated or co-dominated by *Banksia attenuata* (candlestick banksia, slender banksia) and/or *B. menziesii* (firewood banksia). Other Banksia species that dominate in some examples of the ecological community are *B. prionotes* (acorn banksia) or *B. ilicifolia* (holly-leaved banksia); and
	• The patch must include at least one of the following diagnostic species:
	  o *Banksia attenuata* (candlestick banksia)
	  o *Banksia menziesii* (firewood banksia)
	  o *Banksia prionotes* (acorn banksia)
	  o *Banksia ilicifolia* (holly-leaved banksia).
	• If present, the emergent tree layer often includes *Corymbia calophylla* (marri), *E. marginata* (jarrah), or less commonly *Eucalyptus gomphocephala* (tuart); and
	• Other trees of a medium height that may be present, and may be codominant with the Banksia species across a patch, include *Eucalyptus todtiana* (blackbutt, pricklybark), *Nuytsia floribunda* (Western Australian Christmas tree), *Allocasuarina fraseriana* (western sheoak), *Callitris arenaria* (sandplain cypress), *Callitris pyramidalis* (swamp cypress) and *Xylomelum occidentale* (woody pear); and
	• The understorey typically contains a high to very high diversity of shrub and herb species that often vary from patch to patch***
	• Contra-indicators:
	  o Patches clearly dominated by *Banksia littoralis* are not part of the Banksia Woodlands ecological community but indicates a different, dampland community is present.
	  o Patches clearly dominated by *Banksia burdettii* are not part of the Banksia Woodlands ecological community but indicates a tall shrubland and not the Banksia Woodlands ecological community.
	  o FCT 20c – Eastern shrublands and woodlands, corresponds with a separate EPBC ecological community listing, Shrublands and Woodlands of the eastern Swan Coastal Plain. Occurrences of this FCT should be considered under that separate listing.
		As per above, there is no woodland structure present for Iluka or Burns Beach survey areas. The composition key diagnostic characteristic has not been met.

Step	Key diagnostic characteristics	Outcome
2	**Condition thresholds** • Assessments of a patch should initially be centered on the area of highest native floristic diversity and/or cover, i.e. the best condition area of the patch. • Consideration must be given to the timing of surveys and recent disturbance. Ideally surveys should be undertaken in spring with two sampling periods to capture early and late flowering species. • The surrounding context of a patch must also be taken into account when considering factors that add to the importance of a patch that meets the condition thresholds. • Certain vegetation components of the Banksia Woodlands ecological community merit consideration as critical elements to protect. Three components are recognised as threatened in their own right in WA and, as such, are priorities for protection; refer to **Table 1** in the Approved Conservation Advice (TSSC 2016). • A relevant expert (e.g. ecological consultant, local NRM or environment agency) may be useful to help identify the ecological community and its condition.	As per above, there is no woodland structure present for Iluka or Burns Beach survey areas. The BsArSg community was assessed and sampled in the highest condition representation available in the survey area. The survey was completed in spring, which is the most appropriate season to survey on the Swan Coastal Plain. The BsArSg vegetation community has been determined to represent the FCT 24 Northern Spearwood shrublands and woodlands (Gibson *et al.* 1994). FCT 24 forms part of the Banksia Woodlands ecological community listing (TSSC 2016), however BsArSg constitutes the heath form of this FCT, as described in described in Gibson (*et al.* 1994), rather than a distinct Banksia woodland.
3	**Minimum patch size** Minimum patch sizes apply for consideration of a patch as part of the listed ecological community for EPBC Act referral, assessment and compliance purposes. Where patches meet different levels of condition, different minimum patch sizes apply: • 'Pristine' – no minimum patch size applies • 'Excellent' – 0.5 ha or 5,000 m2 (e.g. 50 m x 100 m) • 'Very Good' – 1 ha or 10,000 m2 (e.g. 100 m x 100 m) • 'Good' – 2 ha or 20,000 m2 (e.g. 200 m x 100 m). Note: To be considered as part of the EPBC Act ecological community, a patch should meet at least the Good Condition category.	As per above, there is no woodland structure present for Iluka or Burns Beach survey areas. The minimum patch size hasn't been met.

Step	Key diagnostic characteristics	Outcome
4	**Further information to assist in determining the presence of the ecological community and significant impacts** • The landscape position of the patch, including its position relative to surrounding vegetation also influences how important it is in the broader landscape. For example, if it enables movement of native fauna or plant material or supports other ecological processes • A patch is a discrete and mostly continuous area of the ecological community. A patch may include small-scale (<30 m) variations, gaps and disturbances, such as tracks, paths or breaks. Where there is a break in native vegetation cover, from the edge of the tree canopy of 30 m or more (e.g. due to permanent artificial structures, wide roads or other barriers; or due to water bodies typically more than 30m wide) then the gap typically indicates that separate patches are present. • Variation in canopy cover, quality or condition of vegetation across a patch should not initially be considered to be evidence of multiple patches. Patches can be spatially variable and are often characterised by one or more areas within a patch that meet the key diagnostic characteristics and condition threshold criteria amongst areas of lower condition. Average canopy cover and quality across the broadest area that meets the general description of the ecological community should be used initially in determining overall canopy cover and vegetation condition. Also note any areas that are either significantly higher or lower in quality, gaps in canopy cover and the condition categories that would apply across different parts of the site respectively. Where the average canopy cover or quality falls below the minimum thresholds, the next largest area or areas that meet key diagnostics (including minimum canopy cover requirements) and minimum condition thresholds should be specified and protected. This may result in multiple patches being identified within the overall area first considered. • A buffer zone is a contiguous area immediately adjacent to a patch of the ecological community that is important for protecting its integrity. The purpose of the buffer zone is to help protect and manage the national threatened ecological community. The edges of a patch are considered particularly susceptible to disturbance and the presence of a buffer zone is intended to act as a barrier to further direct disturbance. • The recommended minimum buffer zone for the ecological community is 20–50 m from the outer edge of a patch, and the appropriate size depends on the nature of the buffer and local context (e.g. slope). A larger buffer zone should be applied, where practical, to protect patches that are of particularly high conservation value, or if patches are down slope of drainage lines or a source of nutrient enrichment, or groundwater drawdown.	No vegetation within the Iluka and Burns Beach survey areas were assessed as representing the Banksia Woodlands of the Swan Coastal Plain TEC.

*The term 'woodland' has been chosen as the most typical structure, but the ecological community may also be considered to include examples of shrubland, open woodland or forest under some classification systems. The percentage canopy cover is more than 2% and typically less than 50%. The structure and appearance may also vary due to disturbance history. Similarly, component species of the dominant upper sclerophyllous layer may be variously considered 'tall or large shrubs' or 'small trees'.

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** Refers to relevant *Banksia* species typically being amongst the most common plant species in the upper sclerophyllous layer. There may be localised exceptions to this, either as natural variation or due to disturbance history (e.g. fire).

*** Key species in the sclerophyllous shrub layer of the ecological community include members of the families Asteraceae, Dilleniaceae, Ericaceae, Fabaceae, Myrtaceae and Proteaceae. Widespread species include *Adenanthos cygnorum* (woolly bush), *Allocasuarina humilis* (dwarf sheoak), *Bossiaea eriocarpa* (common brown pea), *Conostephium pendulum* (pearl flower), *Daviesia* spp., *Eremaea pauciflora*, *Gompholobium tomentosum* (hairy yellow pea), *Hibbertia hypericoides* (yellow buttercups), *Jacksonia* spp., *Kunzea glabrescens, Petrophile linearis* (pixie mops), *Philotheca spicata* (pepper and salt), *Stirlingia latifolia* (blueboy), *Phlebocarya ciliata, Hypolaena exsulca* and *Xanthorrhoea preissii* (balga). Key species in the herbaceous ground layer include members of the families Cyperaceae, Droseraceae, Haemodoraceae, Orchidaceae, Restionaceae and "lilies" from various families. Widespread species include *Amphipogon turbinatus* (tufted beard grass), *Burchardia congesta* (milkmaids), *Caladenia* spp. (spider orchids), *Dasypogon bromeliifolius* (pineapple bush), *Desmocladus flexuosus, Drosera erythrorhiza* (red ink sun dew), *Lepidosperma squamatum* (a tufted sedge), *Lomandra hermaphrodita, Lyginia barbata* (southern rush), *Lyginia imberbis, Mesomelaena pseudostygia* (semaphore sedge), *Patersonia occidentalis* (purple flag), *Podolepis* spp., *Stylidium brunonianum* (pink fountain trigger plant), *Stylidium piliferum* (common butterfly trigger plant), *Trachymene pilosa* (dwarf parsnip), and *Xanthosia huegelii* (heath xanthosia).

Appendix M Fauna species list

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Birds													
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill			X								
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill			X								
Acanthizidae	*Acanthiza inornata*	Western Thornbill			X								
Acanthizidae	*Acanthiza sp.*	Thornbill						X					
Acanthizidae	*Gerygone fusca*	Western Gerygone			X								
Acanthizidae	*Sericornis frontalis*	White-browed Scrubwren			X		X						
Accipitridae	*Accipiter cirrocephalus*	Collard Sparrowhawk						X					
Accipitridae	*Accipiter cirrocephalus*	Collared Sparrowhawk			X								
Accipitridae	*Accipiter fasciatus*	Brown Goshawk			X								
Accipitridae	*Hieraaetus morphnoides*	Little Eagle			X						X		
Alcedinidae	**Dacelo novaeguineae*	Laughing Kookaburra						X				X	X
Artamidae	*Artamus cinereus*	Black-faced Woodswallow			X							X	X
Artamidae	*Artamus cyanopterus*	Dusky Woodswallow			X								
Cacatuidae	*Cacatua galerita*	Sulpher-crested Cockatoo						X					
Cacatuidae	*Cacatua sanguinea*	Little Corella						X				X	X
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Cockatoo	EN	EN	X	X			X		X		X
Cacatuidae	*Eolophus roseicapilla*	Galah			X						X	X	X
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckooshrike			X			X				X	X
Campephagidae	*Lalage tricolor*	White-winged Triller			X								
Columbidae	**Spilopelia senegalensis*	Laughing Dove			X							X	X

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Columbidae	*Ocyphaps lophotes*	Crested Pigeon										X	
Columbidae	*Phaps chalcoptera*	Common Bronzewing			X								
Corvidae	*Corvus bennetti*	Little Crow										X	X
Corvidae	*Corvus coronoides*	Australian Raven			X			X			X	X	X
Cracticidae	*Cracticus nigrogularis*	Pied Butcherbird						X				X	X
Cracticidae	*Cracticus tibicen*	Australian Magpie			X			X				X	X
Cracticidae	*Cracticus torquatus*	Grey Butcherbird			X								
Cuculidae	*Chrysococcyx basalis*	Horsfield's Bronze Cuckoo			X								
Falconidae	*Falco cenchroides*	Nankeen Kestrel			X								
Hirundinidae	*Cheramoeca leucosterna*	White-backed Swallow			X								
Hirundinidae	*Hirundo neoxena*	Welcome Swallow			X								X
Hirundinidae	*Petrochelidon nigricans*	Tree Martin			X								
Laridae	*Larus novaehollandiae*	Silver Gull										X	X
Maluridae	*Malurus lamberti*	Variegated Fairywren										X	X
Maluridae	*Malurus leucopterus*	White-winged Fairywren			X		X					X	X
Maluridae	*Malurus sp.*	Fairywren						X					
Maluridae	*Malurus splendens*	Splendid Fairywren			X		X	X			X		
Meliphagidae	*Acanthagenys rufogularis*	Spiny-cheeked Honeyeater						X					
Meliphagidae	*Acanthorhynchus superciliosus*	Western Spinebill			X			X					
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird			X			X				X	X
Meliphagidae	*Anthochaera lunulata*	Western Little Wattlebird			X								
Meliphagidae	*Gliciphila melanops*	Tawny-crowned Honeyeater			X								
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater			X							X	X

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater			X							X	X
Meliphagidae	*Manorina flavigula*	Yellow-throated Miner			X								
Meliphagidae	*Phylidonyris niger*	White-cheeked Honeyeater			X							X	X
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater			X			X			X	X	X
Meropidae	*Merops ornatus*	Rainbow Bee-eater			X								
Monarchidae	*Grallina cyanoleuca*	Magpie-lark						X				X	X
Pachycephalidae	*Colluricincla harmonica*	Grey Shrike-thrush			X			X					
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler			X								
Pandionidae	*Pandion haliaetus*	Eastern Osprey											X
Pardalotidae	*Pardalotus striatus*	Striated Pardalote						X					
Phalacrocoracidae	*Microcarbo melanoleucos*	Little Pied Cormorant										X	X
Podargidae	*Podargus strigoides*	Tawny Frogmouth											X
Psittacidae	*Neophema elegans*	Elegant Parrot			X								
Psittacidae	*Platycercus spurius*	Red-capped Parrot			X								
Psittacidae	*Platycercus zonarius*	Australian Ringneck			X			X				X	X
Psittaculidae	*Trichoglossus moluccanus.*	Rainbow Lorikeet						X					
Rhipiduridae	*Rhipidura albiscapa*	Grey Wagtail			X								
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail			X			X				X	X
Threskiornithidae	*Threskiornis molucca*	Australian White Ibis										X	X
Zosteropidae	*Zosterops lateralis*	Silvereye			X						X		
Mammals													
Canidae	**Vulpes vulpes*	Red Fox			X			X			X	X	X
Felidae	**Felis catus*	Cat			X						X	X	X

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Leporidae	**Oryctolagus cuniculus*	European Rabbit			X		X	X			X		X
Macropodidae	*Macropus fuliginosus subsp. melanops*	Western Grey Kangaroo			X			X			X		
Macropodidae	*Notamacropus irma*	Western Brush Wallaby		P4							X		
Molossidae	*Austronomus australis*	White-striped Free-tailed Bat										X	X
Muridae	**Mus musculus*	House Mouse			X							X	X
Peramelidae	*Isoodon fusciventer*	Quenda		P4	X						X	X	X
Tachyglossidae	*Tachyglossus aculeatus*	Short-beaked Echidna			X								
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat										X	X
Reptiles													
Agamidae	*Pogona minor subsp. minor*	Western Bearded Dragon			X			X		X	X	X	
Carphodactylidae	*Underwoodisaurus milii*	Southern Barking Gecko								X			
Elapidae	*Demansia psammophis*	Reticulated Whipsnake			X								
Elapidae	*Echiopsis curta*	Bardick								X			X
Elapidae	*Notechis scutatus*	Tiger snake										X	X
Elapidae	*Pseudonaja affinis subsp. affinis*	Dugite			X			X		X	X	X	X
Elapidae	*Simoselaps bertholdi*	Jan's Banded Snake								X			X
Elapidae	*Simoselaps calonotus*	Black-striped Snake										X	
Gekkonidae	*Christinus marmoratus*	Marbled Gecko								X			
Gekkonidae	*Strophurus spinigerus*	Southwest Spiny-tailed Gecko			X					X			X
Pygopodidae	*Delma concinna*	Javelin Legless Lizard			X								
Pygopodidae	*Lialis burtonis*	Burton's Legless Lizard			X					X			
Scincidae	*Cryptoblepharus buchananii*	Fence Skink								X		X	X
Scincidae	*Cryptoblepharus plagiocephalus*	Fence Skink			X								

Family	Species	Common name	Conservation status		Previous studies								
			EPBC Act	BC Act / DBCA	Beaumaris Land Sales	Cardno 2006	CoJ 2009	GHD 2013	CoJ 2014	Knowles 2015-2018	AECOM 2018	Burns Beach (ELA	Iluka (ELA 2021)
Scincidae	*Crytoblepharus buchananii*	Buchanan's Snake-eyed Skink									X		
Scincidae	*Ctenotus australis*	West-coast Long-tailed Ctenotus									X		
Scincidae	*Ctenotus fallens*	West-coast Laterite Ctenotus			X					X		X	X
Scincidae	*Cyclodomorphus celatus*	Slender Blue-tongue Lizard			X								X
Scincidae	*Egernia kingii*	King's Skink								X			
Scincidae	*Egernia napoleonis*	South-western Crevice Egernia			X								
Scincidae	*Hemiergis quadrilineata*	Two-toed Earless Skink			X								X
Scincidae	*Lerista elegans*	Elegant Slider			X					X		X	X
Scincidae	*Lerista lineopunctulata*	West Coast Line-spotted Lerista			X								
Scincidae	*Lerista praepedita*	Western Worm Lerista											
Scincidae	*Menetia greyii*	Common Dwarf Skink			X					X			
Scincidae	*Morethia obscura*	Shrubland Morethia Skink			X								X
Scincidae	*Tiliqua occipitalis*	Western Bluetongue			X								
Scincidae	*Tiliqua rugosa subsp. rugosa*	Bobtail			X			X		X	X		X
Typhlopidae	*Anilos australis*	Southern Blind Snake											X
Varanidae	*Varanus gouldii*	Gould's Sand Goanna						X					
		Total			**69**	**1**	**5**	**28**	**1**	**14**	**18**	**37**	**47**

Appendix N Fauna survey photos

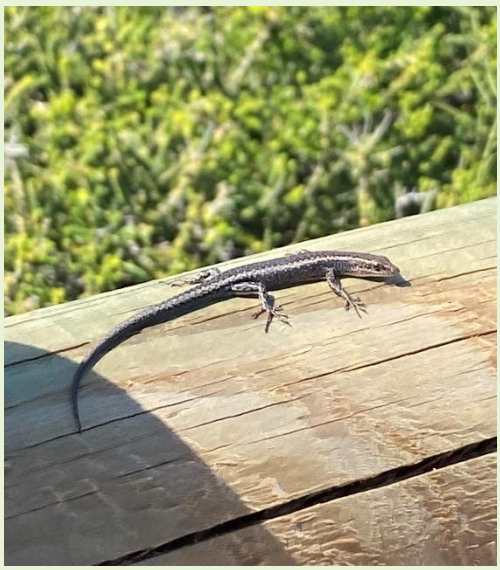
Quenda *Isoodon fusciventer* (P4)	
Red Fox **Vulpes vulpes*	
Cat **Felis catus*	

House Mouse **Mus musculus*	
Western Bearded Dragon *Pogona minor minor*	
Bardick *Echiopsis curta*	

Jan's Banded Snake *Simoselaps bertholdi*	
Black-striped Snake *Simoselaps calonotus*	
Southwest Spiny-tailed Gecko *Strophurus spinigerus*	

West-coast Laterite Ctenotus *Ctenotus fallens*	
Slender Blue-tongue Lizard *Cyclodomorphus celatus*	
Two-toed Earless Skink *Hemiergis quadrilineata*	

Elegant Slider *Lerista elegans*	
Shrubland Morethia Skink *Morethia obscura*	
Bobtail Lizard *Tiliqua rugosa*	

Fence Skink *Cryptoblepharus buchananii*	

Appendix O Raw fauna trapping data

Date	Trap number	Trap type	Common name	Scientific name	Number of individuals	Comments
10/11/2020	TS1 P1	Pitfall	House Mouse	*Mus musculus*	2	
10/11/2020	TS1 P6	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
10/11/2020	TS1 P9	Pitfall	House Mouse	*Mus musculus*	2	
10/11/2020	TS2 CAM	Camera	Cat	*Felis catus*	1	
10/11/2020	TS2 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
10/11/2020	TS2 P10	Pitfall	House Mouse	*Mus musculus*	1	
10/11/2020	TS3 CAM	Motion camera	Pied Butcherbird	*Cracticus nigrogularis*	1	
10/11/2020	TS3 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
10/11/2020	TS1 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
11/11/2020	TS1 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
11/11/2020	TS1 P1	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
11/11/2020	TS1 P4, F3-4	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
11/11/2020	TS1 P7	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
11/11/2020	TS1 P9	Pitfall	House Mouse	*Mus musculus*	1	
11/11/2020	TS2 C1	Cage	Quenda	*Isoodon fusciventer*	1	Male, healthy
11/11/2020	TS2 CAM	Camera	Cat	*Felis catus*	1	
11/11/2020	TS2 CAM	Camera	Quenda	*Isoodon fusciventer*	1	
11/11/2020	TS2 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
11/11/2020	TS2 E7	Elliot	House Mouse	*Mus musculus*	1	
11/11/2020	TS2 P10	Pitfall	House Mouse	*Mus musculus*	1	
11/11/2020	TS2 P5	Pitfall	House Mouse	*Mus musculus*	1	
11/11/2020	TS3 CAM	Camera	Magpielark	*Grallina cyanoleuca*	1	
11/11/2020	TS3 CAM	Camera	Pied Butcherbird	*Cracticus nigrogularis*	1	
11/11/2020	TS3 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
11/11/2020	TS3 P10	Pitfall	Two-toed Earless Skink	*Hemiergis quadrilineata*	1	
11/11/2020	TS4 C3	Cage	Quenda	*Isoodon fusciventer*	1	Female with pouch young

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Date	Trap number	Trap type	Common name	Scientific name	Number of individuals	Comments
11/11/2020	TS4 CAM	Camera	Cat	*Felis catus*	1	
11/11/2020	TS4 CAM	Camera	Singing Honeyeater	*Lichenostomus virescens*	1	
11/11/2020	TS4 P1	Pitfall	Southern Blind Snake	*Anilos australis*	1	
11/11/2020	TS4 P2, F1-2	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
11/11/2020	TS4 P6, F5-6	Funnel	Shrubland Morethia Skink	*Morethia obscura*	1	
11/11/2020	TS4 P7	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
12/11/2020	TS1 CAM	Camera	Australian Raven	*Corvus coronoides*	1	
12/11/2020	TS1 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
12/11/2020	TS1 P3	Pitfall	Black-striped Snake	*Simoselaps calonotus*	1	
12/11/2020	TS1 P5	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	2	
12/11/2020	TS1 P8	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
12/11/2020	TS2 C1	Cage	Quenda	*Isoodon fusciventer*	1	Male
12/11/2020	TS2 C2	Cage	Quenda	*Isoodon fusciventer*	1	Male, missing most of tail
12/11/2020	TS2 C3	Cage	Quenda	*Isoodon fusciventer*	1	Male
12/11/2020	TS2 C4	Cage	Quenda	*Isoodon fusciventer*	1	Male, missing most of tail
12/11/2020	TS2 CAM	Camera	Cat	*Felis catus*	1	
12/11/2020	TS2 CAM	Camera	Red Fox	*Vulpes vulpes*	1	
12/11/2020	TS2 P4	Pitfall	Elegant Slider	*Lerista elegans*	2	
12/11/2020	TS2 P5	Pitfall	Elegant Slider	*Lerista elegans*	1	
12/11/2020	TS3 C4	Cage	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS3 CAM	Camera	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS3 CAM	Camera	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS4 CAM	Camera	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS4 CAM	Camera	Willy Wagtail	*Rhipidura leucophrys*	1	
12/11/2020	TS4 P2, F1-2	Funnel	Bobtail Lizard	*Tiliqua rugosa*	1	
12/11/2020	TS4 P4, F3-4	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	

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Date	Trap number	Trap type	Common name	Scientific name	Number of individuals	Comments
13/11/2020	TS1 P1	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	2	
13/11/2020	TS1 P10	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS1 P6	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS1 P6	Funnel	West-coast Laterite Ctenotus	*Ctenotus fallens*	2	
13/11/2020	TS1 P7	Pitfall	Elegant Slider	*Lerista elegans*	1	
13/11/2020	TS2 C2	Cage	Quenda	*Isoodon fusciventer*	1	Male, recapture of individual missing most of tail
13/11/2020	TS2 E7	Elliot	House Mouse	*Mus musculus*	1	
13/11/2020	TS2 P2	Pitfall	Elegant Slider	*Lerista elegans*	1	
13/11/2020	TS2 P3	Pitfall	Elegant Slider	*Lerista elegans*	1	
13/11/2020	TS2 P3	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS3 C4	Cage	Quenda	*Isoodon fusciventer*	1	Male
13/11/2020	TS3 CAM	Camera	Australian Raven	*Corvus coronoides*	1	
13/11/2020	TS3 CAM	Camera	Laughing Dove	*Spilopelia senegalensis*	1	
13/11/2020	TS3 P2	Pitfall	Jan's Banded Snake	*Simoselaps bertholdi*	1	
13/11/2020	TS3 P4, F3-4	Pitfall	Southwest Spiny-tailed Gecko	*Strophurus spinigerus*	1	
13/11/2020	TS3 P7	Pitfall	Elegant Slider	*Lerista elegans*	1	
13/11/2020	TS4 CAM	Camera	Singing Honeyeater	*Lichenostomus virescens*	1	
13/11/2020	TS4 P2	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS4 P3	Pitfall	Slender Blue-tongue Lizard	*Cyclodomorphus celatus*	1	
13/11/2020	TS4 P5	Pitfall	Bardick	*Echiopsis curta*	1	
13/11/2020	TS4 P7	Pitfall	West-coast Laterite Ctenotus	*Ctenotus fallens*	1	
13/11/2020	TS5 E5	Elliot	House Mouse	*Mus musculus*	1	

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Appendix P Invertebrate species

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Acrididae	*^Austroicetes*	*vulgaris*	X	
Acrididae	*Austracris*	*guttulosa*	X	
Acrididae	*Cedarinia*	*fuscotibialis*	X	
Acrididae	*Coryphistes*	*ruricola*	X	
Acrididae	Gen.	sp. TBC	X	
Acrididae	Gen. *Novum* 47 (Rentz)	*pilipes* (walker)	X	
Acrididae	*Goniaea*	*australasiae*	X	
Acrididae	*Goniaea*	*opomaloides*	X	
Acrididae	*Pycnostictus*	*seriatus*	X	
Acrididae	*Urnisa*	*rugosa*	X	
Aeshnidae	**Hemianax*	*papuensis*	X	
Agromyzidae	Gen.	sp. TBC	X	
Agromyzidae	Gen.	sp. TBC	X	
Alloniscidae	*Alloniscus*	*pallidulus*	X	
Amorphoscelidae	*Paraoxypilus*	*laticollis*	X	
Anisolabididae	*Carcinophora*	*occidentalis*	X	
Anisolabididae	nr. *Gonolabis*	sp. TBC	X	
Anostostomatidae	*Leponosandrus*	*lepismoides*	X	
Anthelidae	*Anthela*	*inornata*	X	
Anthomyiidae	Gen.	sp. TBC	X	
Anthomyiidae	Gen.	sp. TBC	X	
Anthomyiidae	Gen.	sp. TBC	X	
Apidae	*^Apis*	*mellifera*	X	
Apidae	*Amegilla (Notomegilla)*	*chlorocyanea*	X	
Araneidae	*Araneus*	nr. *eburneiventris*	X	
Araneidae	*Argiope*	*protensa*	X	
Araneidae	*Argiope*	*trifasciata*	X	
Araneidae	*Backobourkia*	*heroine*	X	
Araneidae	*Dolophones*	*conifera* TBC	X	
Araneidae	*Eriophora*	*biapicata* TBC	X	
Araneidae	Gen.	sp. TBC	X	
Araneidae	Gen.	sp. TBC	X	
Araneidae	Gen.	sp.		X
Araneidae	Gen.	sp. TBC	X	
Araneidae	*Nephila*	*edulis*	X	
Armadillidae	Gen.	sp. TBC	X	
Armadillidiidae	*^Armadillidium*	*vulgare*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Aslidae	*Cerdistus*	sp. TBC	X	
Aslidae	Gen.	sp. TBC	X	
Aslidae	Gen.	sp. TBC	X	
Barychelidae	*Idiommata*	*blackwalli*	X	
Belidae	*Rhinotia*	*acaciae*	X	
Belidae	*Rhinotia*	*suturalis*	X	
Bethylidae	*Rhabdepyris*	sp. TBC	X	
Blaberidae	*Calolampra*	*marginalis*	X	
Blattidae	*Drymaplaneta*	*semivitta*	X	
Blattidae	*Melanozosteria*	sp. TBC	X	
Blattidae	*Melanozosteria*	sp. TBC	X	
Blattidae	*Zonioploca*	*bicolor*	X	
Bombyliidae	*Anthrax*	sp. TBC	X	
Bombyliidae	*Villa*	sp. TBC	X	
Bothriembryontidae	*Bothriembryon (Bothriembryon)*	*kendricki*	X	
Braconidae	*Callibracon*	nr. *capitator*	X	
Braconidae	Gen.	sp. TBC	X	
Buprestidae	*Castiarina*	*cupreoflava*	X	
Buprestidae	*Castiarina*	*dilatata*	X	
Buprestidae	*Castiarina*	*placida*	X	
Buprestidae	*Castiarina*	*simulata*	X	
Buprestidae	*Diphucrania* (D.)	*pamela*	X	
Buprestidae	*Melobasis*	sp. TBC	X	
Buprestidae	*Neospades*	sp. TBC	X	
Buprestidae	*Stigmodera*	*roei*	X	
Buthidae	*Lychas*	sp. *'marmoreus'* complex TBC	X	
Byrridae	*Microchaetes*	sp. TBC	X	
Caeciliusidae	Gen.	sp. TBC	X	
Calliphoridae	*^Calliphora*	*dubia*	X	
Calliphoridae	Gen.	sp.		X
Calliphoridae	*Stomorhina*	sp. TBC	X	
Carabidae	*Hypharpax*	*ranula*	X	
Carabidae	*Mecylothorax*	*ambiguus* TBC	X	
Carabidae	*Trigonothops*	sp. TBC	X	
Carabidae	*Trigonothops (Trigonothops)*	*pacificus* TBC	X	
Carposinidae	*Carposina*	*telesla*	X	
Castniidae	*Synemon*	*gratiosa*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Cerambycidae	*Ancita*	*marginicollis*	X	
Cerambycidae	*Ancita*	*sparsa*	X	
Cerambycidae	*Stenoderus*	*suturalis*	X	
Chalcididae	*Brachymeria*	sp. TBC	X	
Chernetidae	Gen.	sp. TBC	X	
Chironomidae	**Chironomus*	*cloacalis* TBC	X	
Chironomidae	**Procladius*	sp. TBC	X	
Chrysomelidae	*^Chrysolina*	*hyperici*	X	
Chrysomelidae	*Ditropidus*	*fugitivus*	X	
Chrysomelidae	Gen.	sp. TBC	X	
Chrysomelidae	Gen.	sp. TBC	X	
Chrysomelidae	Gen.	sp. TBC	X	
Chrysomelidae	Gen.	sp. TBC	X	
Chrysomelidae	*Loxopleurus*	*obtusus*	X	
Chrysomelidae	*Paropsisterna*	sp. TBC	X	
Chrysomelidae	*Paropsisterna*	sp. TBC	X	
Chrysomelidae	*Peltoschema*	sp. TBC	X	
Chrysomelidae	*Peltoschema*	*subapicalis*	X	
Chrysomelidae	*Peltoschema*	*suturalis*	X	
Chrysopidae	Gen.	sp. TBC	X	
Chrysopidae	*Mallada*	*tripunctatus*	X	
Chrysopidae	*Plesiochrysa*	*ramburi*	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadellidae	Gen.	sp. TBC	X	
Cicadidae	*Pauropsalta*	*encaustica*	X	
Cicadidae	*Physeema*	*quadricincta*	X	
Cleridae	*Eunatalis*	*hirta* TBC	X	
Coccidae	*Cryptes*	*baccatus marmoreus*	X	
Coccinellidae	*^Coccinella*	*transversalis*	X	
Coccinellidae	*Harmonia*	*conformis*	X	
Cochlicellidae	*^Cochlicella*	*acuta*	X	
Coelopidae	*Chaetocoelopa*	*sydneyensis* TBC	X	
Coelopidae	Gen.	sp. TBC	X	
Colletidae	Gen.	sp. TBC	X	
Colletidae	*Hylaeorhiza*	*quadratus* TBC	X	
Colletidae	*Hylaeus (Prosopisteron)*	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Colletidae	*Hylaeus (Pseudhylaeus)*	sp. TBC	X	
Colletidae	*Leioproctus (Leioproctus)*	sp. TBC	X	
Coreidae	*Mictis*	*profana*	X	
Cosmopterigidae	*Macrobathra*	*sarcoleuca*	X	
Cosmopterigidae	*Macrobathra*	sp. TBC	X	
Cosmopterigidae	*Macrobathra*	sp. TBC	X	
Cossidae	*Endoxyla*	*biarpiti*	X	
Crambidae	*^Antigastra*	*catalaunalis*	X	
Crambidae	*Achyra*	*affinitalis*	X	
Crambidae	*Achyra*	*massalis*	X	
Crambidae	Gen.	sp. TBC	X	
Crambidae	*Hednota*	*pedionoma*	X	
Crambidae	*Herpetogramma*	*licarsisalis*	X	
Crambidae	*Nacoleia*	*rhoeoalis*	X	
Crambidae	nr. *Metasia*	sp. TBC	X	
Crambidae	*Otiophora*	*clavifera* TBC	X	
Crambidae	*Ptochostola*	*microphaeellus*	X	
Crambidae	*Scoparia*	*syntaracta* TBC	X	
Crambidae	*Spoladea*	*recurvalis*	X	
Crambidae	*Uresiphita*	*ornithopteralis*	X	
Culicidae	**Culex (Culex)*	*australicus*	X	
Culicidae	Gen.	sp.		X
Curculionidae	*^Phlyctinus*	*callosus*	X	
Curculionidae	*Ancytallia*	*acaciae*	X	
Curculionidae	*Catasarcus*	*ashphaltinus*	X	
Curculionidae	*Catasarcus*	*spinipennis*	X	
Curculionidae	*Decilaus*	sp. TBC	X	
Curculionidae	Gen.	sp. TBC	X	
Curculionidae	Gen.	sp. TBC	X	
Curculionidae	*Leptopius*	*spinipennis*	X	
Curculionidae	*Lycosura*	*breweri* TBC	X	
Curculionidae	*Orthorrhinus*	*cylindrirostris*	X	
Curculionidae	*Pascoellus*	sp. TBC	X	
Curculionidae	*Pelororhinus*	*argentosus* TBC	X	
Curculionidae	*Pseudonotophones*	*lemnus*	X	
Curculionidae	*Rhinaria*	*tesselata*	X	
Curculionidae	*Titinia*	*brevicollis*	X	
Cydnidae	*Adrisa*	sp. TBC	X	
Cydnidae	Gen.	sp. TBC	X	
Cylindrachetidae	*Cylindraustralia*	*kochii*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Deinopidae	*Deinopis*	*subrufa*	X	
Dermestidae	Gen.	sp. TBC	X	
Desidae	*Badumna*	*insignis*	X	
Ectobiidae	*Ellipsidion*	*humerale*	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Elateridae	*Conoderus*	sp. TBC	X	
Erebidae	*Acyphas*	*chionitis*	X	
Erebidae	*Anomis*	*involuta*	X	
Erebidae	*Ardices*	*glatygnyi*	X	
Erebidae	*Arrade*	*destituta*	X	
Erebidae	*Dasypodia*	*selenophora*	X	
Erebidae	Gen.	sp. TBC	X	
Erebidae	*Hypoprora*	*tyra*	X	
Erebidae	*Nyctemera*	*amicus*	X	
Erebidae	*Pantydia*	*canescens*	X	
Erebidae	*Pantydia*	*diemeni*	X	
Erebidae	*Pantydia*	*sparsa*	X	
Erebidae	*Praxis*	*marmarinopa*	X	
Erebidae	*Scoliacma*	*nr. pactolias* TBC	X	
Erebidae	*Scoliacma*	*pasteophara*	X	
Erebidae	*Teia*	*athlophora*	X	
Erebidae	*Utetheisa*	*pulchelloides*	X	
Eriophyidae	Gen.	sp. TBC	X	
Erirhinidae	*Aonychus*	*bicruciatus*	X	
Eurybrachyidae	*Maon*	*sinuatus*	X	
Eutichuridae	*Cheiracanthium*	*gracile*	X	
Eutichuridae	*Cheiracanthium*	*mordax* TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	
Family TBC	Gen.	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Family TBC	Gen.	sp. TBC	X	
Family TBC	*Gen.*	*sp. TBC*	X	
Flatidae	*Siphanta*	*roseicincta*	X	
Formicidae	*^Pheidole*	*megacephala*	X	
Formicidae	*Amblyopone*	sp. TBC	X	
Formicidae	*Aphaenogaster*	*poultoni*	X	
Formicidae	*Camponotus*	*chalceus*	X	
Formicidae	*Camponotus*	*darlingtoni*	X	
Formicidae	*Camponotus*	*gasseri*	X	
Formicidae	*Camponotus*	*insipidus*	X	
Formicidae	*Camponotus*	*terebrans*	X	
Formicidae	*Cerapachys*	*ruficornis*	X	
Formicidae	*Cerapachys*	*sp. TBC*	X	
Formicidae	*Crematogaster*	(*cornigera* group) sp. TBC	X	
Formicidae	*Crematogaster*	(*cornigera* group) sp. TBC	X	
Formicidae	*Iridomyrmex*	*bicknelli*	X	
Formicidae	*Iridomyrmex*	*chasei*	X	
Formicidae	*Iridomyrmex*	*dromus* TBC	X	
Formicidae	*Iridomyrmex*	sp.		X
Formicidae	*Myrmecia*	sp.		X
Formicidae	*Myrmecia*	*swalei*	X	
Formicidae	*Odontomachus*	*ruficeps*	X	
Formicidae	*Polyrhachis (Campomyrma)*	*phryne*	X	
Formicidae	*Rhytidoponera*	*metallica*	X	
Formicidae	*Rhytidoponera*	*punctigera*	X	
Formicidae	*Technomyrmex*	*albipes*	X	
Gelastocoridae	*Nerthra*	sp. TBC	X	
Gelechiidae	Gen.	sp. TBC	X	
Gelechiidae	Gen.	sp. TBC	X	
Gelechiidae	Gen.	sp. TBC	X	
Gelechiidae	Gen.	sp. TBC	X	
Gelechiidae	*Anarsia*	*molybdota*	X	
Gelechiidae	*Anarsia*	sp. TBC	X	
Geometridae	*Anachloris*	*subochraria*	X	
Geometridae	*Anachloris*	*uncinata*	X	
Geometridae	*Capusa*	*stenophara*	X	
Geometridae	*Casbia*	*celidosema*	X	
Geometridae	*Chlenias*	sp. ANIC3	X	
Geometridae	*Chlorocoma*	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Geometridae	*Ciampa*	*heteromorpha*	X	
Geometridae	*Cleora*	*injectaria*	X	
Geometridae	*Cryphaea*	sp. ANIC17 TBC	X	
Geometridae	*Dichromodes*	sp. ANIC76	X	
Geometridae	*Dichromodes*	sp. ANIC77	X	
Geometridae	*Epyaxa*	*nr. sodaliata* TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen.	sp. TBC	X	
Geometridae	Gen. (*Boarmia*)	sp. ANIC6	X	
Geometridae	Gen. *(Boarmia)*	*zaloschema*	X	
Geometridae	*Isturgia*	*penthearia*	X	
Geometridae	*Lipogya*	nr. *exprimataria* TBC	X	
Geometridae	nr. *Melanodes*	sp. TBC	X	
Geometridae	*Phrissogonus*	*laticostata*	X	
Geometridae	*Phrixocomes*	sp. ANIC1	X	
Geometridae	*Phrixocomes*	sp. ANIC5	X	
Geometridae	*Poecilasthena*	*xylocyma*	X	
Geometridae	*Prasinocyma*	*ocyptera*	X	
Geometridae	*Rhinodia*	*undiferaria*	X	
Geometridae	*Scioglyptis*	*canescaria*	X	
Geometridae	*Scopula*	*optivata*	X	
Geometridae	*Syneora*	*cymatomita*	X	
Geometridae	*Syneora*	*leucanthes*	X	
Geometridae	*Xanthorohe*	nr. *vacuaria*	X	
Gnaphosidae	*Anzacia*	sp. TBC	X	
Gnaphosidae	*Encoptarthria*	nr. *echemophthalma* TBC	X	
Gracillariidae	*Caloptilia*	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gracillariidae	Gen.	sp. TBC	X	
Gryllidae	*^Gryllodes*	*sigillatus*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Gryllidae	*Pteronemobius*	sp. TBC	X	
Gryllotalpidae	*^Gryllotalpa*	*pluvialis*	X	
Halictidae	Gen.	sp. TBC	X	
Halictidae	*Lipotriches (Austronomia)*	*flavoviridis*	X	
Heleomyzidae	Gen.	sp. TBC	X	
Helicidae	*^Theba*	*pisana*	X	
Hemerobiidae	*Micromus*	*tasmaniae*	X	
Hemicorduliidae	**Hemicordulia*	*tau*	X	
Hepialidae	*Aenetus*	*djernaesae*	X	
Hesperiidae	*Anisynta*	*sphenosema*	X	
Hesperiidae	*Taractrocera*	*papyria agraulia*	X	
Hydrophilidae	**Limnoxenus*	*zealandicus*	X	
Hyocephalidae	*Maevius*	*indecorus*	X	
Hypertrophidae	*Thudaca*	*campylota*	X	
Hypertrophidae	*Thudaca*	*haplonota*	X	
Ichneumonidae	*Ctenochares*	*bicolorus*	X	
Ichneumonidae	*Echthromorpha*	*intricatoria*	X	
Ichneumonidae	Gen.	sp. TBC	X	
Ichneumonidae	Gen.	sp. TBC	X	
Ichneumonidae	*Labium*	sp. TBC	X	
Ichneumonidae	*Netelia*	*producta* TBC	X	
Ichneumonidae	*Xanthopimpla*	sp. TBC	X	
Iridopterygidae	*Bolbe*	nr. *nigra* TBC	X	
Ixodidae	*Amblyomma*	*albolimbatum*	X	
Ixodidae	*Amblyomma*	*triguttatum*	X	X
Julidae	*^Ommatoiulus*	*moreletii*	X	X
Keroplatidae	Gen.	sp. TBC	X	
Keroplatidae	Gen.	sp. TBC	X	
Lamponidae	*Lampona*	*brevipes*	X	
Lamponidae	*Lampona*	*cylindrata*	X	
Lasiocampidae	*Genduara*	*nr. pinnalis*	X	
Lasiocampidae	*Genduara*	*subnotata*	X	
Lasiocampidae	*Symphyta*	*nephelodes*	X	
Lepismatidae	*Acrotelsella*	sp. TBC	X	
Lepismatidae	*Acrotelsella*	sp. TBC	X	
Leptoceridae	**Triplectides*	sp. TBC	X	
Lestidae	**Austrolestes*	*analis*	X	
Libellulidae	**Diplacodes*	*bipunctatus*	X	
Libellulidae	**Orthetrum*	*caledonicum*	X	
Libellulidae	**Pantala*	*flavescens*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Lycaenidae	*Candalides*	*acasta*	X	
Lycaenidae	*Nacaduba*	*biocellata*	X	
Lycaenidae	*Theclinesthes*	*serpentata*	X	
Lycidae	*Porrostoma (Porrostoma)*	sp. TBC	X	
Lycosidae	*Artoria*	sp. TBC	X	
Lycosidae	*Artoriopsis*	*eccentrica*	X	
Lycosidae	Gen.	sp.		X
Lycosidae	Gen. (*'Lycosa'*)	*australicola*	X	
Lycosidae	Gen. (*Ariadne* Group)	sp. TBC	X	
Lycosidae	Gen. (*Ariadne* Group)	sp. TBC	X	
Lycosidae	*TasmANICosa*	*godeffroyi*	X	
Lycosidae	*Tetralycosa*	*oraria*	X	
Lycosidae	*Venator*	*immansueta*	X	
Lycosidae	*Venatrix*	*pallustra*	X	
Lygaeidae	*Spilostethus*	*pacificus*	X	
Mantidae	*Archimantis*	*sobrina*	X	
Mantidae	*Mantis*	*octospilota*	X	
Mantidae	*Orthodera*	*ministralis*	X	
Mantidae	*Trachymantis*	*dentifrons*	X	
Megachilidae	*Megachile*	sp.		X
Megachilidae	*Megachile*	sp. TBC	X	
Megachilidae	*Megachile*	sp. TBC	X	
Megachilidae	*Megachile (Eutricharaea)*	*chrysopyga*	X	
Membracidae	*Sextius*	*virescens* TBC	X	
Miridae	*Creontiades*	*dilutus*	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miridae	Gen.	sp. TBC	X	
Miturgidae	Odo	sp. TBC	X	
Morabidae	Heide	sp. TBC	X	
Morabidae	Heide	sp. TBC	X	
Mordellidae	Gen.	sp. TBC	X	
Muscidae	*^Musca*	*domestica*	X	
Muscidae	*^Musca*	*vetustissima*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Muscidae	Gen.	sp. TBC	X	
Mutillidae	*Ephutomorpha*	sp. TBC	X	
Mutillidae	*Ephutomorpha*	sp. TBC	X	
Myrmeleontidae	*Heoclisis*	*acuta*	X	
Nemesiidae	*Aname*	*mainae*	X	
Nemesiidae	*Aname*	sp. TBC	X	
Nicoletiidae	*Australiatelura*	*michaelseni*	X	
Nitidulidae	Gen.	sp. TBC	X	
Noctuidae	*^Agrotis*	*infusa*	X	
Noctuidae	*^Agrotis*	*munda*	X	
Noctuidae	*^Apina*	*callisto*	X	
Noctuidae	*^Chrysodeixis*	*argentifera*	X	
Noctuidae	*^Helicoverpa*	*punctigera*	X	
Noctuidae	*^Mythimna (Pseudaletia)*	*convecta*	X	
Noctuidae	*^Persectania*	*dyscrita*	X	
Noctuidae	*^Persectania*	*ewingii*	X	
Noctuidae	*Athetis*	*tenuis*	X	
Noctuidae	*Australothis*	*rubrescens*	X	
Noctuidae	*Ectopatria*	*clavigera*	X	
Noctuidae	*Ectopatria*	nr. *aspera* TBC	X	
Noctuidae	Gen.	sp. TBC	X	
Noctuidae	Gen.	sp. TBC	X	
Noctuidae	Gen.	sp. TBC	X	
Noctuidae	Gen.	sp. TBC	X	
Noctuidae	*Leucania*	*diatrecta*	X	
Noctuidae	*Leucania*	*uda* TBC	X	
Noctuidae	*Proteuxoa*	*cornuta* TBC	X	
Noctuidae	*Proteuxoa*	*florescens*	X	
Noctuidae	*Proteuxoa*	*gypsina*	X	
Noctuidae	*Proteuxoa*	*hypochalcis* TBC	X	
Noctuidae	*Proteuxoa*	*metaneura*	X	
Noctuidae	*Proteuxoa*	*nr. melanographa* TBC	X	
Noctuidae	*Proteuxoa*	*paragypsa*	X	
Noctuidae	*Proteuxoa*	*poliocrossa*	X	
Noctuidae	*Proteuxoa*	*tibiata*	X	
Noctuidae	*Spodoptera*	*litura*	X	
Nogodonidae	*Bilbilicallia*	sp. TBC	X	
Nolidae	*Nola*	*hesycha*	X	
Nolidae	*Nola*	sp. TBC	X	
Nymphalidae	*^Danaus*	*plexippus*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Nymphalidae	*Geitoneura*	*minyas*	X	
Nymphalidae	Gen.	sp.		X
Nymphalidae	*Junonia*	*villida*	X	
Nymphalidae	*Vanessa*	*kershawi*	X	
Ocypodidae	**Ocypode*	*convexa*	X	
Oecophoridae	*Barea*	sp. TBC	X	
Oecophoridae	Gen.	sp. TBC	X	
Oecophoridae	Gen.	sp. TBC	X	
Oecophoridae	Gen.	sp. TBC	X	
Oecophoridae	Gen.	sp. TBC	X	
Oecophoridae	*Hoplostega*	*ochroma*	X	
Oecophoridae	nr. *Conobrosis*	sp. TBC	X	
Oecophoridae	nr. *Eochrois*	sp. TBC	X	
Oecophoridae	nr. *Thema*	sp. TBC	X	
Oecophoridae	*Philobota*	sp. TBC	X	
Oecophoridae	*Tachystola*	sp. TBC	X	
Oxypidae	*Oxyopes*	*gracilipes*	X	
Pachygronthidae	*Stenophyella*	*macreta*	X	
Paradoxosommatidae	Gen.	sp. TBC	X	
Pentatomidae	*Cermatulus*	*nasalis*	X	
Pentatomidae	*Cuspicona*	*procallosa*	X	
Pentatomidae	*Kalkadoona*	*enchylaenae* TBC	X	
Pentatomidae	*Kapunda*	*troughtoni*	X	
Pentatomidae	*Oechalia*	*schellenbergii*	X	
Pentatomidae	*Oncocoris*	*apicalis* TBC	X	
Pentatomidae	*Poecilometis*	*apicalis apicalis*	X	
Phalacridae	*Litochrus*	sp. TBC	X	
Phasmatidae	*Acanthomima*	*rhipheus*	X	
Phasmatidae	*Acanthomima*	sp.		X
Phasmatidae	*Denhama*	*eutrachelia*	X	
Phlaeothripidae	*Klambothrips*	sp. TBC	X	
Pholcidae	*^Holocnemus*	*pluchei*	X	
Pieridae	*^Pieris*	*rapae*	X	
Platystomatidae	Gen.	sp. TBC	X	
Platystomatidae	*Rivellia*	sp. TBC	X	
Platystomatidae	*Rivellia*	sp. TBC	X	
Pompilidae	*Ctenostigmus*	*immitis* TBC	X	
Pompilidae	Gen.	sp. TBC	X	
Porcellionidae	*^Porcellio*	*laevis*	X	
Porcellionidae	*^Porcellio*	*scaber*	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Porcellionidae	*^Porcellionides*	*pruinosus*	X	
Prodidomidae	*Molycria*	*vokes*	X	
Psychidae	*Clania*	*ignobilis*	X	
Psychidae	*Clania*	sp. TBC	X	
Psychidae	*Hyalarcta*	sp. TBC	X	
Psyllidae	Gen.	sp. TBC	X	
Psyllidae	*Glycaspis*	*brimblecombei*	X	
Pyralidae	*^Faveria*	*tritalis*	X	
Pyralidae	*Balanomis*	*encyclia*	X	
Pyralidae	*Epicrocis*	*mesembrina*	X	
Pyralidae	Gen.	sp. TBC	X	
Pyralidae	nr. *Crocydopora*	sp. TBC	X	
Pyralidae	*Salma*	*ebenina*	X	
Pyralidae	*Spectrotrota*	*fimbrialis*	X	
Pyralidae	*Vinicia*	*gypsopa*	X	
Pyrgomorphidae	Gen.	sp.		X
Pyrgotidae	*Cardiacera*	sp. TBC	X	
Pyrgotidae	*Cardiacera*	sp. TBC	X	
Rhyparochromidae	*Euander*	sp. TBC	X	
Rhyparochromidae	*nr. Tempyra*	sp. TBC	X	
Salticidae	*Clynotis*	*severus*	X	
Salticidae	Gen.	sp.		X
Salticidae	Gen.	sp. TBC	X	
Salticidae	Gen.	sp. TBC	X	
Salticidae	*Hypoblemum*	*villosum*	X	
Salticidae	*Jotus*	sp. TBC	X	
Salticidae	*Maratus*	*parvonis*	X	
Salticidae	*Maratus*	*speciosus*	X	
Salticidae	*Maratus*	*speculifer*	X	
Salticidae	*Opisthoncus*	nr. *polyphemus*	X	
Salticidae	*Servaea*	sp.	X	
Salticidae	*Simaethula*	sp. TBC	X	
Scarabaeidae	*^Australaphodius*	*frenchi* TBC	X	
Scarabaeidae	*^Heteronychus*	*arator*	X	
Scarabaeidae	*Aphodius*	sp. TBC	X	
Scarabaeidae	*Colpochila*	sp. TBC	X	
Scarabaeidae	*Glycyphana*	*stolata*	X	
Scarabaeidae	*Heteronyx*	sp. TBC	X	
Scarabaeidae	*Heteronyx*	sp. TBC	X	
Scarabaeidae	*Heteronyx*	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Scarabaeidae	*Heteronyx*	sp. TBC	X	
Scarabaeidae	*Heteronyx*	sp. TBC	X	
Scarabaeidae	*Liparetrus*	sp. TBC	X	
Scarabaeidae	*Neophyllotocus*	nr. *legnotus*	X	
Scarabaeidae	*Prochelyna*	*velutina* TBC	X	
Scoliidae	*Austroscolia*	*soror*	X	
Scoliidae	*Radumeris*	*tasmaniensis*	X	
Scolopendridae	*Cormocephalus*	*hartmeyeri*	X	
Scutelleridae	*Choerocoris*	*paganus*	X	
Scutelleridae	*Coleotichus*	*costatus*	X	
Sparassidae	*Delena*	*convexa*	X	
Sparassidae	Gen.	sp. TBC	X	
Sphecidae	*Podalonia*	*tydei suspiciosa*	X	
Sphecidae	*Sphex*	*ephippium*	X	
Sphecidae	*Sphex*	*fumipennis*	X	
Sphingidae	*Hippotion*	*celerio*	X	
Sphingidae	*Hippotion*	*scrofa*	X	
Stratiomyidae	Gen.	sp. TBC	X	
Stratiomyidae	Gen.	sp. TBC	X	
Tabanidae	*Scaptia (Pseudoscione)*	sp. TBC	X	
Tachinidae	Gen.	sp. TBC	X	
Tachinidae	Gen.	sp. TBC	X	
Tachinidae	Gen.	sp. TBC	X	
Tachinidae	Gen.	sp. TBC	X	
Tachinidae	*Rutilia (Chrysorutilia)*	sp. TBC	X	
Tachinidae	*Winthemia*	sp. TBC	X	
Talitridae	*Platorchestia*	*platensis*	X	
Tenebrionidae	*Chalcopteroides*	sp. TBC	X	
Tenebrionidae	*Ectyche*	*erebea* TBC	X	
Tenebrionidae	Gen.	sp. TBC	X	
Tenebrionidae	Gen.	sp. TBC	X	
Tenebrionidae	*Gonocephalum*	*elderi*	X	
Tenebrionidae	*Helea*	*perforata*	X	
Tenebrionidae	*Metistete*	nr. *ebenina*	X	
Tenebrionidae	*Pterohelaeus*	sp. TBC	X	
Tenebrionidae	*Pterohelaeus*	sp. TBC	X	
Tenebrionidae	*Sympetes*	*bremei*	X	
Tenebrionidae	*Sympetes*	sp. TBC	X	
Tettigoniidae	*Caedicia*	sp. TBC	X	
Tettigoniidae	Gen.	sp.		X

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Tettigoniidae	*Hemisaga*	*denticulata*	X	
Tettigoniidae	*Metaballus*	*frontalis*	X	
Tettigoniidae	*Mygalopsis*	*marki*	X	
Tettigoniidae	*Requena*	*verticalis*	X	
Theridiidae	*Cryptachaea*	sp. TBC	X	
Theridiidae	*Cryptachaea*	sp. TBC	X	
Theridiidae	*Euryopis*	*elegans*	X	
Theridiidae	Gen.	sp. TBC	X	
Theridiidae	Gen.	sp. TBC	X	
Theridiidae	*Latrodectus*	*hasselti*	X	
Thomisidae	*Hedana*	*valida*	X	
Thomisidae	*Lehtinelagia*	nr. *prasina* TBC	X	
Thomisidae	*Sidymella*	*longipes*	X	
Thomisidae	*Sidymella*	*trapezia*	X	
Tineidae	*Monopis*	*ethelella*	X	
Tineidae	*Monopis*	*meloriella*	X	
Tiphiidae	*Epactiothynnus*	sp. TBC	X	
Tiphiidae	Gen.	sp. TBC	X	
Tipulidae	*Gen.	sp. TBC	X	
Tipulidae	*Gen.	sp. TBC	X	
Tipulidae	**Leptotarsus*	nr. *clavatus* TBC	X	
Tipulidae	**Leptotarsus*	sp. TBC	X	
Tortricidae	*Cacoecia*	*tessulatana*	X	
Tortricidae	*Cryptophlebia*	*endophaga*	X	
Tortricidae	*Epiphyas*	*liadelpha*	X	
Tortricidae	Gen.	sp. TBC	X	
Tortricidae	Gen.	sp. TBC	X	
Tortricidae	*Holocola*	*deloschema*	X	
Tortricidae	*Oxysemaphora*	*hacobiani*	X	
Tortricidae	*Parastranga*	*macrogona*	X	
Tortricidae	*Strepsicrates*	*macropetana*	X	
Tortricidae	*Ancylis*	sp. TBC	X	
Tortricidae	*Capua*	nr. *leucospila* TBC	X	
Tortricidae	Gen. (as *Conchylis tasmaniana)*	sp. TBC	X	
Tortricidae	*Tortrix*	*phaeoneura*	X	
Tortricidae	*Tortrix*	*procapna*	X	
Torymidae	Gen.	sp. TBC	X	
Torymidae	Gen.	sp. TBC	X	
Torymidae	*Megastigmus*	sp. TBC	X	

Family	Genus	Species	Knowles 2015-2018	ELA 2020
Vespidae	*^Polistes (Polistes)*	*dominulus*	X	
Vespidae	*Delta*	*latreillei*	X	
Zodariidae	Gen.	sp. TBC	X	
Zodariidae	Gen.	sp. TBC	X	
Zodariidae	Gen.	sp. TBC	X	
Zodariidae	*Habronestes*	*australiensis*	X	
Zodariidae	*Neostorena*	sp. TBC	X	
Zygaenidae	*Pollanisus*	sp. TBC	X	
		Total	**548**	**14**

Appendix Q Conservation significant fauna locations

Common name	Scientific name	Conservation status		Easting	Northing	Observation type
		EPBC Act	BC Act/DBCA			
Carnaby's Cockatoo	*Calyptorhynchus latirostris*	EN	EN	379067	6487636	Observed flying overhead
Quenda	*Isoodon fusciventer*		P4	378531	6489126	2 x individuals trapped in a cage trap over two trapping nights
Quenda	*Isoodon fusciventer*		P4	378531	6489114	2 x individuals trapped in a cage trap over two trapping nights
Quenda	*Isoodon fusciventer*		P4	378536	6489069	1 x individual trapped in a cage trap
Quenda	*Isoodon fusciventer*		P4	378534	6489059	1 x individuals trapped in a cage trap over two trapping nights
Quenda	*Isoodon fusciventer*		P4	379027	6487701	1 x individual trapped in a cage trap
Quenda	*Isoodon fusciventer*		P4	378859	6488356	1 x individual trapped in a cage trap
Quenda	*Isoodon fusciventer*		P4	378533	6489072	Detected on motion camera

Appendix R Introduced fauna species locations

Type	Species	Common name	Easting	Northing	Observation type
Bird	**Dacelo novaeguineae*	Laughing Kookaburra	378911	6488354	Heard, directly observed
Bird	**Spilopelia senegalensis*	Laughing Dove	378536	6489069	Heard, directly observed
Bird	**Spilopelia senegalensis*	Laughing Dove	379046	6487612	Heard, directly observed
Invertebrate	**Ommatoiulus moreletii*	Portuguese Millipede	378929	6488625	Bycatch from pitfall and funnel traps
Mammal	**Felis catus*	Cat	378533	6489072	Detected on motion camera
Mammal	**Felis catus*	Cat	379084	6487639	Detected on motion camera
Mammal	**Mus musculus*	House Mouse	378128	6489766	Individual trapped in small aluminium box trap
Mammal	**Mus musculus*	House Mouse	378178	6489694	Individual trapped in small aluminium box trap
Mammal	**Mus musculus*	House Mouse	378525	6489084	Individual trapped in small aluminium box trap
Mammal	**Mus musculus*	House Mouse	378533	6489060	Individual trapped in small aluminium box trap
Mammal	**Mus musculus*	House Mouse	378813	6488180	Individual trapped in small aluminium box trap
Mammal	**Oryctolagus cuniculus*	European Rabbit	378917	6488634	Scats found
Mammal	**Vulpes vulpes*	Red Fox	378083	6489789	Detected on motion camera
Mammal	**Vulpes vulpes*	Red Fox	378533	6489072	Detected on motion camera
Mammal	**Vulpes vulpes*	Red Fox	378909	6488641	Detected on motion camera

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Burns Beach Foreshore Reserve Honeymyrtle Shrubland TEC report and Black Cockatoo assessment

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Project Name	Burns Beach Foreshore Reserve Honeymyrtle Shrubland TEC report and Black Cockatoo assessment
Project Number	24PER8879
Project Manager	Glenn Harris-Maslen
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Reviewed by	Jeff Cargill
Approved by	**Jeff Cargill**
Status	**Final**
Version Number	**v3**
Last saved on	**10 December 2024**

This report should be cited as 'Eco Logical Australia 2024. *Burns Beach Foreshore Reserve Honeymyrtle Shrubland TEC report and Black Cockatoo assessment*. Prepared for City of Joondalup.'

ACKNOWLEDGEMENTS

This document has been prepared by Eco Logical Australia Pty Ltd with support from City of Joondalup.

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Abbreviations

Abbreviation	Description
BAM Act	State *Biosecurity and Agriculture Management Act 2007*
BC Act	State *Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
CLUSTER	Hierarchical Clustering
CR	Critically Endangered
DAWE	Department of Agriculture, Water and the Environment
DBCA	Department of Biodiversity, Conservation and Attractions
DEC	Department of Environment and Conservation
DotEE	Department of the Environment and Energy
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
ELA	Eco Logical Australia
EN	Endangered
EPA	Environmental Protection Authority
EPBC Act	Commonwealth *Environment Protection and Biodiversity Act 1999*
FCT	Floristic Community Type
IBRA	Interim Biogeographical Regionalisation for Australia
MDS	Multi-Dimensional Scaling
P	Priority
PEC	Priority Ecological Community
PRIMER	Plymouth Routines in Multivariate Ecological Research v6
SIMPER	Similarity Percentages
TEC	Threatened Ecological Community
TSSC	Threatened Species Scientific Committee
VU	Vulnerable
WA	Western Australia
WAH	Western Australian Herbarium
WAM	Western Australian Museum
WAOL	Western Australian Organism List
WoNS	Weed of National Significance

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Executive Summary

Eco Logical Australia (ELA) was engaged by the City of Joondalup (the City) to undertake a Targeted Honeymyrtle Shrubland Threatened Ecological Community (TEC) assessment and Black Cockatoo habitat assessment of the Burns Beach café development area (herein referred to as the survey area). The survey area is 0.9 ha in size and located on the Burns Beach Foreshore approximately 30 km north of Perth, Western Australia.

A comprehensive desktop assessment was undertaken to assess the potential presence of Black Cockatoos and ecological communities listed under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the WA Biodiversity Conservation Act 2016 (BC Act), and by the WA Department of Biodiversity, Conservation and Attractions (DBCA). One conservation significant ecological community, Honeymyrtle Shrubland Limestone TEC (Critically Endangered [CR]) was assessed as having Potential to occur, whilst the Priority Ecological Community (PEC) 'Coastal shrublands on shallow sands' (FCT29a; Priority 3 [P3]) was considered as Likely to occur given that the survey area is covered by the SgSa vegetation community mapped by ELA in 2020, which showed close affiliation with the Gibson *et al.* (1994) FCT29a. A desktop search of the DBCA threatened fauna database identified 521 records of Black Cockatoos within 10 km of the survey area (DBCA 2024b). Searches of the City of Joondalup Black Cockatoo database and Birdlife Australia database of Black Cockatoo roosting and nesting sites identified seven confirmed white-tailed roosts, one confirmed forest red-tailed roost, and three confirmed joint roosts within 12km of the survey area (Birdlife 2024).

The Targeted Honeymyrtle Shrubland TEC assessment and Black Cockatoo habitat assessment was conducted on the 6th of September 2024 in accordance with the EPA *Technical Guidance for Flora and Vegetation* (EPA 2016) and the *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo, and the Forest Red-tailed Black cockatoo* (DAWE 2022). Vegetation communities were described from three quadrats and one relevé established within the survey area. Black cockatoos were surveyed by walking transects across the survey area and mapping black cockatoo habitat.

A total of 39 flora species (15 native and 24 introduced) from 23 families and 34 genera were recorded from three quadrats and one relevé established across the survey area. No Threatened flora species listed under the EPBC Act or BC Act or Priority species listed by DBCA were recorded within the survey area.

A total of 24 introduced (weed) species were recorded within the survey area, representing 61.5% of the total species recorded. All these species are listed on the Western Australian Organism List Database as permitted (s-11) species (DPIRD 2024), indicating that no specific management of these species is required.

One intact vegetation community was delineated and mapped within the survey area, namely MiTdEl. This vegetation type covered 0.7 ha (82.2%) of the survey area. This community was assessed as having floristic affinities to Gibson *et al.* (1994) floristic community type FCT29a, listed as a Priority 3 PEC. In addition to this vegetation community, one highly modified vegetation type was recorded. This included managed gardens of **Casuarina equisetifolia* over a mix of understorey species, commonly **Tetragonia decumbens* and **Arctotis stoechadis.* This modified vegetation type covered 0.1 ha (12%) of the survey

area. The remainder of the survey area comprised of cleared areas. An assessment against the Honeymyrtle Shrubland TEC listed under the EPBC Act found that vegetation within the survey area was not representative of the TEC given that it did not meet the key diagnostic characteristics for the community (DCCEEW 2023). In addition, vegetation within the survey area was not found to align floristically with FCT26a and therefore also does not represent the Honeymyrtle Shrubland TEC listed under the BC Act.

The condition of intact native vegetation in the survey area ranged from Good to Completely Degraded, based on the vegetation condition scale of Keighery (1994) provided in EPA (2016) for the South-West Botanical Province. Most of the areas mapped as intact vegetation were classed as being in Good condition, with modified areas being classed as Completely Degraded. The remainder of the survey area was classed as Cleared. Disturbances in the survey area included tracks, clearing, weeds, housing and roadsides.

Black cockatoo foraging habitat quality within the survey area was assessed as having 'No foraging value' given that no species present in the survey area are listed as Primary or Secondary foraging species for Carnaby's or Forest Red-tailed Black Cockatoos. No potentially suitable breeding trees or roosting trees were recorded in the survey area, with the only tall trees in the survey area being **Casuarina equisetifolia,* not considered to be a suitable breeding or roosting tree.

1. Introduction

1.1 Project background

Eco Logical Australia (ELA) were engaged by the City of Joondalup (the City) to undertake a Targeted Honeymyrtle Shrubland TEC assessment and Black Cockatoo habitat assessment of the Burns Beach café development area (herein referred to as the survey area). The survey area is 0.9 ha in size and located on the Burns Beach Foreshore located approximately 30 km north of Perth, Western Australia (**Figure 1**).

The City plans to clear the survey area for a proposed restaurant development. ELA previously assessed flora and vegetation values within the survey area during ecological surveys of the Iluka-Burns Beach Foreshore (ELA 2021). This assessment builds on the results of that assessment to consider potential impacts to listed Black Cockatoo species and the Honeymyrtle Shrubland TEC. Specifically, the objectives of this assessment include:

- An assessment to verify if the vegetation meets the requirements specified in the Commonwealth *Environment Protection and Biodiversity Act 1999* (EPBC Act) 'Approved Conservation Advice (incorporating listing advice) for Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain ecological community', using the four-stage assessment process itemised in the Approved Conservation Advice (Threatened Species Scientific Committee [TSSC] 2016);
- A targeted habitat assessment for Black Cockatoos, including the Carnaby's Cockatoo (*Zanda latirostris;* listed as Endangered [EN] under the EPBC Act and BC Act) and Forest Red-tailed Black Cockatoo (*Zanda banksii naso*; listed as Vulnerable [VU] under the EPBC Act and BC Act).

In addition, ELA has re-assessed the vegetation within the survey area in accordance with the EPA technical guidance (EPA 2016) to provide updated mapping of vegetation communities and condition within the survey area, at a more refined scale for the purposes of the overarching project.

1.2 Scope of works

The purpose of this project was to provide an assessment of the environmental values of the survey area to support the environmental assessment and approval process. This technical report addresses the following items:

- Undertaking an initial desktop assessment to determine environmental values such as flora, vegetation, and ecological communities relating to the survey area;
- Undertaking a field survey to assess values pertaining to flora, vegetation, and black cockatoo habitat values;
- Preparation of a technical flora, vegetation, and black cockatoo habitat survey report for the survey area; and
- Provision of all spatial/mapping data collected during the survey.

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Figure 1: Survey area location

Survey Area

N

0 10 20 40

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-SNC Date: 21/10/2024

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2. Environmental setting

2.1 Geology, landforms, and soils

The Perth Basin, on which the Swan Coastal Plain is located, is filled by Mesozoic to recent sediments. During the Quaternary the present coastal plain was formed by deposition of sediments on an underlying eroded embayment, which reaches east to the Darling Scarp (Beard 1990). Three dune systems run parallel to the present coastline and from west to east (youngest to oldest), namely the Quindalup, Spearwood, and Bassendean systems.

Soil-landscape mapping prepared by the Department of Primary Industries and Regional Development (DPIRD), provides an inventory and condition survey of lands at a 1:250,000 scale (DPIRD 2022). The survey area is located primarily on the Quindalup Dune System, with some minor intersections with the Spearwood Dune System. The Quindalup Dune System is the youngest of the aeolian dune systems associated with the Swan Coastal Plain. It is characterised by unconsolidated white calcareous sands that form a series of dunes and beach-ridge plains (DPIRD 2022). The Spearwood Dune System is comprised of sand overlaying cemented coastal limestone (i.e. Tamala Limestone) (Semeniuk & Glassford 1989). It is characterised by yellow deep sands, pale deep sands, and yellow/brown shallow sands that lay to the east of the Quindalup dune system (DPIRD 2022).

2.2 Regional vegetation

Vegetation type and extent have been mapped at a regional scale by Beard (1979) who categorised vegetation into broad vegetation associations. Based on this mapping at a scale of 1:250,000, DPIRD has compiled a list of vegetation extent and types across Western Australia (DPIRD 2019; Shepherd *et al.* 2002). One system-vegetation association, Spearwood 949, occurs within the survey area (DPIRD 2019). The floristic description of the 949 vegetation association is described as consisting of Acacia spp., Banksia spp., *Agonis flexuosa,* Callitris spp., Allocasuarina spp., and *Eucalyptus loxophleba* Low woodland or open low woodland (Shepherd *et al.* 2002). The 949 vegetation association has 56.45% of its total pre-European extent remaining in the SWA02 subregion (Table 1).

Table 1: Beard's (1979) vegetation associations in the survey area

Vegetation association	Vegetation	Pre-European extent in SWA02 subregion (ha)	Current extent in SWA02 subregion (ha)	% Remaining in SWA02 subregion
949	Low woodland; banksia (*Banksia sp*).	184,476	104,129	56.45

Source: DBCA Statewide Vegetation Statistics (DBCA 2019)

Vegetation within the Perth metropolitan area has been described by Heddle *et al.* (1980) as System 6 vegetation complexes. One vegetation complex occurs within the survey area, namely the Cottesloe Complex – Central and South) (**Table 2**).

Table 2: System 6 vegetation complexes within the survey area

Vegetation complex	System 6 code	Description	Pre-European extent in Swan Coastal Plain (ha)	Current extent in Swan Coastal Plain (ha)	% remaining
Cottesloe – Central and South	52	Mosaic of woodland of *Eucalyptus gomphocephala* (Tuart) and open forest of *Eucalyptus gomphocephala* (Tuart) - *Eucalyptus marginata* (Jarrah) - *Corymbia calophylla* (Marri); closed heath on the Limestone outcrops.	44,676.1	14,724.6	33.0

Source: DBCA 2018

2.3 Previous vegetation mapping

A total of five vegetation communities were delineated and mapped within the Burns Beach area during surveys conducted by ELA in 2020. Vegetation within the survey area was mapped as part of the SgSa vegetation community, described as *Spyridium globulosum, Santalum acuminatum* tall sparse shrubland over *Olearia axillaris, Myoporum insulare* mid shrubland and *Rhagodia baccata* mid sparse chenopod shrubland over **Tetragona decumbens, Scaevola crassifolia* low open shrubland and *Lepidosperma gladiatum* low open sedgeland (ELA 2021). Vegetation condition within the survey area was mapped as being in Good condition. The SgSa vegetation community showed close affiliation with Gibson *et al.* (1994) Floristic Community Type (FCT) 29a. FCT 29a ('Coastal shrublands on shallow sands') is listed by the Department of Biodiversity, Conservation and Attractions (DBCA) as a Priority 3 ecological community.

3. Methodology

3.1 Desktop review

3.1.1 Database searches

The following databases were searched for information relating to Black Cockatoos and conservation-significant ecological communities (**Table 3**). Applied search buffers used are considered suitable based on ecological communities and fauna expected to occur within the survey area. Additionally, Commonwealth and State government spatial datasets for land system mapping and regional vegetation mapping were reviewed, as described in Sections 2.2 and 2.3.

Table 3: Database searches undertaken for the survey area

Database	Reference	Search area
Commonwealth EPBC Act Protected Matters Search Tool (PMST) for Matters of National Environmental Significance, including any Threatened species listed under the EPBC Act.	DCCEEW 2024	10 km buffer around the survey area
DBCA Database search – Honeymyrtle Shrubland TEC	DBCA 2024a	All known boundaries of Honeymyrtle Shrubland TEC
DBCA Database search – conservation significant fauna	DBCA 2024b	10km buffer around survey area
Birdlife roosting dataset	Birdlife 2024	12 km buffer around survey area
City of Joondalup Black Cockatoo Dataset	City of Joondalup 2024	12 km buffer around survey area

3.1.2 Likelihood of occurrence assessment

An assessment of the likelihood of Threatened and Priority ecological communities present within the survey area was undertaken. The assessment is based on specific likelihood of occurrence criteria. The criteria include factors such as: location and recency of previous records in relation to the survey area; suitable landforms, soils and habitat that appear to be present based on the desktop review and aerial imagery. Conservation codes, categories and criteria for flora, fauna, and ecological communities protected under the EPBC Act and BC Act are provided in **Appendix A**. Criteria used for the likelihood of occurrence assessment are presented in **Appendix B**.

3.2 Field survey

3.2.1 Survey team and timing

The Detailed vegetation survey and Targeted Black Cockatoo habitat assessment was conducted by Glenn Harris-Maslen (Senior Ecologist) and Olivia Sinclair (Graduate Environmental Consultant) on the 6th of September 2024. Field staff had valid scientific licenses to conduct flora and vegetation surveys and to take Threatened and Priority flora in WA at the time of the survey. The survey timing was consistent with the Environmental Protection Authority (EPA) recommendations for undertaking flora and vegetation surveys in the South-west climatic region (i.e. Spring, September to November; EPA 2016).

Rainfall data from the nearby Wanneroo weather station (station number 9105, located approximately 10 km south-east of the survey areas) recorded a total of 13.2 millimetres (mm) during the flora survey (Bureau of Meteorology [BoM] 2024). In the three months prior to the flora field survey (June – August), a total of 458 mm of rainfall was recorded (BoM 2024). This is greater than the long-term average for the same time period (445.2 mm). Conditions at the time of survey were considered suitable with the majority of flora species in various reproductive stages (e.g. flowering, fruiting), allowing for positive identification of individuals.

3.2.2 Detailed vegetation survey

A single season Detailed vegetation survey was undertaken across the survey area (0.9 ha), in accordance with the EPA *Technical Guidance for Flora and Vegetation* (EPA 2016). Tasks undertaken during the flora and vegetation survey included:

- Compiling a flora species inventory (angiosperm and gymnosperm) of both native and introduced species across the survey area;
- Describing and mapping of vegetation units, including the presence of any TECs/PECs;
- Vegetation condition mapping, adapted from Keighery (1994), including the location of any Weeds of National Significance (WoNS) or Declared Pests listed under the BC Act or by DBCA; and
- Targeted searches for conservation significant flora species listed under the EPBC Act, BC Act, or by DBCA.

The survey involved the use of 10 x 10 m quadrats as recommended for the Swan Coastal Plain bioregion (EPA 2016). Quadrats were not permanently marked. Dominant vegetation communities were described, with respect to dominant species, structure, and overall condition. Photos were taken from the north-western corner of each quadrat. Where relevant, opportunistic sampling of species not recorded within the quadrats was undertaken to supplement the existing list of species recorded from within the survey area.

A total of three quadrats were established across the survey area (**Figure 2**). The following data were recorded within each quadrat:

- Vegetation structure and classes, cover of all species and dominant species list for each vegetation type (in accordance with the National Vegetation Information System (NVIS) Level V structure and floristics);
- Vegetation condition, in accordance with the scale outlined in EPA (2016) adapted from Keighery (1994);

- Full species inventory (angiosperm and gymnosperm) of both native and introduced species across the subject site; and
- Relevant site data including coordinates, site photograph, soil, geology, drainage, slope and any other relevant observational data.

Additionally, one relevé was established in the survey area in a section not considered to represent intact native vegetation (**Figure 2**). Dominant vegetation types were described, with respect to dominant species, structure, and overall condition. The following data was recorded in the relevé:

- Site details (site name, number, observer/s, date and location);
- Photograph from the centre of the relevé;
- Broad vegetation type survey based on an assessment of the dominant flora species for the three traditional strata (upper, mid and ground) and mapping extent; and
- Vegetation condition in accordance with the Keighery (1994) vegetation condition scale, as provided in the EPA Technical Guidance (EPA 2016).

Flora species able to be identified in the field were recorded, and voucher specimens of unfamiliar species were collected for later identification. All collections were assigned a unique collecting number. For conservation-significant flora identified in the field, the following was recorded:

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

3.2.3 Flora identification and nomenclature

Flora specimen identification following the field survey was undertaken by taxonomic specialists at the Western Australian Herbarium (WAH). Suitable material that meets WAH specimen lodgement requirements, such as flowering material and range extensions, was submitted along with Threatened and Priority Report forms to DBCA, as required by conditions of collection licences issued under the BC Act.

Nomenclature used for the flora species within this report follows the WA Plant Census as available on FloraBase (WAH 1998-).



Figure 2: Survey effort

Survey Area
Survey tracks

Sample sites
Photo-point
Quadrat

N

0 10 20 40
Metres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-SNC Date: 10/12/2024

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3.2.4 Flora and vegetation data analysis

3.2.4.1 Flora species accumulation curve

A flora species accumulation curve was undertaken to indicate adequacy of the survey effort (Clarke & Gorley 2015). As the number of survey sites increases, and correspondingly the size of the area surveyed increases, there should be a diminishing number of new species recorded. At some point, the number of new species recorded becomes essentially asymptotic. The asymptotic value was determined using Michaelis-Menten modelling and provided an incidence-based coverage estimator of species richness. When the number of new species being recorded for survey effort expended approaches this asymptotic value, the survey effort can be considered adequate.

3.2.4.2 Vegetation communities

Plymouth Routines in Multivariate Ecological Research v7 (PRIMER) statistical analysis software was used to analyse species-by-site data and discriminate survey sites based on their species composition (Clarke & Gorley 2015). To down-weight the relative contributions of quantitatively dominant species, a fourth-root transformation was applied to the species percentage cover dataset. Specimens not identified to species level and singletons (species not recorded at a single quadrat and not forming a dominant structural component) were excluded from the dataset prior to analysis. Computation of similarity matrices was based on the Bray-Curtis measure (Bray & Curtis 1957). Data were analysed using a series of multivariate analysis routines including Similarity Profile, Hierarchical Clustering, and Similarity Percentages. Results were used to inform and support interpretation of aerial photography and delineation of individual plant communities.

3.2.4.3 FCT analysis

Species within the Gibson *et al*. (1994) dataset were updated to align with current names as specified by FloraBase (WAH 1998-). Using current records, several species in the Gibson *et al*. (1994) dataset were shown to be significant range extensions from the Swan Coastal Plain; where appropriate such cases were removed. In addition, excluded and misapplied names were removed from the dataset and infra-specific names were reduced. Data from individual quadrats in the current survey were merged with the updated Gibson *et al*. (1994) dataset. Each merged dataset was analysed using a combination of pre-treatments such as the removal of taxa not identified to species level and singletons. Transformed data were analysed using a combination of multivariate analysis routines including Bray-Curtis Similarity Matrices, Cluster Analysis (single site insertion Flexible Beta) and non-metric Multi-Dimensional Scaling (nMDS).

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to Floristic Community Types (FCTs) defined by Gibson *et al*. (1994). To identify the presence of FCTs appropriate multivariate analyses comparing current data to that of Gibson et al. (1994) species by quadrat data, and inferences based on dominant species and geomorphology were used. Given the nature of the data (e.g., spatial and temporal differences), results and subsequent extrapolations, assigned FCTs within the survey area were inferred and not absolute, i.e., a vegetation code assigned to an FCT was inferred to comprise, to varying degrees, floristic aspects of that FCT as defined by Gibson et al. (1994). These FCTs were subsequently compared with vegetation communities delineated by ELA.

3.2.4.4 Assessment of diagnostics to assess presence of Threatened Ecological Communities

The Honeymyrtle shrubland on limestone ridges of the Swan Coastal Plain Bioregion (Honeymyrtle Shrubland TEC) was assessed as possible occurring within the survey area. The Honeymyrtle Shrubland

TEC is listed as Critically Endangered (CR) under the EPBC Act (DCCEEW 2023). For information to assist in referral, environmental assessment, and compliance issues, it has been recommended to refer to the Listing Advice and/or Conservation Advice and Recovery Plan on the Commonwealth Species Profile and Threats Database (DCCEEW 2023). The Listing Advice and/or Conservation Advice defines the national ecological community and includes key diagnostic characteristics, condition thresholds, and additional considerations.

To determine whether the Honeymyrtle Shrubland TEC is present in the flora, vegetation, and fauna survey area, key diagnostic characteristics must be met under Section 2.1 of the Conservation Advice (DCCEEW 2023). This includes an assessment of species assemblages, vegetation condition, patch size, and landform. This assessment was undertaken by ELA following the field survey.

3.2.5 Targeted Black Cockatoo Habitat Assessment

A Targeted black cockatoo habitat assessment was conducted in accordance with the *Referral guideline for 3 WA threatened black cockatoo species: Carnaby's Cockatoo, Baudin's Cockatoo, and the Forest Red-tailed Black cockatoo* (DAWE 2022). Consideration was also given to the Survey guidelines for Australia's threatened birds (DEWHA 2010) when designing the survey methodology.

Three species of black cockatoo occur in the south-west of Western Australia:

- Baudin's Cockatoo (*Zanda baudinii*; listed as Endangered [EN] under the EPBC Act and BC Act);
- Carnaby's Cockatoo (*Zanda latirostris*; listed as Endangered [EN] under the EPBC Act and BC Act); and
- Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*; listed as Vulnerable [VU] under the EPBC Act and BC Act).

Broad scale maps are available for the modelled distribution of all three species of black cockatoo (DAWE 2022). The survey area occurs within the Likely to occur range of the Forest Red-tailed Black Cockatoo and Carnaby's Cockatoo, however is outside of the predicted range of the Baudin's Cockatoo. As such, the survey focused on assessing the habitat values for the Carnaby's and Forest Red-tailed Black Cockatoo. Any individuals of Carnaby's Cockatoo and/or Forest Red-tailed Black Cockatoo observed in the survey area were recorded, including the number of individuals.

The Targeted survey involved personnel walking transects across the survey area and mapping black cockatoo habitat. Black Cockatoo habitat is conventionally separated into foraging, potential breeding, and potential night roosting categories, as defined in **Appendix C**. Foraging, potential breeding and potential roosting habitat was assessed within the survey area. The field methodology for each of these is defined below.

3.2.5.1 Foraging habitat

Foraging habitat is defined for each species of black cockatoo in **Appendix C**. The foraging value (i.e. quality) of vegetation to black cockatoos depends upon several factors including the foraging plant species present, the extent and density (including projected foliage cover) of those foraging species, and the overall structure and condition of foraging species present. In addition, connectivity, proximity to known breeding and roosting sites, and the presence of weeds and/or tree deaths (i.e. disease or drought) is also to be considered.

Vegetation communities and types delineated and mapped within the survey area were assigned a foraging quality (i.e. negligible to low, low to moderate, moderate, moderate to high, or high) based on the criteria outlined in **Appendix D**. The DAWE (2022) foraging quality scoring tool was not used in this assessment given that the vegetated part of the survey area amounts to 0.9 ha, and this tool is only relevant for areas greater than 1 ha.

Evidence of black cockatoo foraging (i.e. branch clippings and/or chewed fruit) was also searched for to identify if the vegetation within the survey area has previously been or is currently being used by black cockatoos for feeding.

3.2.5.2 Potential breeding habitat

Potential breeding habitat is defined in **Appendix C**. Potential nesting trees 'diameter at breast height' (DBH) were recorded in the following ranges:

- Small; approximately 500-600 mm
- Medium; between 600 and 1000 mm
- Large; over 1000 mm.

All potential nesting trees encountered within the black cockatoo survey area were recorded with a GPS (+/- 5-10 m accuracy). Each potential nesting tree was also visually assessed from the ground (i.e., with binoculars) for the presence of suitable nest hollows (defined in **Appendix C**) and allocated a nesting and/or hollow rank

Table 4: Potential breeding trees nest and/or hollow ranking

Rank	Description of tree nest and/or hollows
1	Active nest observed (adult bird seen entering or emerging from hollow, their eggs, fledglings or other evidence of recent nesting activity present); known active nest (as described by Birdlife 2022).
2	Hollow of suitable size and angle (i.e., near-vertical) observed with chew marks around entrance.
3	Potentially suitable hollow observed but no chew marks present.
4	Tree lacking suitable hollows or broken branches that might have large hollows, a tree with mainly intact branches and a spreading crown.

[1]ELA takes a precautionary approach and identifies potentially suitable hollows as those with an entrance diameter over 10 cm that could potentially accommodate Forest Red-tailed Black Cockatoo, which requires a diameter opening range of 12 – 41 cm.

3.2.5.3 Potential roosting habitat

Potential night roosting habitat is defined in **Appendix C**. Potential night roosting habitat was delineated by mapping tall trees in proximity to water (i.e., within 12 km). A 5 m buffer was applied around each of these trees to depict projected foliage cover to estimate potential roosting habitat as hectares.

3.3 Limitations

The EPA Technical Guidance documents (EPA 2016; 2020) recommend including a discussion of the constraints and limitations of the survey methods used. An assessment of potential constraints and limitations of this survey are summarised in **Table 5** below. No survey constraints or limitations were identified.

Table 5: Survey limitations

Constraint	Limitations
Sources of information and availability of contextual information (i.e., pre-existing background versus new material).	**Not a limitation.** The Swan Coastal Plain has been well surveyed, with increasing survey work occurring due to the ongoing urban development of the Perth metropolitan area. Several flora and fauna surveys have been undertaken in the survey area which have been utilised for the purposes of this survey. Gibson *et al.* 1994 was a primary source for determination of methods, analysis and results for assessing FCTs. Broad-scale vegetation mapping at a scale of 1:1,000,000 was available. Land system mapping at a scale of 1:2,000,000 and soil and landform mapping was also available. The information which was available was sufficient and as such sources of information were not considered a major limitation.
Scope (i.e., what life forms, etc., were sampled).	**Not a limitation.** The survey requirement for a Detailed and Targeted flora survey and vegetation condition assessment in accordance with the EPA *Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016) was adequately met. The survey requirement for a Detailed fauna survey in accordance with the EPA *Technical Guidance: Terrestrial vertebrate fauna surveys for environmental impact assessment* (EPA 2020) was adequately met.
Proportion of flora collected and identified (based on sampling, timing and intensity).	**Not a limitation.** Adequacy of sampling effort was tested via a species accumulation curve; approximately 80% of the flora potentially present within the quadrats in the survey area were recorded. The urban location and stochastic occurrence of weeds (singletons) within the quadrats likely had an influence on the number of taxa recorded. This fact, as well as the seven additional taxa recorded via relevés and opportunistic collections, indicates that the majority of flora species potentially present within the survey area were recorded. The sample effort was considered acceptable.
Completeness and further work which might be needed (i.e. was the relevant survey area fully surveyed).	**Not a limitation.** The survey area was fully covered to meet requirements outlined in the scope of works. Site selection and replication was considered adequate to accurately analyse and discriminate sites based on species composition and subsequently delineate vegetation community boundaries.
Mapping reliability.	**Not a limitation**. Coverage of the survey area was considered to be good. High quality aerial maps were used for both the survey and subsequent vegetation mapping.
Timing, weather, season, cycle.	**Not a limitation**. The survey was undertaken in the appropriate season as specified by the EPA Technical Guidance (EPA 2016, 2020).
Disturbances (fire, flood, accidental human intervention, etc.).	**Not a limitation**. Disturbances within the survey area included weeds, tracks, invasive animals, nearby housing, and roadsides. These disturbances did not negatively impact the ability to meet objectives outlined in the scope of works.
Intensity (in retrospect, was the intensity adequate).	**Not a limitation.** The survey effort was adequately met. The area was searched for conservation significant flora and fauna species by field staff undertaking transects spaced adequately apart across the survey area. This method provides an accurate assessment of habitat characteristics and likelihood of conservation significant species. The number of quadrats established was sufficient to determine the vegetation communities present

Constraint	Limitations
	(including their structurally and compositionally dominant species) and to identify any vegetation of conservation significance.
Resources (i.e., were there adequate resources to complete the survey to the required standard).	**Not a limitation**. The number of personnel conducting this field survey in the given time was adequate to undertake the required level of survey. Additional resources, including equipment available, additional support and personnel were adequate.
Access problems (i.e., ability to access survey area).	**Not a limitation**. All relevant areas within the survey area were able to be accessed and surveyed.
Experience levels (e.g., degree of expertise in plant identification to taxon level).	**Not a limitation**. The personnel conducting this field survey were all suitably qualified to identify specimens, having previously undertaking flora and fauna surveys in the South-west of Western Australia.

The black cockatoo habitat assessment was undertaken in accordance with the Referral guidelines (DAWE 2022). The requirements of DAWE (2022) and detail regarding how the survey meets these requirements, is summarised in **Table 6**. All requirements are considered to have been met.

Table 6: Summary of survey compliance with black cockatoo referral guidelines

Referral guideline recommendation	Compliant	Justification
Surveys should be done by a suitably qualified person with experience in vegetation or cockatoo surveys, depending on the type of survey being undertaken.	Yes	The ecologist undertaking the black cockatoo habitat assessment, Glenn Harris-Maslen, has five years' experience conducting habitat assessments for black cockatoos.
Survey should maximise the chance of detecting the species' habitat and/or signs of use.	Yes	The survey was undertaken in Spring which aligns with DCCEEW recommendations for undertaking surveys for black cockatoos on the Swan Coastal Plain (i.e., foraging habitat and night roosts – any time of the year; DAWE 2022
Survey should determine the context of the site within the broader landscape—for example, the amount and quality of habitat nearby and in the local region (for example, within 10 km).	Yes	The context of the habitats available within the survey area has been considered at a broader level and are discussed further below.
Survey should account for uncertainty and error (false presence and absences).	N/A	This recommendation refers to individual bird counts where presence/absence data is collected and is not applicable to this type of habitat assessment.
Survey should include collation of existing data on known locations of breeding and feeding birds and night roost locations.	Yes	Data have been obtained from Birdlife roosting and nesting database search (Birdlife 2023) and DBCA Threatened fauna database search (DBCA 2023b).
Survey should assess the extent, type and quality of the vegetation present, including the presence and extent of plants known to be used by the black cockatoos.	Yes	Foraging habitat was delineated and mapped in the field and a list of vegetation present has been compiled (refer to Section 4.3).
In potential breeding habitat, measurements of the diameter at breast height of trees in the patch of woodland/forest must be made to determine	Yes	Potential breeding trees are defined as trees of suitable species with a DBH over 50 cm. Trees were measured for DBH in the field, and where the DBH was over 50 cm, these trees were recorded, and

Referral guideline recommendation	Compliant	Justification
whether the habitat meets the definition of 'breeding habitat'.		signs of use/hollows were observed (refer to Sections below).
Search for signs of use by black cockatoos (e.g. suitable nest hollows, feeding signs or feeding debris, and sighting records).	Yes	The field survey involved walking transects through areas searching for feeding signs. In addition, where hollows were observed, chew marks and other signs of use were searched for using binoculars.

4. Results

4.1 Desktop assessment

A PMST search was undertaken to identify conservation-significant ecological communities recorded within or in proximity to the survey area (DCCEEW 2024; **Appendix E**). The location of known occurrences of the Honeymyrtle Shrubland TEC in proximity to the survey area was reviewed after being received from the City of Joondalup and DBCA (DBCA 2024). In addition, the City of Joondalup Black Cockatoo database and Birdlife Australia database of Black Cockatoo roosting and nesting sites was also queried to identify sites within or near to the survey area (Birdlife 2024).

4.1.1 Conservation significant ecological communities

Areas of the Honeymyrtle Shrubland TEC previously recorded within and in proximity to the survey area are presented in **Figure 3**. The survey area is located in the 'community may occur' range on the SPRAT database, while an area 50 m to the south-east of the survey area is considered likely to contain the Honeymyrtle Shrubland TEC. Given the proximity of this occurrence, the Honeymyrtle Shrubland TEC was considered as having Potential to occur within the survey area prior to the assessment. In addition, the PEC 'Coastal shrublands on shallow sands' (FCT29a) was considered as Likely to occur prior to the survey given that the survey area is located in an area covered by the SgSa vegetation community mapped by ELA in 2020, which showed close affiliation with the Gibson *et al.* (1994) FCT29a. FCT29a is listed by DBCA as a Priority 3 ecological community.

4.1.2 Black cockatoo roosting and nesting records

521 records of Black Cockatoos were identified within 10 km of the survey area as part of the desktop assessment (**Figure 4**). This included 494 records of Carnaby's Cockatoos, 6 records of Forest Red-tailed Black Cockatoos, 3 records of Baudin's Black cockatoos, and 18 records of 'white-tailed black cockatoos' (i.e. not distinguishing between Baudin's and Carnaby's cockatoos). Seven confirmed white-tailed (Carnaby's and/or Baudin's) roosts, one confirmed forest red-tailed roost and three confirmed joint (white-tailed and forest red-tailed) roosts occur within 12 km of the survey area (Birdlife 2024). The closest known confirmed roost occurs 3.4 km to the north-east of the survey area (WANTAMR001). An additional 19 unconfirmed roosts for Black Cockatoos occur within 12 km of the survey area (City of Joondalup 2024). The closest known unconfirmed roost occurs 2.1 km to the south-east of the survey area at Beaumaris Reserve in Ocean Reef (JOOILUR001) (City of Joondalup 2024).

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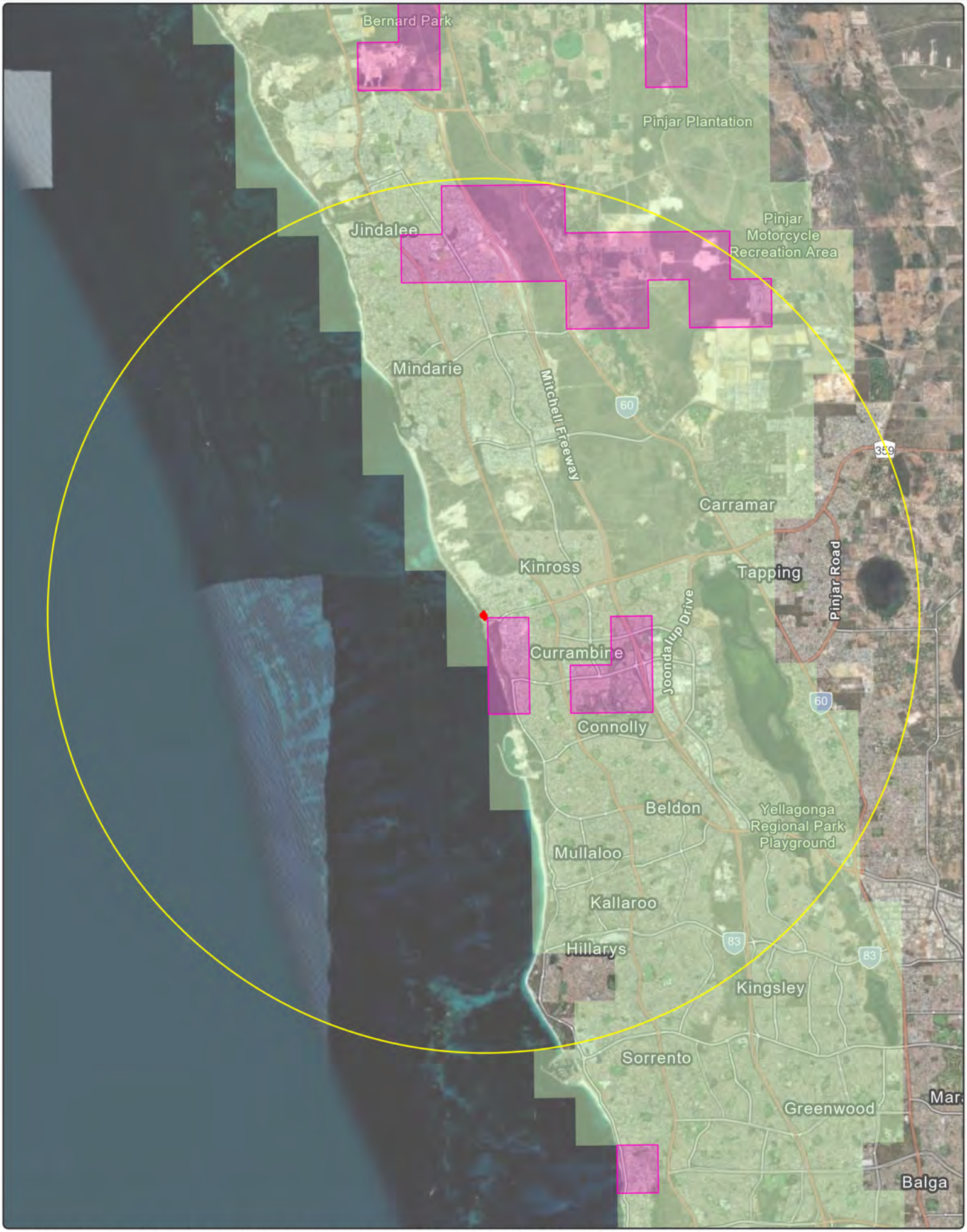


Figure 3: Previously mapped occurrences of Honeymyrtle Shrubland TEC in proximity to the survey area

Survey Area

10km buffer

Honeymyrtle Shrubland TEC

Community likely to occur within area

Community may occur within area

N

0 1 2 4

Kilometers

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-SNC Date: 10/12/2024

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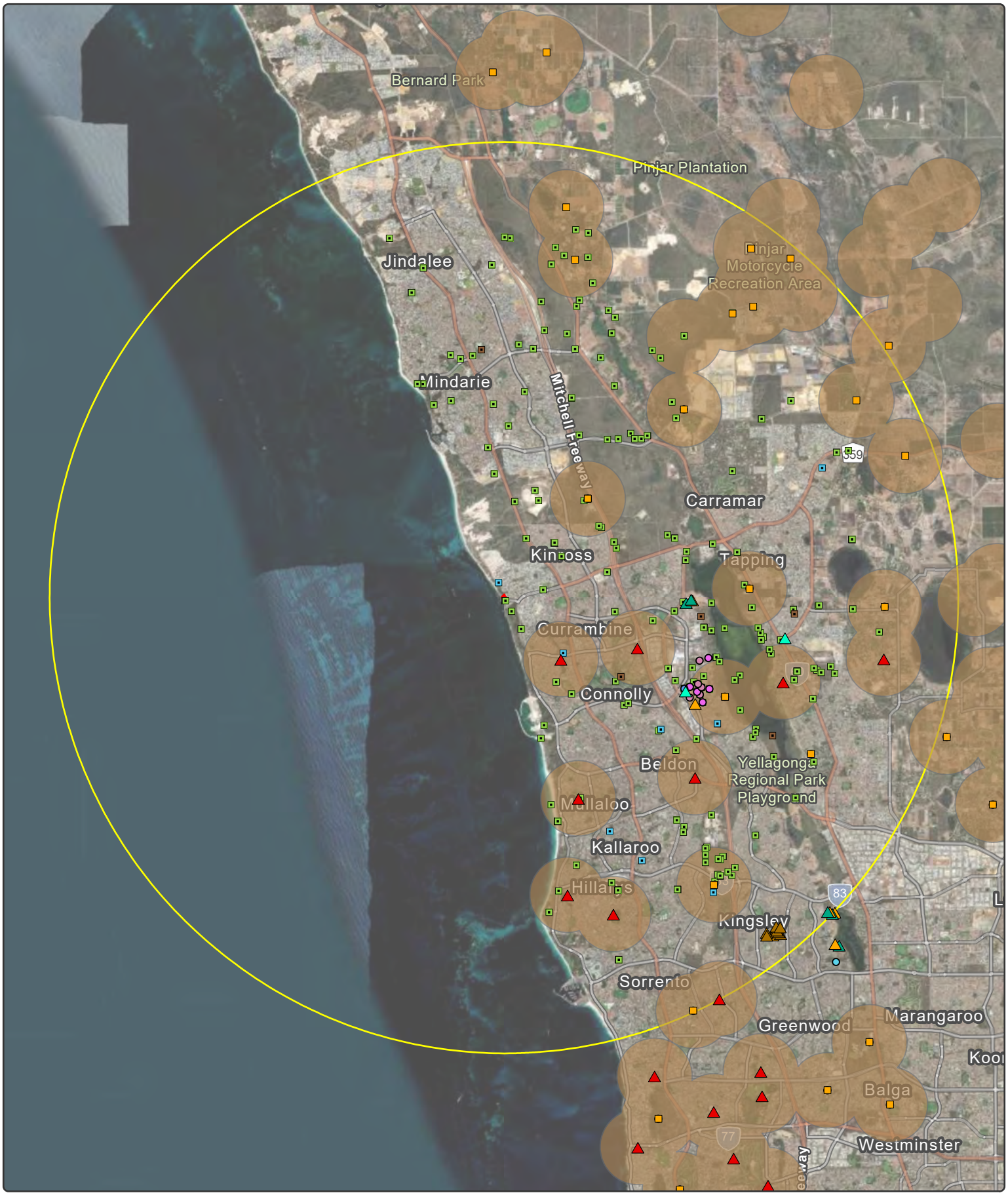


Figure 4: Black cockatoo habitat in proximity to the survey area

- 12km buffer
- Survey Area
- WA Carnaby Cockatoo roost
- Carnaby Cockatoo roosting sites 1km buffer

DBCA Data

- Baudin's cockatoo
- Carnaby's cockatoo
- Forest red-tailed black cockatoo
- White-tailed black cockatoo

CoJ Carnaby Cockatoo sites

- BC Dataset May 2024 DBCA,Confirmed Roost
- Birdlife Data,Confirmed roost
- WTBC Data Set May 2024 DBCA,Confirmed artificial hollow
- BC Dataset May 2024 DBCA,Confirmed Roost (Forest Red Only)
- WTBC Data Set May 2024DBCA,Confirmed artificial hollow
- WTBC Data Set May 2024DBCA,Confirmed natural hollow
- BC Dataset May 2024 DBCA,Unconfirmed Roost
- Eco Logical Data,Unconfirmed roost
- WTBC Data Set May 2024 DBCA,Unconfirmed artificial hollow
- WTBC Data Set May 2024 DBCA,Unconfirmed natural hollow
- WTBC Data Set May 2024DBCA,Unconfirmed artificial hollow

0 1.25 2.5 5
Kilometers

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879- SNC Date: 30/10/2024

N

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4.2 Flora and vegetation survey

4.2.1 Flora overview

A total of 39 flora species (15 native and 24 introduced) from 23 families and 34 genera were recorded from 3 quadrats and one relevé established across the survey area. Average species richness was 22 species, ranging from 19 species in BB02 to 26 species in BB01. The family with the highest number of species was Poaceae (6 species). Acacia was the best represented genus throughout the survey, with two taxa recorded. A full flora list is provided in **Appendix F** and a species by quadrat matrix is provided in **Appendix G**. ELA quadrat site data is provided in **Appendix H**. No flora species listed as Threatened under the EPBC Act or BC Act; or flora listed as Priority by DBCA were recorded within the survey area.

4.2.2 Species accumulation

A species accumulation curve was used to evaluate the adequacy of sampling (Clarke & Gorley 2015). Only species data recorded from defined quadrats were used; no relevé or opportunistic flora collections were included. The asymptotic value was determined using Michaelis Menten modelling. Using this analysis, the incidence-based coverage estimator of species richness was calculated to be 40. Based on this value and the total of 32 species recorded within quadrats, approximately 80% of the flora species potentially present within the survey area were recorded. The urban location and stochastic occurrence of weeds (singletons) within the quadrats likely had an influence of the number of taxa recorded. This fact, as well as the additional seven taxa recorded via relevés and opportunistic collections indicates that the majority of flora species potentially present in the survey area were recorded and the survey effort was therefore sufficient.

4.2.3 Introduced flora

A total of 24 introduced (weed) species were recorded within the survey area, representing 61.5% of the total species recorded. All weed species are listed on the Western Australian Organism List Database as permitted (s-11) species (DPIRD 2024), indicating that no specific management of these species is required.

4.2.4 Vegetation communities

One intact vegetation community – MiTdEl - was delineated and mapped within the survey area, covering 0.7 ha (82.2%) (**Table 7; Figure 5**). The hierarchical clustering dendrogram for this vegetation community is detailed in **Appendix I**. In addition to this vegetation community, one highly modified vegetation type was recorded. This included managed gardens of **Casuarina equisetifolia* over a mix of understorey species, commonly **Tetragonia decumbens* and **Arctotis stoechadis.* This modified vegetation type covered 0.1 ha (12%) of the survey area. Cleared areas covered 0.1 ha (5.9%) of the survey area.

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Table 7: Vegetation communities recorded within the survey areas

Vegetation community code	Representative photograph	Vegetation description	Associated species	Quadrats	Extent within the survey area	Proportion of the survey area
MiTdEl		*Myoporum insulare, Olearia axillaris, Rhagodia baccata* Mid Shrubland over **Tetragonia decumbens*, *Scaevola crassifolia*, **Pelargonium capitatum* Low Sparse Shrubland over **Ehrharta longiflora*, **Bromus diandrus* Low Sparse Grassland and *Lepidosperma gladiatum* Low Sparse Sedgeland	*Acacia rostellifera, Hardenbergia comptoniana, Spinifex longifolius, Spyridium globulosum, Threlkeldia diffusa, *Arctotis stoechadis, *Brassica tournefortii, *Crassula glomerata, *Galium murale, *Lactuca serriola, *Lysimachia arvensis, *Melilotus indicus, *Sonchus oleraceus, *Stellaria media, *Trachyandra divaricata*	BB01, BB02, BB03	0.7	82.2
-		Managed gardens of planted **Casuarina equisetifolia* over shrubland	**Casuarina equisetifolia*, **Metrosideros excelsa*, **Tetragonia decumbens*, **Arctotis stoechadis, *Atriplex prostrata, *Trifolium campestre, *Poaceae* sp., **Lactuca serriola, *Sonchus oleraceus, Grevillea banksii* x *bipinnatifida*	REL01	0.1	12.0
				Cleared	0.1	5.9
				Total	0.9	100

4.2.5 Conservation significant ecological communities

An analysis of vegetation floristics, structure, and composition was undertaken to identify conservation-significant ecological communities within the survey area. This involved an FCT analysis (Section 4.2.5.1) and an assessment against TEC approved conservation advice documentation (Section 4.2.5.2). Conservation-significant ecological communities that were recorded within the survey area are detailed in **Figure 7**.

4.2.5.1 FCT analysis

To identify potential TECs and PECs in the survey area, ELA quadrats and vegetation communities were compared to FCTs defined by Gibson *et al*. (1994). Results of the analysis are shown in Table 8.

Results of the multivariate analysis showed that quadrats assigned to the MiTdEl community floristically aligned with FCT29a (Gibson *et al.* 1994) (**Table 8**). As such, the inferred FCT type for this community is FCT29a, described as 'coastal shrublands on shallow sands'.

Table 8: Relationships between ELA vegetation communities and FCTs defined by GIbson *et al.* (1994).

Inferred FCT	ELA vegetation community	ELA quadrat numbers	Closest affiliated sites (FCT Gibson *et al.* 1994; Bray-Curtis similarity %)
FCT29a	MiTdEl	BB01	PRES-1 (34.8%), BURN-2 (33.3%)
		BB02	PRES-1 (33.3%), BURN-2 (31.8%)
		BB03	PRES-1 (37.2%)

4.2.5.2 Honeymyrtle Shrubland TEC assessment

Vegetation within the survey area was assessed against the key diagnostic characteristics outlined in the Honeymyrtle Shrubland TEC approved conservation advice (DCCEEW 2023) to determine the presence of the TEC in the survey area. The primary defining features of the Honeymyrtle Shrubland TEC include location, species assemblages, patch size, and condition.

Based on the assessment of the MiTdEl vegetation community against the conservation advice, it was determined that the Honeymyrtle Shrubland TEC was not present within the survey area. This was due to the absence of the three indicator species of the TEC (i.e. *Banksia sessilis, Melaleuca huegelii,* and/or *Melaleuca systena*) and absence of limestone outcropping. The assessment of vegetation against the key diagnostic characteristics for this TEC is presented in Appendix J.

The Honeymyrtle Shrubland TEC is also listed as Critically Endangered under the Western Australian *Biodiversity Conservation Act 2016* (BC Act). The state-listed Honeymyrtle Shrubland TEC is contingent on vegetation being floristically representative of FCT type 26a (Gibson *et al.* 1994). Given that the inferred FCT type for vegetation within the survey area is FCT29a, vegetation within the survey area is not considered to represent the Honeymyrtle Shrubland TEC listed under the BC Act.

4.2.6 Vegetation condition

The condition of vegetation in the survey area ranged from Good to Completely Degraded (**Table 9**; **Figure 6)** based on the vegetation condition scale of Keighery (1994) provided in EPA (2016) for the South West Botanical Province. Most of the intact vegetated part of the survey area was classed as being in Good condition, with modified areas of gardens being classed as Completely Degraded.

Disturbances in the survey area included tracks, clearing, weeds, housing, and roadsides. Cleared areas accounted for 5.9% of the survey area.

Table 9: Vegetation condition recorded in the survey area

Vegetation condition	Extent in the survey area (ha)	Proportion of the survey area (%)
Good	0.7	82.2
Completely Degraded	0.1	12.0
Cleared	0.1	5.9
Total	0.9	100%

4.3 Black cockatoo habitat assessment

Foraging quality for vegetation communities and types within the survey area was assessed as having 'No foraging value' based on the foraging habitat quality criteria depicted in Appendix D, given that no species present in the survey area are considered to be species used for foraging by Black Cockatoos. No potentially suitable breeding trees or roosting trees were recorded in the survey area during the assessment, with the only tall trees in the survey area being **Casuarina equisetifolia,* not considered to be a suitable breeding or roosting tree.



Figure 5: Vegetation communities in the survey area

Survey Area

MiTdEl

Cleared

Vegetation communities

Managed gardens of planted **Casuarina equisetifolia* over shrubland

N

0 10 20 40

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-SNC Date: 10/12/2024

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Figure 6: Vegetation condition in the survey area

Survey Area

Vegetation condition

- Cleared
- Completely Degraded
- Good

N

0 10 20 40

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

24PER8879-SNC Date: 10/12/2024

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Figure 7: Conservation significant ecological communities in the survey area

Survey Area

FCT29a Coastal shrublands on shallow sands PEC (P3)

N

0 10 20 40

Metres

Datum/Projection:
GDA 1994 MGA Zone 50

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5. Discussion

5.1 Flora and vegetation

Flora species recorded in the survey area were typical of the Swan Coastal Plain IBRA bioregion (WAH 1998-). No flora species listed under the EPBC Act or BC Act, or as Priority by DBCA were recorded within the survey area. Approximately 62% of the total species recorded in the survey area were introduced species, reflective of the location of the survey area in proximity to urban development, which acts as a vector for the spread of weeds. All introduced species are listed on the Western Australian Organism List Database as permitted (s-11) species, indicating that no specific management of these species is required (DPIRD 2024).

One intact vegetation community – MiTdEl - was delineated and mapped within the survey area, covering approximately 80% of the total survey area. This vegetation community was dominated by shrublands consisting mainly of *Myoporum insulare, Olearia axillaris, Rhagodia baccata, *Tetragonia decumbens, Scaevola crassifolia, *Pelargonium capitatum, Acacia rostellifera,* and *Spyridium globulosum.* The floristic assemblage of this vegetation community is typical of coastal environments across the Perth metropolitan area (Beard 1990). Overall, this vegetation community was considered to be in Good condition, due to the presence of weeds throughout the community. The MiTdEl community does not represent the Federally-listed Honeymyrtle Shrubland TEC based on an assessment against the key diagnostic characteristics described by DCCEEW (2023) as it does not contain any of the key indicator species of the TEC and does not occur on skeletal soils of outcrops derived from Tamala limestone. In addition, this community is not considered to represent the State-listed Honeymyrtle Shrubland TEC as it does not align floristically with FCT type 26a (Gibson *et al.* 1994).

Statistical analysis and comparison of the community against the Gibson *et al.* (1994) dataset found that the quadrats within the MiTdEl vegetation community had a moderate affiliation with FCT29a. This community, covering a total of 0.7 ha (82.2% of the survey area) is considered as representing floristic aspects of FCT 29a, 'coastal shrublands on shallow sands'. FCT29a is listed as a Priority Ecological Community (PEC) by DBCA under the 'Priority 3' category. PECs listed as P3 are classified as 'poorly known' but are made up of several known occurrences, known from a few widespread occurrences, or made up of large and/or widespread occurrences (DEC 2013). The coastal vegetation within the survey area was considered to represent FCT29a PEC during previous assessments by ELA (2021).

In addition, one highly modified vegetation type was recorded in the survey area, comprising of managed gardens of **Casuarina equisetifolia* over a mix of understorey species, commonly **Tetragona decumbens* and **Arctotis stoechadis.* This modified vegetation type covered 0.11 ha and was considered to be in Completely Degraded condition.

5.2 Black Cockatoos

No foraging, breeding, or roosting habitat was recorded within the survey area. None of the flora species recorded during the assessment are listed as Primary or Secondary foraging species for Carnaby's Black Cockatoo or Forest Red-tailed Black Cockatoo. As such the vegetation within the survey area is considered to have 'No foraging value' for Black Cockatoos. No tall Eucalypt trees were recorded and as such, there is no breeding or roosting habitat considered to be present in the survey area.

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Appendix A Appendix A Framework for conservation significant flora and fauna ranking

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

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

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

CONSERVATION CODES FOR WESTERN AUSTRALIA FLORA AND FAUNA

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

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

Threatened species (T)

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

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

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

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

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

Category	Code	Description
		Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.

Extinct species

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

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

Specially protected species

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

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

Categories are detailed below.

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

Priority species (P)

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

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

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

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

Appendix B: Likelihood of occurrence assessment criteria

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

Appendix C: Black cockatoo habitat definitions

Habitat	Definition
Foraging habitat	Foraging habitat is defined as plant species known to support foraging within the range of each species. The specific foraging requirements differ slightly between the three species as described in DAWE 2022: • **Carnaby's Cockatoo** - mainly feeds in native shrubland, kwongan heathland and woodland. Food items include seeds, flowers and nectar of native proteaceous plant species (i.e. *Banksia* spp., *Hakea* spp., and *Grevillea* spp.), as well as *Callistemon* spp. and marri (*Corymbia calophylla*). Also feeds on the seeds of introduced species including *Pinus* spp., *Erodium* spp., wild radish, canola, almonds, macadamia and pecan nuts; insects and insect larvae; occasionally flesh and juice of apples and persimmons; and liquid amber. • **Baudin's Cockatoo –** mainly feeds in eucalypt woodlands and forest, and proteaceous woodlands and heath. Food items primarily include seeds of marri, rarely jarrah (*Eucalyptus marginata*) and seeds of native proteaceous plant species (e.g. *Banksia* spp. and *Hakea* spp.). Also feeds on insects and insect larvae, pith of kangaroo paw (*Anigozanthos flavidus*); tips of *Pinus* spp.; *Macadamia* spp., almonds and pecans; seeds of apples, pears and persimmons. • **Forest Red-tailed Black Cockatoo** – mainly feeds in jarrah and marri woodlands and forest, and edges of karri forests including wandoo and blackbutt. Food items primarily include seeds of marri and jarrah. Also feeds on *Allocasuarina* cones, fruits of Snottygobble (*Persoonia longifolia*) and Mountain Marri (*Corymbia haematoxylon*). Other less important foods include: Blackbutt, Bullich, *Allocasuarina fraseriana*, *Hakea* spp., Tuart, Redheart Moit (*Eucalyptus decipiens*) and Bushy Yate (*E. lehmanni*). Also, some introduced eucalypts such as river red gum (*E. camaldulensis*) and flooded or rose gum (*E. grandis*).
Night roosting habitat	Habitat that contains one, or a group of, known or potential roosting trees: • **Known roosting tree** - a tree (generally the tallest), native or introduced know to be used for night roosting or which demonstrates evidence of roosting. Usually close to an important water source and within an area of high-quality foraging habitat. During the breeding season, male black cockatoos roost in the vicinity of the nesting trees, therefore a breeding area may also be considered to be night roosting habitat. • **Potential roosting tree** - a tall tree of any species within close proximity to water.
Breeding habitat	Breeding habitat: Habitat that contains known, suitable or potential nesting trees: • **Known nesting trees**: Trees (live or dead but still standing) which contains a hollow where black cockatoo breeding has been recorded or which demonstrates evidence of breeding (i.e. showing evidence of use through scratches, chew marks or feathers). • **Suitable nesting trees**: Trees with suitable nesting hollows present, although no evidence of use. Note that any species of tree may develop suitable hollows for breeding. • **Suitable nest hollow**: Any hollow with dimensions suitable for use for nesting by black cockatoos (Carnaby's Cockatoo 23-30cm [EPA 2019], Baudin's Cockatoo 30-40 cm [Chapman 2008], Forest Red-tailed Black Cockatoo 12–41 cm [Chapman 2008]). Suitable nest hollows are only found in live trees with a DBH of at least 500 mm. Usually this will be a natural hollow, but artificial hollows may also be suitable in some circumstances (for example, where the artificial hollow has been specifically designed for use by black cockatoos). Note that artificial hollows have only been shown to have value for Carnaby's Cockatoos to date. • **Potential nesting trees**: Trees that have a suitable DBH to develop a nest hollow, but do not currently have hollows. For most species of trees, suitable nest hollows are only found in live trees with a DBH of at least 500 mm. Trees suitable to develop a nest hollow in the future are 300-500 mm DBH. Note that many species of eucalypt may develop suitable hollows for breeding.

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Appendix D: Black cockatoo foraging habitat quality criteria

Foraging habitat quality	Carnaby's Cockatoo	Forest Black Cockatoo (Baudin's Cockatoo and Forest Red-tailed Black Cockatoo)
High	• Presence of suitable foraging plant species[1] at a high density (i.e. primary food sources[2] present at >60% PFC[3], secondary food sources[2] present at >70% PFC) and presence of preferred food sources at several strata; • Low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term); and/or • Lower quality foraging habitat based on vegetation characteristics, but with evidence of use (i.e. chewed nuts, cones, seeds or flowers). • Example: Banksia forest >60% PFC and Good or higher vegetation condition with low weed invasion and/or low tree deaths.	• Presence of suitable foraging plant species[1] at a high density (i.e. food sources present at >60% PFC[3]) and presence of preferred food sources at several strata; • Low weed invasion and/or low tree deaths (indicating it is robust and unlikely to decline in the medium term); and/or • Lower quality foraging habitat based on vegetation characteristics, but with evidence of use (i.e. chewed nuts, cones, seeds or flowers). • Example: Marri-Jarrah Forest >60% PFC and Good or higher vegetation condition with low weed invasion and/or low tree deaths.
Moderate to high	• Presence of suitable foraging plant species at a high density (i.e. primary food sources present at 40-60% PFC, secondary food sources at >60% PFC) and presence of preferred food sources at several strata; • Foraging species with >60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	• Presence of suitable foraging plant species at a high density (i.e. food sources present at 40-60% PFC) and presence of preferred food sources at several strata; • Foraging species with >60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Moderate	• Presence of suitable foraging plant species at a low to moderate density (i.e. primary food sources present at 20-40% PFC, secondary food sources at 40-60% PFC); • Foraging species with 40-60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	• Presence of suitable foraging plant species at a low to moderate density (i.e. food sources present at 20-40% PFC); • Foraging species with 40-60% PFC but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Low to moderate	• Suitable foraging species present but at a lower density (i.e. primary food sources present at 10-20% PFC, secondary food sources present at 20-40% PFC);	• Suitable foraging species present but at a lower density (i.e. food sources present at 5-20% PFC); • Foraging species with 20-40% projected foliage cover but foraging habitat viability

Foraging habitat quality	Carnaby's Cockatoo	Forest Black Cockatoo (Baudin's Cockatoo and Forest Red-tailed Black Cockatoo)
	• Foraging species with 20-40% projected foliage cover but foraging habitat viability reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).	reduced due to high weed invasion and/or tree deaths indicating that the vegetation could potentially decline in the medium term due to suppressed regrowth or disease; and/or • Lower quality foraging habitat but with evidence of use (i.e. chewed nuts, cones, seeds or flowers).
Low	• Suitable foraging species present at a low density (i.e. primary food sources present at <10% PFC, secondary food sources present at 10-20% PFC); and/or • Scattered foraging species or paddocks with known food sources such as melons or weeds that represent a short-term food source.	• Suitable foraging species present at a low density (i.e. food sources present at 1-5% PFC); and/or • Scattered foraging species or paddocks with known food sources such as melons or weeds that represent a short-term food source.
Negligible to low	• Presence of some scattered foraging species but <2% PFC.	• Presence of some scattered foraging species but <1% PFC.
No foraging value	• No foraging value. No Proteaceae, eucalypts or other potential sources of food. Examples: water bodies, bare ground, developed sites, mown grass.	• No foraging value. No eucalypts or other potential sources of food. Examples: water bodies, bare ground, developed sites.

[1] Based on the list of suitable foraging plants collated from the following sources: DAWE (2022), Groom (2011), Johnstone et al. (2010), Heydenrych (2012) and Lee et al. (2013).

[2] Primary food sources for Carnaby's Cockatoo are defined as those species which are known to provide a regular foraging resource and have been designated as being 'high' priority for planting by the Department of Environment and Conservation (now known as DBCA), where as secondary food items are defined as those species that are only occasionally foraged upon, and which have been assigned as being moderate to low priority for planting by DBCA (Groom 2011).
[3] PFC = projected foliage cover

Note: the general context of the site (i.e., surrounding landscape, connectivity, proximity of species records, proximity of known breeding or roosting sites and any evidence of use) is also taken into consideration when assigning a quality rating.

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Appendix E: PMST database search results

Appendix F: Flora species list

Family	Species name	Status
Aizoaceae	**Carpobrotus edulis*	Permitted – s11
Aizoaceae	**Tetragonia decumbens*	Permitted – s11
Apiaceae	*Daucus glochidiatus*	
Asphodelaceae	**Trachyandra divaricata*	Permitted – s11
Asteraceae	**Arctotis stoechadifolia*	Permitted – s11
Asteraceae	**Lactuca serriola*	Permitted – s11
Asteraceae	**Sonchus oleraceus*	Permitted – s11
Asteraceae	*Olearia axillaris*	
Brassicaceae	**Brassica tournefortii*	Permitted – s11
Caryophyllaceae	**Stellaria media*	Permitted – s11
Casuarinaceae	**Casuarina equisetifolia*	
Chenopodiaceae	**Atriplex prostrata*	Permitted – s11
Chenopodiaceae	*Rhagodia baccata*	
Chenopodiaceae	*Threlkeldia diffusa*	
Crassulaceae	**Crassula glomerata*	Permitted – s11
Cyperaceae	*Lepidosperma gladiatum*	
Euphorbiaceae	**Euphorbia terracina*	Permitted – s11
Fabaceae	**Acacia pycnantha*	Permitted – s11
Fabaceae	*Acacia rostellifera*	
Fabaceae	**Melilotus indicus*	Permitted – s11
Fabaceae	**Trifolium campestre*	Permitted – s11
Fabaceae	*Hardenbergia comptoniana*	
Fabaceae	*Templetonia retusa*	
Geraniaceae	**Pelargonium capitatum*	Permitted – s11
Goodeniaceae	*Scaevola crassifolia*	
Myrtaceae	**Metrosideros excelsa*	Permitted – s11
Oxalidaceae	**Oxalis pes-caprae*	Permitted – s11
Papaveraceae	**Fumaria capreolata*	Permitted – s11
Poaceae	**Bromus diandrus*	Permitted – s11
Poaceae	**Catapodium rigidum*	Permitted – s11
Poaceae	**Ehrharta longiflora*	Permitted – s11
Poaceae	**Lagurus ovatus*	Permitted – s11
Poaceae	*Poaceae* sp.	
Poaceae	*Spinifex longifolius*	

Family	Species name	Status
Primulaceae	**Lysimachia arvensis*	Permitted – s11
Proteaceae	*Grevillea banksii x bipinnatifida*	
Rhamnaceae	*Spyridium globulosum*	
Rubiaceae	**Galium murale*	Permitted – s11
Scrophulariaceae	*Myoporum insulare*	

Appendix G: Species by site matrix

Species	BB01	BB02	BB03
**Arctotis stoechadifolia*	x		
**Brassica tournefortii*	x	x	x
**Bromus diandrus*	x	x	x
**Carpobrotus edulis*			x
**Catapodium rigidum*	x		
**Crassula glomerata*	x	x	x
**Ehrharta longiflora*	x	x	x
**Fumaria capreolata*		x	
**Galium murale*	x		x
**Lactuca serriola*		x	x
**Lagurus ovatus*	x		
**Lysimachia arvensis*	x		x
**Melilotus indicus*	x		x
**Oxalis pes-caprae*	x		
**Pelargonium capitatum*	x	x	x
**Sonchus oleraceus*	x	x	x
**Stellaria media*	x	x	x
**Tetragonia decumbens*	x	x	x
**Trachyandra divaricata*	x	x	
**Trifolium campestre*			x
Daucus glochidiatus	x		
Hardenbergia comptoniana	x	x	
Lepidosperma gladiatum	x	x	x
Myoporum insulare	x	x	x
Olearia axillaris	x	x	
Poaceae sp.	x		
Rhagodia baccata	x	x	x
Scaevola crassifolia	x	x	x
Spinifex longifolius	x		x
Spyridium globulosum	x	x	
Threlkeldia diffusa		x	x

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Appendix H: Quadrat data

Site name	Date	Site type	Observer
BB01	06/09/2024	Quadrat 10 x 10m	GM, OS
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>20)	MiTdEl
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Myoporum shrubland	Dune	South	20
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/yellow	Sand	Limestone	0
Easting		**Northing**	
378644		6488819	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Myoporum insulare	40	M	Shrubs 1-2m
Spyridium globulosum	5	M	Shrubs 1-2m
**Tetragonia decumbens*	10	M	Shrubs 1-2m
Olearia axillaris	1.5	M	Shrubs <1m
Scaevola crassifolia	1	M	Shrubs <1m
Rhagodia baccata	1	M	Shrubs <1m

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Lepidosperma gladiatum	4	M	Sedges
**Ehrharta longiflora*	15	G	Grasses
**Bromus diandrus*	10	G	Grasses
Spinifex longifolius	0.5	G	Grasses
Poaceae sp.	0.5	G	Grasses
**Catapodium rigidum*	0.01	G	Grasses
**Lagurus ovatus*	0.01	G	Grasses
Daucus glochidiatus	0.01	G	Herbs
**Crassula glomerata*	0.2	G	Herbs
**Brassica tournefortii*	0.6	G	Herbs
**Melilotus indicus*	0.01	G	Herbs
**Galium murale*	0.01	G	Herbs
**Pelargonium capitatum*	1.5	G	Herbs
**Stellaria media*	0.01	G	Herbs
**Trachyandra divaricata*	1	G	Herbs
**Arctotis stoechadifolia*	4	G	Herbs
**Sonchus oleraceus*	0.1	G	Herbs
**Oxalis pes-caprae*	0.01	G	Herbs
**Lysimachia arvensis*	0.01	G	Herbs
Hardenbergia comptoniana	0.01	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA02	06/09/2024	Quadrat 10 x 10m	GM, OS
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds	Old (>20)	MiTdEl
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Myoporum shrubland	Dune slope into swale	North	15
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/yellow	Fine sand	Limestone	0
Easting		**Northing**	
378643		6488874	



Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Myoporum insulare	50	M	Shrubs 1-2m
Olearia axillaris	2.5	M	Shrubs 1-2 m
Spyridium globulosum	1	M	Shrubs 1-2 m
Scaevola crassifolia	1.5	M	Shrubs <1m
Rhagodia baccata	2	M	Shrubs <1m
**Tetragonia decumbens*	6	M	Shrubs <1m
Lepidosperma gladiatum	5	M	Sedges
**Ehrharta longiflora*	12	G	Grasses
**Bromus diandrus*	0.1	G	Grasses

Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Fumaria capreolata*	0.5	G	Herbs
**Crassula glomerata*	0.05	G	Herbs
**Trachyandra divaricate*	0.1	G	Herbs
**Sonchus oleraceus*	0.2	G	Herbs
**Brassica tournefortii*	0.1	G	Herbs
Threlkeldia diffusa	0.5	G	Herbs
**Stellaria media*	0.02	G	Herbs
**Lactuca serriola*	0.1	G	Herbs
**Pelargonium capitatum*	0.2	G	Herbs
Hardenbergia comptoniana	1.2	G	Climber

Site name	Date	Site type	Observer
Burns Beach ELA03	06/09/2024	Quadrat 10 x 10m	GM, OS
Vegetation condition	**Disturbance notes**	**Age since fire (years)**	**Vegetation community**
Good	Weeds, Tracks	Old (>20)	MiTdEl
Habitat description	**Landform unit**	**Aspect**	**Slope %**
Myoporum shrubland	Dune	West	25
Soil colour	**Soil type**	**Rock type**	**Outcropping (%)**
Grey/yellow	Fine sand	Limestone	1
Easting		**Northing**	
378658		6488794	

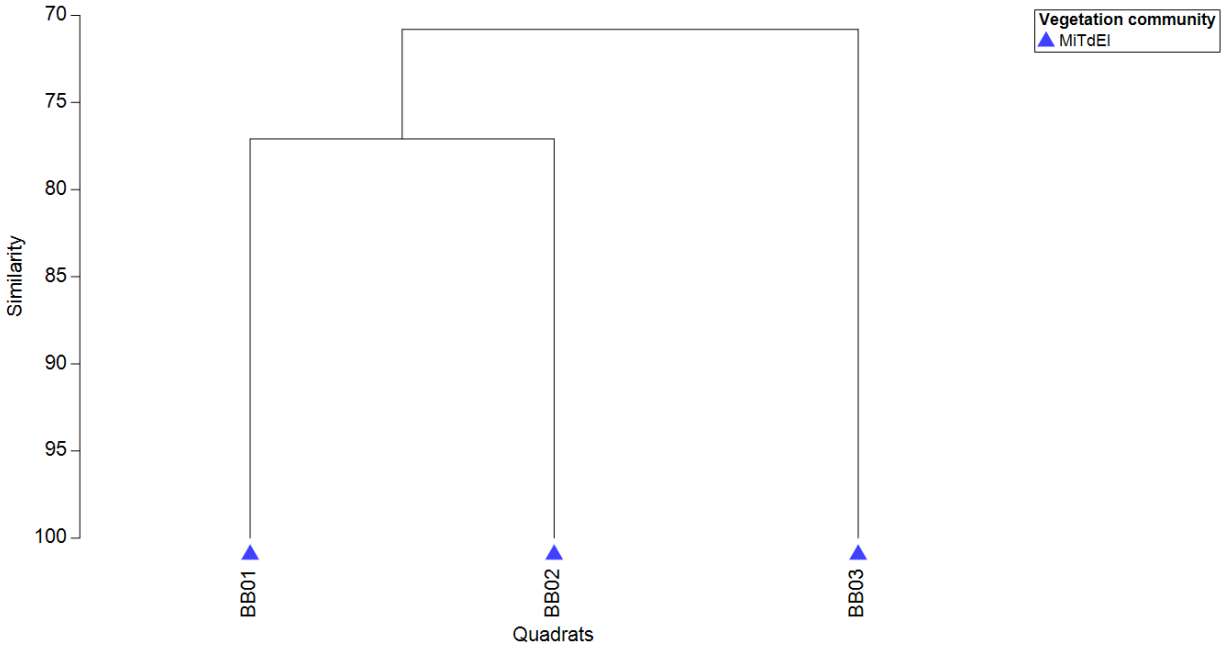


Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
Myoporum insulare	30	M	Shrubs 1-2m
**Tetragonia decumbens*	1.5	M	Shrubs <1m
Rhagodia baccata	5	M	Shrubs <1m
**Carpobrotus edulis*	0.01	M	Shrubs <1m
Scaevola crassifolia	3	M	Shrubs <1m
Lepidosperma gladiatum	20	M	Sedges
Spinifex longifolius	0.1	G	Grasses
**Ehrharta longiflora*	15	G	Grasses
**Bromus diandrus*	3	G	Grasses

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Species	Cover (%)	Stratum (U=Upper, M=Middle, G=Ground)	Sub-stratum
**Brassica tournefortii*	0.5	G	Herbs
**Lactuca serriola*	0.1	G	Herbs
**Melilotus indicus*	1.5	G	Herbs
**Trifolium campestre*	0.01	G	Herbs
**Pelargonium capitatum*	7	G	Herbs
**Crassula glomerata*	0.01	G	Herbs
**Sonchus oleraceus*	0.5	G	Herbs
Threlkeldia diffusa	0.5	G	Herbs
**Galium murale*	0.01	G	Herbs
**Stellaria media*	0.01	G	Herbs
**Lysimachia arvensis*	0.02	G	Herbs

Appendix I: Hierarchical clustering dendrogram



Appendix J: Honeymyrtle Shrubland TEC assessment

Key diagnostic characteristics (DCCEEW 2023)	Outcome
Occurs in the Perth subregion of the Swan Coastal Plain IBRA Bioregion in WA.	The survey area is located within the Perth subregion of the Swan Coastal Plain IBRA bioregion in WA and therefore meets this criterion.
Occurs on shallow to skeletal soils on the ridge slopes and tops of limestone ridges and outcrops associated with Tamala Limestone.	The survey area lies on top of deep sands on primary sand dunes, with no outcropping being observed throughout the survey area during the survey. While the survey area does occur over the Spearwood Dune land system (i.e. Tamala Limestone), the soils are not considered to be skeletal soils on ridge slopes or outcrops and therefore the vegetation within the survey area does not meet this criterion.
Occurs as shrubland, heath, or thickets; and has less than 10% canopy cover of *Eucalyptus* species or other tall trees.	The vegetation within the survey area occurs as a closed shrubland with less than 10% canopy cover of *Eucalyptus* species or other tall trees and therefore meets this criterion.
The shrub layer is dominated by *Melaleuca huegelii,* and/or *M. systena* and/or *Banksia sessilis* – commonly over *Acacia laiocarpa, Grevillea preissii,* and *Spyridium globulosum.*	The shrub layer for the MiTdEl does not contain either *M. huegelii, M. systena,* and/or *B. sessilis* and therefore does not meet this criterion.
The ground layer is typically rich with numerous herbs (including grasses) and smaller shrubs may develop a mossy ground cover.	Vegetation within the survey area lies atop deep sand dunes and the ground layer does not consist of numerous herbs or small shrubs developing a mossy ground layer. As such, the vegetation within the survey area does not meet this criterion.
Structure and diversity of Honeymyrtle shrubland may be altered by recent disturbances and cause a shift to a regenerative state. Under these circumstances the loss is likely to be a temporary phenomenon if natural regeneration is not disrupted. Recovering/regenerating areas are still included in the protected ecological community.	Vegetation within the survey area has not been altered by recent disturbances and as such this criterion is not considered applicable for this assessment.
Patch size – the minimum patch size for the community is considered to be 0.01 ha.	Vegetation within the survey area is greater than 0.01 ha in patch size and therefore meets the criterion for this assessment.



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Attachment 3: Pathogen Hygiene Procedure

City of Joondalup Staff and Contractors Pathogen Hygiene Procedure

All City staff and contractors are responsible for avoiding the spread of pathogens to protect the natural environment. This procedure is in accordance with the City of Joondalup *Pathogen Management Plan* and applies to City parks, urban landscaping areas and natural areas.

Clean-down procedures should be undertaken when conducting

- Works that disturb soil
- Tree pruning

Clean-down procedures consist of the following steps

1. Before entering the site, clean footwear, clothing, tools, equipment and vehicle to remove all soil and plant materials.
2. Conduct site activities.
3. Brush-down footwear, clothing, tools, equipment and vehicles within the site compound area or in the immediate vicinity of construction works to remove all soil and plant materials.
4. Exit the site.

Note: A vehicle washdown bay is available for use at the City of Joondalup Works Operation Centre. Contact your City representative for access.

General pathogen hygiene principles for on-site activities:

Parks and Urban Landscaping Areas

- In pathogen identified areas, avoid pruning trees during wet conditions where possible.
- Avoid damaging the trunk of trees when mowing or trimming.
- When walking on site, remain on paths and avoid bushland or vegetated areas where possible and/or practical.
- If accessing site with a vehicle, remain on formalised tracks or areas demarcated for vehicle access.
- Avoid water draining into bushland and vegetated areas.
- Use mulch that is certified pathogen free to the relevant Australian Standard (AS4454) and source plants from nurseries compliant with Nursery Industry Accreditation Scheme Australia (NIASA), where possible.

Natural Areas Bushland

- Works should commence in non-pathogen identified areas first and in known or suspected pathogen identified areas last.
- Avoid conducting works and accessing site in wet conditions, where possible.
- If accessing site with a vehicle, remain on formalised tracks or areas demarcated for vehicle access.
- When walking on site, remain on paths and avoid bushland or vegetated areas where possible and/or practical.
- In pathogen identified area, avoid pruning trees during wet conditions, where possible.
- Minimise water use in bushland and vegetated areas.
- Avoid water draining into bushland and vegetated areas.
- Use mulch that is certified pathogen free to the relevant Australian Standard (AS4454) and source plants from nurseries compliant with Nursery Industry Accreditation Scheme Australia (NIASA), where possible.

For any queries, please contact the Environmental Development Coordinator or email **enviro@joondalup.wa.gov.au**.

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10995 - LAST UPDATED FEBRUARY 2021