City of Melville

City of Melville

Bull Creek Catchment Strategic Management Plan 2021 - 2026

Executive Summary

The Bull Creek Reserves group is comprised of seven reserves within the Bull Creek Catchment that spans 21.65 hectares of bushland within the City of Melville. This Bull Creek Reserves Strategic Management Plan updates the previous Bullcreek Reserves Strategic Management Plan 2014-2019. The seven reserves within this catchment include:

- Bull Creek Reserve
- Bateman Park
- Reg Burke Reserve
- Richard Lewis Park
- Trevor Gribble Reserve
- Un-named 1 (Curedale Mews)
- Un-named 2 (Debries Place).

A total of 304 flora species were observed across the seven reserves, of which 145 are natives from 43 families. No threatened or priority species were found to be naturally occurring although two species (one priority and one threatened) were planted within the reserves and recorded as dubious, as these plants were outside the extent of their native range. Eight species were recorded during the survey which are part of the City's 'at risk' species list:

- *Cartonema philydroides*
- *Haemodorum paniculatum*
- *Isolepis marginata*
- *Opercularia hispidula*
- *Platysace filiformis*
- *Pterostylis pyramidalis*
- *Samolus repens*
- *Tecticornia indica* subsp*. bidens.*

One threatened ecological community, Temperate and Subtropical Coastal Saltmarsh is present on the northern boundary of Bateman Reserve bordering the Canning River (DBCA, 2021b). This ecological community is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), and as a Priority 3 under the Biodiversity Conservation Act 2016 (WA).

The Bull Creek catchment reserves provide habitat for an array of native fauna species including:

- 29 bird species
- three amphibians
- nine reptiles
- one mollusc
- 34 invertebrates.

A variety of habitat for fauna exists within the reserves, including four bat boxes and the presence of 146 habitat trees.

Several threats are present within the seven reserves which include:

- physical disturbance through vandalism, safety hazards and dumping of rubbish
- unplanned fires
- a total of 78 weeds, of which 12 are rated as Very High and 48 as High. Six weed species identified within the reserves are classified as significant (declared pest and/or Weeds of National Significance)
- habitat loss measured by the percentage of bare ground and weed cover
- a total of nine feral fauna species
- known presence of Dieback within Bull Creek Reserve

- influences through the presence of stormwater which include nutrient runoff, presence of heavy metals, introduction of sediments and weed species
- impacts from climate change.

Management strategies have been developed for 2021 – 2026, including Key Performance Indicators. These include:

- undertaking weed control, primarily targeting Very High and High impact weeds
- revegetation of proposed areas as outlined in Figure 10
- continue to monitor and report any increase in threats within the reserves, and undertake management in accordance with the City's Natural Areas Asset Management Plan (NAAMP)
- continue to monitor assets for decline in health or damage, with repairs or management in accordance with the NAAMP.

Acknowledgements

Natural Area Consulting Management Services would like to acknowledge the contribution of the following people during the preparation of the strategic management plan:

- Jacklyn Kelly from the City of Melville
- Friends of Gabbiljee (Bull Creek Catchment).

Table of Contents

1 Introduction

The City of Melville commissioned Natural Area Consulting Management Services (Natural Area) to prepare a site-specific Management Plan for the Bull Creek Catchment, in accordance with the City of Melville's *Natural Areas Asset Management Plan* (NAAMP, 2019). Natural Area carried out flora, vegetation, and fauna surveys within the Bull Creek Reserves to provide updated flora and fauna inventory lists to those initially outlined in the NAAMP, in order to ensure management strategies are addressing local and current conditions.

1.1 Background

The Bull Creek Catchment is located in the suburb of Bull Creek within the City of Melville, approximately 18 km south of the Perth Central Business District (Figure 1). This catchment covers 21.65 ha and consists of seven reserves, including:

- Bull Creek Reserve
- Bateman Park
- Reg Burke Reserve
- Richard Lewis Park
- Trevor Gribble Reserve
- Un-named 1 (Curedale Mews)
- Un-named 2 (Debries Place).

To date, there have been three management plans produced for the various reserves within the Bull Creek Catchment. They include *Bull Creek Park Management Plan* (Smith, 1987), *Bull Creek Wetlands Management Plan* (Ecoscape, 2004) and *Bull Creek Reserves Strategic Management Plan 2014 – 2019* (Waters, 2014). These management plans highlight site-specific threats and assets while outlining strategies to manage them accordingly. In order to ensure site conditions are updated and management plans are relevant, a review of existing management plans and on-ground surveys was required in order to update existing data and produce a new five-year management plan for the years 2021-2026.

The Bull Creek Reserve Strategic Management Plan 2021 - 2026 updates the Bull Creek Reserves Strategic Management Plan 2014 - 2019.

1.2 Objectives

The objectives of this plan are to provide flexible management strategies for site-specific risks, in accordance with the City's NAAMP, to maintain and enhance the various ecological functions and values associated within the seven Bull Creek reserves. The objectives include:

- identification of threatening processes and their potential levels and extent of impact
- identification of extent and condition of assets such as Bush Forever Sites, ecological linkages and conservation significant flora, fauna and communities
- provide site-specific management recommendations to reduce and manage negative impacts associated with the various threatening processes
- provide a plan to improve degraded areas within the reserve and maintain other areas.

1.3 Scope

Natural Area carried out the following works:

- basic flora survey to record any at-risk species, vegetation types and conditions
- point infestation and density mapping of all weed species
- detailed fauna survey including funnel and Elliot trapping over a 5-day period and installation of camera traps
- mapping locations of existing tracks and paths within the reserves
- mapping locations of disturbance activities and infrastructure
- mapping locations of habitat trees
- assess key threatening processes within the reserve
- producing management recommendations for Bull Creek Reserves.

Figure 1:

Site Boundary
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

2 Assets

2.1 Reserve Ratings

The City of Melville's NAAMP (2019) developed a framework for reserve management considering factors such as species present, vegetation types and community value in order to rate the City's numerous reserves from 1 (highest) to 5 (lowest). This allows the prioritisation and management of higher rated reserves in order to maintain their value. The seven Bull Creek Reserves are rated between 2 and 4, with the two smallest reserves being unrated (Table 1).

Bull Creek Park, Bateman Park, Reg Burke Park and Richard Lewis Park were all previously assigned the highest NAAMP rating. These changes reflect current changes occurring in the reserve by pest species and other impacts. The unnamed reserves that occur along Curedale Mews Reserve and Debries Place have no rating assigned.

Table 1: Bull Creek Reserves City of Melville

Name	Rating	Number	Total Area (ha)
Bateman Park	2	30646, 47415, Lot 9500	3.45
Bull Creek Park	2	32563, 43191	7.97
Reg Burke Reserve	3	32431	3.34
Richard Lewis Park	3	32863	5.94
Trevor Gribble Reserve	4	33964	5.33
Un-named (Curedale Mews)	N/A	42562	0.62
Un-named (Debries Place)	N/A	42570	0.39

2.1.1 Bush Forever

Bush Forever Sites are regionally significant bushland and wetland areas within the Swan Coastal Plain that were identified as requiring protection in Perth's Bushland Project (Government of Western Australia, 2000). One Bush Forever Site (338, *Yagan Wetland and Adjacent Bushland)* falls within four of the seven Bull Creek Reserves, including Bateman Park, Bull Creek Park, Richard Lewis Park and Reg Burke Reserve. This Bush Forever site meets four of the seven key criteria required for an area to be listed as a Bush Forever site, with these listed in Table 2 (Figure 2).

Table 2: Bush Forever criteria, Bull Creek Reserves

Bush Forever Criteria	Comments
Representation of ecological communities	▪ site is within the vegetation complex Bassendean - Central and South. ▪ contains the floristic community type (FCT) -*Seasonal Wetlands (Highly saline seasonal wetlands and Northern woodlands to forests over tall sedgelands alongside permanent wetlands)* (S2).
Rarity	▪ the Endangered Carnaby Cockatoo (*Calyptorhynchus latirostris*) is known to occur in the area.
General criteria for the protection of wetland and coastal vegetation	▪ Bateman Park is located on the Directory of Important Wetlands, Swan-Canning Estuary. ▪ one of the natural remnant vegetated areas on the Canning Estuary.
Criteria not relevant to determination of regional significance, but which may be applied when evaluating areas having similar values	▪ the area provides habitat for fauna ▪ it provides local ecological linkages to nearby reserves in terms of fauna movement ▪ part of open space of regional significance

Government of Western Australia (2000) and City of Melville (2019)

2.1.2 Ecological Linkages

Ecological linkages provide refuge for fauna to move between natural bushland areas, therefore increasing the size of available fauna habitat and increases genetic diversity of species present. Ecological linkages can also increase the effective size and maintain genetic diversity of flora populations between isolated bush remnants (Figure 2).

Table 3: Ecological linkages of the Bull Creek Reserves

Value	Reserve	Assets 2020
High Regional Greenway's; • 95 'Bullcreek Wetland Along Karel Ave to connect with Greenway 73 • 79, Swan River – Canning River	Bateman Park	Maintained (assume unchanged)
	Bull Creek Park	Maintained (assume unchanged)
	Reg Bourke Reserve	Maintained (assume unchanged)
	Richard Lewis	Maintained (assume unchanged)
Medium Reserve supporting remnant vegetation	Trevor Gribble	Maintained (assume unchanged)
	Curedale Mews	Maintained (assume unchanged)
	Debries Place	Maintained (assume unchanged)

Government of Western Australia (2000) and Alan Tingay and Associates (1998)

Figure 2:

Ecological Linkages
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

2.2 Site Assets

This section discusses the environmental, heritage and social assets of the Bull Creek Catchment.

2.2.1 Ecological Communities

2.2.1.1 Vegetation Complex

The Bull Creek Catchment is situated within the Bassendean Complex - Central and South (DBCA, 2021a). This complex is described as woodlands of Jarrah-Sheoak-Banksia on the sand dunes to low lying woodlands of *Melaleuca spp.* Sedgelands on low-lying depressions and swamps. Plant species include *Banksia attenuata, B. grandis, B, menziesii, B. ilicifolia, B. littoralis, M. preissiana, Kunzea vestita, Hypocalymma angustifolium, Adenanthos obovatus* and *Verticordia* spp. (Heddle, Loneragan and Havel, 1980). The pre-European extent of this vegetation complex remaining is:

- 27.7% within the Swan Coastal Plain (WALGA, 2013)
- 8.29% within the City of Melville local government area (WALGA, 2010).

2.2.1.2 Vegetation Types

Ecological communities are biological assemblages of plants and animals found in particular landscapes. They are mainly described based on the dominant flora stratums and compositions present but do provide fauna habitat for specific species. In this strategic management plan ecological communities are described based on the flora assemblages present within each of the reserves. Twelve vegetation types are present at the Bull Creek Catchment reserves and are detailed in Table 4 and shown in Figures 3 and 4.

The vegetation types described following the 2020 survey vary slightly in dominant species but the overarching Estuarine, Dryland and Wetland vegetation associations are still consistent with the previous 2004 survey. The differences are attributed to the judgment of assessors in the field, with more detailed information particularly for the Dryland association. The undertaking of revegetation and growth of species in these areas with flora having reached maturity since the 2004 survey, would have also attributed to changes in vegetation types over time.

One threatened ecological community (TEC) Temperate and Subtropical Coastal Saltmarsh is present on the northern boundary of Bateman Reserve bordering the Canning River (DBCA, 2021b). This ecological community is listed as vulnerable under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth), and as a Priority 3 under the Biodiversity Conservation Act 2016 (WA). The Juncus Sedgeland in the tidal areas adjacent to the river consists of dominant flora species listed in the *Conservation Advice (including Listing Advice) for Subtropical and Temperate Coastal Saltmarsh,* with *Juncus kraussii, Juncus pallidus, Suaeda australis* and *Tecticornia indica* subsp. *bidens* all present within this vegetation type (DAWE, 2021). Banksia Dominated Woodlands of the Swan Coastal Plain was also identified during database searches (DBCA 2021b). Although this TEC is identified as present within the database search, all reserves lack the dominant species required to form part of this TEC.

Table 4: Vegetation Types

Vegetation Associations	Waters (2013) using information from Ecoscape (2004)	Natural Area (2020)	Assets
Bateman Park			
Estuarine	Northern area of inundation abutting river – *Juncus kraussii* Southern area of inundation away from river – *Juncus pallidus, Baumea juncea, Melaleuca rhaphiophylla*	*Juncus kraussii* Sedgeland	Maintained
Wetland	*Melaleuca preissiana* Woodland	*Melaleuca preissiana* Woodland	Maintained
Dryland	*Banksia ilicifolia, Corymbia calophylla* and *Eucalyptus marginata* Woodland	Revegetation Area – *Banksia* spp., mixed shrubs and sedges	Assumed unchanged.
		Acacia saligna and *Kunzea glabrescens* shrubland over weeds	
	No Data	Parkland	
Bull Creek Park			
Wetland	Lower reaches – *Eucalyptus rudis, Melaleuca rhaphiophylla* Mid-section – *Eucalyptus rudis, Taxandria linearifolia* Upper reaches – *Taxandria linearifolia, Melaleuca preissiana*	*Eucalyptus rudis* and *Melaleuca preissiana* Woodland	Maintained. Taxandria linearifolia not recorded as dominant in mid-section
Dryland	*Banksia ilicifolia, Corymbia calophylla, Eucalyptus marginata*	Revegetation Area – *Corymbia calophylla, Banksia* spp., *Dodonaea hackettiana*	Assume unchanged
	Banksia attenuata, Banksia menziesii, Eucalyptus marginata	*Eucalyptus* and *Banksia* Woodland	Assume unchanged
Reg Bourke Reserve			
Wetland	*Melaleuca preissiana* Woodlands	*Melaleuca preissiana* Woodlands	Maintained
Dryland	*Banksia ilicifolia*, *Corymbia calophylla, Eucalyptus marginata*	*Eucalyptus* Woodland over mixed shrubland	Assume unchanged
		Mixed Shrubland	
Richard Lewis Park			
Wetland	*Melaleuca preissiana* Woodlands	*Melaleuca preissiana* Woodlands	Maintained
Dryland	*Banksia ilicifolia, Corymbia calophylla, Eucalyptus marginata* Woodland	Revegetation Area – *Corymbia calophylla, Banksia* spp.	Assume unchanged
		Eucalyptus rudis Woodland	
Trevor Gribble Reserve			
Wetland	*Melaleuca preissiana* Woodlands	*Melaleuca preissiana* Woodlands	Maintained
Dryland	*Banksia ilicifolia, Corymbia calophylla, Eucalyptus marginata* Woodland	*Eucalyptus sp.** over mixed shrubland	Assume unchanged

Vegetation Associations	Waters (2013) using information from Ecoscape (2004)	Natural Area (2020)	Assets
Curedale Mews			
Wetland	*Melaleuca preissiana* Woodlands	*Melaleuca preissiana* Woodlands	Maintained
Debries Place			
Wetland	*Melaleuca preissiana* Woodlands	*Melaleuca preissiana* Woodlands	Maintained
Dryland	*Banksia ilicifolia, Corymbia calophylla, Eucalyptus marginata* Woodland	*Acacia saligna* Shrubland	Assume unchanged

Figure 3:
Vegetation Types
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 17/06/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

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Figure 4:
Vegetation Types
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 17/06/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

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2.2.2 Fauna Habitat

The Bull Creek Catchment serves as an important habitat and refuge for native fauna, providing potential foraging and breeding resources as well as functioning as an ecological linkage for transient fauna species.

Significant habitat trees are important for several threatened species of black cockatoos. Habitat trees, as defined by having diameter at breast height (DBH) greater than 600 mm, are mapped with any notable fauna interactions such as nests, hollows and feral bee hives recorded (Table 5, Figures 5 - 8).

Table 5: Habitat Trees with a DBH > 60 cm in Bull Creek Catchment

Species	Alive	Dead	Total
Bateman Park			
Eucalyptus rudis	11 (1 x small hollow)	0	11
Eucalyptus todtiana	1	0	1
Melaleuca rhaphiophylla	6	0	6
Subtotal	**18**	**0**	**18**
Bull Creek Park			
*Eucalyptus accedens**	1	0	1
*Eucalyptus botryoides**	6	0	6
*Eucalyptus camaldulensis**	3	0	3
*Eucalyptus grandis**	9	0	9
Allocasuarina fraseriana	6	0	6
Eucalyptus marginata	1	0	1
Eucalyptus rudis	33 (1 x small hollow, 1 x bees in hollow)	0	33
Melaleuca preissiana	3	0	3
Nuytsia floribunda	1	0	1
Sub-total	**63**	**0**	**63**
Reg Bourke Reserve			
Eucalyptus sp.*	4	0	4
Allocasuarina fraseriana	1	0	1
Eucalyptus rudis	11 (3 x small hollows, 2 x bees in hollows)	1	12
Melaleuca preissiana	2 (1 x small hollows)	0	2
Sub-total	**18**	**1**	**19**
Richard Lewis Park			

Species	Alive	Dead	Total
Corymbia calophylla	4	0	4
Eucalyptus rudis	25 (2 x small hollows)	0	25
Melaleuca preissiana	1	0	1
Sub-total	**30**	**0**	**30**
Trevor Gribble Reserve			
*Eucalyptus grandis**	1	0	1
Eucalyptus sp.*	1	0	1
Sub-total	**2**	**0**	**2**
Curedale Mews			
*Melaleuca quinquenervia**	1	0	1
Melaleuca preissiana	3 (2 x small hollows)	0	3
Sub-total	**4**	**0**	**4**
Debries Place			
Eucalyptus camaldulensis subsp. *obtusa**	1	0	1
Allocasuarina fraseriana	1	0	1
Corymbia calophylla	1	0	1
Eucalyptus marginata	4	0	4
Melaleuca preissiana	3	0	3
Sub total	**10**	**0**	**10**
Total			**146**

Note: introduced tree species are denoted by *

Four bat boxes were recorded in Bull Creek during the 2020 field surveys, one of which contained an ant nest and therefore would be unsuitable for bats (Figure 8). Other fauna habitat recorded within the sites included two nesting burrows of the Rainbow Bee-eater within Richard Lewis in the turfed areas (Figure 7).

Figure 5:
Habitat Trees
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

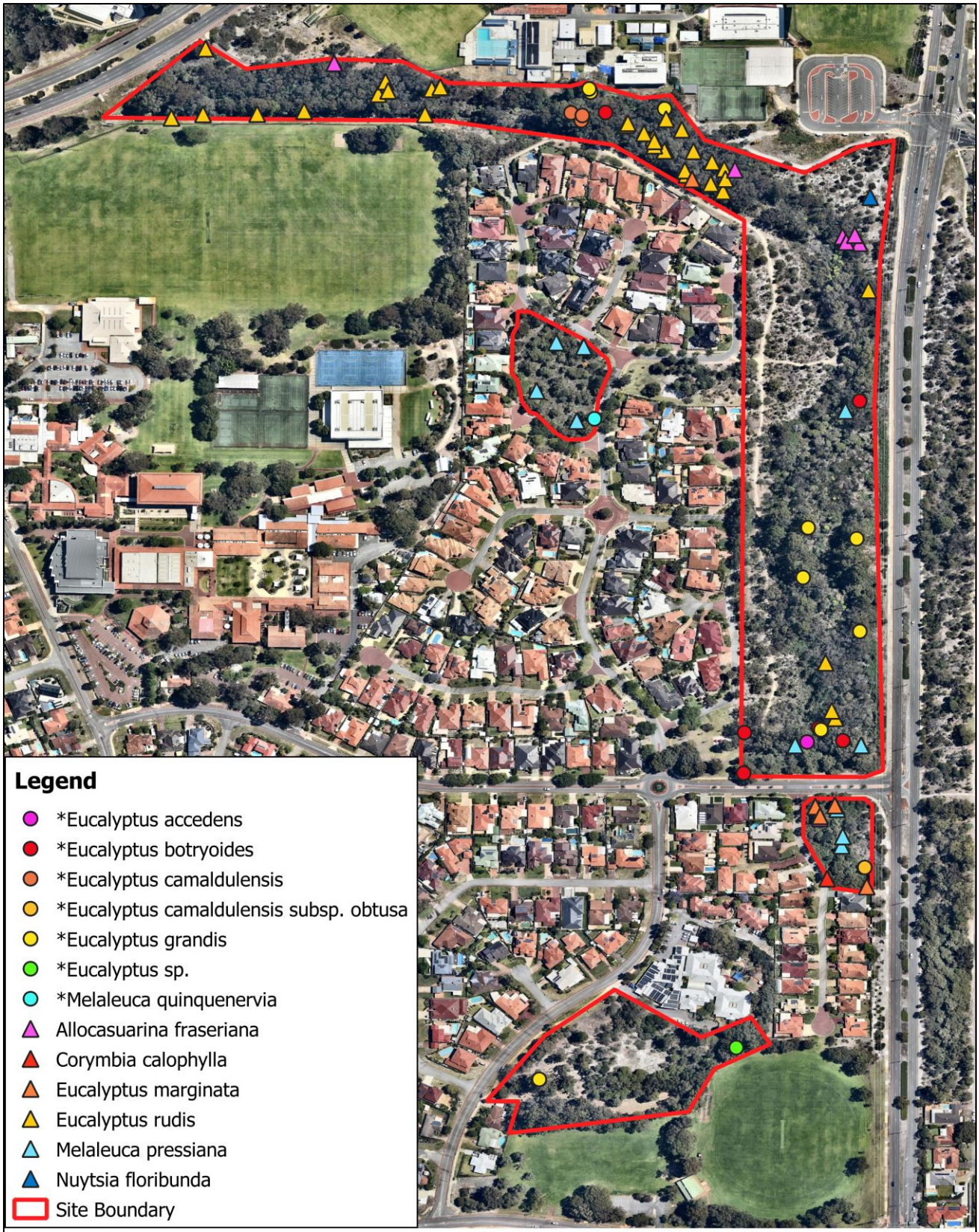

Figure 6:
Fauna Habitat
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Figure 7:
Fauna Habitat
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

Figure 8:
Fauna Habitat
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

2.2.3 Wetlands

Wetlands are areas that experience permanent, seasonal or intermittent waterlogging or inundation by water (DBCA, 2021c). Several natural waterways or wetlands occur within Bull Creek Catchment (Figure 9). They are categorised based on their physical classification and environmental evaluation (Table 6). Wetlands on the Swan Coastal Plain have been evaluated and assigned management categories (DBCA, 2021c), including:

- **Conservation Category**
  - Highest priority wetlands which support high levels of attributes and functions.
  - Preservation and protection through legislation, land use planning and on-ground conservation to maintain environmental values.
- **Resource Enhancement**
  - Priority wetlands which may have been modified but still support substantial ecological attributes and functions.
  - Proper management is required to protect and restore conservation values.
- **Multiple Use**
  - Wetlands with few remaining important attributes and functions.
  - Developments should consider ecological and environmental sustainability to ensure catchments are managed in accordance to best management practices.

Table 6: Wetlands within Bull Creek Reserves

Reserve	Wetland Type	Management Category	Area (ha)
Bateman Park	Basin, Estuary - Peripheral	Conservation	7.13
Bull Creek Park	Basin, Sumpland	Conservation	5.17
Reg Bourke Reserve	Basin, Sumpland	Resource Enhancement	1.68
	Basin, Sumpland	Multiple Use	0.27
	Basin, Sumpland	Conservation	0.04
Richard Lewis Park	Basin, Sumpland	Conservation	2.75
Trevor Gribble Reserve	Basin, Dampland	Resource Enhancement	0.48
Curedale Mews	Basin, Dampland	Conservation	0.94
Debries Place	Basin, Dampland	Resource Enhancement	0.14

Depth to groundwater within the various reserves (DWER, 2021) range from:

- 2.8 to 4.0 m within Richard Lewis
- 2.0 to 4.0 m within Reg Bourke
- 0.0 to 4.2 m within Bateman Park
- 2.5 to 4.0 m within Curedale Mews
- 1.8 to 5.0 m within Bull Creek Reserve
- 2.3 to 4.8 m within Debries Place
- 2.5m to 5.5 m within Trevor Gribble.

Figure 9:

Geomorphic Wetlands
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 17/06/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 200 400 m

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2.2.4 Heritage

The *Aboriginal Heritage Act 1972* (WA) recognizes the strong relationship of Aboriginal people to the land and provides protection for all places and objects of cultural and heritage significance. Section 175 of the *Aboriginal Heritage Act 1972* states that it is an offence to excavate, destroy, damage, conceal or in any way alter an Aboriginal heritage site.

Any management activities carried out within the reserves of Gabbiljee (Bull Creek) Catchment should consider Aboriginal Heritage and other heritage values presence at these sites, and if required, appropriate permits obtained from relevant stakeholders prior to commencement of any proposed works. A list of heritage sites associated with Bull Creek Catchment is provided in Table 7 and shown in Figure 10. The following registers and databases were accessed:

- Australia's National Heritage List (DAWE, 2021)
- Aboriginal Heritage Inquiry System (DPLH, 2021)
- WA Heritage Register (Government of Western Australia, 2021)
- City of Melville Heritage Register (City of Melville, 2019).

Table 7: Aboriginal and Other Heritage Sites listed within Bull Creek catchment

Type	Heritage Site	Site/Place No.	Reserve	Comment
Registered Aboriginal Heritage Site	Djarlgarra (Canning River)	3538	Adjacent to Bateman Park	Mythological, Named Place, Ochre, Water Source. No gender restrictions.
	Derbal Yiragan (Swan River)	3536	Adjacent to Bateman Park	Mythological. No gender restrictions.
Other Aboriginal Heritage Places (not registered)	Gabbiljee (Bull Creek)	3299	Within Bateman Park	Artefacts/ Scatter, Arch Deposits. No gender restrictions.
	Agincourt, Willetton	3661	Adjacent to Trevor Gribble	Artefacts/ Scatter. No gender restrictions.
	Bateman Road, Rossmoyne	4355	Adjacent to Richard Lewis Park	Artefacts/ Scatter. No gender restrictions.
Local Heritage Sites	Grasmere (Bateman Homestead)	1546	Close proximity to Bateman Park	Listed on State Register of Heritage Places which gives legal protection; development requires consultation with the City of Melville.
	Bateman Reserve	25432	Within Bateman Park	Encouragement to the owner under the City of Melville Planning Scheme to conserve the significance of the place.

Source: Department of Planning, Land and Heritage 2021

2.2.5 Community Interest

Bateman Park, Richard Lewis Park, Reg Bourke Reserve and Bull Creek Park are zoned as Parks and Recreation while Trevor Gribble Park, Debries Place and Curedale Mew are zoned as Public Open Space according to City of Melville Local Planning Scheme No.6. As such, these reserves are accessible to the public with some reserves sporting several facilities such as formal paths and park seating. The reserves are mostly utilised for passive recreation such as walking, dog walking, bird watching and bike riding on the sealed paths at Bateman. Educational signage on native flora and

fauna species is also present in the western side of Bateman near the bridge and at Bull Creek Park. Formal pathways, recommended revegetation, and infill areas (previously revegetated) are shown in Figures 11 and 12.

Local community groups, schools and the general public and regularly participate in natural area management activities including revegetation, rubbish removal as well as opportunistic reporting of flora and fauna species encountered within the reserve. Engaging the community in decision-making processes and involving community members in on-ground field work helps to raise awareness and increase knowledge on local environmental related issues. Community groups and schools also provide an invaluable resource to help with on-going revegetation efforts and monitoring.

Friends of Gabbiljee (Bull Creek) is the main active community group servicing the reserves with members undertaking activities such as:

- guided walks
- planting in revegetation sites
- weeding
- watering activities
- monitoring
- rubbish removal.

Figure 10:
Heritage Sites
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 200 400 m

N

Figure 11:

Community Interest
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 17/06/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

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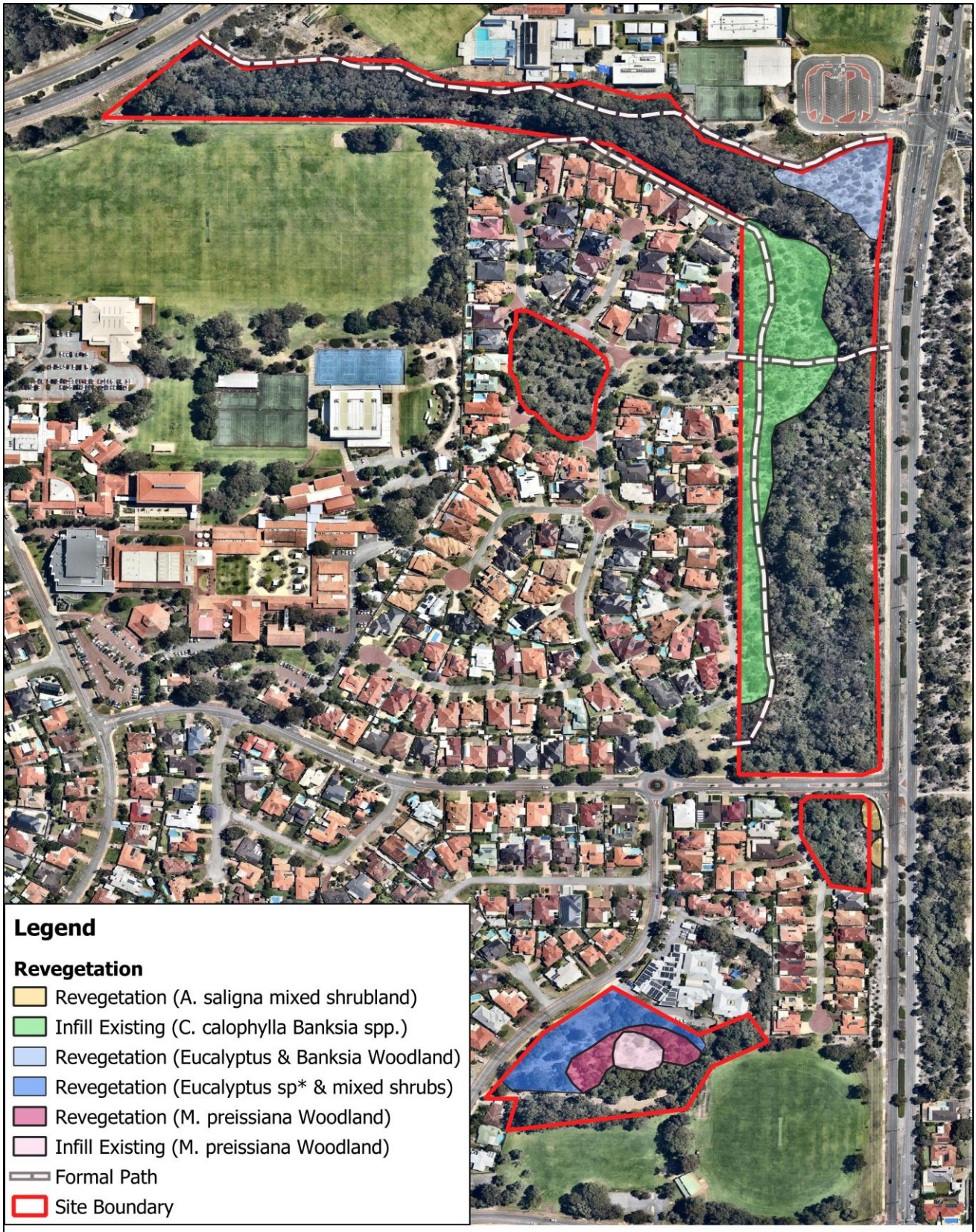


Figure 12:
Community Interest
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 17/06/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

2.2.6 Reference Sites

Natural Area undertook fauna surveys in 2020, including the deployment of fauna traps, where GPS coordinates were recorded (Appendix 1). Fauna trapping consisted of:

- trail cameras
- Elliot traps
- trap lines consisting of funnel traps and fly-wire.

2.3 Species

A total of 304 (145 introduced, 19 dubious) flora species and 82 (8 introduced) fauna species were observed across the seven reserves within Bull Creek Catchment. Introduced and dubious species are described in section 3.3 and 3.5.

2.3.1 Native Flora

A targeted flora assessment was undertaken in spring 2020, observing a total of 145 native species across 43 families. No threatened or priority species were found to be naturally occurring within the Bull Creek Reserves. Table 8 summarised the presence/absence 'at-risk' species within Bull Creek Reserves, with seven species recorded in the Catchment. Examples of the native flora species are shown Figure 13, with a complete flora list in Appendix 3.

Taxandria linearifolia

Hybanthus calycinus
(Wild Violet)

Caladenia flava
(Cowslip Orchid)

Viminaria juncea
(Swishbush)

Gahnia decomposita

Gastrolobium ebracteolatum

Figure 13: Examples of native flora species observed within the Bull Creek Reserves

Table 8: 'At-Risk' (high priority) flora species

At-risk Species	Previous year	2020	Assets 2020
Aotus cordifolia	2004	-	Assumed locally extinct. May be within blackberry thickets
Cartonema philydroides	1983	Bull Creek Reg Burke	Maintained
Eriochilus scaber	1983	-	Assumed locally extinct. – winter orchid, flowers after fire.
Haemodorum paniculatum	No Data	Bull Creek	Maintained
Isolepis marginata	No Data	Richard Lewis	Maintained
Juncus kraussii subsp. australiensis	No Data	-	Assumed locally extinct. *J. kraussii* occurs. Habitat suitable.
Opercularia hispidula	No Data	Richard Lewis	Maintained
Platysace filiformis	No Data	Curedale	Maintained
Pterostylis pyramidalis	No Data	Reg Burke Trevor Gribble	Maintained
Samolus repens	No Data	Bateman Curedale	Maintained
Tecticornia indica subsp. bidens	No Data	Bateman	Maintained

2.3.1.1 Dubious Flora

A targeted flora assessment was undertaken in spring 2020, observing a total of 19 dubious species across seven families. One threatened and one priority species were found within the revegetation area in Bull Creek Park. One 'at-risk' species was found in Trevor Gribble Reserve, due to the degraded nature and proximity to various other planted species it is likely that this species is not naturally occurring. Table 9 summarises the dubious presence/absence 'at-risk' species within Bull Creek Reserves. A complete flora list is provided in Appendix 3 with separate native, weed and dubious flora species lists.

Of the 19 dubious species found across all seven reserves none are considered to be invasive, and as such removal is not necessary. These species are native to the greater Swan Coastal Plain region, but not endemic to Bull Creek Reserves. Future revegetation should include species which are locally endemic and appropriate to the surrounding vegetation type. While no targeted removal is required, opportunistic removal of dubious species can be undertaken while conducting general weed control where any impacts to surrounding native vegetation will be minimal.

Table 9: Summary of Dubious species

Dubious Flora	Count	Comment
Species	19	Species planted as part of revegetation.
Families	8	
Threatened/Priority	2	Bull Creek Park *Dodonaea hackettiana* – P4 *Grevillea thelemanniana* - T
'At-Risk' (as identified by the City)	1	Trevor Gribble Reserve *Anigozanthos flavidus*

2.3.1 Native Fauna

The Bull Creek Reserves provide a variety of different habitats for an array of fauna, particularly reptiles and birds, with a total of 75 species recorded. All fauna surveying including trapping, night

stalks and motion activated camera trapping was conducted between the 9th to the 13th of November 2020.

A total of 67 native fauna species from four taxonomic groups were observed across the Bull Creek Reserves. Examples observed are shown in Figure 14 with a complete species list in Appendix 4.

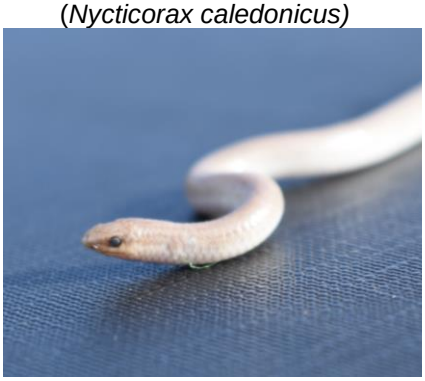
Fauna observed within the Bull Creek Reserves included:

- 29 birds
- three amphibians
- 9 reptiles
- 33 invertebrates.

Nankeen Night Heron
(*Nycticorax caledonicus*)

Brown Goshawk
(*Accipiter fasciatus*)

Splendid Fairywren
(*Malurus splendens*)



Worm Lizard
(*Aprasia repens*)

Ctenotus australis

Red-tailed Black Cockatoo
(*Calyptorhynchus banksii naso*)

Figure 14: Examples of native fauna species observed within the Bull Creek Reserves

2.3.1.1 Mammals

Two mammal species were observed in the 2020 survey, both were feral. No 'At-Risk' Mammal species listed by the City were found within the Bull Creek Reserves; however, their potential presence is assessed in Table 10.

Table 10: 'At-Risk' Mammal Species Indices

Species Values	Mammals	Previously Recorded	Presence 2020	Assets
Very High	Rakali – P4 (*Hydromys chrysogaster*)	-	-	Assumed locally extinct. Targeted survey conducted in 2015, presence undetermined. Habitat suitable
	Southern Brown Bandicoot / Quenda – P4 (*Isoodon fusciventer*)	-	-	Assumed locally extinct. Habitat suitable
Medium	Bush Rat (*Rattus fuscipes*)	-	-	Assumed locally extinct. Habitat suitable

Species Values	Mammals	Previously Recorded	Presence 2020	Assets
	Honey Possum (*Tarsipes rostratus*)	-	-	Assumed locally extinct, lack of suitable understorey foraging flora species present
	Brush-tailed Possum (*Trichosurus vulpecula*)	-	-	Assumed locally extinct. Habitat suitable

BT = Bateman, BC = Bull Creek, RL = Richard Lewis, RB = Reg Burke, TB = Trevor Gribble, CM = Curedale Mews & DP = Debries Place.

2.3.1.1 Bats

Nine microbat species are known to occur within Western Australia's south-west region (Australian Bat Society Inc., 2021). Generally, microbats roost in natural spaces; however, they have been found to roost in ceilings or wall-cavities due to increased urbanisation and fragmentation that has led to increases in urban bat populations (DBCA, 2017). Bats are found to be highly complex social animals, often forming fission-fusion societies with their activity influenced by a number of factors at temporal and thermal scales (Godinho *et al*., 2015 & Milne, 2006).

The Bull Creek Reserves would provide suitable habitat and natural refuge for urban bat populations for the species that populate this region. No bat species or indicators of their presence were observed within Bull Creek Reserves in the 2020 survey. Two species were recorded in 2013 with Gould's Wattle Bat (*Chalinolobus gouldii*) being considered an 'at-risk' species (Waters, 2014). Evidence of microbats utilising the four existing bat boxes in Bull Creek Park has not yet been determined. It is suggested that additional bat boxes be installed on mature trees in clusters to accommodate roosting patterns associated with microbat social dynamics (Godhino *et al*., 2017).

Table 11: At Risk Bat Species Indices

Species Values	Bat Species	Previously Recorded	Presence 2020	Assets
Medium	Gould's Wattled bat (*Chalinolobus gouldii*)	2013 (BC)	Assumed present	Assume present
	Lesser Long-eared Bat (*Nyctophilus geoffroyi*)	-	-	Assume present, habitat suitable.
	Southern Forest Bat (*Vespadelus regulus*)	-	-	
	Chocolate Wattled Bat (*Chalinolobus morio*)	-	-	
	Gould's Long-eared Bat (*Nyctophilus gouldii*)	-	-	
	Greater Long-eared Bat (*Nyctophilus major*)	-	-	

BT = Bateman, BC = Bull Creek, RL = Richard Lewis, RB = Reg Burke, TB = Trevor Gribble, CM = Curedale Mews & DP = Debries Place.

2.3.1.3 Birds

Birds listed within Bull Creek Reserve are listed in Appendix 4. A total of 32 different bird species were observed and of these three are introduced species. Birds that are classified as 'at-risk' by the City are shown in Table 12 and their presence or absence is compared against previous management plans.

Two bird species classified as Threatened under the *Biosecurity Conservation Act 2016* (WA) have been recorded within the Bull Creek Catchment area. The Carnaby's Cockatoo (*Calyptorhynchus*

latirostris) which is also listed as Endangered under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act) *1999* (Cth) was observed in Bull Creek in 2013 (Table 12). All reserves within the Bull Creek Catchment excluding Trevor Gribble Park are listed as sites which require further investigation to determine if they support Carnaby Cockatoo feeding habitat (DBCA 2019a) with five known roosting sites located within 5 km of the Bull Creek Reserves (DBCA, 2019a). The Red-tailed Forest Black Cockatoo (*Calyptorhynchus banksii naso)* is listed as Vulnerable under the EPBC Act 1999, with this species presence noted in five reserves in the 2020 survey, the Bull Creek Reserves are situated within known black cockatoo roosting sites (DBCA, 2019).

Table 12: At Risk Bird Species Indices

Species Values	Birds	Previously Recorded	Presence 2020	Assets
Very High	Carnaby's Cockatoo – T/EN (*Calyptorhynchus latirostris*)	2013 BC	-	Assume present
	Red-tailed Black Cockatoo –VU/EN (*Calyptorhynchus banksii naso*)	-	BT, BC, RL, CM, DP	Assume present
	Eastern Great Egret (*Ardea alba*)	Year N/A BT	BT	Assume present
	Barking Owl (*Ninox connivens*)	-	-	Assume locally extinct
	Cattle Egret (*Ardea ibis*)	-	-	Occurrence possible, habitat suitable
High	Inland Thornbill (*Acanthiza apicalis*)	Year N/A BC?	BC	Maintained
	Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*)	2003 BC?	-	Assume present
	Western Thornbill (*Acanthiza inornata*)	Year N/A BC?	-	Assume locally extinct
	Western Wattlebird (*Anthochaera lunulata*)	2013 BC	-	Potentially locally extinct.
	Musk Duck (*Biziura lobata*)	2013 BT	-	Assume present
	Dusky Moorhen (*Gallinula tenebrosa*)	-	BT	Assume present
	Splendid Fairy-wren (*Malurus splendens*)	2003 BC?	BC, RB	Maintained
	Rainbow Bee-eater (*Merops ornatus*)	2013 BC	RB, RL, TG	Maintained. Burrows at Richard Lewis.
	Nankeen Night-Heron (*Nycticorax caledonicus*)	-	BC	Assume present
	Common Bronzewing (*Phaps chalcoptera*)	2013 BC	RB	Maintained
	New Holland Honeyeater (*Phylidonyris novaehollandiae*)	2013 BC	BC, RB, DP	Maintained
	Weebil (*Smicrornis brevirostris*)	2013 BT, RB, RL	-	Assume locally extinct.
High	Hardhead (*Aythya australis*)	-	-	Occurrence likely at Bateman as this species prefers deep water
	Rufous Treecreeper (*Climacteris rufa*)	-	-	Presume locally extinct. Habitat suitable.
	Grey Strike-thrush (*Colluricincla harmonica*)	-	-	Assume locally extinct

Species Values	Birds	Previously Recorded	Presence 2020	Assets
	Painted Button-quail (*Turnis varia*)	-	-	Assume locally extinct
Medium	Red-capped Parrot (*Platycercus spurius*)	2013 BC	-	Maintained
	Scarlet Robin (*Petroica boodang*)	-	-	Occurrence possible. Habitat suitable.
Low	Western Spinebill (*Acanthorhynchus superciliosus*)	Year N/A BC?	-	Assume locally extinct
	Tree Martin (*Hirundo nigricans*)	2013 BC	BC, RL	Maintained
	Striated Pardalote (*Pardalotus striatus*)	2013 BC	BC	Maintained
	Australian Ringneck (*Platycercus zonarius*)	Year N/A BC	-	Assume present
	Sacred Kingfisher (*Todiramphus sanctus*)	Year N/A BC	-	Assume locally extinct

BT = Bateman, BC = Bull Creek, RL = Richard Lewis, RB = Reg Burke, TB = Trevor Gribble, CM = Curedale Mews & DP = Debries Place.

2.3.1.3 Reptiles and Amphibians

Reptiles and Amphibians observed within Bull Creek Reserve are listed in Appendix 4. A total of 13 different species were observed with no introduced species recorded. Reptiles that are classified as 'at-risk' by the City are shown in Table 13 and their presence or absence is compared against previous management plans.

Table 13: At Risk Reptile and Amphibian Species Indices

Species Values	Reptiles and Amphibians	Previously Recorded	Presence 2020	Assets
Very High	Mourning Skink (*Lissolepis luctuosa*)	Bull Creek	-	Occurrence possible, habitat suitable at Bateman and Bull Creek
	Lined Skink – P3 (*Lerista lineata*)	-	-	Occurrence possible, habitat suitable at Bateman
	Black-striped Snake – P3 (*Neelaps calonotos*)	-	-	Occurrence possible, habitat suitable in dryland areas
High	Gould's Sand Goanna (*Varanus gouldii*)	-	-	Assume locally extinct. Habitat suitable Bull Creek
Medium	Western Heath Dragon (*Ctenophorus adelaidensis*)	Bull Creek?	-	Occurrence possible, habitat suitable
	Gray's Legless Lizard (*Delma grayii*)	Bull Creek?	-	Occurrence possible, habitat suitable
	Fraser's Legless Lizard (*Delma fraseri*)	Bull Creek	-	Occurrence possible, habitat suitable
	Burton's Snake Lizard (*Lialis burtonis*)	Bull Creek	-	Occurrence possible, habitat suitable
	Keeled Legless Lizard (*Pletholax gracilis*)	Bull Creek?	-	Occurrence possible, habitat suitable
	Common Scaly-Foot (*Pygopus lepidopodus*)	Bull Creek?	-	Occurrence possible, habitat suitable

	Western Tiger Snake (*Notechis scutatus*)	-	-	Assume locally extinct. Habitat suitable but areas are small and fragmented.
	Southern Blind Snake (*Anilios australis*)	-	-	Occurrence possible, habitat suitable
	Common Beaked Blind Snake (*Anilios waitii*)	-	-	Occurrence possible, habitat suitable
	Yellow Faced Whip Snake (*Demansia psammophisI*)	-	-	Occurrence unlikely, habitat too fragmented
	Black-naped Snake (*Neelaps bimaculatus*)	-	-	Occurrence possible, habitat suitable
Low	Western Bearded Dragon (*Pogona minor minor*)	Bull Creek	-	Assume present
	Worm Lizard (*Aprasia repens*)	Bull Creek	Curedale	Assume present
	Dugite (*Pseudonaja affinis*)	-	Bull Creek	Confirmed present. Habitat suitable but areas are small and fragmented.
	Marbled Gecko (*Christinus marmoratus*)	-	-	Assume present, habitat suitable and this species does well in urban areas

2.3.1.5 Invertebrates

Invertebrates observed within Bull Creek Park are listed in Appendix 4. A total of 32 different species were observed, with one introduced species recorded. The 'at-risk' invertebrate species listed by the City were not observed (Table 14).

A review of the PMST report indicates that the Carter's Freshwater Mussel (*Westralunio carteri*) listed as Threatened under the BC Act 2016 (WA) and Vulnerable under the EPBC Act 1999 (Cth) or its habitat has the potential to occur within Bull Creek Reserves (DAWE 2021a), specifically within Bateman and Bull Creek Park due to the presence of flowing water. The Carter's Freshwater Mussel has seen a large decline in its range over three generations, a result of secondary salinisation within the waterways it inhabits (Klunzinger *et al*., 2015). This species is associated with riparian vegetation, soft yet stable sediments and the presence of a host organism to complete the glochidia (larval) form of their lifecycle (Threatened Species Scientific Committee, 2017). Further examination of the biology of this species determined it requires an environment with salinity less than 1.62 g L^{-1} and an average total nitrogen level less than 0.69g L^{-1} (Klunzinger *et al*., 2015, Threatened Species Scientific Committee, 2017). Intensive surveying was conducted over coastal freshwater rivers and lakes across the South-West to determine extent of remaining populations, with three survey sites located within Bull Creek Park and Yagan Reserve (adjacent to Bateman Park). No evidence of the mussels were observed during the 2020 survey although their presence within Bull Creek Reserve has been recorded within Bull Creek by the City of Melville (pers. comm.).

Table 14: At Risk Invertebrate Species Indices

Species Value	Invertebrate Species	Previously Recorded	Presence 2020	Assets
Very High	Carters Fresh Water Mussel (*Westralunio carteri*)	-	Present (City of Melville, Pers. comm.)	Occurrence possible. Habitat may occur, water quality highly influential.
High	Western Petalura (*Petalura hesperia*)	Bull Creek?	-	Occurrence possible, habitat suitable
Low	Gilgie (*Cherax quinquecarinatus*)	Bull Creek (Beatty, 2005)	-	Assume present

3 Threats

Threats present within the Bull Creek Reserves include:

- physical disturbance
- fire
- weed species
- habitat loss
- feral animals
- diseases and pathogens
- stormwater
- reticulation
- acid sulphate soils
- climate change.

3.1 Physical Disturbance

Physical disturbance relates to the use of the area by people, including inappropriate access and informal tracks, trampling of vegetation, graffiti and vandalism, dumping of rubbish and garden waste being disposed into the bushland, removal of vegetation and geocaching.

Physical disturbance within the Bull Creek Reserves in the form of:

- rubbish dumping
- graffiti vandalism
- informal tracks
- safety hazards – damaged old drainage covers posing safety hazard to fauna and local community in the area
- illegal cutting of a tree.

Examples of physical disturbances are shown in Figure 15 with locations provided in Appendix 2 and assessed in Table 15.

Vandalism, Marri tree painted pink

Tree cut with an axe

Broken cover over old drainage sump (safety hazard for fauna and personnel) (Reg Bourke)

Old drainage cover overgrown with vegetation and in poor condition (Reg Bourke)

Rubbish Dumping

Rubbish Dumping

Figure 15: Examples of physical disturbance in Bull Creek Catchment reserves

Table 15: Physical Disturbance Indices

Impact	Physical Disturbance	Disturbances 1994-2003	Disturbances 2004-2013	Disturbances 2014-2020	Threats
High Potential to substantially change ecosystem structure, composition or function	Erosion/ sedimentation	No Data	No Data	No data	Change not assessable
	Clearing for utilities	No Data	No data (but trampling and damage caused by contractors pruning beneath power lines)	No data (but clearing observed around existing drainage sump at Trevor Gribble)	Assumed unchanged

Impact	Physical Disturbance	Disturbances 1994-2003	Disturbances 2004-2013	Disturbances 2014-2020	Threats
	Amenity condition	No Data	No Data	Two drainage covers in poor condition in Reg Bourke	Not Contained (increase)
Medium Potential to moderately change ecosystem structure, composition or function	Trampling (informal paths)	260 m^2	1080 m^2	210 m^2	Contained (decrease)
	Rubbish Dumping	No Data	5 m3/month	No data	Assumed unchanged
	Tree Poisoning	No Data	0	0	Assumed unchanged
	Vandalism	No Data	No Data	Tree cut with axe and another tree painted Trevor Gribble	Not Contained (increase)
	Cubby	No Data	No Data	Cubby built in Richard Lewis	Not Contained (increase)

3.2 Fire

Records provided by the City of Melville indicated a fire had occurred in Richard Lewis Park, near Camm Avenue on 29 March 2017. The area was not mapped at the time although fire scars were evident during field assessments and the fire scar was mapped as approximately 0.6 ha in size. The 2020 field surveys noted that the area has successfully recovered since the fire, with vegetation growing back, largely established and in a generally healthy state. Fire indices showing comparisons over time are shown in Table 16.

Two spot fires were also noted within two of the reserves during the 2020 field surveys (Figure 16), including:

- A spot fire in Richard Lewis; this fire was recent, likely occurring in October 2020. Cause of fire is not known although it did occur near a cubby built in the reserve.
- Spot fire noted adjacent the footpath in the north-east corner of Bateman affecting a group of *Melaleuca rhaphiophylla*; this fire was very recent with the smell of smoke still present, so likely to have occurred in late October/November 2020.

Table 16: Fire Indices

Impacts	Fires	Extent of fires 2003 - 2013	Extent of fires 2014 - 2020	Threats
High Potential for local extinctions of ground dwelling species	Large Fires	0 ha	0 ha	Change not assessable
High Potential for local extinctions of trees and shrubs that regenerate only from seed stored in the plant	Repeat fires	0 ha	0 ha	Change not assessable
Medium Potential for moderate impact of ground dwelling species	Small spot fires, unauthorized campfires and bonfires	0 ha	0.6 ha (3 fires)	Not contained (increased)

Spot fire in Richard Lewis (approx. Oct 2020)

Spot fire in Bateman (Oct/Nov 2020)

Figure 16: Fires evidence on site 2020

3.3 Weeds

A total of 78 introduced flora species were recorded within the seven Bull Creek Reserves. Weed species are categorised by the City of Melville as outlined in the NAAMP (2019) to determine their impact on the ecological environment rated as Low, Medium, High or Very High impact. The number of weeds per categories within the Catchment are shown in Table 17, with High and Very High species and their extent per reserve shown in Tables 18 to 24. Examples of weed species recorded within the Bull Creek reserves are shown in Figure 17 and weed maps are provided Section 5.0. Overall coverage of weed species within the Catchment are listed in Table 25.

A total of six significant weed species present within the catchment reserves, including both Declared Pests and Weeds of National Significance (WoNS):

- Arum Lily (*Zantedeschia aethiopica*) (Declared Pest)
- One-leaf Cape Tulip (*Moraea flaccida*) (Declared Pest)
- Bridal Creeper (*Asparagus asparagoides*) (Declared Pest, WoNS)
- Blackberry (*Rubus laudatus*) (Declared Pest, WoNS)
- Asparagus Fern (*Asparagus aethiopicus*) (WoNS)
- Lantana (*Lantana camara*) (Declared Pest, WoNS).

Declared pests are listed on the Western Australian Organism List under the *Biosecurity and Agriculture Management Act 2007* (WA). This classification requires the landowner/land manager to control the population to limit damage as a result of the presence of these species (Department of Primary Industries and Regional Development 2021).

Medium (perennial) and Low (annual) priority weeds were recorded and assessed across the seven reserves. Of the 29 Medium impact weeds Geraldton Carnation Weed and Soursob were the most widespread occurring in more than 75% of the reserves. Low impact weeds were more widespread, with four of the 38 species occurring in more than 75% of the reserves, including White-flowered Fumitory, Cape Bluebell, Cape Weed, *Petrorhagia dubia* and *Ursinia anthemoides*. Bateman Park observed the greatest number of medium and low impact weeds with 33 species while Debries place observed the least with 16 species. Distribution of these weed was concentrated in areas with higher cover of bare ground and recent disturbance such as revegetation and in proximity to paths.

Typha orientalis (Bulrush) is no longer classified as a weed species although is listed within the weed list for the City. As such the presence of this species has been mapped within the reserves although the distribution is shown separately on the weed maps (Section 5.0).

Table 17: Number of Weed Species in Each Impact Category

Impact	Number of Species
Very High	12
High	48
Medium	8
Low	10

Purple Morning Glory
(*Ipomoea indica*)

Common Lantana
(*Lantana camara*)

Arum Lily
(*Zantedeschia aethiopica*)

Dolichos Pea
(*Dipogon lignosus*)

Washington Palm
(*Washingtonia filifera*)

Blackberry
(*Rubus laudatus*)

Figure 17: Examples of introduced flora species

Table 18: Bateman

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Asparagus aethiopicus	Asparagus Fern	Very High	1	N	N	N	Localised
Asparagus asparagoides	Bridal Creeper	Very High	11	N	N	N	Localised
Lantana camara	Common Lantana	Very High	2	N	N	N	Localised
Morea flaccida	One-leaf Cape Tulip	Very High	2	N	N	N	Localised
Rubus laudatus	Blackberry	Very High	15	N	N	N	Localised
Perennial Clumping Grasses *Ehrharta calycina* *Paspalum dilatatum*	Perennial Veldt Grass	Very High	6	N	N	N	Localised
Annual Clumping Grasses *Avena barbata* *Bromus diandrus* *Ehrharta longifolia* *Hordeum leporinum* *Lolium rigidum* *Poa annua* *Sporobolus africanus* *Vulpia myuros*	 Bearded Oat Great Brome Annual Veldt Grass Barley Grass Wimmera Ryegrass Winter Grass Rat's Tail Fescue	High	27	Y	N	Y	Widespread
Perennial Running Grasses *Cenchrus clandestinus* *Cynodon dactylon*	 Kikuyu Couch	High	19	N	N	N	Localised
Clumping Geophytes *Ferraria crispa* *Freesia x leichtlinii* *Gladiolus caryophyllaceus* *Gladiolus undulatus*	 Black Flag Freesia Wild Gladiolus Wild Gladiolus	High	14	N	N	N	Localised
Giant Grasses *Arundo donax* *Cortaderia selloana* *Typha orientalis**	 Giant Reed Pampas Grass Bullrush	High	11	N	N	N	Localised
Trees and Shrubs *Acacia elata* *Acacia longifolia* *Casuarina glauca* *Chamelaucium uncinatum* *Erythrina x sykesii*	 Geraldton Wax Common Coral Tree	High	52	Y	N	Y	Widespread

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Ficus carica *Ipomoea indica* *Melaleuca quinquenervia* *Olea europaea* *Parthenocissus quinquenervia* *Phoenix dactylifera* *Ricinus communis* *Solanum nigrum* *Washingtonia filifera* *Yucca* sp.	Common Fig Purple Morning Glory Broad-leaved Paperbark Olive Virginia Creeper Date Palm Castor Oil Black Berry Nightshade Fan Palm Yucca						

Table 19: Bull Creek

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Asparagus aethiopicus	Asparagus Fern	Very High	1	N	N	N	Localised
Asparagus asparagoides	Bridal Creeper	Very High	2	N	N	N	Localised
Eragrostis curvula	African Love Grass	Very High	1	N	N	N	Localised
Lantana camara	Common Lantana	Very High	8	N	N	N	Localised
Rubus laudatus	Blackberry	Very High	56	Y	N	N	Localised
Schinus terebinthifolius	Japanese Pepper	Very High	30	Y	N	N	Localised
Zantedeschia aethiopica	Arum Lily	Very High	19	N	N	N	Localised
Perennial Clumping Grasses *Ehrharta calycina* *Paspalum dilatatum*	Perennial Veldt Grass	Very High	47	Y	N	N	Localised
Annual Clumping Grasses *Avena barbata* *Briza maxima* *Briza minor* *Bromus diandrus* *Ehrharta longifolia* *Hordeum vulgare* *Lagurus ovatus* *Lolium rigidum* *Melinis repens* *Phalaris paradoxa* *Poa annua* *Vulpia myuros*	 Bearded Oat Blowfly Grass Shivery Grass Great Brome Annual Veldt Grass Barley Grass Hare's Tail Gras Wimmera Ryegrass Paradoxa Grass Winter Grass Rat's Tail Fescue	High	75	Y	N	Y	Widespread
Perennial Running Grasses *Cenchrus clandestinus*	Kikuyu	High	11	N	N	N	Localised

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Cynodon dactylon *Stenotaphrum secundatum*	Couch Buffalo Grass						
Clumping Geophytes *Freesia* x *leichtlinii* *Gladiolus caryophyllaceus*	 Freesia Wild Gladiolus	High	27	Y	N	N	Localised
Giant Grasses Typha orientalis*		High	19	N	N	N	Localised
Trees and Shrubs *Acacia iteaphylla* *Acacia longifolia* *Acacia mearnsii* *Casuarina cunninghamiana* *Casuarina glauca* *Chamelaucium uncinatum* *Eucalyptus accedens* *Eucalyptus botryoides* *Eucalyptus camaldulensis* *Eucalyptus grandis* *Ficus carica* *Homalanthus populifolius* *Melia azedarach* *Populus nigra* *Ricinus communis* *Salix babylonica* *Washington filifera*	 Flinders Range Wattle River She-oak Geraldton Wax Powderbark Wandoo Southern Mahogany River Gum Rose Gum Common Fig Bleeding Heart Tree White Cedar Castor Oil Weeping Willow Fan Palm	High	101	Y	N	Y	Widespread

Table 20: Richard Lewis

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Eragrostis curvula	African Love Grass	Very High	7	N	N	N	Localised
Morea flaccida	One-leaf Cape Tulip	Very High	1	N	N	N	Localised
Rubus laudatus	Blackberry	Very High	10	N	N	N	Localised
Schinus terebinthifolius	Japanese Pepper	Very High	15	N	N	N	Localised
Zantedeschia aethiopica	Arum Lily	Very High	34	Y	N	N	Localised
Perennial Clumping Grasses *Ehrharta calycina* *Holcus lanatus*	 Perennial Veldt Grass Yorkshire Fog	Very High	40	Y	N	Y	Widespread
Annual Clumping Grasses *Avena barbata*	 Bearded Oat	High	49	Y	N	Y	Widespread

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Briza maxima *Briza minor* *Bromus diandrus* *Ehrharta longifolia* *Lagurus ovatus* *Lolium rigidum* *Phleum arenarium* *Vulpia myuros*	Blowfly Grass Shivery Grass Annual Veldt Grass						
Perennial Running Grasses *Cynodon dactylon*	 Couch	High	4	N	N	N	Localised
Clumping Geophytes *Freesia x leichtlinii* *Gladiolus caryophyllaceus* *Gladiolus undulatus*	 Freesia Wild Gladiolus Wild Gladiolus	High	22	Y	N	N	Localised
Giant Grasses *Cortaderia selloana*	 Pampas Grass	High	1	N	N	N	Localised
Trees and Shrubs *Acacia iteaphylla* *Acacia longifolia* *Callitris preissii* *Chamelaucium uncinatum* *Eucalyptus* sp. *Leptospermum laevigatum* *Melaleuca quinquenervia* *Pelargonium capitatum* *Pinus sp.* *Polygala myrtifolia* *Solanum nigrum* *Washingtonia filifera*	Flinders Range Wattle Geraldton Wax Geraldton Wax Victorian Tea-tree Broad-leaved Paperbark Rose Pelargonium Pine Myrtleleaf Milkwort Black Berry Nightshade Fan Palm	High	84	Y	N	Y	Widespread

Table 21: Reg Bourke

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Lachenalia reflexa	Soldiers	Very High	2	N	N	N	Localised
Lantana camara	Common Lantana	Very High	3	N	N	N	Localised
Rubus laudatus	Blackberry	Very High	22	Y	N	N	Localised
Schinus terebinthifolius	Japanese Pepper	Very High	17	N	N	N	Localised
Zantedeschia aethiopica	Arum Lily	Very High	7	N	N	N	Localised
Perennial Clumping Grasses		Very High	13	N	N	N	Localised

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Ehrharta calycina	Perennial Veldt Grass						
Annual Clumping Grasses *Avena barbata* *Briza maxima* *Bromus diandrus* *Ehrharta longifolia* *Hordeum leporinum* *Lolium rigidum*	 Bearded Oat Blowfly Grass Great Brome Annual Veldt Grass Barley Grass Wimmera Ryegrass	High	23	Y	N	N	Localised
Perennial Running Grasses *Cenchrus clandestinus* *Cynodon dactylon*	 Kikuyu Couch	High	3	N	N	N	Localised
Clumping Geophytes *Freesia alba x leichtlinii* *Gladiolus caryophyllaceus* *Gladiolus undulatus*	 Freesia Wild Gladiolus Wild Gladiolus	High	12	N	N	N	Localised
Giant Grasses *Cortaderia selloana*	 Pampas Grass	High	3	N	N	N	Localised
Trees and Shrubs *Acacia dealbata* *Acacia iteaphylla* *Acacia longifolia* *Acacia mearnsii* *Casuarina cunninghamiana* *Eucalyptus sp.* *Melaleuca quinquenervia* *Pelargonium capitatum* *Washingtonia filifera*	 Flinders Range Wattle River She-oak Broad-leaved Paperbark Rose Pelargonium Fan Palm	High	54	Y	N	Y	Widespread

Table 22: Trevor Gribble

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Lachenalia reflexa	Soldiers	Very High	1	N	N	N	Localised
Schinus terebinthifolius	Japanese Pepper	Very High	8	N	N	N	Localised
Perennial Clumping Grasses *Ehrharta calycina*	Perennial Veldt Grass	Very High	6	N	N	N	Localised
Annual Clumping Grasses *Avena barbata* *Ehrharta longifolia* *Hordeum leporinum*	 Bearded Oat Annual Veldt Grass Barley Grass	High	9	N	N	N	Localised

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Lolium rigidum	Wimmera Ryegrass						
Perennial Running Grasses *Cynodon dactylon*	Couch	High	1	N	N	N	Localised
Clumping Geophytes *Gladiolus caryophyllaceus* *Gladiolus undulatus*	Wild Gladiolus Wild Gladiolus	High	5	N	N	N	Localised
Trees and Shrubs *Acacia iteaphylla* *Acacia longifolia* *Casuarina glauca* *Chamelaucium uncinatum* *Eucalyptus grandis* *Eucalyptus* sp. *Lavandula dentata* *Leptospermum laevigatum* *Melaleuca quinquenervia* *Pelargonium capitatum* *Pinus* sp.	Geraldton Wax Rose Gum Lavender Victorian Tea-tree Broad-leaved Paperbark Rose Pelargonium Pine	High	40	Y	N	Y	Widespread

Table 23: Curedale Mews

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Asparagus aethiopicus	Asparagus Fern	Very High	4	N	N	Y	Widespread
Schinus terebinthifolius	Japanese Pepper	Very High	4	N	N	Y	Widespread
Zantedeschia aethiopica	Arum Lily	Very High	1	N	N	N	Localised
Perennial Clumping Grasses *Ehrharta calycina*	Perennial Veldt Grass	Very High	4	N	N	Y	Widespread
Annual Clumping Grasses *Briza maxima*	Blowfly Grass	High	2	N	N	N	Localised
Clumping Geophytes *Freesia x leichtlinii* *Gladiolus caryophyllaceus* *Watsonia meriana var. bulbillifera*	Freesia Wild Gladiolus Watsonia	High	5	N	N	Y	Widespread
Trees and Shrubs *Acacia longifolia* *Casuarina cunninghamiana* *Dracaena sp.* *Lavandula dentata*	River She-oak Lavender	High	40	Y	N	Y	Widespread

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Melaleuca quinquenervia *Melia azedarach* *Olea europaea* *Phoenix dactylifera* *Solanum nigrum*	Broad-leaved Paperbark White Cedar Olive String Palm Black Berry Nightshade						

Table 24: Debries Place

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area>50% of Reserve	Assessment
Perennial Clumping Grasses *Ehrharta calycina* *Paspalum dilatatum*	Perennial Veldt Grass	Very High	3	N	N	Y	Widespread
Annual Clumping Grasses *Bromus diandrus* *Lolium rigidum*	Great Brome Wimmera Ryegrass	High	3	N	N	Y	Widespread
Clumping Geophytes *Gladiolus caryophyllaceus*	Wild Gladiolus	High	2	N	N	N	Localised
Trees and Shrubs *Dracaena sp.* *Eucalyptus camaldulensis* subsp. *obtusa*	Blunt-budded River Red Gum	High	2	N	N	N	Localised

Table 25: Weed Indices, combined reserves

Impacts	Weed	2005	2013	2020	Threats
Very High	Tamarisk Paterson's Curse Narrowleaf Cotton Bush Golden Dodder Madeira Vine	-	-	-	5 weeds Prevented
	Bridal Creeper	0%	5%	4%	6 weeds Contained (no change or decrease)
	Blackberry	<1%	43%	33%	
	Lachenalia	0%	1%	1%	
	Lantana	0%	6%	4%	
	Willows	X	5%	0%	

Impacts	Weed	2005	2013	2020	Threats
	Very Large Trees	X	6%	0%	
	Arum Lily	24%	26%	32%	6 weeds Not contained (increase)
	Asparagus fern	0%	<1%	2%	
	African lovegrass	X	X	3%	
	Brazilian Pepper	0%	20%	36%	
	Perennial Clumping Grass	85%	37%	41%	
	One-leaf Cape tulip	X	0%	1%	
High	Annual Clumping Grasses	74%	39%	61%	5 weeds Not Contained (increase)
	Clumping Geophytes	40%	15%	28%	
	Giant Grasses	13%	3%	8%	
	Perennial Running Grass	X	11%	12%	
	Shrubs and Trees (Woody weeds)	X	83%	100%	
Medium	Perennial Weeds	X	99%	50%	Contained (decrease)
Low	Annual Weeds	X	51%	70%	Not contained (increase)

3.4 Habitat Loss

The Bull Creek catchment is part of a regional ecological linkage with relatively safe fauna movement between reserves, particularly between Bull Creek, Richard Lewis and Reg Bourke as there are less residential properties separating these reserves. The percentage of bare ground for each reserve is shown in Figures 17 – 18 and Table 26, with percentage of weed cover per reserve shown in Table 27.

Overall habitat loss is summarised in Table 28 by assessing the percentage cover of more than 25% weeds and bare ground per reserve. All reserves except Debries Place and Curedale Mews were identified as having high (>25%) habitat loss since 2013. Bull Creek, Trevor Gribble and Debries Place had a reduction of High weed coverage since 2013 whilst the remaining four reserves showed an increase in high weed cover, contributing to habitat loss in these areas.

Table 26: Bare Ground Over 2020

Category	Bateman (%)	Bull Creek (%)	Richard Lewis (%)	Reg Bourke (%)	Trevor Gribble (%)	Curedale mews (%)	Debries Place (%)	All Sites (%)
0%	18.18	0	18.42	30	0	28.57	33.33	12.66
1-5%	45.45	5.98	17.11	7.5	0	57.14	16.67	15.58
6-24%	20.45	70.09	17.11	25	22.22	14.29	50	39.29
≥25%	15.92	23.93	47.36	37.5	77.78	0	0	32.47
Total (%)	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Table 27: Weed Cover 2020

Category	Bateman (%)	Bull Creek (%)	Richard Lewis (%)	Reg Bourke (%)	Trevor Gribble (%)	Curedale mews (%)	Debries Place (%)	All Sites (%)
<5%	32.6	13.56	3.95	0	16.67	28.57	66.67	161.53
5-25%	32.6	35.59	43.42	41.46	33.33	42.86	33.33	261.33
≥25%	34.8	50.85	52.63	58.54	50	28.57	0	272.13
Total (%)	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**N/A**

Table 28: Habitat Loss Indices

Impact	Habitat Loss	Reserve	Percentage of Reserve			Threat
			2004	2013	2020	
Medium Process of moderate ecosystem function modification ▪ reduced natural regeneration ▪ increased fire or erosion risk	Weed Cover >25%	Bateman	No Data	30%	34.8%	Not Contained (increase)
		Bull Creek		62%	49.59%	Contained (decrease)
		Richard Lewis		29%	50.63%	Not Contained (increase)
		Reg Bourke		27%	58.54%	
		Trevor Gribble		71%	50%	Contained (decrease)
		Curedale Mews		0%	28.57%	Not Contained (increase)
		Debries Place		0%	0%	Contained (no increase)
Low Process of low ecosystem function modification ▪ reduced natural regeneration ▪ increased fire or erosion risk	Bare Ground >25%	Bateman	No Data	9%	15.92%	Not Contained (increase)
		Bull Creek		0%	23.93%	
		Richard Lewis		5%	47.36%	
		Reg Bourke		18%	37.5%	
		Trevor Gribble		43%	77.78%	
		Curedale Mews		0%	0%	Contained (no increase)
		Debries Place		0%	0%	

Figure 18:
Habitat Loss
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

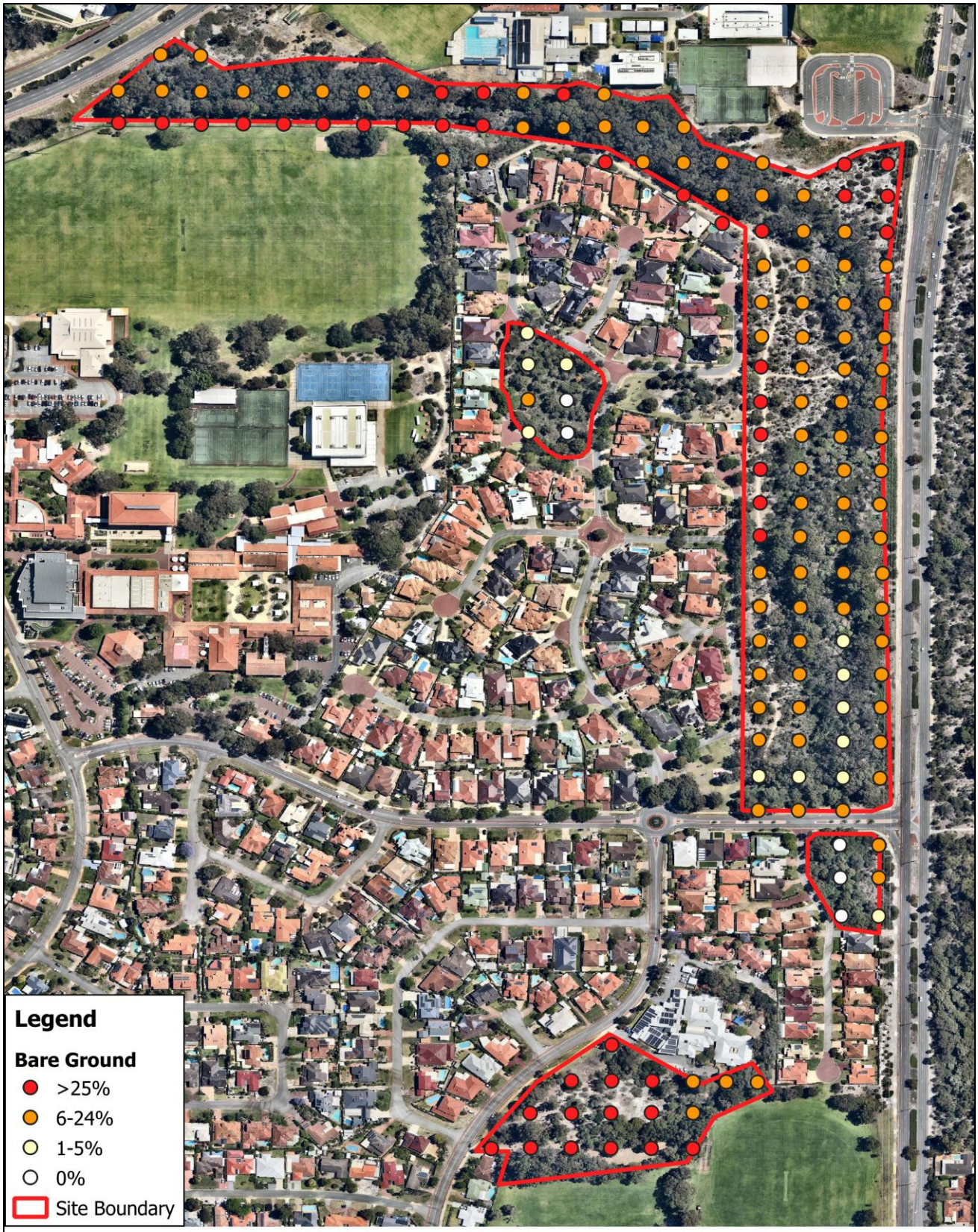


Figure 19:
Habitat Loss
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

3.5 Feral Animals

Feral fauna impact native fauna species through predation, competition for food and shelter. In addition, they can spread disease and destroy habitat. A total of nine feral fauna species were recorded during the 2020 survey including three mammals, four birds and two invertebrates (Appendix 4). The introduced European Honey Bee can increase competition for hollows and potentially take up residence in nesting boxes, the records of bee hives found in the Catchment are listed in Table 29. The feral fauna indices are listed in Table 30 and a complete fauna list for the 2020 fauna survey is provided in Appendix 4. Examples of feral fauna recorded are shown in Figure 20.

Rainbow Lorikeet (Reg Bourke)

Black Rat (Bull Creek)

Figure 20: Example of feral fauna in Bull Creek Catchment

Table 29: Feral Bee Hive Records

Reserves	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Bull Creek	2 hives	No data	1 hive	2 hives	1 hive	1 hive
Bateman Park	2 hives	No data	3 hives	6 hives	6 hives	0
Richard Lewis	4 hives	No data	10 hives	1 hive	1 hive	0
Reg Bourke	3 hives	No data	1 hive	3 hives	2 hives	2 hives
Trevor Gribble	No data	No data	No data	No data	No data	0
Debries Place	No data	No data	No data	No data	No data	0
Curedale Mews	No data	No data	No data	No data	No data	0

Table 30: Feral Fauna Indices

Feral Animal		Status 2004	Status 2013	Status 2020
Mammals	European Rabbit *Oryctolagus cuniculus*,	Confirmed Present	Confirmed Present	Confirmed Present
	Feral Cats, *Felis catus*	Assumed Present	Assumed Present	Assumed Present
	House Mice, *Mus musculus*			Confirmed Present
	Brown Rat, *Rattus norvegicus*			Assumed Present
	Black Rat, *Rattus rattus*			Confirmed Present

Feral Animal		Status 2004	Status 2013	Status 2020
Birds	Laughing Kookaburra, *Dacelo novaeguineae*	Confirmed 1987	Confirmed Present	Confirmed Present
	Laughing Dove, *Spilopelia senegalensis*	Confirmed 2003		
	Spotted Turtle Dove, *Spilopelia chinensis*			
	Rainbow Lorikeet, *Trichoglossus haematodus*		Assumed Present	
	Eastern Long-billed Corella, Cacatua tenuirostris	Not Confirmed		Assumed Present
	Rock Dove, *Columbia livia*			Assumed Present
Fish	One spot Livebearer, *Phalloceros caudimaculatus*	Confirmed 2002	Assumed Present	Assumed Present
	Mosquitofish, *Gambusia holbrooki*	No data Replaced by One spot Livebearer prior to 2006	Assumed absent	Assumed Absent
Insects	European Honey Bee, *Apis mellifera*	No Data	Confirmed Present	Confirmed Present
	Ommatoiulus moreleti	No Data	No Data	Confirmed Present

3.6 Diseases and Pathogens

Surveys for Dieback (*Phytophthora cinnamomi*) was undertaken by Terratree in Bateman in 2016 and in Bull Creek and Richard Lewis in 2018. Majority of the reserves were uninterpretable or excluded based on the vegetation present not being susceptible to Dieback. Although the eastern boundary of Bull Creek Reserve was found to be infested with Dieback. Dieback maps for the Bull Creek Catchment are shown in Figures 21 - 23. Assessment of dieback presence over time are listed in Table 31.

Table 31: Disease and Pathogen Indices

Impact	Disease and Pathogens	Extent 2004	Extent 2013	Extent 2020	Threat
Very High Key Threatening Processes under the EPBC Act 1999	*Phytophthora cinnamomi* Dieback	No Data	Unknown	-	Present Assumed Unchanged
Medium Native species capable of moderate modification of structure and composition of flora by killing multiple species	*Armillaria luteobubalina* Honey Fungus		0 ha	0 ha	Assumed Not Present

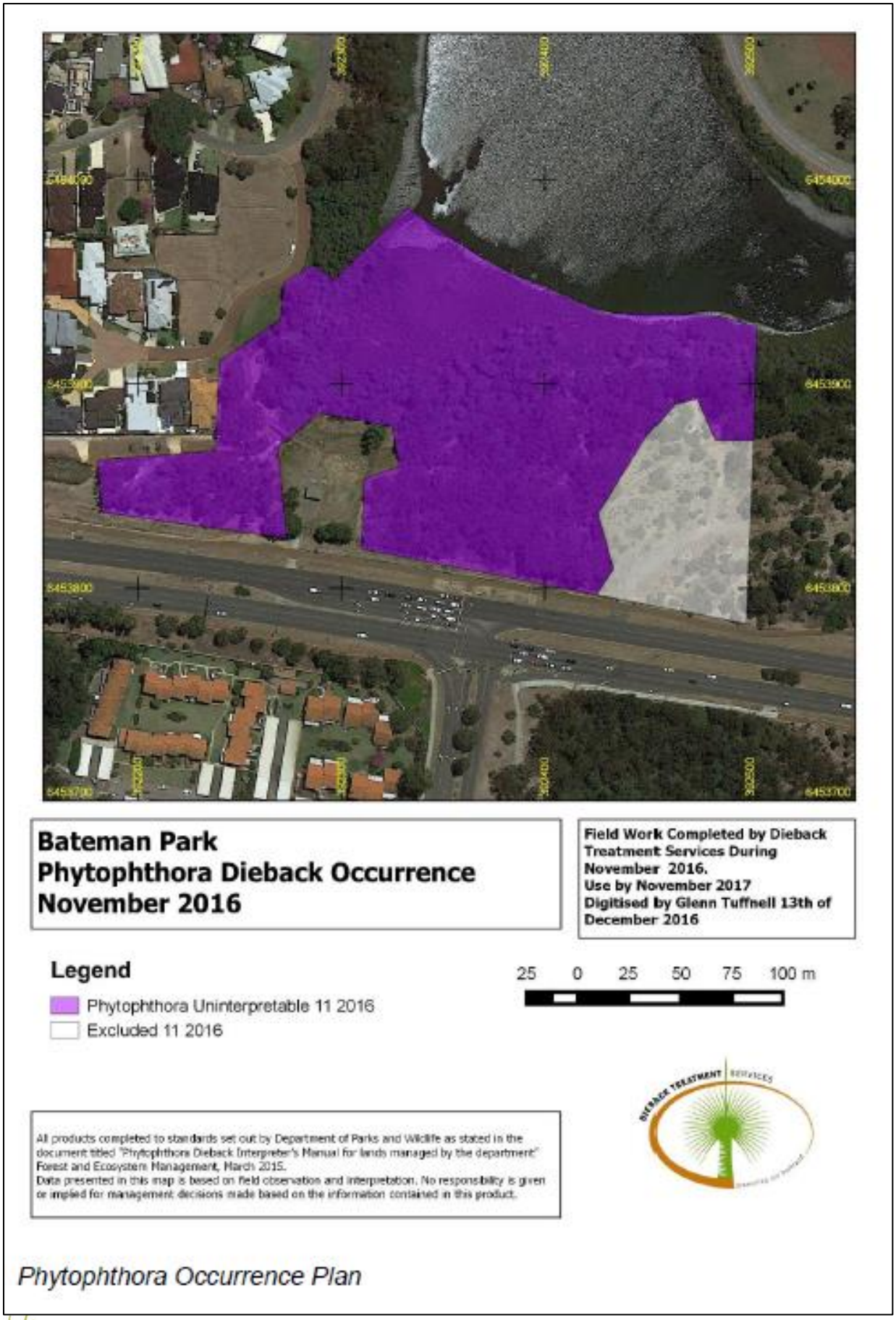


Figure 21: Bateman Park *Phytophthora* Occurrence

Figure 22: Bull Creek Park *Phytophthora* Occurrence

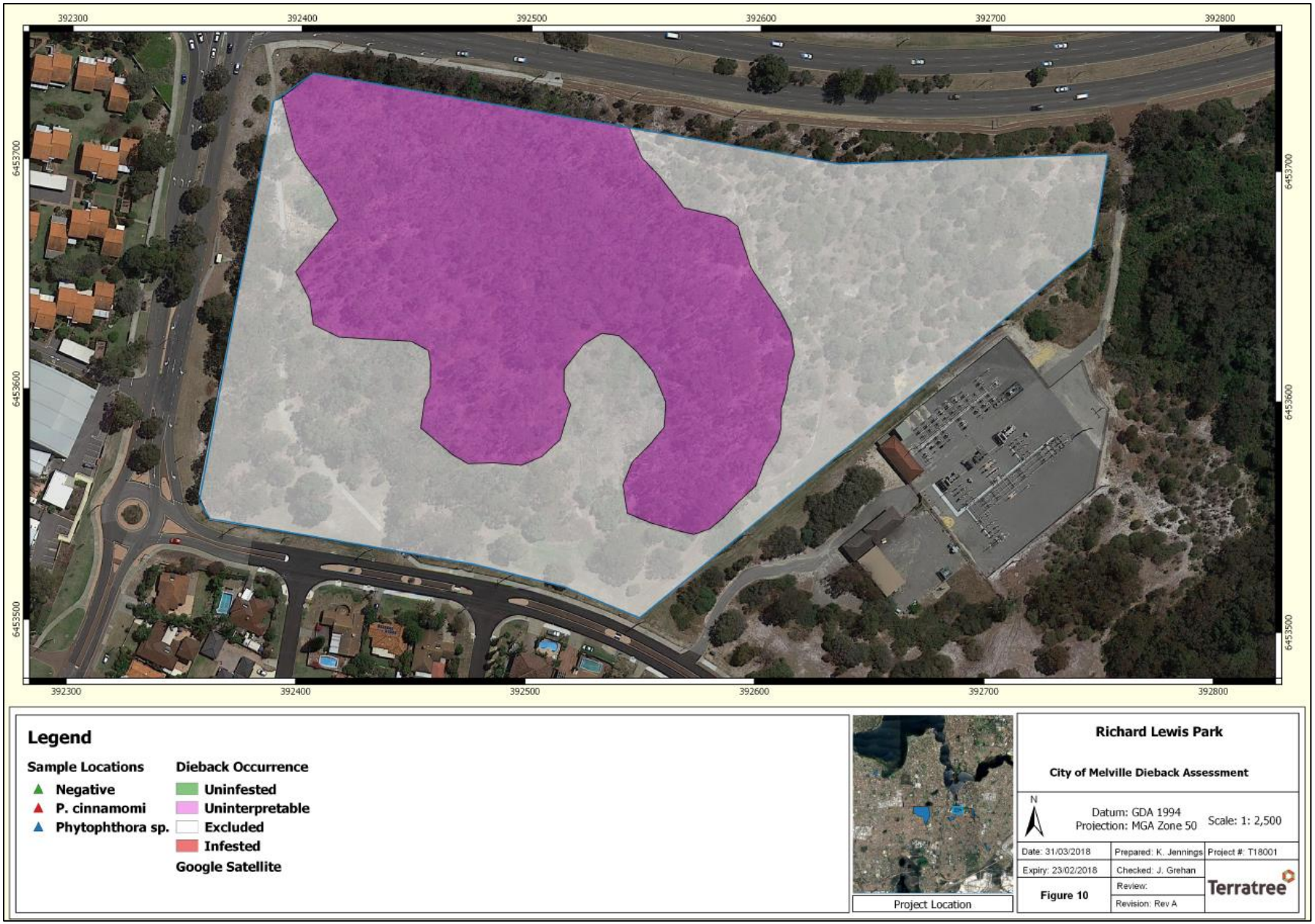


Figure 23: Richard Lewis Reserve *Phytophthora* Occurrence

3.7 Stormwater

Stormwater drains flow into Bull Creek and Bateman Reserve from the surrounding urban environment (Figure 24). This has the potential to act as a vector for the introduction of weeds, increase nutrient loads, sediment, pathogens and the potential for increased erosion where these drains enter the reserves. The water level in Bull Creek was observed to noticeably rise during the 2020 on-ground survey with water overflowing the creek onto the informal track adjacent, post rainfall.

Stormwater also has the capacity to introduce heavy metals and excessive nutrients into waterways which has a detrimental effect on the environment. Annual water and sediment monitoring within the Bull Creek Catchment has been conducted between 2004 and 2018 with Table 32 summarising stormwater indices outside acceptable ranges (SERCUL, 2019). Current water quality monitoring is being undertaken to update the 2018 data.

Stormwater quality monitoring results (2014-2018) at the individual sites within the Bull Creek catchment are (SERCUL 2019):

- Bull Creek main drain (PSDTBCMD)
  - pH, phosphorus, reactive phosphorus, chromium, copper and lead are within the normal range
  - dissolved oxygen, conductivity, nitrogen, oxidised nitrogen, nitrogen as ammonia, aluminium, and iron were all outside of the normal range
  - all but one result in August 2014 within the normal range for Total Suspended Solids and zinc.
- Brockman Park (MELDR 02):
  - total suspended solids, phosphorus, reactive phosphorus, chromium, copper, and lead within the normal range
  - pH, dissolved oxygen, conductivity, nitrogen, nitrogen as ammonia, aluminium, and iron were all outside of the normal range
  - all but one result in August 2014 within the normal range for zinc
  - 11 out of 20 occurrences of oxidised nitrogen outside the normal range.
- Bateman Park (MELDR 06):
  - pH, nitrogen, phosphorus, reactive phosphorus, chromium, and lead within the normal range
  - dissolved oxygen, nitrogen as ammonia, aluminium, and iron were all outside of the normal range
  - all but one result in August 2014 outside of the normal range for conductivity
  - nine occurrences outside of the normal range for Total Suspended Solids
  - fifteen occurrences outside of the normal range of oxidised nitrogen
  - all but one result in August 2014 within the normal range for copper and zinc.

These results indicate that excessive nutrients and some heavy metals are continuously entering waterways associated with the Bull Creek Catchment. Sources of these pollutants likely upstream of these three sampling points e.g., at MELDR15 and MELDR05 (Figure 24).

Exceedances over ANZECC trigger values of some metals for example zinc and copper is reported as commonly occurring within the Swan and Canning River drainage catchments (City of Melville, pers. Comm.). High concentrations of iron and aluminium are also recorded as present within the Bull Creek main drain sampling location although these levels are similar to those recorded within the Swan and Canning River catchments (City of Melville, pers. comm.). The presence of these metals is of concern due to detrimental effects on aquatic biota. Historic and current heavy metal records (e.g., lead levels) may be attributed to a legacy of previous contamination, potentially from a previous landfill at John Creaney Park which may have flow on effects downstream to the Bull Creek Reserves (City of Melville, pers. comm.).

Excessive nutrient levels, more commonly nitrogen is persistently recorded at all three sampling points within the Bull Creek Catchment. Total nitrogen levels above ANZECC trigger values have been recorded within Bull Creek Park sampling sites since 2007, with nitrogen as ammonia introduced at Brockman Park which flows into Bull Creek Park and ultimately the Swan River (City of Melville, pers. comm.). Excessive levels of heavy metals and nutrients are detrimental to aquatic biota and can result in eutrophication. Numerous eutrophication events have been previously recorded within the Swan River Estuary and its tributaries as a result of settlement, change in land use and change in water quality (Government of Western Australia, 2005). To prevent continued impacts to aquatic biota it is recommended that the sources of these heavy metals and nutrients entering the waterway be identified to allow for mitigation measures to be implemented, particularly pollutants entering from Brockman Park.

Areas such as Trevor Gribble could potentially be developed into a constructed seasonal wetland to filter water and provides a number of benefits (Department of Environment and Conservation, 2012), including:

- reduced water flow during storm events
- increased absorption and filtration of pollutants before entering waterways
- creation of high value space (conservation, visual, cultural)
- increase available create habitat for native flora and fauna.

Table 32: Combined stormwater indices for Bull Creek Main Drain (MELDR-01, MELDR-02, MELDR-06)

Impact	Water Quality Parameter	Acceptable Range (lowland rivers)	Monitoring Events Outside Acceptable Ranges 1994-2003	Monitoring Events Outside Acceptable Ranges 2004-2013	Monitoring Events Outside Acceptable Ranges 2014-2018	Threat
Very High Metals	Aluminum	0.055 mg/L (pH>6.5)	No Data	62% (43/69)	100% (24/24)	Increased
	Arsenic	0.024 mg/L		0% (0/70)	No data	Assume unchanged
	Cadmium	0.0001 mg/L*		0% (0/36)	No data	Assume unchanged
	Chromium	0.001 mg/L*		0% (0/72)	0% (0/24)	Assume unchanged
	Copper	0.001 mg/L*		0% (1/72)	4% (1/24)	Increased
	Iron	0.3 mg/L		100% (72/72)	100% (24/24)	Unchanged
	Mercury	0.0001 mg/L*		0% (0/48)	No data	Assume unchanged
	Nickel	0.001 mg/L*		0% (0/72)	No data	Assume unchanged
	Lead	0.001 mg/L*		0% (0/72)	0%	Assume unchanged
	Zinc	0.02 mg/L*		0% (1/72)	12.5% (3/24)	Increased
High Nutrients	Total Nitrogen	1.2 mg/L		67% (48/72)	67% (40/60)	Unchanged
	Total oxidized Nitrogen	0.15 mg/L		53% (38/72)	77% (46/60)	Increased

Impact	Water Quality Parameter	Acceptable Range (lowland rivers)	Monitoring Events Outside Acceptable Ranges 1994-2003	Monitoring Events Outside Acceptable Ranges 2004-2013	Monitoring Events Outside Acceptable Ranges 2014-2018	Threat
	Nitrogen as Ammonia/ Ammonium	0.15 mg/L		99% (71/72)	100% (60/60)	Increased
	Total Phosphorus	0.065 mg/L		1% (1/72)	0% (0/60)	Decreased
	Soluble reactive Phosphorus	0.04 mg/L		0% (0/72)	0% (0/60)	Assume unchanged
Low Physical	pH	6.5-8	28% (11/39)	38% (17/69)	32% (19/60)	Decreased
	Dissolved Oxygen	80-120%	82% (9/11)	86% (39/45)	100% (60/60)	Increased
	Total suspended solids	6 mg/L	No Data	39% (21/72)	17% (10/60)	Decreased
	Conductivity	0.12-0.3 mS/cm		100% (69/69)	98% (59/60)	Decreased

Figure 24:

Hydrology

Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 17/06/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 200 400 m

N

3.8 Reticulation

No reticulation within any of the bushland reserves, although there are reticulated lawns and ovals adjacent to Bull Creek, Reg Bourke and Trevor Gribble. However, no overspray or water leaks was noted as additional water being applied to the adjacent bushland. The indices for reticulation are listed in Table 33. If an occurrence of excessive drift or leaking is observed it is to be recorded and rectified within 5 working days of the observation. Monitoring should occur at the site of the rectification to ensure the overspray or leak into adjacent bushland is eliminated.

Table 33: Reticulation Indices

Impact	Water Sources	Occurrences 1994 - 2003	Occurrences 2004 - 2013	Occurrences 2014-2020	Threat
Low Alteration of Surface Water Flows	Overspray / leakages from reticulation	No Data	No Data	No Data	Contained (assumed unchanged)

3.9 Acid Sulfate Soils

Acid sulphate soils are naturally occurring soils that contain iron sulphides, primarily in the form of pyrite materials, formed under waterlogged conditions in fresh and saline wetlands around Western Australia. If left unexposed to air they do not pose a significant risk to humans or the environment. However, if exposed to air sulphuric acid is formed and this can lead to the release of heavy metals into the surrounding environment (DER, 2015). Acid sulfate soils can occur when the soils are disturbed, where:

- excavations for drainage maintenance or infrastructure construction are dug below the minimum level of the water table
- groundwater extraction results in oxidation of soils previously permanently saturated by lowering the minimum level of the water table.

Maintenance activities that require excavations or groundwater extractions are to be managed so that acid sulphate soil reactions do not occur. If this is done those activities will not be recorded as an occurrence of the threat. A review of the DWER acid sulfate risk map indicated that all seven of the Bull Creek reserves have a high to moderate risk of acid sulfate soils occurring due to their close proximity to waterways and high water tables (DWER, 2021a). No records of previous acid sulfate soils occurring form excavations or groundwater extraction are available for the Bull Creek reserves. No obvious signs of acid sulfate soils were noted within the reserves during the 2020 survey as shown in Table 34.

Table 34: Acid Sulfate Soil Indices

Impact	Potential Initiation of ASS Reactions	Occurrences 1994 - 2003	Occurrences 2004 - 2013	Occurrences 2014 - 2019	Threat
Very High An occurrence of could result in the reserve being listed as a contaminated site under the Contaminated Sites Act 2003	Excavations below the minimum level of the water table	No Data	0	0	Prevented (assumed none occurred and no change)
	Groundwater extraction resulting in lowering of minimum level water table		0	0	

3.10 Climate Change

Climate change within the south-west of Western Australia is expected to cause more frequent and intense weather events, decreasing rainfall, rising sea levels and increasing temperatures. These changes are likely to increase the potential for erosion during storm events and associated strong winds and increased water stress on plants due to rising temperatures and decreasing rainfall. Water stress has the potential to lead to changes in vegetation types and complexes which has the potential to affect the fauna that these vegetation associations support. Reduced rainfall may decrease the groundwater table and in turn negatively affect groundwater dependent species.

As Bateman and Bull Creek reserves are associated with the Canning River and Bull Creek, rising water levels may directly impact riparian vegetation along the banks and leading to greater erosion in these areas. Sea levels are predicted to rise by 0.74 m by 2100, by using the coastal risk Australia 2100 which will not majorly affect the Bull Creek Reserves (Coastal Risk Australia, 2021). This rise is no greater than that of a flood that has a 1% chance of occurring within a year (DWER, 2021c) as shown in Figure 24. This floodway limit occurs over low topography areas that consist of wetland and estuarine vegetation adapted to wet conditions. It is possible with increased storm events and risk of erosion that reinforcing shorelines and river systems through planting of buffer zones in order to slow erosion and absorb floods may be required in the future. The City of Melville has undertaken a risk assessment to establish climate change risks within the Melville area which was used to develop a Climate Change Adaptation Plan.

In regards to increased temperature and reduced rainfall all reserves associated with the Bull Creek Catchment have a depth to ground level between 2 and 4 m (DWER, 2021b). It is unlikely that the dampland areas will dry out due to the proximity to groundwater and the river system. A flexible approach to revegetation activities is recommended to allow for changes due to climate change with species lists requiring review if changes in vegetation structure and composition occur.

4 Implementation

4.1 Management Strategies

The management objectives and implementation of strategies for 2021 – 2026 will be measured in KPIs discussed in the NAAMP (2019).

4.1.1 Key Performance Indicators (KPIs)

Leading indicators and trends indicate (for the like of a reserve management plan):

- whether guidelines and procedures are being affective in meeting objectives of preventing, eliminating, containing and managing impacts from threats; and
- provide a feedback mechanism as to whether guidelines and procedures need to be modified.

4.1.2 Leading Indicators

Leading indicators are associated with changes in the density/ abundance/ extent/ occurrences of threats (Table 35). The levels of acceptable changes are determined in the framework established in the NAAP as summarised in Table 35 and applied for the Bull Creek Catchment in Tables 36 and 37.

Table 35: Application of leading indicators

Objective	Leading indicators	Acceptable When
Prevent	Prevent ▪ introduction to or occurrence of	Treat absent from reserve Unplanned introduction possible
Eliminate	Reduce ▪ rate of density/ abundance/ extent ▪ eventual complete removal (short term may only reduce numbers or prevent seed set on site)	Large discrepancy between current and potential impact Potential impact high Elimination feasible
Contain	Stop, restrict, or reduce ▪ rate of spread or ▪ frequency of occurrence	Moderate discrepancy between current and potential impact Potential but not current impact high Elimination not feasible
Manage	Limit ▪ negative impacts on assets	Small discrepancy between current and potential impact Threat “naturalised” or near maximum extent No information on density/ abundance/ extent
Confirm	Identify ▪ number of threats for which their presence/ extent is uncertain	Historic but no records in reserve and/ or Presence/ extent uncertain in reserve
None	Not applicable	Threat absent from reserve only planned introduction possible

Table 36: Objective for Weed species in Bull Creek Reserve

Objective	Impact	Weed Species/ Group	2020 Extent	Comment
Prevent	Very High	Tamarisk Golden Dodder Madeira Vine Narrowleaf Cotton Bush Paterson's Curse	0	Not present on site
Eliminate (Eliminate species of concern and prevent re-introduction across all reserves within the Catchment)	Very High	African Lovegrass Arum Lily Asparagus fern (*A. aethiopicus*) Blackberry Bridal Creeper *Lachenalia reflexa* *Lantana camara* One-leaf Cape Tulip *Schinus terebinthifolius*	3% 32% 2% 33% 4% 1% 4% 1% 36%	Localised RL and BC Localised RL and BC Localised BT and BC, CM Localised BT, BC, RL and RB Localised BT, BC Localised RB and TG Localised BT, BC and RB Localised RL and BT Localised BC, RL, RB, TG; widespread in CM
	High	Annual Clumping Grasses Clumping Geophytes Giant Grasses Trees and shrubs (particularly *Homalanthus populifolius*) Perennial Running Grasses	61% 28% 8% 100% 12%	Localised RB, TB and DP; widespread CM, RL, BC and BT Localised BT, BC, RL, RG, TG and DP; widespread at CM Localised RB, RL, BC and BT Widespread BT, BC, RL, RB, TG and CM; localised DP Localised TG, RL, BC and BT
Contain	Very High	Perennial Clumping Grasses	41%	Localised TG, RB, BC and BT; widespread DP, CM, RL
Manage	Medium	All other perennial weeds	50%	Widespread all reserves usually in area with open understory
	Low	All other annual weeds	70%	Widespread all reserves usually in area with open understory

BT = Bateman, BC = Bull Creek, RL = Richard Lewis, RB = Reg Burke, TB = Trevor Gribble, CM = Curedale Mews & DP = Debries Place.

Table 37: Objective for all other threats in Bull Creek Reserves

Objective	Impact	Threat	Comment
Prevent	Very High	Acid Sulphate Soils	These should not occur as no excavation or groundwater extraction is proposed, works of this nature should take into account potential for acid sulfate soils
		Ferals (Foxes)	Absent – implement controls within 10 working days of observation
	High	Fires (large)	Prevent large fires that burn more than one third of the reserves, work in consultation with the Department of Fire and Emergency Services
	High	Fire (repeat)	Prevent repeat fires that burn the same portion of the reserve reserves, work in consultation with the Department of Fire and Emergency Services
Eliminate	Very High	Ferals (Rabbits)	Present – implement controls as per the City's Feral Animal Management Guidelines
	High	Ferals (Bees)	Present – implement controls as per the City's Feral Animal Management Guidelines
Contain	Very High	Habitat Loss	Habitat loss should be mitigated through weed control and revegetation activities proposed in Figure 11 and 12.
	Medium	Physical Disturbance	Present across reserves in the form of rubbish dumping (including garden waste), graffiti vandalism, informal tracks, safety hazards (poor condition amenities/infrastructure), cubby's and illegal cutting of trees. Contain disturbance caused by utilities, such as clearing vegetation under powerlines and damage by vehicles. Limit public access into bushland through the use of fencing or soft barricades such as plantings or brush mattressing. Report any noted disturbances through the City's current maintenance program and implement controls as per the NAAMP.
		Small spot fires, unauthorized campfires and bonfires	3 fires noted within Richard Lewis, Bateman, and Reg Burke.
Manage	Very High	Ferals (Cats)	Likely present although not recorded due to close proximity of residential housing. Implement controls within 10 working days of observations in accordance with City's guidelines.
		Diseases and Pathogens (Dieback)	Present and therefore cannot be prevented, cannot be eliminated and difficult to contain. Management should focus on Phosphite treatment and monitoring/dieback testing to confirm extent in line with the NAAMP.
		Climate Change	Consideration should be given to the wider context of climate change and impacts that may occur over time. Reference sites could be installed in the areas adjacent the Canning River and Bull Creek to determine water level changes over time, and near groundwater dependent species such as the *Melaleuca rhaphiophylla* and Flooded Gum Woodlands. Records should be taken over time to increase knowledge and understanding of ongoing processes and to assist in determining potential solutions.

Objective	Impact	Threat	Comment
			Flexible approach to revegetation activities to allow for changes due to climate change with species lists requiring review if changes in vegetation structure and composition occur.
	Medium	Ferals (Rainbow Lorikeet)	Present – implement controls as per the City's Feral Animal Management Guidelines
None	Low	Stormwater	No additional stormwater to be diverted to the reserves. Investigate and manage source of sediment into Brockman Park drain outlet.
		Reticulation	Monitor for incidence of overspray or leaks from reticulation into native bushland and if observed

4.1.3 Lagging Indicators

Lagging indicators and trends in assets, indicate whether strategic goals of maintaining assets are being met. The levels of acceptable change are discussed in the NAAMP and are summarised in Table 38 and applied to the Bull Creek Catchment in Table 39 and 40.

Table 38: Tiered Goals for assets and associated lagging indicators

Goal	Lagging Indicator	Application When
Enhance	Increase in either: ▪ extent ▪ density ▪ number ▪ occurrence	Assets can be enhanced when: occurs in only one reserve and/ or at risk of local extinction and/ or minimal cost (e.g. incorporated in revegetation program) and/ or reduces operational costs (e.g. reduced requirements for on-going for threat management)
Maintain	No decrease in either: ▪ extent ▪ density ▪ number ▪ occurrences	Assets can be maintained when: asset occurs in a number of reserves and / or not a risk of local extinction and/or occurs in only one reserve but insufficient knowledge/resources to enhance
Confirm	Decrease in: ▪ number of assets for which their presence is uncertain	Assets significant when: historic but no recent records in reserve and/or potentially to be in reserve based on habitat and/or proximity to other records
Monitor	No indices for management effectiveness	Assets that cannot be maintained by action within City of Melville boundaries for which no quantifiable indices exist when: reserved are not critical component of habitat (e.g. highly mobile/ wide roaming and/or infrequent/irregular visitors to the City of Melville) there is risk of local extinction from processes that cannot be mitigated by the City of Melville (e.g. climate change, some pathogens)

Table 39: Goals for species

Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
Maintain Species	**Very High**	Red-tailed Black Cockatoo –T/VU (*Calyptorhynchus banksii naso*)	3	Both species are migratory and are protected by the BC Act 2016 and EBPC Act 1999. Recommended management: ▪ continued maintenance of existing resources including habitat trees and food sources including *Banksia* and *Eucalyptus* species. Incorporate flora species endemic to the location as well as food sources in future revegetation efforts (Department of Environment and Conservation, 2011).
		Carnaby's Cockatoo – T/EN (*Calyptorhynchus latirostris*)	5	
		Eastern Great Egret (*Ardea alba*)	7	Maintain habitat through continued revegetation, weed control and feral management
		Cattle Egret (*Ardea ibis*)	1	
		Black-striped Snake – P3 (*Neelaps calonotos*)	1	Maintain habitat through restoration and management, particularly focusing on enhancing areas lacking understory flora, leaf litter and habitat logs.
	High	Inland Thornbill (*Acanthiza apicalis*)	6	Maintain habitat through continued revegetation, weed control and feral management.
		Dusky Moorhen (*Gallinula tenebrosa*)	3	
		Splendid Fairy-wren (*Malurus splendens*)	5	
		Rainbow Bee-eater (*Merops ornatus*)	21	Species breeding within reserves, active nest sites observed in Reg Burke grassed area: ▪ continued maintenance of habitat ▪ continued monitoring and isolation of nesting birds using temporary fencing of active nesting burrows
		Nankeen Night-Heron (*Nycticorax caledonicus*)	3	Maintain habitat through continued revegetation, weed control and feral management.
		Common Bronzewing (*Phaps chalcoptera*)	3	
		New Holland Honeyeater (*Phylidonyris novaehollandiae*)	5	Maintain habitat through continued revegetation, weed control and feral management.
	Low	Tree Martin (*Hirundo nigricans*)	12	

Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
		Striated Pardalote (*Pardalotus striatus*)	10	
		Worm Lizard (*Aprasia repens*)	4	Maintain habitat through restoration and management, particularly focusing on enhancing areas lacking understory flora, leaf litter and habitat logs.
		Gilgie (*Cherax quinquecarinatus*)	-	Recommended management: ▪ improvement of water quality ▪ education programs in universities, schools and local community groups to assist in surveys and reporting potential sightings of these species.
	At-risk	*Haemodorum paniculatum*	1	Recommenced management: ▪ continued maintenance of habitat through weed management ▪ if possible, source tubestock or seed of these species (some cannot be grown) to be utilised in revegetation works where they occur.
		Isolepis marginata	1	
		Cartonema philydroides	1	
		Opercularia hispidula	1	
		Platysace filiformis	1	
		Pterostylis pyramidalis	4	
		Samolus repens	1	
		Tecticornia indica subsp. bidens	-	
Confirm	**Very High**	Carter's Freshwater Mussel – T/VU (*Westralunio carteri*)	-	Vulnerable species, highly influenced by water quality. Recommended management: ▪ improvement of water quality to meet or exceed salinity less than 1.6 g L-1 and an average total nitrogen level less than 0.69g L-1 (Klunzinger *et al.* 2015) ▪ education programs in universities, schools and involvement of local community groups to assist in surveys and reporting potential sightings host organisms (fish, freshwater crayfish etc.) present within the waterway.
		Rakali – P4 (*Hydromys chrysogaster*)	1	Both are priority 4 species. Targeted survey for Rakali in 2015 did not determine any individuals present. Recommended management:
		Southern Brown Bandicoot / Quenda – P4	6	

Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
		(*Isoodon fusciventer*)		▪ continued maintenance of habitat, particularly understory species to be incorporated into revegetation efforts ▪ reduce predator populations through continuation of feral animal management programs targeting foxes and cats ▪ education programs in universities, schools and involvement of local community groups to assist in surveys and reporting potential sightings of these species.
		Mourning Skink (*Lissolepis luctuosa*)	1	Maintain habitat through restoration and management, particularly focusing on enhancing areas lacking understory flora, leaf litter and habitat logs.
		Lined Skink – P3 (*Lerista lineata*)	4	
		Black-striped Snake – P3 (*Neelaps calonotos*)	1	
	High	Rufous Treecreeper (*Climacteris rufa*)	1	Maintain habitat through continued management and protection of habitat tree species.
		Gould's Sand Goanna (*Varanus gouldii*)	2	Recommended management: ▪ continued maintenance of habitat particularly understory flora species, leaf litter and habitat logs ▪ reduce predator populations and habitat competition through continuation of feral animal management programs targeting foxes, cats and rabbits.
		Western Petalura (*Petalura hesperia*)	1	Recommended management: ▪ continued maintenance of habitat. ▪ education programs in universities, schools and local community groups to assist in surveys and reporting potential sightings of this species.
	Medium	Bush Rat (*Rattus fuscipes*)	1	Recommended management: ▪ continued maintenance of habitat, particularly understory species are incorporated into revegetation efforts ▪ reduce predator populations through continuation of feral animal management programs targeting foxes and cats ▪ education programs in universities, schools and involvement of local community groups to assist in surveys and reporting potential sightings of these species.
		Brush-tailed Possum (*Trichosurus vulpecula*)	1	
		Gould's Wattled Bat (*Chalinolobus gouldii*)	1	Previous observation of Gould's Wattled Bat within reserve.
		Lesser Long-eared Bat (*Nyctophilus geoffroyi*)	1	

Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
		Southern Forest Bat (*Vespadelus regulus*)	1	Four bat boxes exist within Bull Creek Park; however, it has not been determined if they have been utilized as no species were observed. Recommended management: ▪ confirm species present through targeted surveys ▪ monitor and maintain existing and additional bat boxes ▪ install additional bat boxes in clusters of 3 to 5 within wetland areas of Bull Creek reserves.
		Chocolate Wattled Bat (*Chalinolobus morio*)	1	
		Gould's Long-eared Bat (*Nyctophilus gouldii*)	1	
		Greater Long-eared Bat (*Nyctophilus major*)	1	
		Red-capped Parrot (*Platycercus spurius*)	10	Maintain habitat through revegetation, weed control and disease management to enhance habit for these species. Further investigation required. Education programs in universities, schools and local community groups to assist in surveys and reporting potential sightings of these species.
		Scarlet Robin (*Petroica boodang*)	1	
		Western Heath Dragon (*Ctenophorus adelaidensis*)	2	
		Gray's Legless Lizard (*Delma grayii*)	2	
		Fraser's Legless Lizard (*Delma fraseri*)	2	
		Burton's Snake Lizard (*Lialis burtonis*)	2	
		Keeled Legless Lizard (*Pletholax gracilis*)	2	
		Common Scaly-Foot (*Pygopus lepidopodus*)	2	
		Western Tiger Snake (*Notechis scutatus*)	2	
		Southern Blind Snake (*Anilios australis*)	1	
		Common Beaked Blind Snake (*Anilios waitii*)	1	
		Black-naped Snake (*Neelaps bimaculatus*)	1	
	Low	Australian Ringneck (*Platycercus zonarius*)	12	
		Sacred Kingfisher (*Todiramphus sanctus*)	8	

Goal	Priority	Asset	No. of Reserves (NAAMP)	Comments
		Western Bearded Dragon (*Pogona minor minor*)	3	
		Dugite (*Pseudonaja*)	4	
		Marbled Gecko (*Christinus marmoratus*)	4	
	At-risk	*Aotus cordifolia*	2	Maintain habitat through revegetation, weed control and disease management to enhance habit for these species. Further investigation required. Education programs in universities, schools and local community groups to assist in surveys and reporting potential sightings of these species.
		Eriochilus scaber	1	
		Juncus kraussii subsp. australiensis	1	

Table 40: Goals for Site

Goal	Priority	Asset	Comments
Enhance	**Medium**	Proposed Revegetation Sites	▪ revegetate areas proposed in Table 10 and Figure 11, in accordance with the standard of rehabilitation in the NAAMP and following City Guidelines. ▪ increase engagement with surrounding schools, TAFE and university in revegetation activities i.e. community planting days ▪ where tubestock is available, prioritise at risk species and food sources for black cockatoos (Department of Environment and Conservation, 2011).
		Community Interest Sites (bat and bird boxes)	▪ additional bat boxes installed (refer to Table 39) ▪ continued monitoring of assets during the City's current inspection and maintenance works, any damage or repair requirements noted to be reported with maintenance to occur as soon as practicable. ▪ increase engagement with surrounding schools, TAFE and university in creek activities (e.g., water quality monitoring, revegetation works) ▪ investigate the use of citizen science applications (e.g. FrogID, Photomon, iNaturalist) to engage the wide community and provide monitoring and educational opportunities.
Maintain	**Very High**	Ecological communities and Wetland Sites	▪ continued maintenance to control threats within the reserves including weed control, undertaking revegetation, feral animal management and general reserve management (e.g. rubbish removal, fence maintenance) ▪ rehabilitation within specified areas (refer to Figure 10) using endemic species appropriate to the vegetation type present ▪ continued monitoring, identification of pollutant sources, improvement of water quality entering Bull Creek waterway
	High	Regional Ecological Linkage	▪ continued maintenance and enhancement of ecological communities through proposed rehabilitation and maintenance and by minimising clearing and fragmentation of the reserves.
		Habitat Trees	▪ continued management of threats such as fire and disease ▪ continued enhancement of these communities via proposed rehabilitation using endemic species appropriate to the vegetation type present ▪ where safe maintain dead habitat trees.
	Low	Revegetation Sites	▪ maintain revegetation sites via infill planting, weed control and watering as required to complete the revegetation to the standard outlined in the NAAMP.
Monitor	**Low**	All assets (e.g. benches, signs and fencing)	▪ monitoring of all assets should occur in accordance with the City's policies and guidelines outlined in the NAAMP.

5.0 Weed Maps

Very High Impact Weeds
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

Very High Impact Weeds
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Very High Impact Weeds
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

Very High Impact Weeds
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Very High Impact Weeds
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

Very High Impact Weeds
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Very High Impact Weeds
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

Very High Impact Weeds
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N


Legend
Density
<5%
5-25%
>25%
Site Boundary
Perennial Clumping Grasses Distribution
Bull Creek Reserves, Bull Creek
Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94
0
100
200 m
N

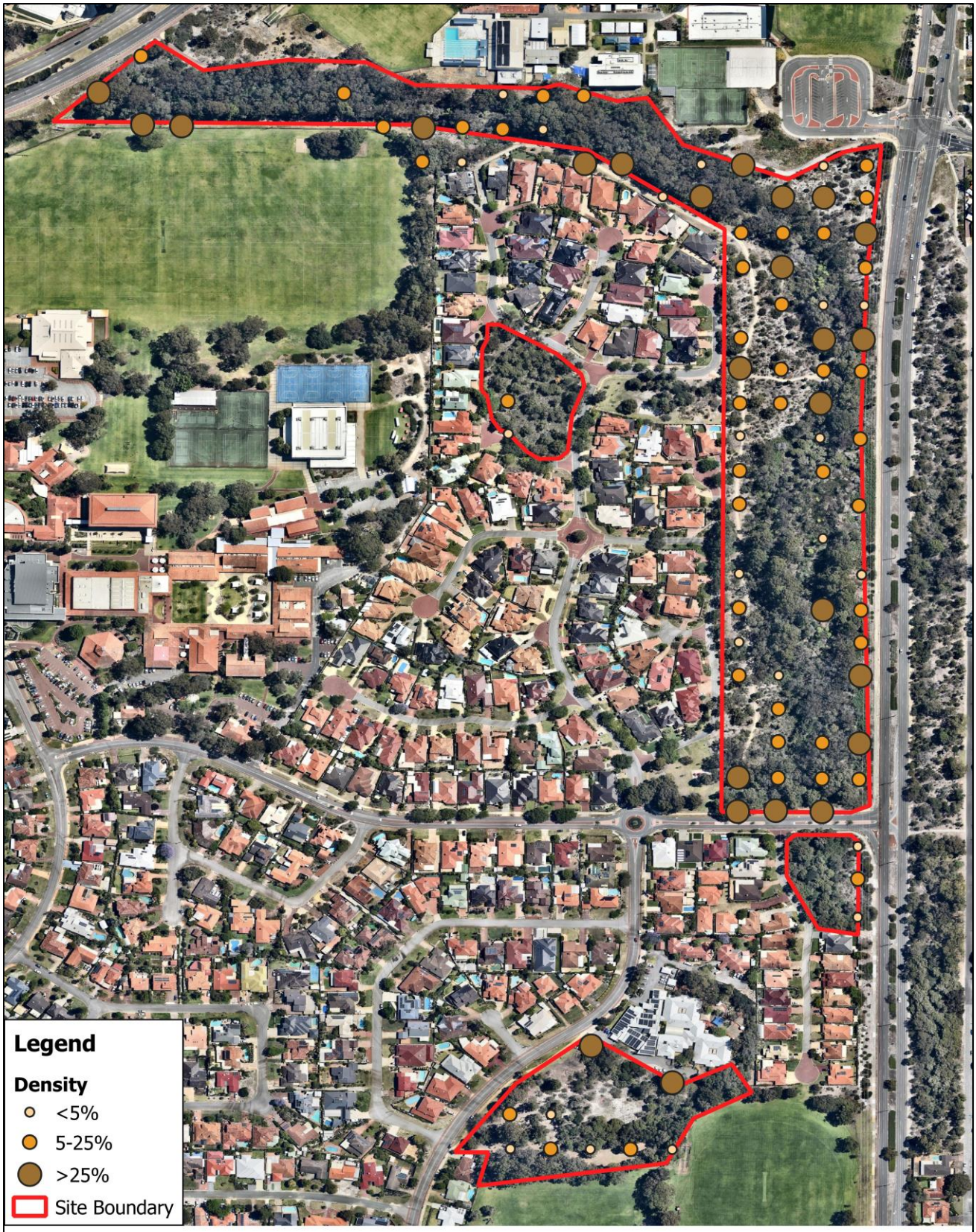
Perennial Clumping Grasses Distribution
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N


Legend
Density
<5%
5-25%
>25%
Site Boundary
Annual Clumping Grasses Distribution
Bull Creek Reserves, Bull Creek
Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94
0
100
200 m
N



Annual Clumping Grasses Distribution
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Perennial Running Grasses Distribution
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

Perennial Running Grasses Distribution
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Geophyte Distribution
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

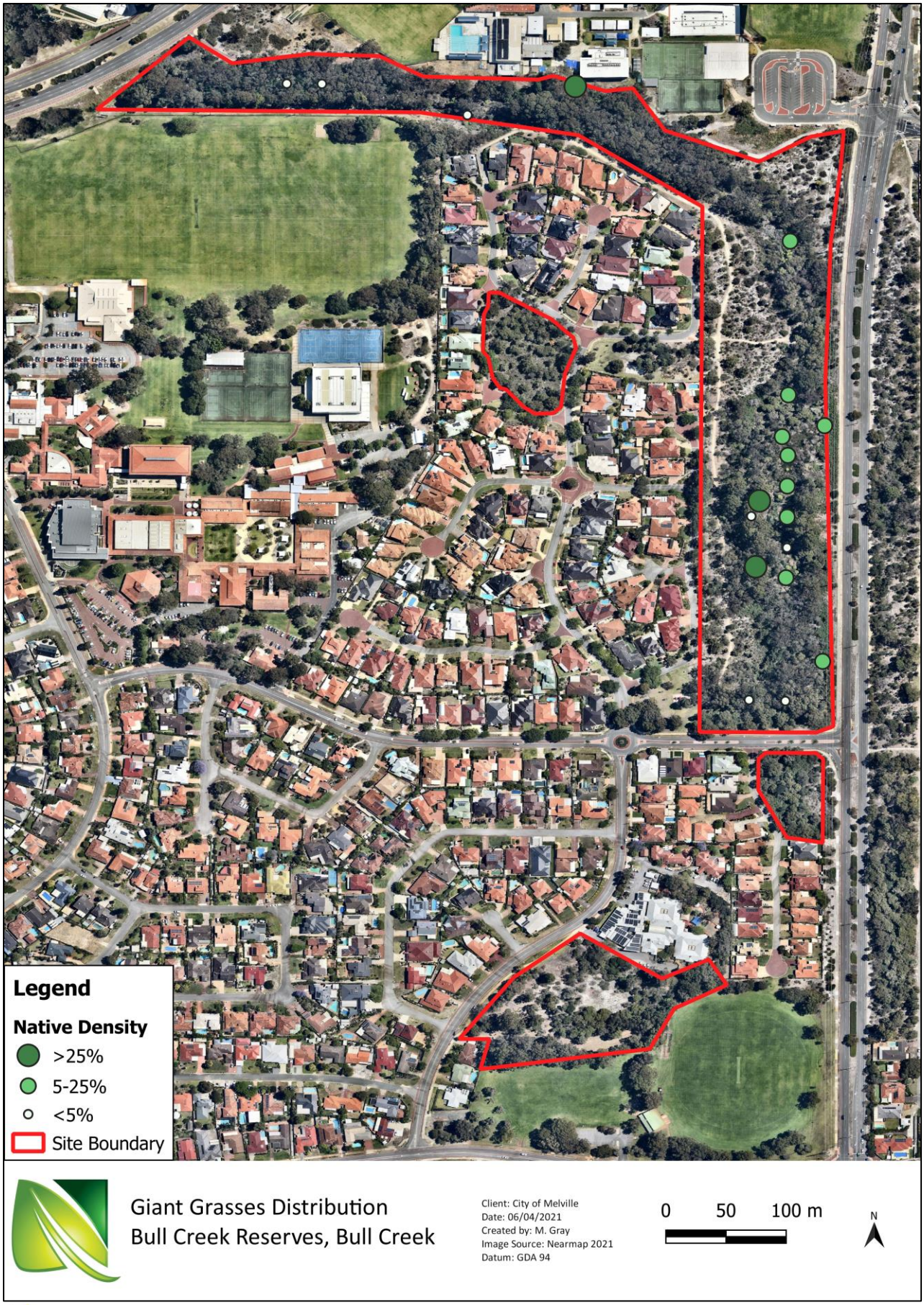
Geophyte Distribution
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

*Native density – *Typha orientalis*



*Native density – *Typha orientalis*

Woody Weed Distribution
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

Woody Weed Distribution
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

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Appendix 1 – Fauna Trapping Locations


C8
E21
T16
C9
C7
E22
T17
E20
T15
C6
T12
E16
E19
T14
E17
E15
T11
C3
C5
T13
E18
E12
T9
E13
C4
E14
T10
Legend
Camera
Elliot
Trapline
Site Boundary
Fauna Trap Locations
Bull Creek Reserves, Bull Creek
Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94
0
100
200 m
N

Fauna Trap Locations
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Appendix 2 - Disturbance

Disturbance Activities
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Informal Paths
Bull Creek Reserves, Bull Creek

Client:City of Melville
Date: 6/04/2021
Created by: M. Gray
Image Source: Nearmap, 2021
Datum: GDA 94

0 100 200 m

N

Informal Paths
Bull Creek Reserves, Bull Creek

Client: City of Melville
Date: 06/04/2021
Created by: M. Gray
Image Source: Nearmap 2021
Datum: GDA 94

0 50 100 m

N

Appendix 3 – Flora Species List

Native Species

Green = 'at-risk' species, * denotes species not recorded during the 2020 survey but have previously been recorded by the City of Melville (pers. Comm.)

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Acacia applanata				X			
Acacia pulchella	X	X	X	X	X	X	
Acacia saligna	X	X	X	X	X		X
Acacia willdenowiana		X					
Acacia stenoptera						X	
Adenanthos cygnorum		X		X	X	X	X
Adenanthos obovatus						X	
Agonis flexuosa	X	X	X	X			
Allocasuarina fraseriana	X	X	X	X			X
Allocasuarina humilis		X					
Allocasuarina fraseriana						X	
Anigozanthos humilis	X						X
Anigozanthos manglesii	X	X	X	X			X
Astartea scoparia			X	X	X	X	X
Austrostipa compressa		X		X		X	
Banksia attenuata		X					
Banksia dallanneyi		X					
Banksia grandis	X	X		X			
Banksia ilicifolia	X	X		X			

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Banksia menziesii	X	X	X	X			X
Banksia nivea	X						
Banksia littoralis		X					
Baumea articulata	X	X		X			
Baumea juncea	X	X		X			
Bolboschoenus caldwellii	X						
Boronia crenulata subsp. *viminea*			X				
Bossiaea eriocarpa	X	X	X				X
Brachyloma preissii			X				
Burchardia congesta		X				X	
Caladenia flava				X		X	
Caladenia latifolia		*					
Calothamnus quadrifidus		X	X		X		
Calothamnus lateralis		X					
Carex sp.		X					
Carpobrotus virescens		X					
Cartonema philydroides		X	X				
Cassytha racemosa				X		X	
Cassytha sp.	X						
Centella asiatica	X	X		X			
Chamaescilla corymbosa			X			X	
Comesperma calymega						X	

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Conostylis aculeata		X	X	X		X	X
Conostylis candicans	X	X		X			
Conostylis juncea			X	X		X	
Conostylis setigera			X	X			
Corymbia calophylla		X	X	X	X	X	X
Corynotheca micrantha			X	X			
Crassula exserta				X			
Dampiera linearis		X	X			X	X
Dasypogon bromeliifolius	X	X	X	X	X	X	X
Daviesia divaricata				X			
Daviesia physodes		X		X			
Desmocladus asper			X				
Desmocladus flexuosus		X	X	X		X	X
Dianella revoluta		X	X			X	
Dichopogon capillipes							X
Diuris sp.		*				X	
Drosera erythrorhiza						X	
Drosera pallida							X
Eucalyptus marginata		X				X	X
Eucalyptus rudis	X	X	X	X			
Eucalyptus todtiana	X	X					
Ficinia nodosa	X						

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Gahnia decomposita	X	X					
Gahnia trifida	X						
Gastrolobium ebracteolatum	X	X		X	X		
Gompholobium tomentosum	X	X	X	X	X	X	X
Haemodorum paniculatum		X					
Haemodorum spicatum			X	X		X	X
Hakea prostrata		X		X			X
Hakea trifurcata		X					
Hakea varia	X						
Hardenbergia comptoniana	X	X	X	X	X	X	X
Hemiandra pungens	X	X		X		X	X
Hibbertia hypericoides		X					
Hovea trisperma	X	X		X		X	
Hybanthus calycinus				X			
Hypocalymma angustifolium			X	X	X	X	X
Hypocalymma robustum		X					
Hypolaena exsulca						X	
Isolepis marginata				X			
Jacksonia furcellata	X	X	X	X	X	X	X
Jacksonia sternbergiana		X	X	X		X	
Juncus kraussii	X						
Juncus pallidus			X	X			

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Kennedia prostrata	X	X	X	X		X	
Kunzea glabrescens	X	X	X	X	X		X
Laxmannia squarrosa		X	X	X		X	X
Lechenaultia floribunda		X			X		
Lepidosperma angustatum						X	
Lepidosperma gladiatum	X	X					
Lepidosperma longitudinale	X	X	X	X	X	X	
Lepidosperma scabrum							X
Leucopogon tenuis		X					
Levenhookia pusilla		X					
Levenhookia stipitata							X
Lobelia anceps				X			
Lomandra caespitosa		X		X			X
Lomandra hermaphrodita		X	X	X		X	X
Lomandra preissii	X					X	
Luzula meridionalis						X	
Lyginia imberbis		X	X			X	
Lyperanthus nigricans		X					
Macrozamia riedlei		X	X	X			X
Melaleuca huegelii					X		
Melaleuca lateritia	X						
Melaleuca preissiana	X	X	X	X	X	X	X

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Melaleuca rhaphiophylla				X			
Melaleuca seriata							X
Mesomelaena pseudostygia				X			
Microtis media	X	X	X	X	X	X	X
Nuytsia floribunda		X	X	X		X	
Opercularia hispidula				X			
Opercularia vaginata		X	X			X	
Patersonia occidentalis	X			X			
Pericalymma ellipticum						X	
Persicaria decipiens		X					
Phlebocarya ciliata		X	X	X		X	X
Pimelea rosea	X					X	
Platysace filiformis						X	
Podotheca gnaphalioides		X					X
Pteridium esculentum	X	X	X	X			X
Pterostylis pyramidalis			X		X		
Pterostylis recurva				X			
Pyrorchis nigricans		*					
Regelia inops			X		X		
Samolus repens	X						
Schoenoplectus tabernaemontani	X						
Schoenus pedicellatus							X

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Schoenus grandiflorus		X					
Scholtzia involucrata							X
Senecio condylus			X	X			
Siloxerus filifolius			X	X			
Siloxerus humifusus		X				X	
Stirlingia latifolia		X		X			X
Stylidium brunonianum						X	
Stylidium hispidum						X	
Styphelia propinqua						X	
Suaeda australis	X						
Taxandria linearifolia	X	X	X	X			X
Tecticornia indica subsp. bidens	X						
Thelymitra sp.	X	X	X	X			
Thysanotus manglesianus		X	X			X	
Thysanotus sparteus				X		X	
Trachymene pilosa			X	X		X	X
Typha orientalis		X					
Verticordia densiflora	X						
Viminaria juncea	X		X	X			
Xanthorrhoea brunonis		X	X			X	X
Xanthorrhoea preissii		X	X	X			X

Weed and Dubious Species

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Dubious Species (total)	**2**	**9**	**1**	**2**	**6**		
Anigozanthos flavidus					#		
Dodonaea hackettiana		#					
Eucalyptus accedens		#					
Eucalyptus botryoides					#		
Eucalyptus camaldulensis		#	#		#		
Eucalyptus sp.				#			
Grevillea bipinnatifida		#					
Grevillea crithmifolia		#					
Grevillea thelemanniana		#					
Hakea laurina		#					
Hakea petiolaris					#		
Melaleuca nesophila						#	
Myrtaceae sp.		#					
Olearia axillaris	#						
Ricinocarpos glaucus		#			#	#	
Scaevola canescens				#			
Scaevola crassifolia	#						
Scholtzia sp.					#		
Weed species	**242**	**155**	**111**	**120**	**85**	**88**	**91**
*Acacia dealbata**			*		*		
*Acacia elata**	*						

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
*Acacia iteaphylla**		*	*	*	*		
*Acacia longifolia**	*	*	*	*	*	*	
*Acacia mearnsii**		*	*				
*Aeonium arboreum**							*
*Agapanthus praecox**						*	
Ailanthus altissima	*						
*Ailanthus altissima**	*	*					
*Aira cupaniana**		*					
*Arctotheca calendula**	*	*	*	*	*		*
*Arundo donax**	*						
*Asparagus aethiopicus**	*	*				*	
*Asparagus asparagoides**	*	*					
*Atriplex prostrata**	*						
*Avena barbata**	*	*	*	*	*		*
*Brassica tournefortii**	*	*	*		*		*
*Briza maxima**		*	*	*		*	*
*Briza minor**		*		*			
*Bromus diandrus**	*	*	*	*	*		*
Callistemon citrinus 'Kings Park Special'	*	*					
*Callitris preissi**		*		*			
*Carpobrotus edulis**			*	*			
*Casuarina cunninghamiana**		*	*		*	*	

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
*Casuarina glauca**	*	*			*		
*Cenchrus clandestinus**	*	*	*				
*Chamelaucium uncinatum**	*	*	*	*	*		
*Cirsium vulgare**	*						
*Cortaderia selloana**	*		*	*			
*Cotula turbinata**	*						
*Crassula alata**							*
*Cynodon dactylon**	*	*	*	*	*		
*Cyperus eragrostis**			*	*			
*Cyperus involucratus**		*					
Cyperus rotundus	*						
*Cyperus rotundus**	*	*		*			
Dietes grandiflora						*	
*Dietes grandiflora**						*	
*Dipogon lignosus**			*	*			
*Disa bracteata**			*	*	*	*	
Dracaena sp.*						*	*
*Ehrharta calycina**	*	*	*	*	*	*	*
*Ehrharta longiflora**	*	*	*	*	*	*	*
*Eragrostis curvula**		*	*	*	*		
*Erigeron bonariensis**	*					*	
*Erigeron sumatrensis**				*			

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
*Erodium botrys**	*	*					*
Erythrina x *sykesii**	*						
Eucalyptus accedens		*					
*Eucalyptus botryoides**		*					
Eucalyptus camaldulensis		*					
Eucalyptus camaldulensis subsp. *obtusa**							*
*Eucalyptus grandis**		*	*		*		
Eucalyptus sp.*			*		*		
*Euphorbia maculata**	*						
*Euphorbia terracina**	*	*	*	*	*	*	*
*Ferraria crispa**	*						
*Ficus carica**	*	*					
Freesia alba x *leichtlinii**	*	*	*	*		*	
*Fumaria capreolata**	*	*	*	*	*	*	*
*Galium murale**			*	*			
*Gazania linearis**		*		*	*		
*Geranium molle**	*						
*Gladiolus caryophyllaceus**	*	*	*	*	*	*	*
*Gladiolus undulatus**	*		*	*	*		
*Hesperantha falcata**						*	
*Holcus lanatus**				*			
*Homalanthus populifolius**		*	*				

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
*Hordeum leporinum**	*	*	*		*		
*Hypochaeris glabra**		*	*		*		*
*Hypochaeris radicata**	*			*	*	*	
*Ipomoea indica**	*						
*Isolepis prolifera**		*					
*Juncus microcephalus**	*	*	*				
*Lachenalia reflexa**			*		*		
*Lactuca serriola**	*	*		*			*
*Lagurus ovatus**	*	*	*	*			
*Lantana camara**	*	*	*				
*Lathyrus tingitanus**	*						
*Lavandula dentata**					*	*	
*Leontodon rhagadioloides**		*	*		*	*	
*Leptospermum laevigatum**				*	*		
*Liquidambar styraciflua**		*					
*Lobularia maritima**		*					
*Lolium rigidum**	*	*	*	*	*	*	*
Lomandra hystrix	*						
*Lotus angustissimus**		*		*	*		
*Lupinus angustifolius**	*				*		
*Lupinus cosentinii**	*						
*Lysimachia arvensis**	*	*		*			

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
*Malva parviflora**	*						
*Medicago polymorpha**	*						
*Melaleuca quinquenervia**	*	*	*	*	*	*	
*Melia azedarach**		*				*	
*Melinis repens**		*					
*Mentha x piperita**	*						
*Moraea flaccida**	*			*			
*Nothoscordum gracile**							*
*Oenothera drummondii**		*		*	*		
*Olea europaea**	*					*	
*Ornithopus compressus**					*		
*Orobanche minor**		*		*	*		
*Osteospermum ecklonis**		*	*		*		
*Oxalis pes-caprae**	*		*	*	*	*	*
*Parthenocissus quinquefolia**	*						
*Paspalum dilatatum**	*	*					*
*Pelargonium capitatum**	*	*	*	*	*	*	
*Petrorhagia dubia**		*	*	*	*	*	*
*Petroselinum crispum**		*					
*Phalaris paradoxa**	*	*					
*Phleum arenarium**				*			
*Phoenix dactylifera**	*					*	

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
*Pinus sp.**		*		*	*		
*Plantago major**		*					
*Poa annua**	*	*					
*Polygala myrtifolia**				*			
*Populus nigra**		*					
*Pseudognaphalium luteoalbum**		*		*			
*Ranunculus muricatus**		*		*			
*Ricinus communis**	*	*					
*Romulea rosea**		*	*	*	*	*	*
*Rubus laudatus**	*	*	*	*			
*Rumex crispus**	*	*					
*Salix babylonica**		*					
*Schinus terebinthifolia**	*	*	*	*	*		*
*Silene gallica**		*		*		*	
*Solanum nigrum**	*	*		*		*	
*Sonchus asper**	*	*	*	*			
*Sonchus oleraceus**	*	*			*	*	
*Sphaeropteris cooperi**		*	*				
*Sporobolus africanus**	*						
*Stachys arvensis**	*						
*Stellaria media**	*				*		*
*Stenotaphrum secundatum**		*					

Species Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
*Trachyandra divaricata**	*			*			
*Trachymene pilosa**		*					
*Trifolium arvense**				*	*		
*Trifolium campestre**	*		*	*	*		
*Trifolium dubium**							*
*Trifolium repens**		*					
*Tropaeolum majus**			*				
*Urospermum picroides**		*	*	*			
*Ursinia anthemoides**		*	*	*	*	*	*
*Vicia sativa**	*	*	*	*		*	
*Vulpia myuros**	*	*		*			
*Wahlenbergia capensis**	*	*	*	*	*	*	*
*Washingtonia filifera**	*	*	*	*			
Yucca sp.*	*						
*Zantedeschia aethiopica**	*	*	*	*		*	

Appendix 4 – Fauna Species List

Family	Species Name	Common Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Mammals									
Muridae	*Mus musculus*	House Mouse	X	X					
Leporidae	*Oryctolagus cuniculus*	Rabbit		X				X	
Muridae	*Rattus rattus*	Black Rat				X			
Birds									
Alcedinidae	*Dacelo novaeguineae*	Laughing Kookaburra	X	X	X				X
Columbidae	*Spilopelia senegalensis*	Laughing Turtle Dove		X					
Columbidae	*Spilopelia chinensis*	Spotted Turtle Dove		X					
Psittacidae	*Trichoglossus moluccanus*	Rainbow Lorikeet	X		X		X		
Acanthizidae	*Acanthiza apicalis*	Inland Thornbill		X					
Accipitridae	*Accipiter fasciatus*	Brown Goshawk			X				
Anatidae	*Anas superciliosa*	Pacific Black Duck	X	X					
Meliphagidae	*Anthochaera carunculata*	Red Wattlebird			X		X	X	
Ardeidae	*Ardea modesta*	Eastern Great Egret	X						
Ardeidae	*Ardea novaehollandiae*	White-faced Heron	X						
Cacatuidae	*Cacatua roseicapilla*	Galah			X		X		
Cacatuidae	*Calyptorhynchus banksii naso*	Red-tailed Black Cockatoo	X	X		X		X	X
Cacatuidae	*Calyptorhynchus latirostris*	Carnaby's Cockatoo					X		
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike			X				X
Corvidae	*Corvus coronoides*	Australian Raven	X		X	X		X	X

Family	Species Name	Common Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Cracticidae	*Cracticus tibicen*	Australian Magpie		X				X	
Rallidae	*Gallinula tenebrosa*	Dusky Moorhen	X						
Monarchidae	*Grallina cyanoleuca*	Magpie-lark		X					
Hirundinidae	*Hirundo neoxena*	Welcome Swallow		X		X			
Psittacidae	*Lichmera indistincta*	Brown Honeyeater			X				
Maluridae	*Malurus splendens*	Splendid Fairywren		X	X				
Meropidae	*Merops ornatus*	Rainbow Bee-eater			X	X	X		
Ardeidae	*Nycticorax caledonicus*	Nankeen Night Heron		X					
Pardalotidae	*Pardalotus striatus*	Striated Pardalote		X					
Columbidae	*Phaps chalcoptera*	Common Bronzewing			X				
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater		X	X				X
Podargidae	*Podargus strigoides*	Tawny Frogmouth			X				
Rallidae	*Porphyrio porphyrio*	Pruple Swamphen	X						
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail			X				
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail		X	X	X	X	X	
Laridae	*Sterna dougalii gracilis*	Roseate Tern	X						
Threskiornithidae	*Threskiornis moluccus*	Australian Whit Ibis	X	X			X	X	
Zosteropidae	*Zosterops lateralis*	Grey-breasted White-eye (Silvereye)			X				
Amphibians									
Myobatrachidae	*Crinia sp.*		X						
Myobatrachidae	*Crinia georgiana*	Quacking Frog	X						

Family	Species Name	Common Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Limnodynastidae	*Limnodynastes dorsalis*	Western Banjo Frog		X					
Reptiles									
Scincidae	*Acritoscincus trilineatus*	South-western Cool Skink							X
Pygopodidae	*Aprasia repens*								X
Scincidae	*Cryptoblepharus plagiocephalus*	Fence Skink							X
Scincidae	*Ctenotus australis*		X	X	X				X
Scincidae	*Ctenotus fallens*				X				
Scincidae	*Egernia kingii*	King's Skink		X		X			
Scincidae	*Hemiergis quadrilineata*					X			
Scincidae	*Menetia greyii*	Common Dwarf Skink		X					
Scincidae	*Tiliqua rugosa rugosa*	Bobtail		X	X				
Invertebrates									
Julidae	*Ommatoiulus moreleti*	Portuguese Millipede	X	X	X		X	X	X
Araneidea	*Eriophora transmarina*	Australian Garden Orbweaver	X	X		X	X		
Gnaphosidae	*Intruda signata*	Gnaphospider							
Lamponidae	*Lampona cylindrata*	Common White-tail Spider				X			
Salticidae	*Maratus pavonis*	Common Peacock Spider				X			
Philodromidae	*Tibellus tenellus*	Running Crab Spider		X		X			
Gnaphosidae		Ground Spider 1		X					
Gnaphosidae		Ground Spider 2					X		
Theridiidae						X			

Family	Species Name	Common Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Triaenonychidae	*Nunciella aspera*	Harvestman		X					
Pholcidae	*Smeringopus natalensis*	Natal's Daddy Long Legs			X			X	
Paradoxosmatidae	*Antichiropus variabilis*				X				
Limacidae	*Lehmannia* sp.	Banded Garden Slug	X	X	X			X	X
Ectobiidae	*Balta hebardi*	Hebard's Balta		X					
Ectobiidae	*Ellipsidion humerale*	Bush Cockroach				X			X
Curculionidae	*Catasarcus pallidiventris*						X		
Tenebrionidae	*Helea* sp.	Pie-dish Beetle				X			
Belidae	*Rhinotia suturalis*						X		
Coreidae	*Amorbus* sp.								X
Coreidae	*Mictis profana*	Crusader Bug		X					
Pentatomidae	*Pseudapines* sp.						X		
Pentatomidae		Beetle 1			X				
Formicidae	*Dolichoderus* sp.		X	X	X		X		X
Formicidae	*Iridomyrmex* purpureus	Meat Ant	X						
Formicidae	*Iridomyrmex* sp.	Meat Ant			X				
Ichneumonidae	*Lchneum* sp.	Parasitoid Wasp			X				
Formicidae	*Myrmecia* sp.	Bull Ant							X
Scoliidae	*Radumeris* sp.		X						
Formicidae	*Rhytidoponera metallica*	Green-head Ant				X	X		
Formicidae		Ant 1							X
Psychidae	*Clania* sp.	Case Moth		X					

Family	Species Name	Common Name	Bateman	Bull Creek	Reg Burke	Richard Lewis	Trevor Gribble	Curedale Mews	Debries Place
Nymphalidae	*Danaus plexippus*	Monarch Butterfly			X				
Acrididae	*Goniaea australasiae*	Common Gumleaf Grasshopper					X		
Chrysomelidae		Insect 1							X
Porcellionidae	*Porcellio scaber*	Common Rough Woodlouse	X	X					

*introduced species (highlighted red)