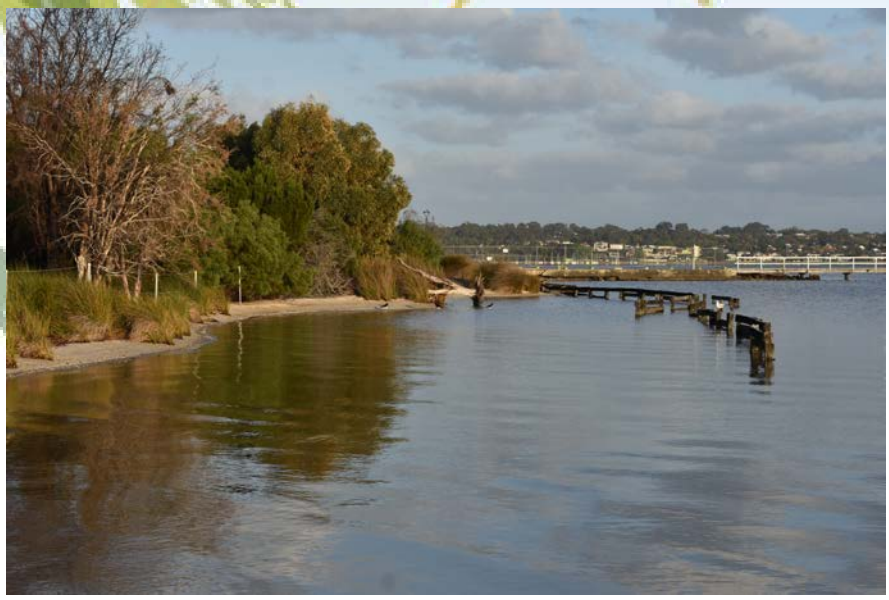
City of Melville



City of Melville

Estuarine Reserves Strategic Management Plan

April 2020

Executive Summary

The Estuarine Reserves are comprised of Attadale Foreshore, Blackwall Reach, Jeff Joseph, Point Walter and Troy Park within the City of Melville. The Estuarine Strategic Management Plan 2020 updates the Estuarine Reserves Strategic Management Plan 2014-2019.

There are ten vegetation types identified within the Estuarine Reserves, namely:

- *Ficinia* Sedgeland
- Mixed Woodland
- Mixed Sedgeland
- Marri, Jarrah, *Banksia* Woodland
- *Casuarina obesa* Woodland
- Mixed Coastal Shrubland
- Melaleuca Woodland
- Tuart Woodland
- *Banksia prionotes*, Tuart Woodland
- Peppermint Woodland.

The Estuarine Reserves provide areas of fauna habitat in the form of habitat trees as well as existing bird and bat boxes.

A total of 131 native species from 37 families were identified within the Estuarine Reserves during the survey, with one threatened flora species found at Point Walter Reserve, namely *Grevillea thelemanniana,* along with 15 “at-risk” flora species as identified by the City were recorded, along with their locations.

The Estuarine Reserves provide dryland habitat for an array of fauna species particularly reptiles and birds with a total of 72 fauna species recorded, including:

- 23 invertebrate species (22 native, one feral)
- nine reptiles (all native)
- 36 birds (30 native, six feral)
- four mammals (one native, three feral).

Several threats are present within the Estuarine Reserves including:

- a total of 85 introduced flora species identified during the spring 2019 survey with seven Very High and 29 High impact weeds present
- ten feral animals were identified with three Very High and one High impact feral animals present
- three prominent stormwater drains were observed causing erosion and acting as vectors for weed dispersal into Blackwall Reach Reserve along with the potential presence of Armillaria along the eastern edge of Blackwall Reach
- dieback was found within the southern portion of Point Walter Reserve.

Management strategies have been developed for 2020-2025 including Key Performance Indicators for the Estuarine Reserves. The main management for the North West Reserve including:

- undertake weed control of Very High and High impact weeds
- secure bird box at the south of Blackwall Reach
- revegetate areas proposed in Table 9 and Figure 16 – 18 to enhance vegetation condition and reduce habitat loss within the reserves
- continue to monitor and report any increase in threats in the reserves and undertake management in accordance with the NAAMP
- continue to monitor assets for decline in health or damage and repair or manage 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
- Kellie Fowler from the City of Melville

Table of Contents

1 Introduction

The City of Melville commissioned Natural Area Consulting Management Services (NACMS/Natural Area) to prepare a site-specific Management Plan for the Estuarine Reserves, in accordance with the City of Melville's *Natural Areas Asset Management Plan* (NAAMP). The Estuarine Reserves are comprised of Attadale Foreshore Reserve, Blackwall Reach, Jeff Joseph Reserve and Point Walter Reserve. In addition to these four sites, a supplementary survey of Troy Park Bushland will be included (Appendix 5).

1.1 Background

The Estuarine Reserves Strategic Management Plan 2020 updates the Estuarine 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. The aim of the management plan is to maintain and enhance the various ecological functions and values associated within the four Estuarine Reserves, which included:

- Identification of threatening processes outlined within the NAAMP that occur within the bushland areas
- Identification of Assets
- Identification of site-specific threatening processes over time
- Provide clear reserve management recommendations to reduce negative impacts associated with the various threatening processes
- Provide a plan to improve degraded areas within the reserve and maintain areas.

1.3 Scope

In the context of the strategic management plan objective, Natural Area carried out the following works:

- Level 1 flora survey of each of the reserves including mapping the presence and density of weed species
- Targeted level 2 fauna survey of all reserves including trapping over a 5 day period and setting out of camera traps to determine fauna occurrence
- 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
- Management recommendations for each of the four estuarine reserves

1.4 Database

Estuarine Reserves are comprised of five reserves (Figure 1) which include:

- Attadale Foreshore Reserve - parks and recreation
- Blackwall Reach - parks and recreation
- Jeff Joseph Reserve – parks and recreation, water
- Point Walter Reserve - parks and recreation
- Troy Park Reserve – parks and recreation.

These reserves are located in the suburbs of Attadale, Bicton and Applecross within the City of Melville and ranging from approximately 6 km to 10 km south west of the Perth CBD.

2 Assets

2.1 Reserve Ratings

The estuarine reserves (Table 1) have been assigned overall ratings under the City's NAAMP framework. These are:

- Attadale Reserve – 2
- Blackwall Reach – 2
- Point Walter – 1

Point Walter is assigned the highest NAAMP rating which is consistent with the previous rating. Both Attadale and Blackwall Reach have been reduced from a previous rating of 1 which reflects the changes in categories for ratings of public open spaces and parks from 4 to 5 categories, ratings are scored from 1 highest to 5 lowest. Jeff Joseph Reserve and Troy Park Reserve have not yet been assigned a NAAMP rating.

Table 1: Estuarine reserves, City of Melville

Reserve Name	Reserve Number	Total Reserve Area
Attadale Foreshore Reserve*	Lot 301	28.73 ha
Blackwall Reach	Lot 11240	12.5 ha
Jeff Joseph Reserve	Lot 7840	5.17 ha
Point Walter Reserve*	Lot 11241	57.5 ha
Troy Park Reserve*	Lot 301	4.56 ha

*Only the bushland portion of these reserves were assessed.

2.1.1 Bush Forever

Bush Forever sites are regionally significant bushland and wetland areas within the Swan Coastal Plain that were identified are needing protection in Perth's Bushland Project (Government of Western Australia, 2000). Bush Forever Sites listed by the Government of Western Australia which are subject to non-statutory protection, identified as containing regionally significant bushland (City of Melville Natural Area Asset Management Plan 2011).

Bush forever sites include Point Walter, Blackwall Reach, Attadale Foreshore and Troy Park Bushland (BF331) (WALGA 2020). These four Estuarine reserves meet five of the Bush Forever selection criteria (City of Melville 2019, Government of Western Australia, 2000) (Table 2, Figure 1). Jeff Joseph is not classified as a Bush Forever site.

Table 2: Bush Forever criteria, Estuarine Reserves

Bush Forever Criteria	Comments
Representation of ecological communities	▪ the site is within the vegetation complex Karrakatta Complex – Central and South ▪ the floristic community type is comprised of Seasonal Wetlands and Uplands centred on Spearwood and Quindalup Dunes
Rarity	▪ Locally significant flora is known to occur in the area which include, Lechenaultia linarioides and Caladenia latifolia
Ecological processes or natural systems	▪ As fringing vegetation on the Swan River the Reserves play a role in hydrological cycles, reduction of erosion and nutrient stripping of material and water before it enters the River.
Scientific or evolutionary importance	▪ As parts of the Estuarine reserves are wetlands and tidal wetlands, they provide habitat for specialised

Bush Forever Criteria	Comments
	species such as frogs and reptiles that do not travel over great distances and are locally endemic to the area
General criteria for the protection of wetland and coastal vegetation	▪ All five Estuarine reserves are located on the banks of the Swan River and are comprised of coastal and riparian vegetation.
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 ▪ provides a linkage between areas of bushland enabling fauna movements ▪ part of open space of regional significance

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 bushland remnants. Blackwall Reach, Point Walter Reserve, Attadale Foreshore and Troy Park are connected along the regional linkage No. 50 with Jeff Joseph Reserve separated approximately 6 km along the riverbank to the north east (Figure 1).

As stated in the NAAMP and shown in Table 3 Point Walter, Blackwall Reach, Attadale Foreshore and Troy Park are identified as having Very High value as they are within Regional Linkages, with Jeff Joseph classified as Medium value being outside any ecological linkage but still an area of remnant vegetation.

Table 3: Ecological linkages of the Estuarine Reserves

Value	Reserve	Assets 2019
Very High Within No.35 Regional Linkage (regionally significant continuous linkage)	Blackwall Reach	Maintained (assume unchanged)
Very High Within No. 50 Regional Linkage (potentially regionally significant linkage)	Attadale Foreshore	Maintained (assume unchanged)
	Blackwall Reach	Maintained (assume unchanged)
	Point Walter Reserve	Maintained (assume unchanged)
	Troy Park Bushland	Maintained (assume unchanged)
Medium Reserve supporting remnant vegetation	Jeff Joseph	Maintained (assume unchanged)

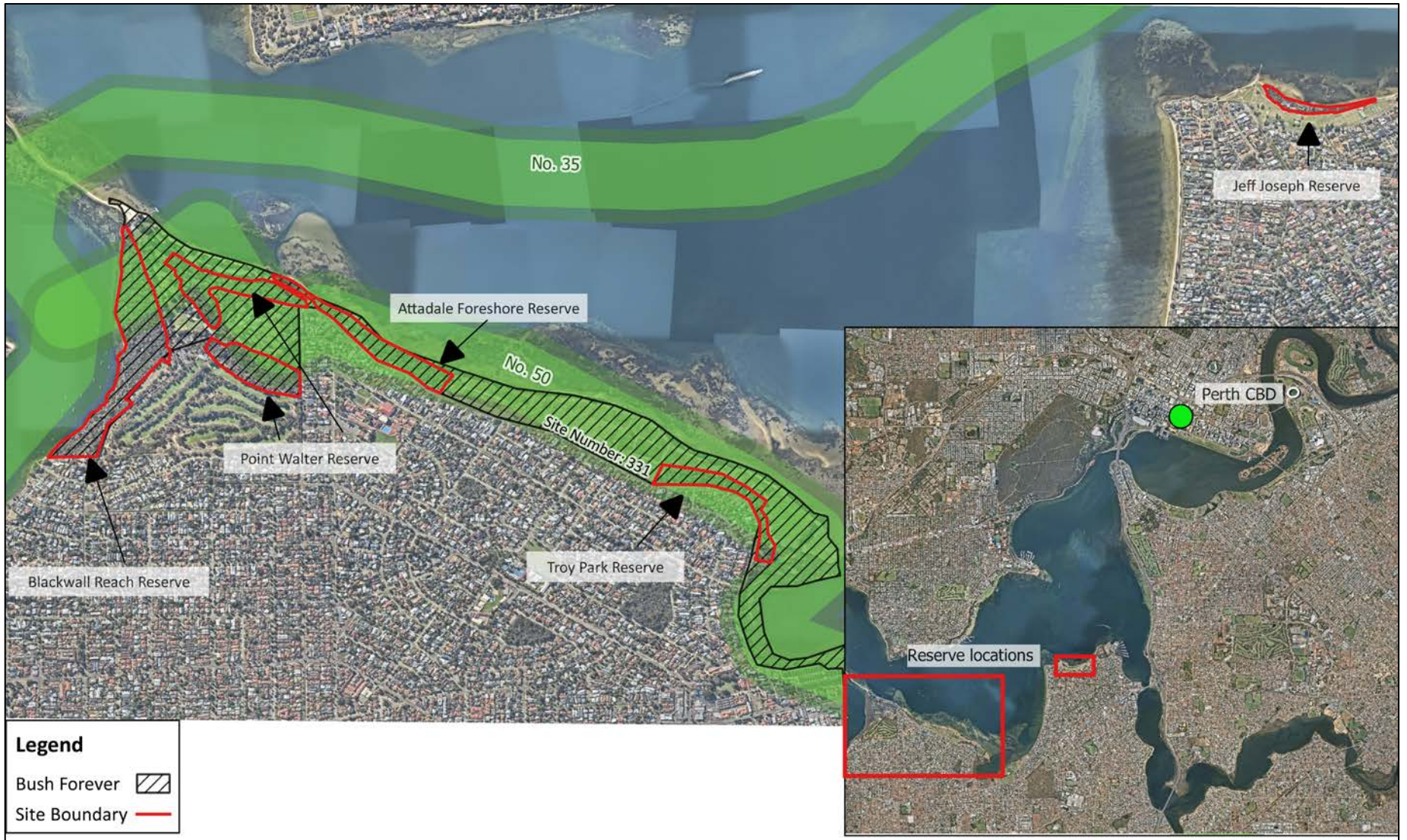


Figure 1:
Site Locations, Bush Forever and Ecological Linkages Estuarine Reserves - Attadale FS, Blackwall Reach, Jeff Joseph, Point Walter and Troy Park

Client: City of Melville
Date: 29/04/2020
Created by: A. Braxton-Smith
Image Source: Nearmap, 2020
Datum: GDA 94

2.2 Site Assets

This section discusses the environmental, heritage and social assets of the Estuarine Reserves.

2.2.1 Ecological Communities

2.2.1.1 Vegetation Complex

The Estuarine Reserves are situated within the Karrakatta Complex – Central and South vegetation complex (WALGA, 2020). This complex is described as open forest of Tuart, Jarrah and Marri, with Tuarts towards the coastal areas, Jarrah towards the eastern areas and Marri located in damper locations where elevation is lower (Heddle, Loneragan and Havel, 1980). The pre-European extent of this vegetation complex remaining is:

- 23.91% within the Swan Coastal Plain (WALGA, 2013)
- 4.76% 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 plant structures and assemblages 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. Ten vegetation types are present at the Estuarine Reserves and are detailed in Table 5 and shown in Figures 2, 3 and 4 for each Estuarine Reserve (Troy Park vegetation type map is provided in Appendix 5).

The DBCA database search identified three Threatened Ecological Communities present within the Estuarine Reserves, namely *Banksia Dominated Woodlands of the Swan Coastal Plain*, *Subtropical and Temperate Coastal Saltmarsh* and *Northern Spearwood shrublands and woodlands* (DBCA, 2020a). Table 4 shows the estuarine reserve each TEC/PEC are within.

Table 4: Threatened and Priority Ecological Communities within the Estuarine Reserves

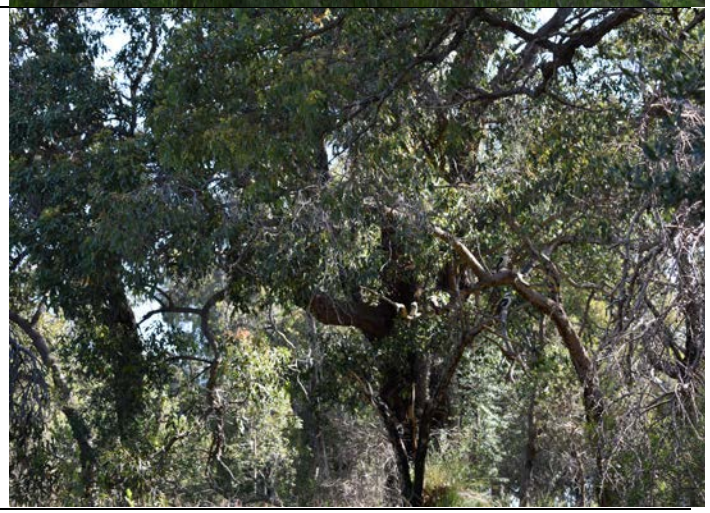
Threatened and/or Priority Ecological Community	WA	Cwlth	Estuarine Reserves	Presence
Banksia Dominated Woodlands of the Swan Coastal Plain	P3	EN	Attadale Foreshore	Confirmed
			Blackwall Reach	Confirmed
			Jeff Joseph	Confirmed
			Point Walter Reserve	Confirmed
			Troy Park	Confirmed
Subtropical and Temperate Coastal Saltmarsh	P3	VU	Attadale Foreshore	Confirmed
			Blackwall Reach	No presence
			Jeff Joseph	No presence
			Point Walter Reserve	No presence
			Troy Park	Confirmed
Northern Spearwood shrublands and woodlands	P3	-	Attadale Foreshore	No presence
			Blackwall Reach	No presence
			Jeff Joseph	No presence
			Point Walter Reserve	Confirmed
			Troy Park	No presence

Table 5: Vegetation types, Estuarine Reserves

Type	Description	Occurrence					Photograph
		Attadale FS	Blackwall Reach	Jeff Joseph	Point Walter	Troy Park	
Ficinia Sedgeland	This vegetation is comprised of *Ficinia nodosa* over an understory of mixed introduced herbs and sedges.	X		X			
Mixed Woodland	This vegetation is comprised of an overstory of *Acacia* spp. and *Casuarina* spp. over an understory of mixed native sedges.			X			

Type	Description	Occurrence					Photograph
		Attadale FS	Blackwall Reach	Jeff Joseph	Point Walter	Troy Park	
Mixed Sedgeland	This vegetation is comprised of an overstory of mixed native sedges over an understory of Kikuyu and mixed weedy herbs.			X			
Marri, Jarrah, Banksia Woodland	This vegetation is comprised of an overstory of Marri (*Corymbia calophylla*) and Jarrah (*Eucalyptus marginata*) over a middle story of mixed native shrubs and an understory of native herbs and introduced weed species.		X		X		

Type	Description	Occurrence Attadale FS	Blackwall Reach	Jeff Joseph	Point Walter	Troy Park	Photograph
Casuarina obesa Woodland	This vegetation is comprised of an overstory of *Casuarina obesa* over an understory of *Juncus* spp. *Ficinia nodosa* and mixed introduced species.	X	X				
Mixed Coastal Shrubland	This vegetation is comprised of an overstory of *Acacia rostellifera* and *Banksia sessilis* and mixed low shrubs over an understory of native herbs.		X				

Type	Description	Occurrence					Photograph
		Attadale FS	Blackwall Reach	Jeff Joseph	Point Walter	Troy Park	
Melaleuca Woodland	This vegetation is comprised of and overstory of *Melaleuca rhaphiophylla* and *Melaleuca cuticularis* over an understory of *Baumea juncea, Juncus pallidus* and weedy herbs and grasses.	X				X	
Tuart Woodland	This vegetation is comprised of and overstory of *Eucalyptus gomphocephala* over a middle story of mixed native shrubs and an understory of native herbs and introduced species.		X		X		

Type	Description	Occurrence					Photograph
		Attadale FS	Blackwall Reach	Jeff Joseph	Point Walter	Troy Park	
Banksia prionotes, Tuart Woodland	This vegetation is comprised of an overstory of *Banksia prionotes* over a middle story of mixed native shrubs and an understory of native herbs.				X		
Peppermint Woodland	This vegetation is comprised of Agonis flexuosa over mixed native shrubs and an understory of native herbs, weedy grasses and herbs.		X				

Figure 2:
Vegetation Types
Estuarine Reserves - Blackwall Reach

Figure 3:
Vegetation Types
Estuarine Reserves - Jeff Joseph

Client: City of Melville
Date: 03/04/2020
Created by: S. Hynes
Image Source: Nearmap, 2020
Datum: GDA 94

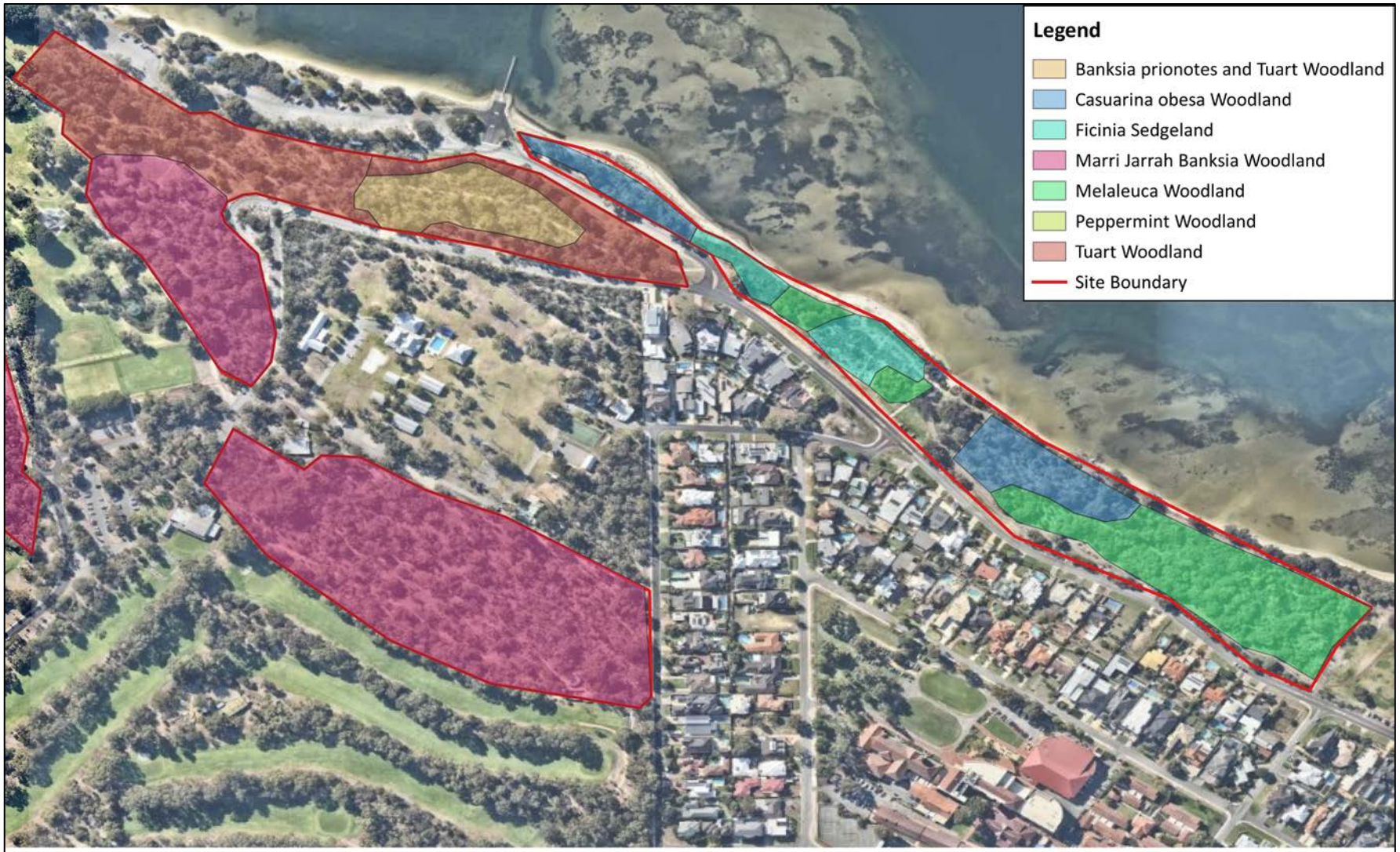


Figure 4:

Vegetation Types
Estuarine Reserves - Attadale FS and Point Walter

Figure 5: Vegetation types within Troy Park (Woodgis, 2017)

Figure 6: Showing the Management Zones within Troy Park (Woodgis 2017)

2.2.2 Fauna Habitat

The Estuarine Reserves provide important habitat for native fauna at a local level. They provide additional habitat for fauna that utilise the nearby regional ecological linkage, in particular mobile fauna such as birds and bats. A review of the Western Australian Local Government Association (WALGA) Environmental Planning Tool indicated that all four estuarine reserves are confirmed roosting areas for the endangered Carnaby's Cockatoo (*Calyptorhynchus latirostris*), and are potential breeding and feeding areas for this species and other threatened black cockatoos (WALGA, 2020). Spring surveys during 2019 undertaken by NACMS confirmed all four reserves contained preferred food source flora species for threatened black cockatoos including Jarrah, Marri, *Banksia* and *Hakea* species.

Large native habitat trees with a diameter at breast height (DBH) over 60cm were recorded across the Estuarine Reserves (Table 6, Figures 8, 9, 10 and 11). These trees are important habitat for native bat and bird species providing roosting and nesting habitat and hollows, with larger trees more likely to contain hollows. A total of 359 large habitat trees were found and for each tree the species was recorded, whether they were alive or dead and if they contained hollows or bird nests. The presence of the bird and bat boxes were recorded in each reserve and are shown in Figures 12, 13 and 14, with Figure 7 showing examples of the bird and bat boxes observed.

Table 6: Habitat trees with DBH > 60 cm in Estuarine Reserves

Species	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Total
Agonis flexuosa		39 alive 16 dead		7 alive 0 dead	62
Allocasuarina fraseriana		1 alive 0 dead		13 alive 4 dead	18
Casuarina obesa	12 alive 1 dead		1 alive 0 dead		14
Corymbia calophylla		19 alive 5 dead		28 alive 5 dead	57
Eucalyptus gomphocephala		70 alive 2 dead		36 alive 2 dead	110
Eucalyptus marginata		2 alive 0 dead		55 alive 9 dead	66
**Eucalyptus sp*. (foreign)	1 alive 1 dead	3 alive 0 dead			5
**Ficus macrophylla*				1 alive 0 dead	1
Melaleuca rhaphiophylla	16 alive 0 dead			2 alive 0 dead	18
**Melia azedarach*				2 alive 0 dead	2
**Pinus pinaster*		6 alive 0 dead			6
Total	31	163	1	164	359

Note: introduced tree species are denoted by * and highlighted pink.

Figure 7: Bat Box (Left) and Bird Box at Blackwall Reach

Fauna Habitat site indices for large habitat trees from 2005 to 2019 are shown in Table 7 and are recorded in trees per hectare for easier comparison between reserves within the City of Melville. The previous survey undertaken by Woodgis in 2013 recorded medium trees with a DBH > 30 cm but < 50 cm and large trees with a DBH > 50 cm. As NACMS recorded large trees with a DBH > 60 cm in 2019 it is more difficult to compare results but as the dead native trees/hectare numbers have not increased we can assume the additional live native trees recorded in 2013 were those which have a DBH between 50 and 60 cm, and that numbers are consistent for the Estuarine Reserves over time. It should also be noted that the 2019 NACMS survey included Jeff Joseph Reserve which has not been previously surveyed in the Estuarine Reserves Strategic Management Plan.

Table 7: Fauna Habitat Site Indices

Values	Habitat sites	Trees/ha 2005	Trees/ha 2013[1]	Trees/ ha 2019[2]	Assets 2005-2019
Medium Very Large Trees	Live native tree	No Data	18	11	Maintained (assumed unchanged)
	Dead native tree		3	2	

Note: 1. DBH > 50 cm recorded; 2. DBH > 60 cm recorded

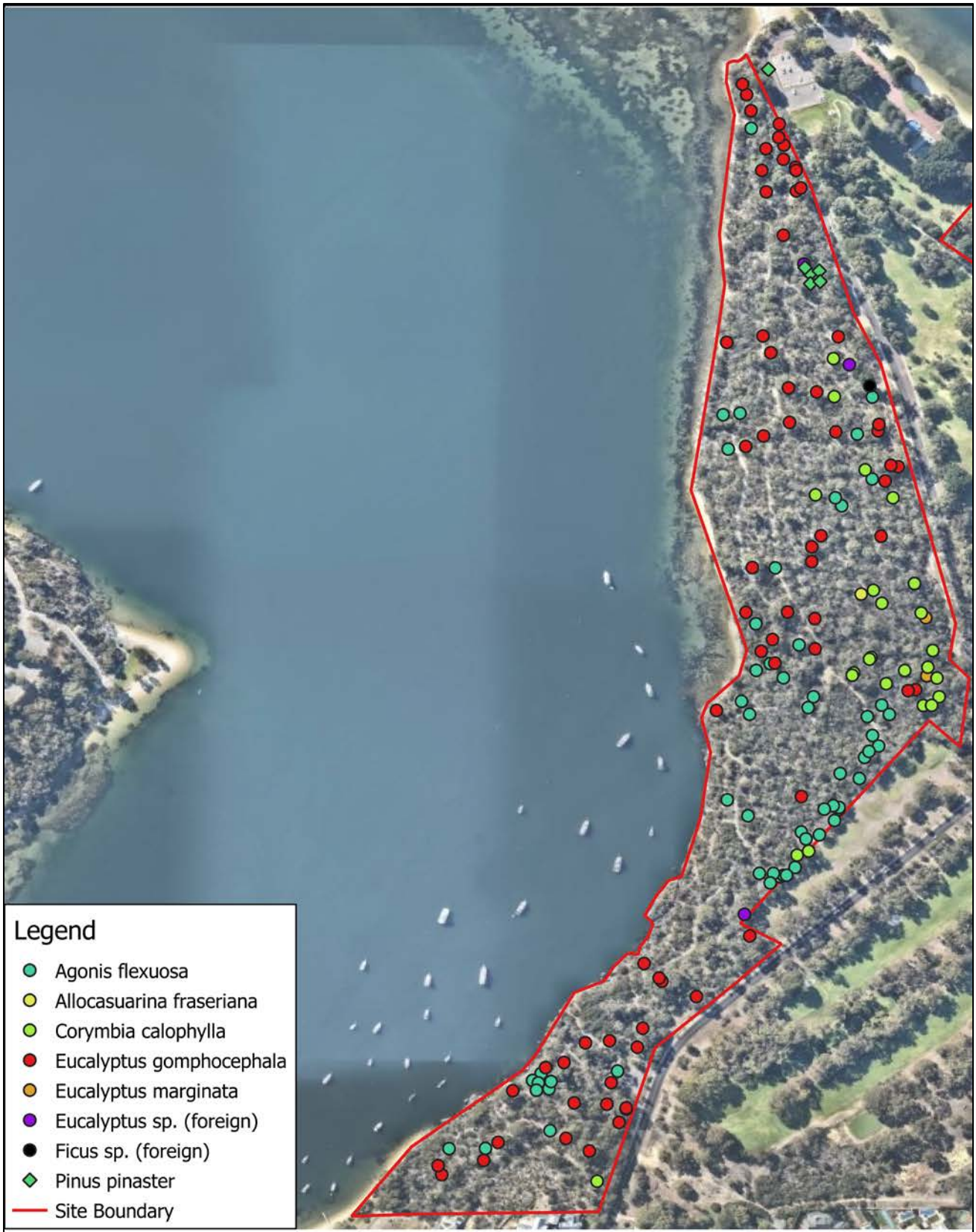


Figure 8:
Habitat Trees
Estuarine Reserves - Blackwall Reach

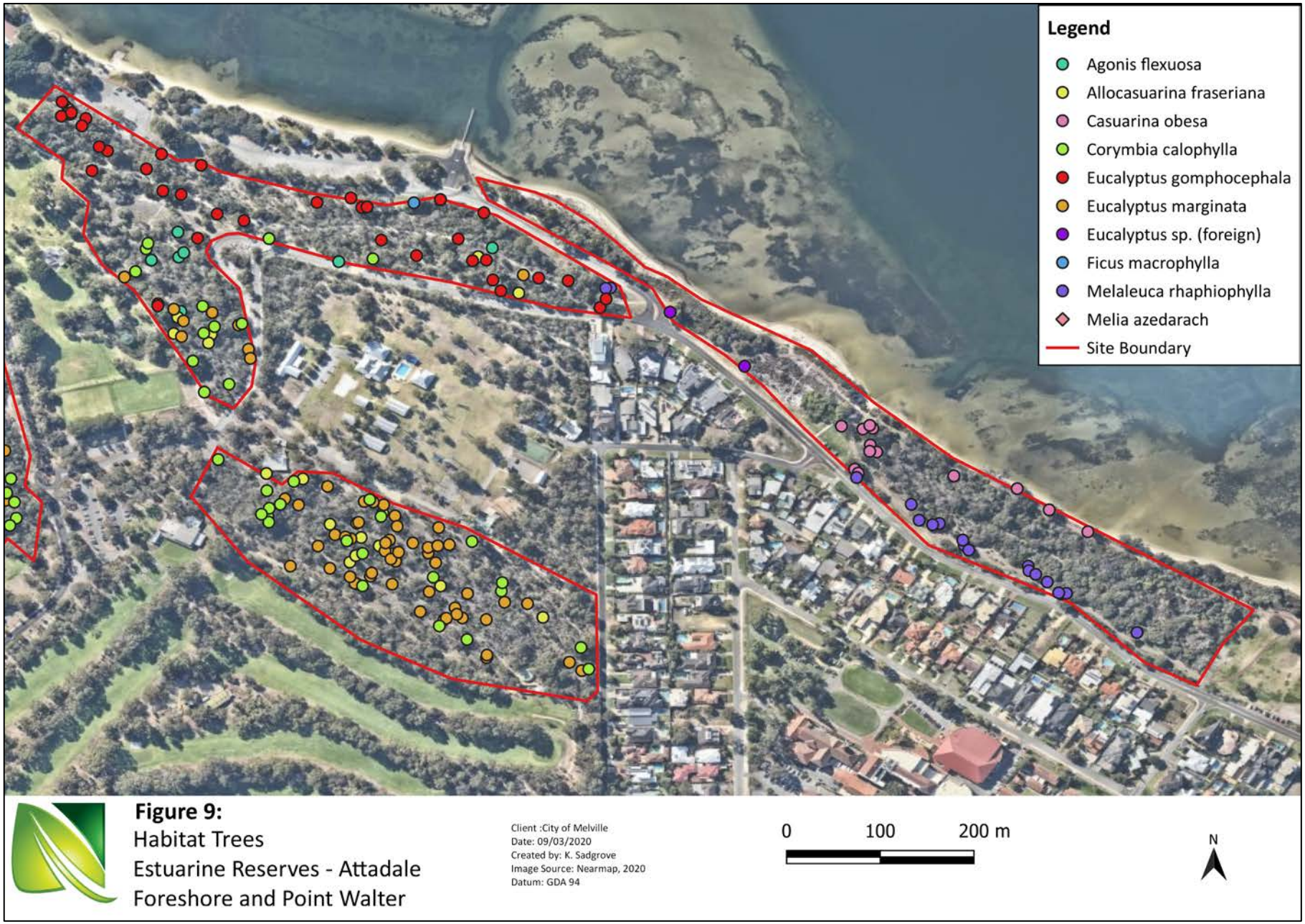


Figure 9:
Habitat Trees
Estuarine Reserves - Attadale
Foreshore and Point Walter

Figure 10:
Habitat Trees
Estuarine Reserves - Jeff Joseph

Client: City of Melville
Date: 09/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94

Figure 11: Habitat Trees within Troy Park (Woodgis, 2017)

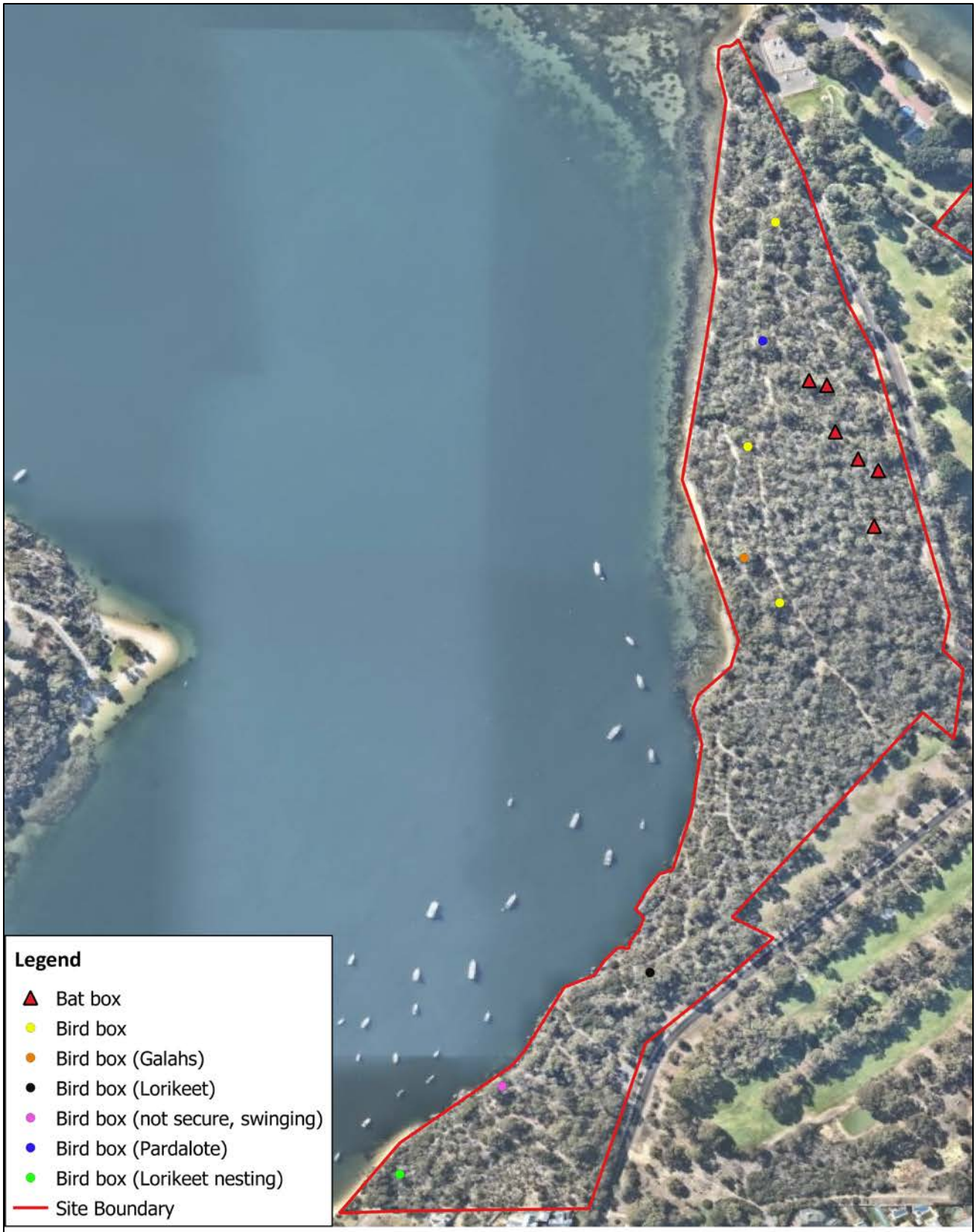


Figure 12:
Bird and Bat Box Locations
Estuarine Reserves - Blackwall Reach

Figure 13:

Bird and Bat Box Locations
Estuarine Reserves - Attadale FS and Point Walter

Figure 14: Bat and Bird Box Locations within Troy Park (Woodgis, 2017)

2.2.3 Wetlands

Wetlands are areas that experience permanent, seasonal or intermittent waterlogging or inundation by water (DBCA, 2020b). Depth to groundwater within the reserves ranges from:

- -0.3 to 4.0 m within Attadale Foreshore
- -1.0 to 25.5 m within Blackwall Reach
- -1.0 to 0.2 m within Jeff Joseph Reserve
- 2.3 to 38 m within Point Walter Reserve
- 0.5 to 1.5 m within Troy Park Bushland.

No wetlands were identified within the sites although they are adjacent to the Swan River. Riparian vegetation is present at Attadale Foreshore, Backwall Reach and Jeff Joseph Reserve which is associated with wetland areas along rivers and would experience intermittent tidal activity.

According to the Groundwater Dependent Ecosystem Atlas, Attadale Foreshore and a portion of Troy Park Bushland are classified as having a high potential to be a groundwater dependent ecosystem (GDE). Blackwall Reach was classified as having moderate potential and Point Walter Reserve was classified as having moderate potential in the lower lying areas and low potential in the higher areas adjacent to the golf course. Jeff Joseph Reserve had no classification of potential to be a GDE (BOM, 2020).

2.2.4 Heritage

The *Aboriginal Heritage Act 1972* (WA) recognises the strong relationship of Aboriginal people to the land and provides protection for all places and objects that were important to them. Under Section 174 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 estuarine reserves needs to consider the presence of these sites, and if required, appropriate permits obtained from the DPLH prior to commencement. A list of heritage sites associated with the Estuarine Reserves is provided in Table 8 and locations in Figure 15.

Table 8: Heritage Sites associated with the Estuarine Reserves

Value	Heritage Site	Site or Place Number	Reserve	Comment
Very High Registered Aboriginal Heritage Site	Swan River	3565	Adjacent to Blackwall Reach, Attadale Foreshore, Jeff Joseph	No gender restrictions and classified as mythological
	Blackwall Reach	3650	Within Blackwall Reach	No gender restrictions and classified as mythological
High Unregistered Aboriginal Heritage Sites	Burke Drive	4104	Adjacent to Troy Park	No gender restrictions (artefacts/scatter)
	Warragoon Crescent	4105	Buffer zone within Troy Park	No gender restrictions (artefacts/scatter)
Medium WA Heritage Register Sites	Former Migrant Reception Centre	18715	Adjacent to Point Walter	Also known as Point Walter Former Army Camp Site and contains the Point Walter Recreation and Conference Centre. This site is of cultural heritage significance though its original use as an army

				training and rehabilitation centre in 1941 during World War 2, and consecutively a Detention Barracks for Prisoners of War in 1946 to 1947, and Migrant reception centre from 1947 to 1971 after World War 2
	Honour Avenue Memorial Drive	-	Adjacent to Blackwall Reach and Point Walter	Connected with the western side of the road and commemorates soldiers who died in World War 1 and 2. The heritage site include the trees and associated metal plaques within the verge area
	Point Dundas, Majestic Hotel Site, Boardwalk and Applecross Jetty	6054	Adjacent to Jeff Joseph	Utilised by the Beeliar Nyoongar people for hunting and camping and the jetty was built in 1897 for the ferry service that provided the only direct link to Perth city after the original Applecross division
Low Sites not registered	Tram Line	-	Within Blackwall Reach	Operated from 1915 to 1939 and has been incorporated into the pedestrian path network within Blackwall Reach

(Government of Western Australia, 2020)

Figure 15:

Heritage Sites
Estuarine Reserves - Attadale FS, Blackwall Reach, Jeff Joseph, Point Walter and Troy Park

Client: City of Melville
Date: 29/04/2020
Created by: A. Braxton-Smith
Image Source: Nearmap, 2020
Datum: GDA 94

2.2.5 Community Interest

The Estuarine Reserves have no recreation areas but are well utilised by surrounding residents for passive recreation such as walking, bird watching and dog walking on lead. This occurs through several formal pathways (Figure 6, 7 and 8). Although there are no recreational areas, the reserves are adjacent to parkland and the golf course.

There are three environmental groups operating within the Estuarine Reserves, including Bicton Environmental Action Group, Swan Estuary Reserves Action Group (SERAG) and Friends of Attadale Foreshore. The Bicton Environmental Action Group works in Blackwall Reach and along the river foreshore at Blackwall Reach parade. Works include restoration and erosion control, holding regular workdays and planting days throughout the year. Jeff Joseph Reserve has held several large community plating days in conjunction with the Applecross Primary School, Waylen Bay Scouts Club and Applecross Rotary Club. Figures 16, 17, 18 and 19 show the potential revegetation sites within each reserve and the area sizes are listed in Table 9. These sites have been identified due to the high level of bare ground, weeds and few native species within these areas. Some areas required revegetation of understorey only as canopy cover was adequate.

Table 9: Revegetation proposed for the Estuarine Reserves

Revegetation Proposed	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter	Troy Park Bushland
Yes	None	None	4,487 m^2	1,219 m^2	922 m^2
Yes – understorey only	1,406 m^2	2,993 m^2	None	None	5,027 m^2

Figure 16:

Community Interest
Estuarine Reserve - Jeff Joseph

Figure 17:
Community Interest Estuarine Reserve - Attadale FS and Point Walter

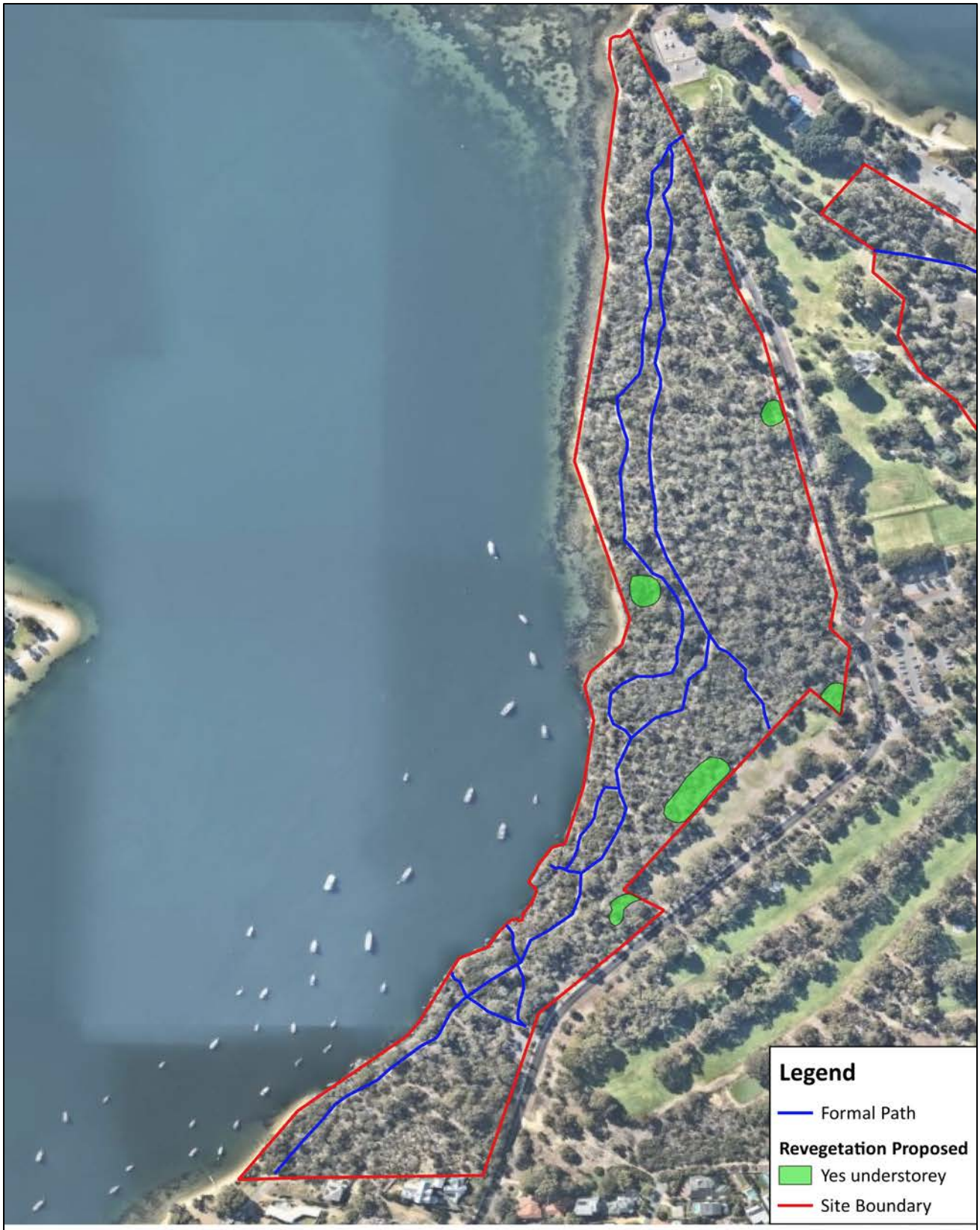


Figure 18:
Community Interest Estuarine Reserve - Blackwall Reach

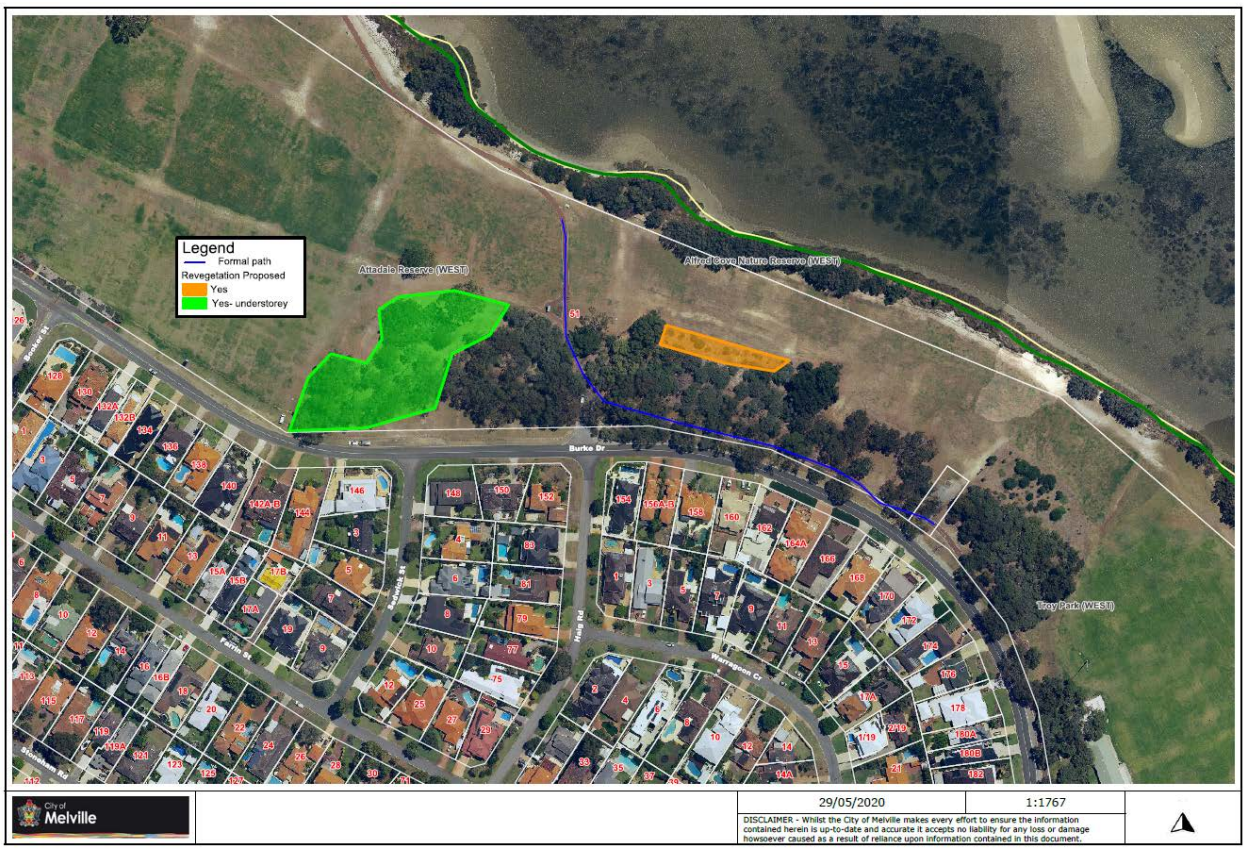


Figure 19: Community Interest

2.2.6 Reference Sites

Reference sites present within the Estuarine Reserves are the fauna trap sites set up during the 2019 NACMS fauna survey (Appendix 1). Trapping sites consisted of:

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

2.3 Species

Native flora, fauna and weed species were identified as well as some potentially planted species within the Estuarine Reserves.

2.3.1 Native Flora

A targeted flora assessment was undertaken in spring 2019 with the results summarised in Table 10, a list of 'At-Risk' species in Table 11 and examples of native flora shown below, with a complete flora list in Appendix 3.

Table 10: Native Flora

Native flora	Count	Comment
Species	131	
Families	37	
Threatened/Priority	1	*Grevillea thelemanniana* (Threatened) Found at Point Walter Reserve, potentially planted
'At-Risk' (as identified by the City)	15	Refer to Table 11

Caladenia flava (Cowslip Orchid)

Petrophile linearis (Pixie Mops)

Ptilotus polystachyus (Prince of Wales Feather)

Scaevola crassifolia (Thick-leaved Fan-flower)

Agonis flexuosa (Peppermint)

Melaleuca trichophylla

Examples of native flora species observed within the Estuarine Reserves

Table 11: 'At-risk' (high priority) flora species

At-risk Species	2004	2013	2019	Assets 2013-2019
Acacia xanthina	Assumed present	Confirmed present	Confirmed present	Species Maintained
Alyogyne huegelii	Assumed present	Confirmed present	Confirmed present	Species Maintained
Alyxia buxifolia	Assumed present	Confirmed present	Confirmed present	Species Maintained
Amyema linophylla	No Data	No Data	Confirmed present	Species Maintained
Apium prostratum	No Data	No Data	Confirmed	Species

			present	Maintained
Beaufortia squarrosa	No Data	No Data	Confirmed present	Species Maintained
Caesia micrantha (Pale Grass-lily)	No Data	No Data	Confirmed present	Species Maintained
Cyperus gymnocaulos	No Data	No Data	Confirmed present	Species Maintained
Diplopeltis huegelii	No Data	No Data	Confirmed present	Species Maintained
Dodonaea hackettiana	Assumed present	Confirmed present	Confirmed present	Species Maintained
Drosera stolonifera (Leafy Sundew)	No Data	No Data	Confirmed present	Species Maintained
Isolepis marginata	No Data	No Data	Confirmed present	Species Maintained
Loxocarya cinerea	No Data	No Data	Confirmed present	Species Maintained
Melaleuca trichophylla	No Data	No Data	Confirmed present	Species Maintained
Scaevola anchusifolia	No Data	No Data	Confirmed present	Species Maintained

2.3.1 Native Fauna

The Estuarine Reserves provide a variety of different habitats for an array of fauna particularly reptiles and birds with a total of 72 species recorded. Fauna trapping was undertaken from 21 to 25 October 2019, and a night stalk occurred on 07 November 2019. Motion activated cameras were set up throughout the estuarine reserves from 21 October to 07 November 2019.

Fauna observed within the Estuarine Reserves included:

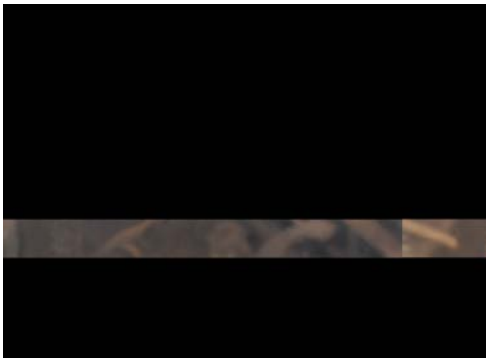
- 23 invertebrate species (22 native, one feral)
- nine reptiles (all native)
- 36 birds (30 native, six feral)
- four mammals (one native, three feral).

Examples of the species observes are shown in Figure 20 and a complete species list in Appendix 4.

Australian Boobook (*Ninox boobook*)

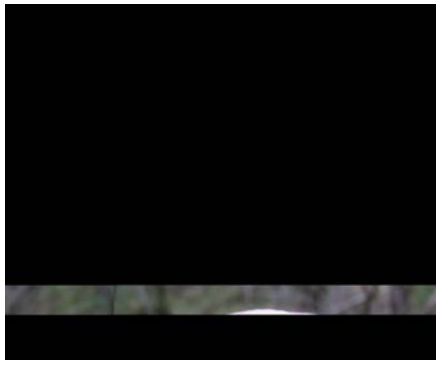
Australian Magpie (*Craticus tibicen*)

Bobtail Lizard (*Tiliqua rugosa rugosa*)



White-Tailed Spider from the family Lamponidae

Native Earwig (*Gonolabis michaelseni*)



West-Coast Laterite Ctenotus (*Ctenotus fallens*)

Figure 20: Examples of fauna observed within the Estuarine Reserves

2.3.1.1 Mammals

Of the four mammal species found in the 2019 survey, one was native, namely the Common Brushtail Possum (*Trichosurus vulpeca*) categorised as 'At Risk' by the City of Melville (Table 12).

Table 12: At Risk Mammal Species Indices

Species Values	Mammals	Presence 1985-2004	Presence 2005-2013	Presence 2014-2019	Assets
Very High Categorised as 'At- Risk' by the City of Melville NAAMP	Common Brushtail Possum (*Trichosurus vulpeca*)	No Data	No Data	Present	Maintained

2.3.1.2 Bats

The 2013 survey confirmed three bat species present within the Estuarine Reserves (Bamford Consulting Ecologists, 2013), namely, *Vespadelus regulus*, *Tadarida australis* and *Chalinolobus gouldii*. The 2016 survey of Troy Park confirmed the presence of *Chalinolobus gouldii* and *Chalinolobus morio* (Woodgis, 2017). No bats were found in the bat boxes nor recorded with the Echo Meter touch 2 Pro during the night stalk, which is used to record and catalogue bat calls, during the 2019 survey. Even with no evidence or confirmation of native bats found within the Estuarine Reserves in the 2019 survey, it is assumed that native bats would still be present and utilise the sites for breeding. Results are summarised in Table 13.

Table 13: Bat Species Indices

Species Values	Bat species	Presence 1985-2004	Presence 2005-2013	Presence 2014-2019	Assets
Low Listed 'At-Risk' by the City	Southern Forest Bat (*Vespadelus regulus*)	Assumed Present	Confirmed Present	Assumed Present	Assume unchanged
	Gould's Wattled Bat (*Chalinolobus gouldii*)	Assumed Present	Confirmed Present	*Troy Park survey 2016	Maintained
	Chocolate Wattled Bat *(Chalinolobus morio)*	Assumed Present	Assumed Present	*Troy Park survey 2016	Maintained
Low Bushland dependent	White-striped Bat (*Tadarida australis*)	Assumed Present	Confirmed Present	Assumed Present	Assume unchanged

* (Woodgis, 2017)

2.3.1.3 Birds

Birds observed within the Estuarine Reserves are listed in Appendix 4. A total of 36 different bird species were observed and of these five are introduced species. Birds that are classified 'at risk' by the City are shown in Table 14 and their presence or absence is compared against previous management plans.

Table 14: At Risk Bird Species Indices

Species Values	Birds	Presence 1985-2004	Presence 2005-2013	Presence 2014-2019	Assets
Very High Listed under the EPBC Act 1999 (Migratory)	Common Sandpiper (*Tringa hypoleucos*)	No Data	No Data	Confirmed Present	Maintained
	Grey-tailed Tattler (*Tringa brevipes*)	No Data	No Data	Confirmed Present	Maintained
	Rainbow Bee-eater (*Merops ornatus*)	No Data	Confirmed Present	Confirmed Present	Maintained
Very High Listed under the EPBC Act 1999 (Threatened)	Carnaby's Cockatoo (*Calyptorhynchus latirostris*)	No Data	Confirmed Present	Assumed Present	Assume unchanged
	Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)	No Data	No Data	Confirmed Present	Maintained
High Listed by WAPC as habitat specialist with reduced populations on Swan Coastal Plain	Weebill (*Smicrornis brevirostris*)	No Data	Confirmed Present	Assumed Present	Assume unchanged
High Listed by Birdlife Australia as wide ranging with reduced populations on the Swan Coastal Plain	Brown Goshawk (*Accipiter fasciatus*)	No Data	No Data	Confirmed Present	Maintained
Low Bushland dependent species	New Holland Honeyeater (*Phylidonyris novaehollandiae*)	Assumed Present	Confirmed Present	Confirmed Present	Maintained
	Western Little Wattlebird (*Anthochaera lunata*)	Confirmed Present	Confirmed Present	Assumed Present	Assume unchanged
	Sacred Kingfisher (*Todiramphus sanctus*)	No Data	Confirmed Present	Assumed Present	Assume unchanged
	Tree Martin (*Hirundo nigricans*)	Confirmed Present	Confirmed Present	Assumed Present	Assume unchanged
	Striated Pardalote (*Pardalotus striatus*)	Confirmed Present	Confirmed Present	Confirmed Present	Maintained
	Red-capped Parrot (*Platycercus spurius*)	Confirmed Present	Confirmed Present	Assumed Present	Assume unchanged
	Australian Ringneck (*Platycercus zonarius*)	Confirmed Present	Confirmed Present	Confirmed Present	Maintained

2.3.1.4 Reptiles

Reptiles observed within the Estuarine Reserves are listed in Appendix 4. A total of nine different species were observed with no introduced species recorded. Reptiles that are classified 'at risk' by the City are shown in Table 15 and their presence or absence is compared against previous management plans.

Table 15: At Risk Reptile Species Indices

Species Values	Reptiles	Presence 1985-2004	Presence 2005-2013	Presence 2014-2019	Assets
Very High Listed as Priority 3 under the Biodiversity Conservation Act 2016 (WA)	Perth Slider (*Lerista lineata*)	No Data	No Data	Confirmed Present	Maintained
High Noted in Bush Forever	Western Three-lined Skink (*Acritoscincus trilineatus*)	No Data	Not Data	Confirmed Present	Maintained
Low Bushland Dependent Species	West Coast Ctenotus (*Ctenotus fallens*)	Confirmed Present	Confirmed Present	Confirmed Present	Maintained
	Long-tailed Ctenotus (*Ctenotus australis*)	Assumed Present	Confirmed Present	Assumed Present	Assume unchanged
	Bobtail Lizard (*Tiliqua rugosa*)	Confirmed Present	Confirmed Present	Confirmed Present	Maintained

2.3.1.5 Invertebrates

Invertebrates observed within the Estuarine Reserves are listed in Appendix 4. A total of 23 different species were observed, of which one introduced species was recorded.

3 Threats

Threats present within the Estuarine Reserves include:

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

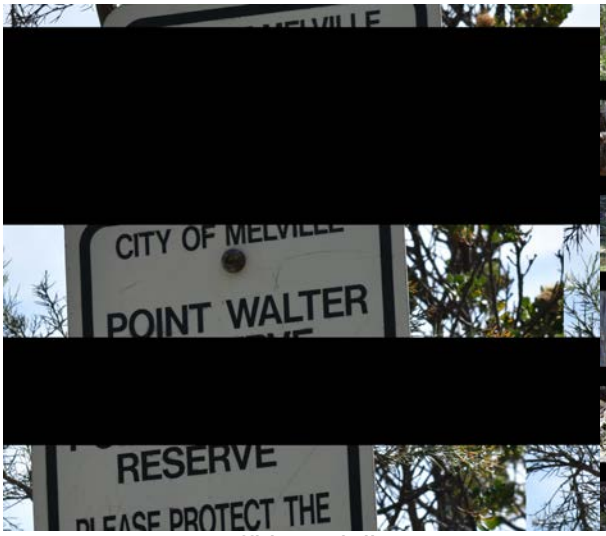
3.1 Physical Disturbance

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 Estuarine reserves in the form of:

- children's cubby
- rubbish dumping
- graffiti vandalism
- informal tracks and trampling including informal BMX tracks.

Examples of physical disturbances are shown in Figure 21 and 22 with locations provided in Appendix 2 and assessed in Table 16.



Graffiti vandalism

Children's cubby

Rubbish dumping Rubbish dumping

Figure 21: Examples of physical disturbance at Blackwall Reach

Figure 22: Manipulation of a Melaleuca into a cubby at Attadale Foreshore

Table 16: Physical Disturbance Indices

Impact	Physical Disturbance	Disturbance 1994-2003	Disturbance 2004-2014	Disturbance 2014-2019	Threats
High Potential to substantially change ecosystem structure, composition or function	Erosion/sedimentation	No Data	1,100 m^2	1,100 m^2	Maintained
	Clearing for utilities		0 m^2	0 m^2	Prevented
Medium Potential to moderately change ecosystem structure,	Trampling (informal paths)		0 m^2	Approx. 1,000 m^2	Increased
	Rubbish Dumping		22-32 m^3	< 1 m^3	Decreased (Contained)
	Tree Poisoning		1 tree	0 trees	Contained

composition or function	Vandalism		No Data (Graffiti)	1 incident (sign)	Increased
	Children's Cubby		No Data	2 cubby's (AFS and BWR)	Increased

3.2 Fire

Records provided by the City of Melville indicate that seven fires have occurred within the reserve in the last 6 years (Table 17) (with one fire marked on Carroll Drive (Appendix 2) at Point Walter Reserve previous to 1 January 2015), including:

- unauthorised campfire at Blackwall Reach on 27 January 2015
- unauthorised bonfire of rubbish and waste in cliff area of Blackwall Reach on 28 November 2015
- unauthorised bonfire in scrub at Blackwall Reach on 8 June 2017(<1 ha)
- scrub and grass fire at Blackwall Reach on 27 August 2018 (<1 ha)
- passenger vehicle fire near boat ramp at Point Walter Reserve on 7 January 2016
- unauthorised rubbish, waste fire at Point Walter Reserve on 21 March 2019
- evidence of a small spot fire at Jeff Joseph Reserve was observed during the 2019 survey but not reported to the DFES (Appendix 2).

Table 17: Fire Indices

Impact	Fires	Extent of Fires 1994-2003	Extent of Fires 2004-2013	Extent of Fires 2014-2019	Threats
High Potential for local extinctions of ground dwelling species	Large fires	No Data	0 ha	0 ha	Prevented
High Potential for local extinctions of trees and shrubs that regenerate only from seed stored in the plant	Repeat fires		0 ha	0 ha	Prevented
Medium Potential for moderate impact of ground dwelling species	Small spot fires, unauthorised campfires and bonfires		0 ha	<1 ha (4 incidences at Blackwall Reach and 1 at Point Walter)	Increased
Low Potential for moderate impact, embers could start fire in the adjacent vegetation	Vehicle fire in carpark areas		No data	0 ha (1 incident, only occurred in carpark area of Point Walter)	Increased

3.3 Weeds

A total of 85 introduced flora species were identified in the spring 2019 survey, undertaken by Natural Area botanists, Sharon Hynes and Tshering Chekey. Weed species were then categorised

through the categorisation plan by the City of Melville under the categories Very High, High, Medium and Low. As shown in Table 18, most weeds were rated High or Low impact.

Tables 19 to 22 show the individual weed species and groups rated as Very High and High within each reserve, where they have been assessed as either widespread (highlighted pink) or localised. Density weed maps of these Very High and High weed species or groups are provided from pages 60 through 80 and examples of weeds are shown in Figure 23.

All other medium (perennial) and low (annual) priority weeds were recorded and assessed as localised within Attadale Foreshore Reserve and Jeff Joseph Reserve. Blackwall Reach Reserve had only localised infestations of perennial weeds with medium impact, but had widespread infestations of low impact annual weeds; with Whiteflower Fumitory (*Fumaria capreolata*), Smooth Cats-ear (*Hypochaeris glabra*) and False Hawkbit (*Urospermum picroides*) making up significant components of this weed cover category. Similarly Point Walter Reserve had widespread infestations of low impact annual weeds, with Smooth Cats-ear (*Hypochaeris glabra*) and Ursinia (*Ursinia anthemoides*) making up the major components and one widespread medium impact perennial weed, namely Soursob (*Oxalis pes-caprae*) with all other perennial weeds being assessed as localised.

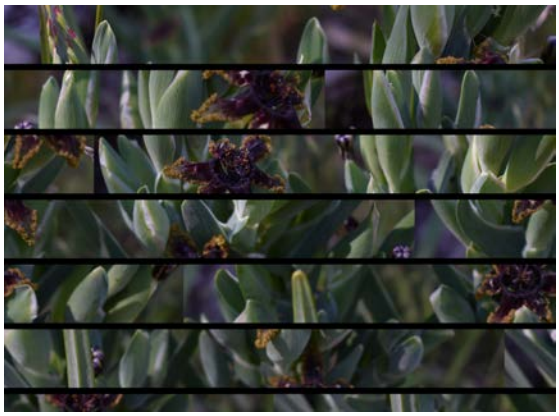
Table 18: Number of Weed Species in each Impact Category

Impact	Number of Species
Very High	7
High	29
Medium	13
Low	36
Total	**85**

Plumbago
(*Plumbago auriculata*)

Acacia podalyriifolia

Bugle Lily
(*Watsonia meriana* var. *bulbillifera*)



Black Flag
(*Ferraria crispa*)

Figure 23: Examples of introduced flora species

Table 19: Extent of infestation within Attadale Foreshore Reserve

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area >50% of Reserve	Extent
Asparagus asparagoides	Bridal Creeper	Very High	10	No	No	No	Localised
Ehrharta calycina	Perennial Veldt Grass	Very High	8	No	No	No	Localised
Lachenalia reflexa	Yellow Soldiers	Very High	3	No	No	No	Localised
Lantana camara	Common Lantana	Very High	1	No	No	No	Localised
Moraea flaccida	One-leaf Cape Tulip	Very High	3	No	No	No	Localised
Schinus terebinthifolius		Very High	10	No	No	No	Localised
Annual Clumping Grass *Avena barbata* *Briza minor* *Bromus diandrus* *Ehrharta longiflora* *Hordeum leporinum* *Lolium rigidum*		High	39	Yes	Yes	Yes	Widespread
Perennial Running Grass *Cynodon dactylon* *Stenotaphrum secundatum*		High	10	No	Yes	Yes	Widespread
Clumping Geophytes *Ferraria crispa* *Gladiolus undulatus*		High	7	No	Yes	Yes	Widespread
Giant Grasses *Typha orientalis*		High	1	No	No	No	Localised
Trees and Shrubs *Leptospermum laevigatum* *Olea europaea*		High	2	No	No	No	Localised

Table 20: Extent of infestation within Blackwall Reach

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area >50% of Reserve	Extent
Asparagus asparagoides	Bridal Creeper	Very High	1	No	No	No	Localised
Ehrharta calycina	Perennial Veldt Grass	Very High	35	Yes	Yes	Yes	Widespread
Lachenalia reflexa	Yellow Soldiers	Very High	14	No	Yes	No	Widespread
Lantana camara	Common Lantana	Very High	1	No	No	No	Localised
Schinus terebinthifolius		Very High	3	No	No	No	Localised
Annual Clumping Grasses *Avena barbata* *Briza maxima* *Bromus diandrus* *Ehrharta longiflora*		High	54	Yes	Yes	Yes	Widespread
Clumping Geophytes *Ferraria crispa* *Watsonia meriana* var. *bulbillifera*		High	112	Yes	Yes	Yes	Widespread
Trees and Shrubs *Acacia iteaphylla* *Eucalyptus sp.* *Olea europaea*		High	24	Yes	Yes	No	Widespread

Table 21: Extent of infestation within Jeff Joseph Reserve

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area >50% of Reserve	Extent
Ehrharta calycina	Perennial Veldt Grass	Very High	5	N/A	N/A	No	Localised
Moraea flaccida	One-leaf Cape Tulip	Very High	3	N/A	N/A	No	Localised
Schinus terebinthifolius		Very High	1	N/A	N/A	No	Localised

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area >50% of Reserve	Extent
Perennial Running Grass *Cynodon dactylon*		High	5	N/A	N/A	Yes	Widespread
Clumping Geophytes *Freesia alba x leichtlinii* *Gladiolus undulatus* *Watsonia meriana* var *bulbillifera*		High	8	N/A	N/A	No	Localised
Giant Grasses *Typha orientalis*		High	2	N/A	N/A	No	Localised
Trees and Shrubs *Casuarina glauca* *Cupressus sempervirens* *Polygala myrtifolia* *Washingtonia filifera*		High	13	N/A	N/A	Yes	Widespread

Table 22: Extent of infestation within Point Walter Reserve

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area >50% of Reserve	Extent
Ehrharta calycina	Perennial Veldt Grass	Very High	79	Yes	Yes	Yes	Widespread
Eragrostis curvula	African Lovegrass	Very High	16	No	Yes	No	Widespread
Lachenalia reflexa	Yellow Soldiers	Very High	59	Yes	Yes	Yes	Widespread
Moraea flaccida	One-leaf Cape Tulip	Very High	7	No	No	No	Localised
Schinus terebinthifolius		Very High	5	No	No	No	Localised
Annual Clumping Grass *Avena barbata* *Briza maxima* *Briza minor* *Bromus diandrus* *Ehrharta longiflora*		High	108	Yes	Yes	Yes	Widespread

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area >50% of Reserve	Extent
Hordeum leporinum *Lagurus ovatus* *Lolium rigidum* *Melinis repens*							
Perennial Running Grass *Cenchrus clandestinus* *Cynodon dactylon* *Stenotaphrum secundatum*		High	9	No	No	No	Localised
Clumping Geophytes *Ferraria crispa* *Freesia alba x leichtlinii* *Gladiolus caryophyllaceus* *Watsonia meriana* var *bulbillifera*		High	67	Yes	Yes	Yes	Widespread
Trees and Shrubs *Acacia iteaphylla* *Brachychiton populneus* *Casuarina glauca* *Hibbertia scandens* *Olea europaea* *Plumeria* sp.		High	95	Yes	Yes	Yes	Widespread

3.4 Habitat Loss

The Estuarine Reserves are ecologically linked which means there is relatively safe fauna movement between the reserves (mainly between Attadale Foreshore, Blackwall Reach and Point Walter due to their proximity). Habitat loss has occurred in each of the five reserves and can be assessed through the percentage of bare ground and weed coverage and can be used over time to establish trends. The percentage of bare ground for each reserve is shown in Figure 24, 25, 26 and 27 and in Table 23, with percentage weed cover per reserve shown in Table 24. Overall Habitat loss is assessed in Table 25 through looking at the percentage cover of more than 25% weeds and bare ground per reserve. There are several areas identified as having high (≥25%) habitat loss in all reserves. It is recommended that these areas be targeted for future revegetation and to maximise success it is recommended to undertake revegetation in conjunction with weed control activities.

It should be noted that bare ground was unable to be assessed between the 2004, 2013 and 2019 survey data due to inconsistencies in data collection. 'Bare Ground' cover was mapped as a percentage where 0% was no bare ground and >25% was the highest bare ground cover.

Table 23: Bare Ground Cover 2019

Category	Attadale Foreshore	Blackwall Reach	Point Walter	Jeff Joseph	Troy Park*
0%	26.5	1.8	19.3	23.1	64
1-5%	38.2	21.6	63.6	46.1	28
6-24%	20.6	33.3	14.8	7.7	4
≥25%	14.7	43.2	2.3	23.1	4
Total	100	100	100	100	100

*(Woodgis, 2017)

Table 24: Weed Cover 2019

Category	Attadale Foreshore	Blackwall Reach	Point Walter	Jeff Joseph	Troy Park*
0%	0	0	1.2	0	0
<5%	34.4	63.9	18.6	81.8	20
5-25%	25.0	20.4	27.9	0	8
>25%	40.6	15.7	52.3	18.2	72
Total	100	100	100	100	100

*(Woodgis, 2017)

Table 25: Habitat Loss Indices

Impact	Habitat Loss	Reserve	% of Reserve 2004	% of Reserve 2013	% of Reserve 2019	Threat
Medium Process of moderate ecosystem function modification - reduced natural regeneration - increased fire or erosion risk	Weed Cover >25%	Attadale Foreshore	No Data	26%	40.6%	Increase in weed cover
		Blackwall Reach	92%	55%	15.7%	Decrease in weed cover
		Jeff Joseph Reserve	No Data	No Data	18.2%	Change not assessable
		Point Walter Reserve	100%	76%	52.3	Decrease
		*Troy Park	No Data	No Data	72%	Change not assessable
Low Process of low ecosystem function modification - reduced natural regeneration - increased fire or erosion risk	Bare Ground >25%	Attadale Foreshore	No Data	0%	14.7%	Increase in bare ground
		Blackwall Reach	No Data	0%	43.2%	Increase in bare ground
		Jeff Joseph Reserve	No Data	No Data	23.1%	Change not assessable
		Point Walter Reserve	No Data	2%	2.3%	Increase in bare ground
		*Troy Park	No Data	No Data	4%	Change not assessable

*(Woodgis, 2017)

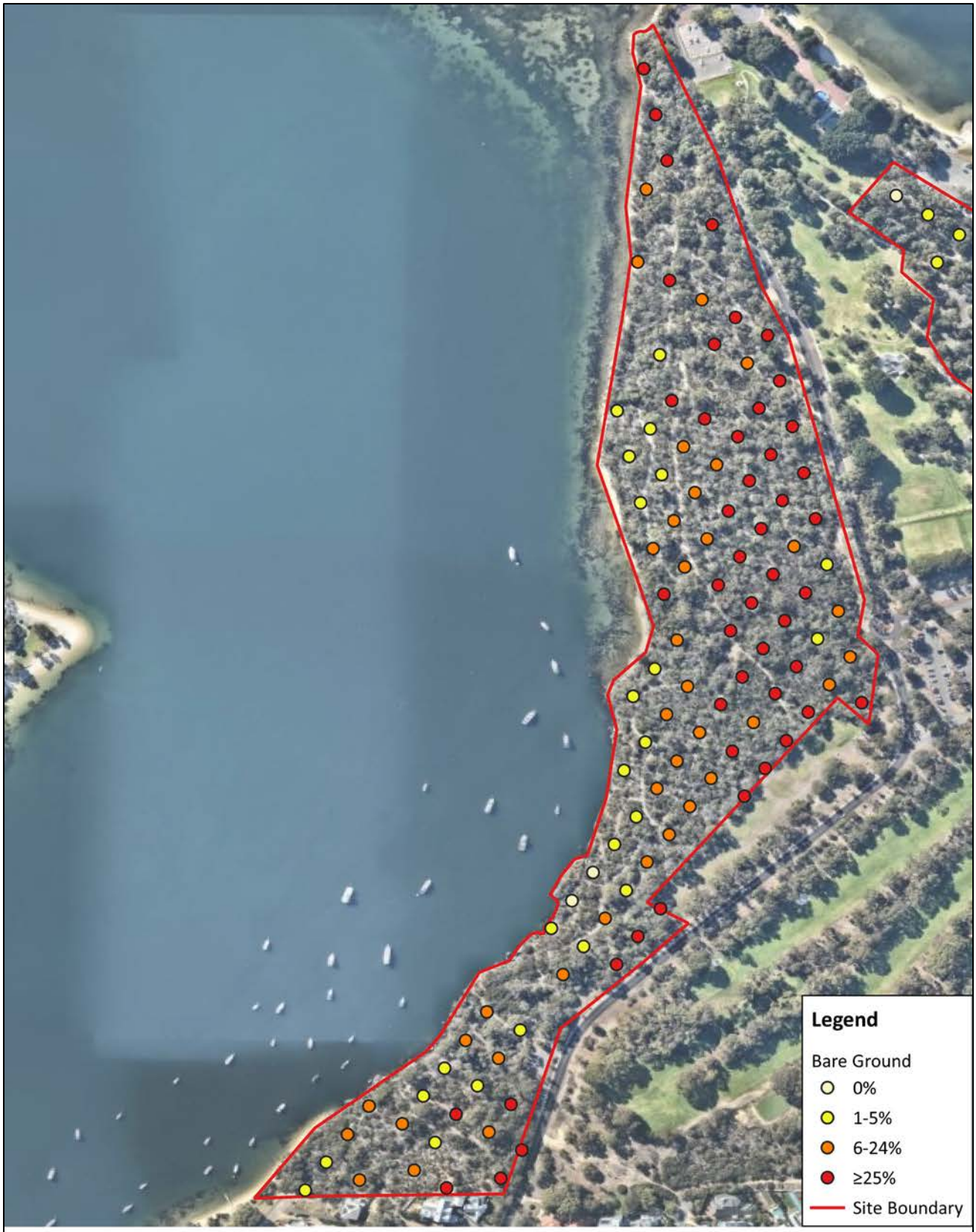


Figure 24:
Habitat Loss
Estuarine Reserves - Blackwall Reach

Figure 25:
Habitat Loss
Estuarine Reserves - Jeff Joseph

Client: City of Melville
Date: 03/04/2020
Created by: S. Hynes
Image Source: Nearmap, 2020
Datum: GDA 94

Figure 26:

Habitat Loss

Estuarine Reserves - Attadale FS and Point Walter

Figure 27: Habitat Loss at Troy Park (Woodgis, 2017)

3.5 Feral Animals

Feral fauna impact native fauna and flora through predation, competition for food, and shelter, spreading disease and destroying habitat. Ten feral animals were recorded during the 2019 survey. The feral fauna indices are listed in Table 26 and a complete list of feral fauna occurrences (historical and during this survey) are shown in Table 27, with examples of hollow and bird box competition in Figure 28.

Table 26: Feral Animal Indices

Impact	Feral Animal	Occurrence 1994-2003	Occurrence 2004-2013	Occurrence 2014-2019	Threat
Very High Key threatening process under the EPBC Act 1999	*Felis catus*, Feral Cat	No Data	No Data	9 sightings via trail cameras	Increase in predation on native fauna
	Oryctolagus cuniculus, Rabbit		No Data although scats were found in 2013 survey	>100 sightings via trail cameras	Increased land degradation and competition
	Vulpes vulpes, Fox		>5 active dens	No evidence	Contained
High Competition with native birds for hollows and food	*Apis mellifera*, Honeybee		>6 beehives	2 hives	Reduced
Low Competition with native birds and mammals for food and hollows	*Trichoglossus haematodus*, Rainbow Lorikeet	Present	Present	Present	Increase in competition
Low Competition for food, predation and disease transfer	*Rattus rattus*, Black Rat	No Data	Present	Present	Manage

Table 27: Feral Animals observed within the Estuarine Sites with years observed

Feral Animals		Blackwall Reach	Point Walter	Attadale Foreshore	Jeff Joseph	*Troy Park
Mammals	*Felis catus*, Feral Cat	1985, 2019	2019	-	2019	-
	Oryctolagus cuniculus, Rabbit	1985, 2013, 2019	2019	-	2019	-
	Rattus rattus, Black Rat	2013, 2019	2019	-	2019	2016
Birds	*Columba livia*, Rock Dove	2013, 2019	-	-		-
	Trichoglossus haematodus, Rainbow Lorikeet	2004, 2013, 2019	2019	2019	2019	2016
	Cacelo navaeguineae, Laughing Kookaburra	1985, 2013,	2019	2019	-	2016

Feral Animals		Blackwall Reach	Point Walter	Attadale Foreshore	Jeff Joseph	*Troy Park
		2019				
	Streptopelia chinensis, Spotted Turtledove	2013, 2019	2013	2013	2019	2016
	Streptopelia senegalensis, Laughing Turtledove	1985, 2013, 2019	-	2013	2019	-
	Cacatua tenuirostris, Eastern Long-billed Corella	2013, 2019	2013, 2019	-	-	2016
Invertebrates	*Ommatoiulus moreletii*, Portuguese Millipede	-	-	-	2019	-

*(Woodgis, 2017)

Figure 28: Evidence of competition for hollows and bird boxes by Rainbow Lorikeets

Trail cameras captured domestic cats at three of the four Estuarine Reserves, namely Blackwall Reach, Point Walter Reserve and Jeff Joseph Reserve in the 2019 survey (Figure 29).

Figure 29: Example of fauna caught using camera traps; domestic cat at Blackwall Reach.

3.6 Diseases and Pathogens

Vegetation can be subject to diseases that result in a decline in their vigour or death in the longer term. Common plant pathogens include *Phytophthora* (dieback), potential *Armillaria luteobubalina*, *Quambalaria* (Marri Canker) and Myrtle Rust. Activities that impact directly on trees, such as the installation of nesting boxes can result in wounds that make them more susceptible to infection from pathogens. No evidence of *Quambalaria* or Myrtle Rust were found within the Estuarine reserves, but potential Armillaria was found along the eastern edge of Blackwall Reach Reserve (Figure 30 and Appendix 2) and dieback was found in two locations within Point Walter Reserve (Appendix 2). Indices provided in Table 28.

Phytophthora (dieback), has many different species including *P. inundata, P. litoralis* and *P. humicola,* which were found at Attadale Foreshore in 2016 (City of Melville, 2020, Personal communication) (Figure 31 and 32). Point Walter was uninfested, with Blackwall Reach testing positive but uninterpretable in 2016 (Figure 33). Troy Park and Jeff Joseph have not been assessed for the presence of *Phytophthora* sp. (dieback).

Figure 30: Example of potential Armillaria within Blackwall Reach

Table 28: Disease and Pathogen Indices

Impact	Disease	Occurrences 1994-2003	Occurrences 2004-2013	Occurrences 2014-2019	Threat
Very High Key Threatening Process under the EPBC Act 1999	*Phytophthora cinnamomi*, Dieback	No Data (extent unknown)	No Data (extent unknown)	Present	Increased
Medium Native species capable of moderate modification of structure and composition	*Armillaria luteobubalina*, Honey Fungus		0 ha	Present (needs confirmation)	Increased

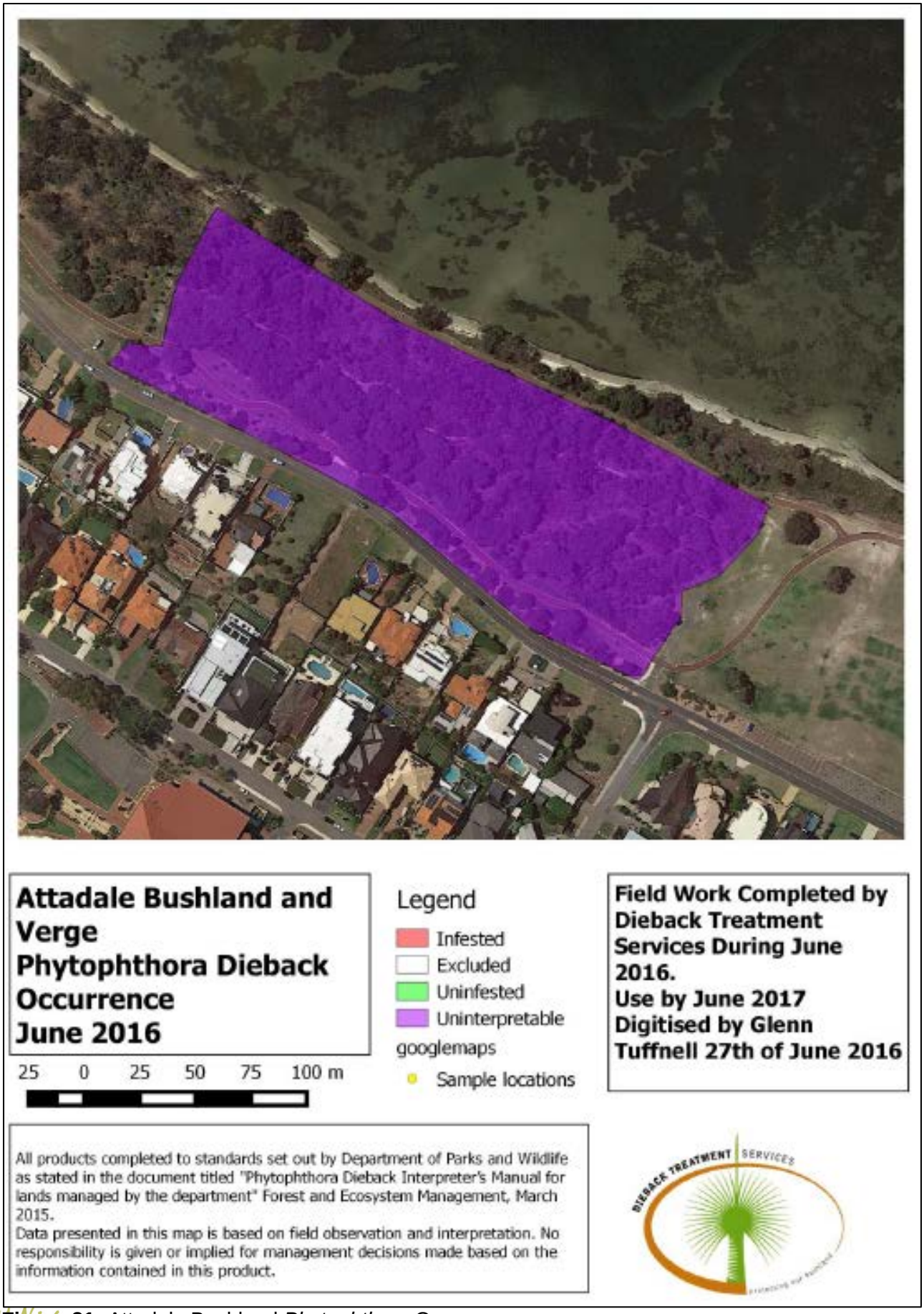


Figure 31: Attadale Bushland *Phytophthora* Occurrence

Figure 32: Attadale *Phytophthora* Quarantine Area

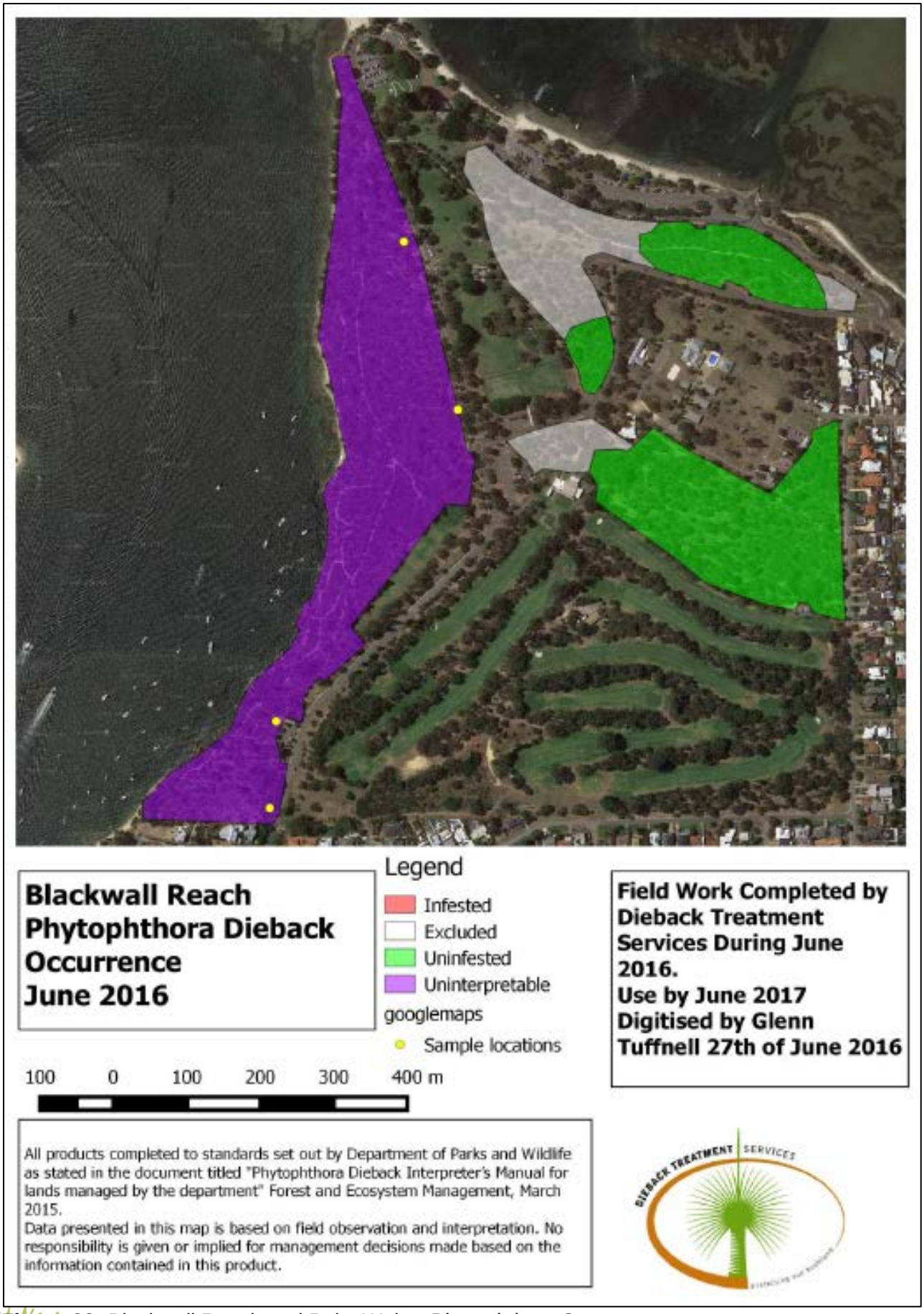


Figure 33: Blackwall Reach and Point Walter *Phytophthora* Occurrence

3.7 Stormwater

Three stormwater drains were observed at Blackwall Reach causing erosion and acting as a vector for weed dispersal within the vegetated area (Figure 34 and Appendix 2). Water quality monitoring has not been undertaken within the Estuarine Reserves.

Central drain

Southern drain

Figure 34: Examples of stormwater drains causing erosion and acting as a vector for weed dispersal at Blackwall Reach

3.8 Reticulation

There is no reticulation present within the Estuarine reserves, only within the adjacent parks and golf course. No observed or reported instances of additional water being applied to the vegetated areas of the Estuarine reserves or occurrences of overspray or leakage from the reticulation in the nearby parks. Indices for reticulation is found in Table 29 where an occurrence is defined as a recorded sighting of excessive overspray from reticulation or leakage.

Table 29: Reticulation Indices

Impact	Water source	Occurrences 1994-2003	Occurrences 2004-2013	Occurrences 2014-2019	Threat
Low Alteration of Surface Water Flows	Overspray or leakage from reticulation adjacent to the reserve	No Data	No Data	No Data	Contained (assumed unchanged)

3.9 Acid Sulfate Soils

Acid sulfate soils are naturally occurring which as soils and sediments which contain iron sulphides. When exposed to the air these soils react and produce different iron compounds and sulfuric acid. As a result of this reaction other substances can be released including heavy metals into the groundwater and surrounding environment.

Within the Estuarine reserves, Blackwall Reach and Troy Park have a moderate to high risk of acid sulfate soils occurring, Attadale Foreshore Reserve and Jeff Joseph Reserve have a low to moderate risk and Point Walter Reserve has a small area to the north east corner that also has a low to moderate risk (DWER, 2020a).

Even with the risk of acid sulfate soils occurring within the Estuarine reserves, no evidence has been found and consistent with historical data (Table 30).

Table 30: Acid Sulfate Soils Indices

Impact	Potential initiation of Acid Sulfate Soil Reactions	Occurrences 1994-2003	Occurrences 2004-2013	Occurrences 2014-2019	Threat
Very High	Excavations below the minimum level of the water table	No Data	0	0	Prevented (assumed non occurred and no change)
	Groundwater extraction resulting in lowering of minimum level watertable		0	0	Prevented (assumed non occurred and no change)

3.10 Climate Change

Climate change in the near future is expected to lead to increased intensity and frequency of storm events, a drying climate, increased temperatures and rising sea levels in the south-west of Western Australia. Since 1850 the mean global surface temperature has increased by 0.75^{o}C with sea levels rising by approximately 0.17 m in the 20th Century (DPaW, 2007). With expected impacts including increased potential for erosion with stronger winds during storm events, and an increase in water on flora and vegetation, particularly on estuarine reserves that are heavily affected by groundwater levels. This may affect fauna that these vegetation associations support.

4 Management Strategies

4.1 Management Strategies 2020 – 2025

The management objectives and implementation of strategies for 2020 – 2025 will be measured in KPIs discussed in the NAAMP (2011).

4.1.1 Key Performance Indicators (KPIs)

Leading indicators and trends in threats indicate (for the life of a reserve management plan) (Table 31):

- 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 31). The levels of acceptable changes are determined in the framework established in the NAAMP as summarized in Table 31 and applied in Tables 32 and 33.

Table 31: Application of leading indicators

Objective	Leading Indicator	Applicable When
Prevent	Prevent ▪ introduction to or occurrence of	▪ Threat absent from reserve ▪ Unplanned introduction possible
Eliminate	▪ Reduce rate of density/abundance/extent (Eventual complete removal but 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	Reduce ▪ 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 32: Objectives for Weed species in the Estuarine Reserves

Objective	Impact	Weed Species/Group	2019 Extent	Comment
Prevent	**Very High**	▪ Tamarisk ▪ Paterson's Curse ▪ Arum Lily ▪ Blackberry ▪ Asparagus Fern ▪ Golden Dodder ▪ Madeira Vine	0	Not present on site
Eliminate	**Very High**	▪ *Lachenalia reflexa* ▪ *Moraea flaccida* ▪ *Asparagus asparagoides* ▪ *Schinus terebinthifolius* ▪ *Lantana camara*	<5->50% 7-12% <5-26% <5-24% <5-3%	Widespread at PW, localised at AFS, BWR and none at JJ Localised at all four reserves Absent from JJ and PW, 1 grid point at BWR, 10 at AFS 9 grid points at AFS, 3 at BWR, 1 at JJ and 5 at PW None at JJ or PW, 1 grid point at AFS and BWR
	High	▪ Annual Clumping Grasses ▪ Perennial Running Grasses ▪ Clumping Geophytes ▪ Trees and Shrubs ▪ Giant Grasses	<5%->50% <5%-26% 18%->50% <5%->50% <5%	Widespread at AFS, BWR and PW, none at JJ Widespread at AFS and JJ, localised at PW, none at BWR Widespread at AFS, BWR and PW, localised at JJ with 8 points Localised at AFS with 2 points, Widespread at BWR (24 points), JJ (13 points) and PW (95 points) 1 grid point at AFS and 2 at JJ, none at BWR and PW
Contain	**Very High**	▪ Perennial Clumping Grass	20%->50%	Widespread at BWR (35 points) and PW (95%), localised at AFS (8 points) and JJ (5 points). Difficult to eliminate in the short term
Manage	**Medium**	All other perennial weeds	<5->50%	All reserves had localised infestations with only PW having one widespread infestation of *Oxalis pes-caprae* (Soursob)
	Low	All other annual weeds	<5->50%	AFS and JJ had only localised infestations, whereas BWR and PW had a majority localised but also had widespread infestations of *fumaria capreolata* (BWR), *Hypochaeris glabra* (BWR, PW), *Urospermum picroides* (BWR) and *Ursinia anthemoides* (PW)

* Where, AFS = Attadale Foreshore, BWR = Blackwall Reach, JJ = Jeff Joseph, PW = Point Walter and Troy Park is excluded

Table 33: Objectives for all other threats in the Estuarine Reserves

Objective	Impact	Threat	Comments
Prevent	**Very High**	Acid sulfate soils	These should not occur as no excavation or groundwater extraction is proposed
		Feral Animals (foxes)	Absent – implement controls within 10 working days of observation
	High	Fire (large)	Prevent large fires that burn more than one third of the reserves, work in consultation with the Department Fire and Emergency Services
Eliminate	**Very High**	Feral Animals (bees)	Present – implement controls outlined in the NAAMP
		Feral Animals (rabbits)	Present – implement controls outlined in the NAAMP
Contain	**Very High**	Feral Animals (cats)	Present – implement controls within 10 working days of observation in accordance with the City's guidelines
	High	Fires (repeat)	Present – small recent fire scars observed within Estuarine reserves, limit fires burning in the same location within the bushland in consultation with the Department Fire and Emergency Services
	Medium	Physical disturbance	This is present within the estuarine reserve in the form of cubby building, rubbish dumping, graffiti, informal tracks and trampling. Limit public access into bushland through the use of fencing or soft barricades such as planting and brush mattressing. Report disturbances through the City's current maintenance inspections and implement controls in accordance with the NAAMP
		Small spot fires, unauthorised campfires and bonfires	Five incidences of small spot fires occurring within the Estuarine Reserves were reported to the DFES since 1 January 2015
	Low	Vehicle fire in carpark areas	1 incident occurred at Point Walter boat ramp in 2016
Manage	**Very High**	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 within that contain groundwater dependant species, such as the Flooded Gum Woodland in WH and the area containing Marri trees and Spearwood in HS. Management can include: ▪ undertaking weed control to minimise competition for water with native plants ▪ planting and enhancement of native vegetation cover within the reserves particularly where large-scale deaths occur, and potentially substituting species that are declining in the area with more adaptable species that can fill the same niche records should be taken of changes over time to assist with knowledge and understanding of ongoing processes.
		Disease and Pathogens (Dieback)	Present and therefore cannot be prevented. Cannot be eliminated and very difficult to contain, as boundary of Dieback unknown. Point Walter and Attadale

			Foreshore are on a three-year cycle of Phosphite treatment (City of Melville,2020: personal communication). Monitoring and dieback testing should also be undertaken at Jeff Joseph and Troy Park, for overall management of the Estuarine Reserves. Maintaining thick tree canopy and leaf litter to reduce soil temperatures is also recommended. Replacement of susceptible species with resistant ones during revegetation, if planting success of the susceptible species is unsuccessful.
	Low	Stormwater	No stormwater to be diverted into the bushland reserves.
		Reticulation	Monitor and manage any over spray from irrigation or leaks within 5 working days of being observed.
Confirm	**Very High**	Diseases and Pathogens (*Armillaria luteobubalina*)	Confirm the presence of *Armillaria luteobubalina* and enact management as per the NAAMP as soon as possible to prevent spread.

4.1.3 Lagging Indicators

Lagging indicators and trends in assets, indicate whether strategic goals of maintaining and enhancing assets are being met. The levels of acceptable change are discussed in the NAAMP and are summaries in Table 34 and applied to the Estuarine reserves in Table 35 and 36.

Table 34: Tiered Goals for assets and associated lagging indicators

Goal	Lagging indicator	Application When
Enhance	Increase in either: ▪ extent ▪ density ▪ number or occurrences	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. reduces requirements for on-going for threat management)
Maintain	No decrease in either: ▪ extent ▪ density ▪ number or 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 of other records
Monitor	No indices for management effectiveness	Assets that cannot be maintained by actions within City of Melville boundaries or for which no quantifiable indices exist when: ▪ reserves are not critical component of habitat (e.g. highly mobile/wide roaming and/or infrequent/irregular visitors to the City of Melville)

Goal	Lagging indicator	Application When
		there is a risk of local extinction from processes that cannot be mitigated by the City of Melville (e.g. climate change, some pathogens)

Table 35: Goals for species

Goal	Priority	Asset	No. of Reserves	Comments
Maintain Species	**Very High**	*Calyptorhynchus banksii naso*	1	Migratory species that uses the reserves for a food source, maintaining the habitat and food source trees such as Marri and Jarrah onsite will protect this species.
		Lerista lineata	1	Maintenance of this species will occur through the maintenance of habitat particularly understorey, leaf litter and habitat logs.
	High	*Acacia xanthina*	1	Maintain the population through maintenance of habitat and weed control. If possible, source tubestock of these species (some cannot be grown) to be utilised in revegetation works where they occur.
		Alyogyne huegelii	1	
		Alyxia buxifolia	1	
		Amyema linophylla	2	
		Apium prostratum	1	
		Beaufortia squarrosa	1	
		Caesia micrantha	1	
		Cyperus gymnocaulos	2	
		Diplopeltis huegelii	1	
		Dodonaea hackettiana	2	
		Drosera stolonifera	1	
		Grevillea thelemanniana	1	
		Isolepis marginata	2	
		Loxocarya cinerea	1	
		Melaleuca trichophylla	1	
		Scaevola anchusifolia	1	
Confirm	**Very High**	Calyptorhynchus latirostris	0	Confirm is this threatened migratory species is still utilising the site for foraging, it is likely they are due to them being recorded in nearby reserves on the Swan River within Melville.
	Low	Bats	0	Undertake further Bat surveys to Confirm if the bat species observed in 2013 are still present within the Estuarine Reserves (highly likely)

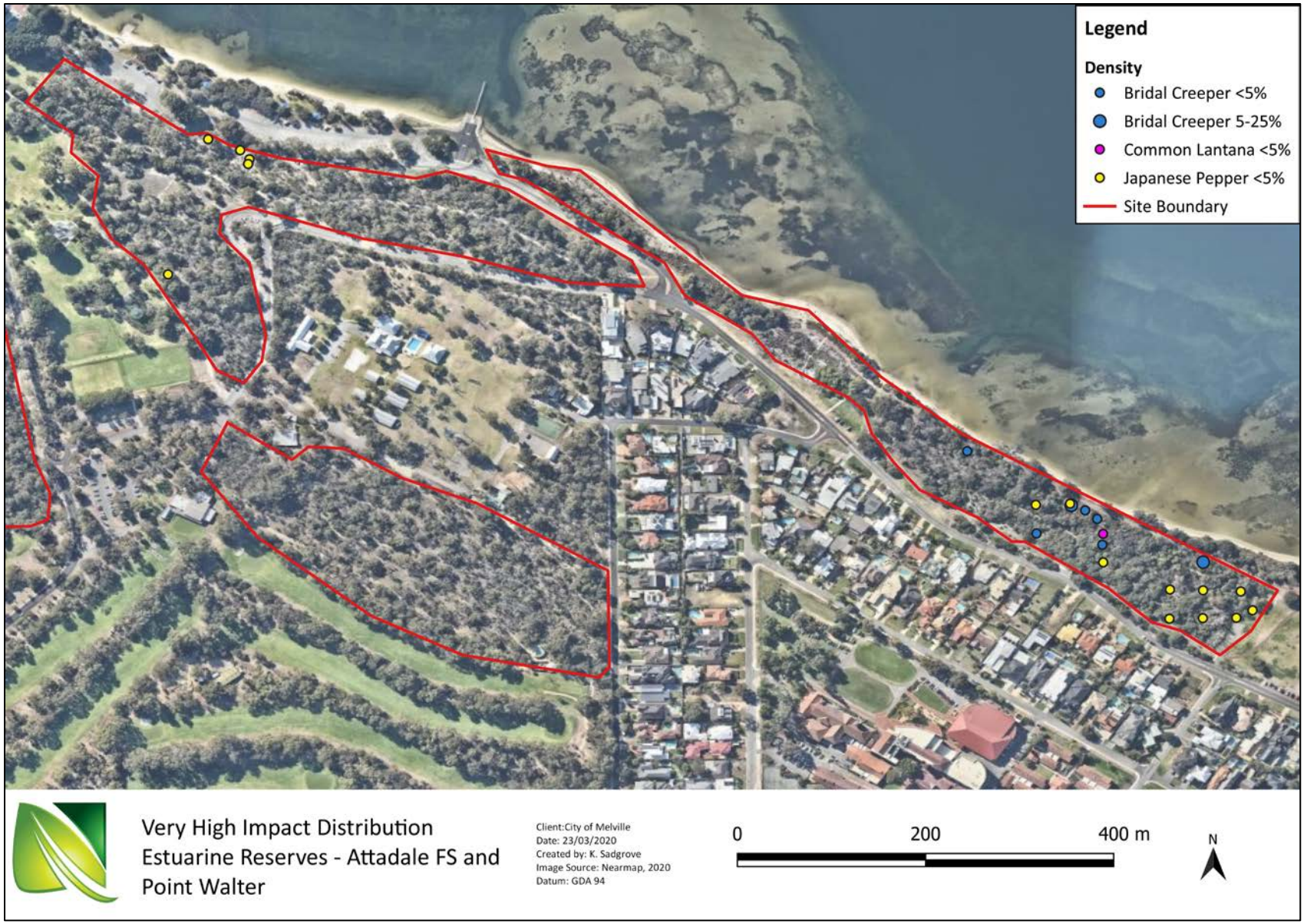
Table 36: Goals for Sites

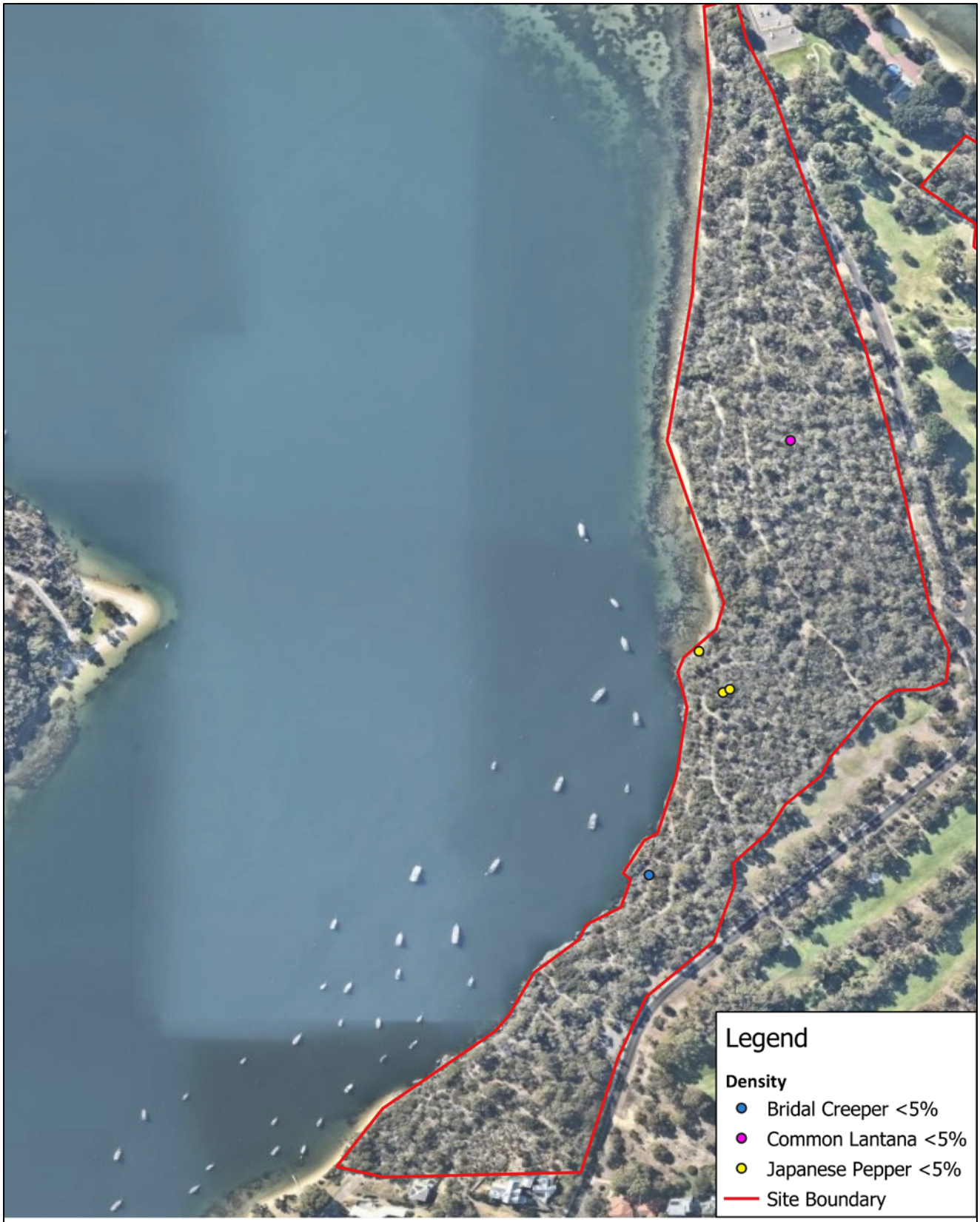
Goal	Priority	Asset	Comments
Enhance	**Medium**	Proposed revegetation sites	Revegetate areas proposed in Table 6 and Figures 16 – 19, in accordance with the standard of rehabilitation in the NAAMP. Where tube stock is available, prioritise species in Table 31 under 'High Priority'.
Maintain	**High**	Ecological communities (Ficinia Sedgeland, Mixed Woodland, Mixed Sedgeland, Marri Jarrah Banksia Woodland, Casuarina obesa Woodland, Mixed Coastal Shrubland, Melaleuca Woodland, Tuart Woodland, Banksia prionotes Tuart Woodland, Peppermint Woodland)	Ecological communities are to be maintained through weed control and revegetation, and management of threats within the reserves. The Threatened and Priority ecological communities, *Banksia Dominated Woodlands of the Swan Coastal Plain, Northern Spearwood shrublands and woodlands and Subtropical and Temperate Coastal Saltmarsh*, should also have special attention to be retained and enhanced through weed control and revegetation.
		Regional Ecological linkages	Ecological linkages can be maintained through the maintenance of ecological communities and enhancement of these communities via proposed rehabilitation, also through avoiding clearing and fragmentation of the reserves.
		Habitat trees	Habitat trees to be protected by the management of threats such as fire and disease, and enhancement of the ecological community within the reserves through revegetation works. If it is safe, retain dead habitat trees.
	Medium	Revegetation sites (Jeff Joseph)	Maintain revegetation sites via infill planting, weed control and watering as required to complete the revegetation to the standard outlined in the NAAMP.
		Community interest sites and amenities (signs, bench seats, formal tracks, fencing, bins, bird boxes, bat boxes)	Assets to be monitored during the City's current inspection and maintenance works, and any damage or repair requirements noted to be reported with maintenance to occur as soon as practicable.
	Low	Reference sites- 2019 fauna trap locations	One bird box at the southern end of BR needs to be secured to the tree as it is currently swinging in the breeze and unlikely to be utilised by birds (see Figure 9). Investigate the potential for installation of multi chambered bat boxes as most endemic species roost in groups.
Monitor	**Very High**	Aboriginal Heritage sites	Monitor heritage site to ensure no ground works occur in these areas, if works are required in these sites approval will be required from Department of Planning, Land and Heritage. If any artefacts are exhumed during any on-ground maintenance works a stop work order should be executed and findings reported.
		European Heritage sites	Consideration should be given to works conducted in close proximity to heritage sites to ensure no negative impacts to the sites.
	Low	All assets	Monitoring of all assets should occur in accordance with the City's policies and guidelines outline in the NAAMP.

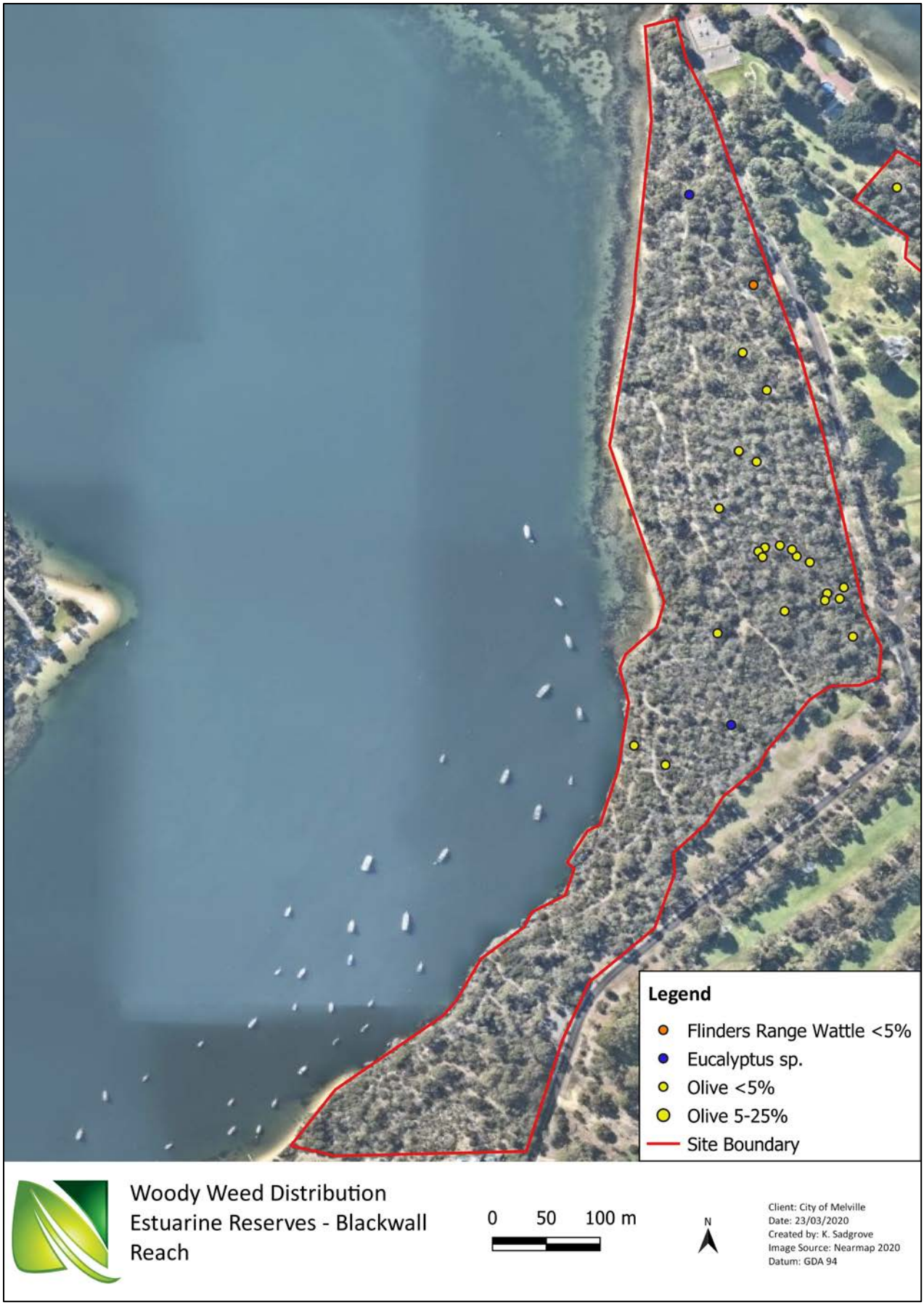
Weed Maps

Only areas containing weed species present are shown in the following weed maps.

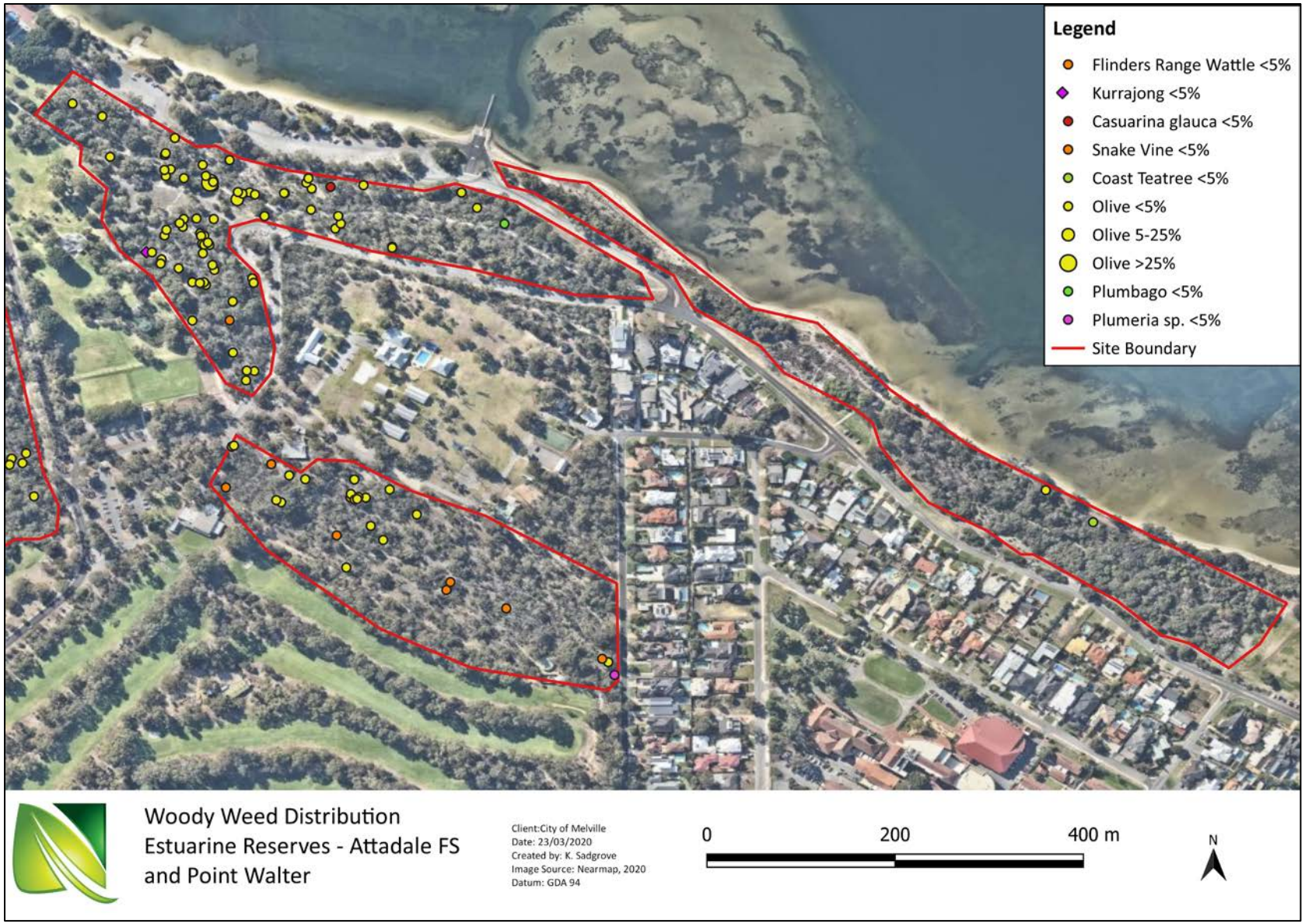

Legend
Density
Japanese Pepper <5%
Site Boundary
Very High Impact Distribution
Estuarine Reserves - Jeff Joseph
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N


Legend
Density
Bridal Creeper <5%
Bridal Creeper 5-25%
Common Lantana <5%
Japanese Pepper <5%
Site Boundary
Very High Impact Distribution
Estuarine Reserves - Attadale FS and
Point Walter
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
200
400 m
N

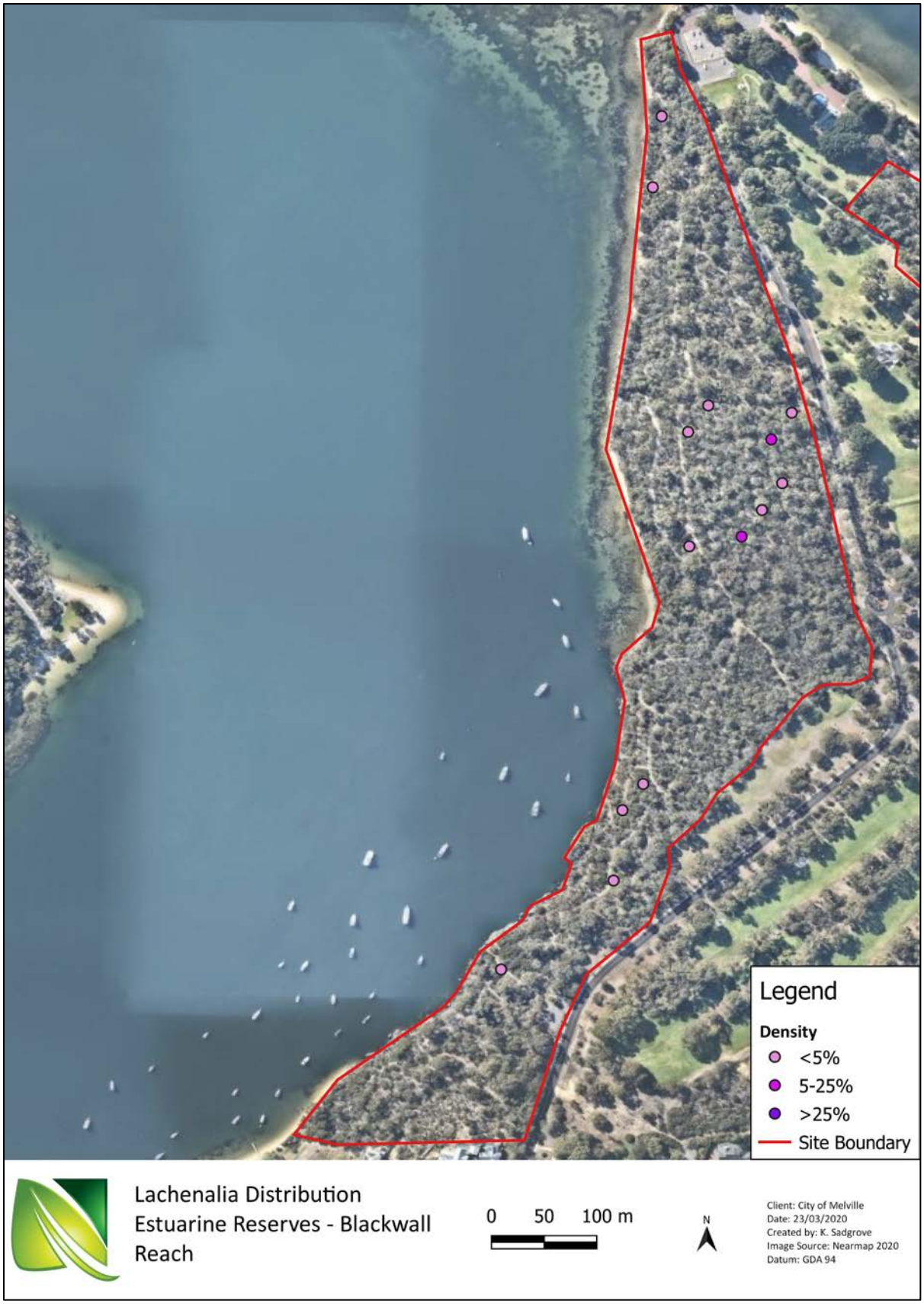

Legend
Density
Bridal Creeper <5%
Common Lantana <5%
Japanese Pepper <5%
Site Boundary
Very High Impact Distribution
Estuarine Reserves - Blackwall
Reach
0 50 100 m
N
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap 2020
Datum: GDA 94

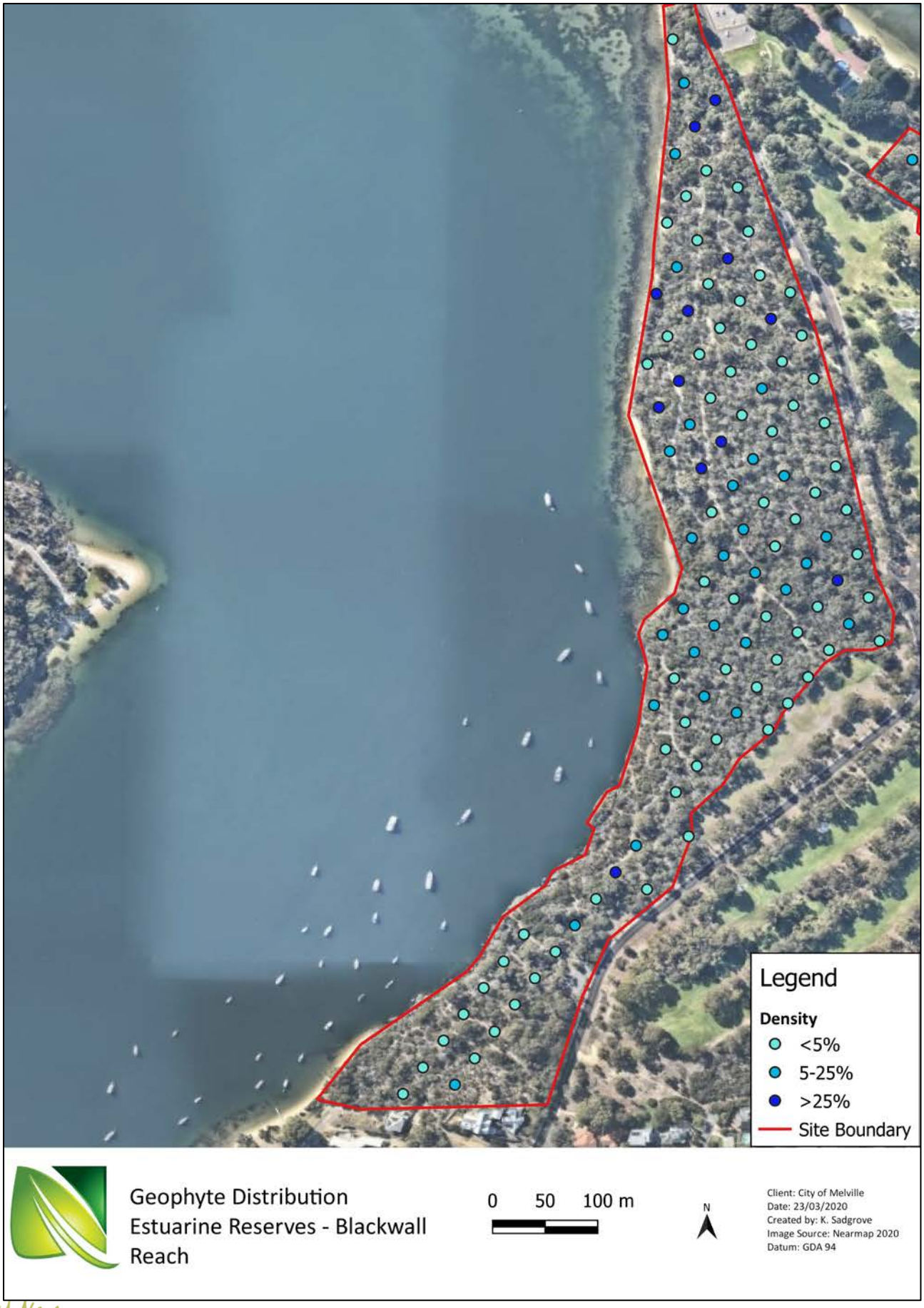

Legend
Flinders Range Wattle <5%
Eucalyptus sp.
Olive <5%
Olive 5-25%
Site Boundary
Woody Weed Distribution
Estuarine Reserves - Blackwall Reach
0 50 100 m
N
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap 2020
Datum: GDA 94


Legend
Casuarina glauca <5%
Casuarina glauca 5-25%
Pencil Pine
Myrtleleaf Milkwort <5%
Cotton Palm <5%
Site Boundary
Woody Weed Distribution
Estuarine Reserves - Jeff Joseph
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N


Legend
Flinders Range Wattle <5%
Kurrajong <5%
Casuarina glauca <5%
Snake Vine <5%
Coast Teatree <5%
Olive <5%
Olive 5-25%
Olive >25%
Plumbago <5%
Plumeria sp. <5%
Site Boundary
Woody Weed Distribution
Estuarine Reserves - Attadale FS
and Point Walter
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
200
400 m
N


Legend
Density
<5%
5-25%
>25%
Site Boundary
Lachenalia Distribution
Estuarine Reserves - Attadale FS
and Point Walter
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
200
400 m
N


Legend
Density
<5%
5-25%
>25%
Site Boundary
Lachenalia Distribution
Estuarine Reserves - Blackwall Reach
0 50 100 m
N
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap 2020
Datum: GDA 94

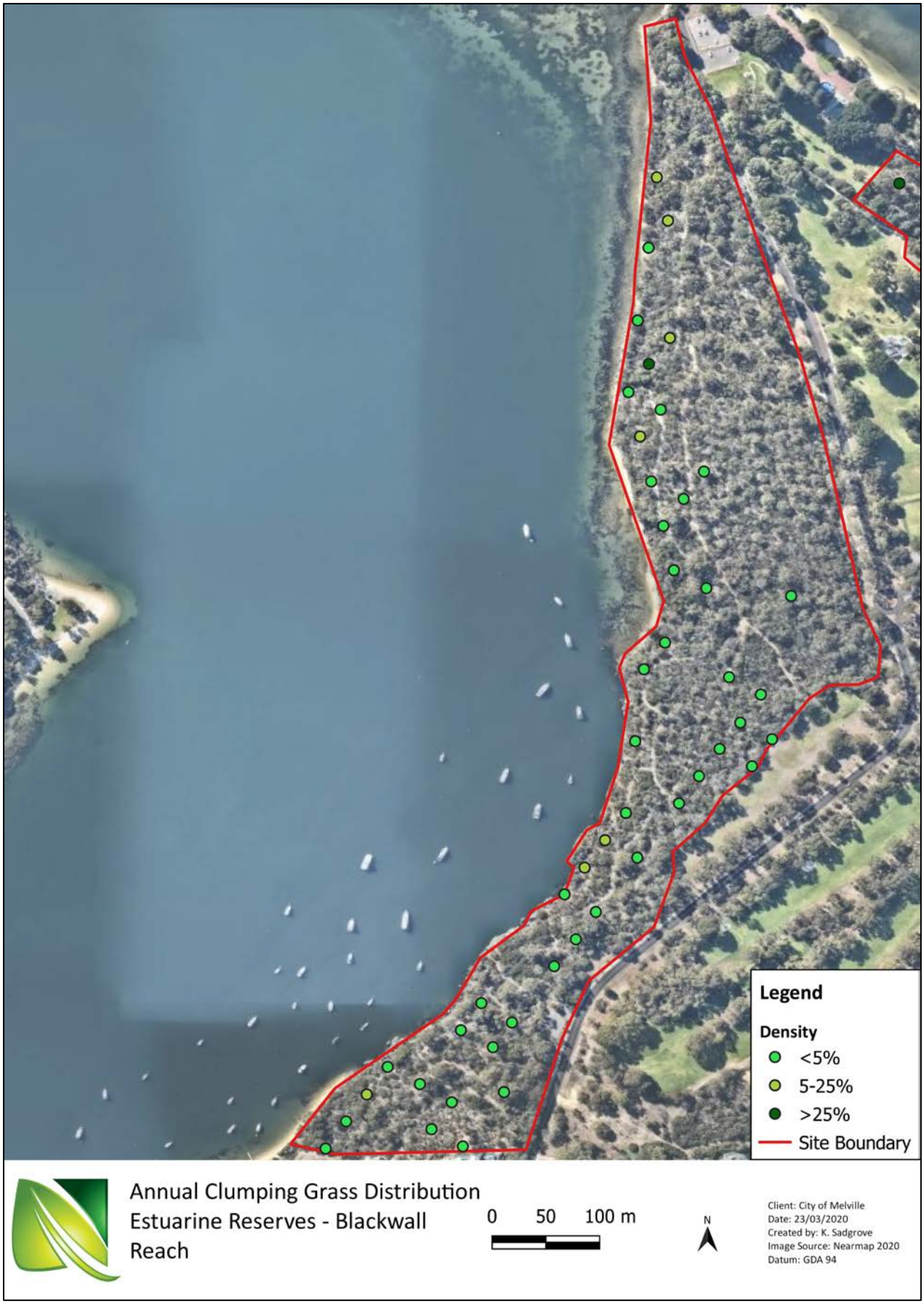

Legend
Density
<5%
5-25%
>25%
Site Boundary
Geophyte Distribution
Estuarine Reserves - Blackwall Reach
0 50 100 m
N
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap 2020
Datum: GDA 94


Legend
Density
<5%
5-25%
>25%
Site Boundary
Geophyte Distribution
Estuarine Reserves - Jeff Joseph
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N


Legend
Density
<5%
5-25%
>25%
Site Boundary
Geophyte Distribution
Estuarine Reserves - Attadale FS
and Point Walter
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
200
400 m
N


Legend
Density
Bulrush <5%
Bulrush 5-25%
Site Boundary
Giant Grass Distribution
Estuarine Reserves - Jeff Joseph
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N


Legend
Density
Bulrush 5-25%
Site Boundary
Giant Grass Distribution
Estuarine Reserves - Attadale
Foreshore
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
100
200 m
N


Legend
Density
<5%
5-25%
>25%
Site Boundary
Annual Clumping Grass Distribution
Estuarine Reserves - Blackwall Reach
0 50 100 m
N
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap 2020
Datum: GDA 94


Legend
Density
<5%
5-25%
>25%
Site Boundary
Annual Clumping Grass
Distribution
Estuarine Reserves - Attadale FS
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
200
400 m
N


Legend
Density
<5%
5-25%
>25%
Site Boundary
Perennial Clumping Grass Distribution
Estuarine Reserves - Blackwall Reach
0 50 100 m
N
Client: City of Melville
Date: 24/03/2020
Created by: K. Sadgrove
Image Source: Nearmap 2020
Datum: GDA 94


Legend
Density
<5%
Site Boundary
Perennial Clumping Grass Distribution
Estuarine Reserves - Jeff Joseph
Client:City of Melville
Date: 24/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N


Legend
Density
0%
<5%
5-25%
>25%
Site Boundary
Perennial Clumping Grass Distribution
Estuarine Reserves - Attadale FS and Point Walter
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
200
400 m
N


Legend
Density
<5%
Site Boundary
Perennial Running Grass
Distribution
Estuarine Reserves - Jeff Joseph
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N


Legend
Density
<5%
5-25%
>25%
Site Boundary
Perennial Running Grass Distribution
Estuarine Reserves - Attadale FS and
Point Walter
Client:City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
200
400 m
N

References

Alan Tingay and Associates (1998) A Strategic Plan for Perth's Greenways - Final Report, Perth: prepared for Environment Australia, Ministry for Planning, CALM, WAMA, DEP, WRC, Main Roads

Bureau of Meteorology (BOM), (2020). Groundwater Dependent Ecosystem Atlas. Viewed April 2020 from: http://www.bom.gov.au/water/groundwater/gde/map.shtml

City of Melville, (2019) City of Melville Natural Areas Asset Management Plan 2019, accessed January 2020 via https://www.melvillecity.com.au/waste-and-environment/environmental-conservation-and-management/environmental-management-plans

Department of Biodiversity, Conservation and Attractions, (2020a), *Communities* database search. Personal Communication

Department of Biodiversity, Conservation and Attractions, (2020b), Wetlands, viewed March 2020 from: https://www.dpaw.wa.gov.au/management/wetlands.

Department of Parks and Wildlife (DPaW), (2007). *Potential impacts of climate change on the Swan and Canning Rivers.* Accessed April 2020 via: https://www.dpaw.wa.gov.au/images/documents/conservation-management/riverpark/reports/Potential%20impacts%20of%20Climate%20Change%20on%20the%20Swan%20and%20Canning%20rivers.pdf

Department of Planning, Land and Heritage (DPLH), (2020). *Aboriginal Heritage Places*. Accessed March 2020 via http://www.nationalmap.gov.au

Department of Water and Environmental Regulation, (2020), *Perth Groundwater Map*, accessed February 2020 from: https://maps.water.wa.gov.au/#/webmap/gwm.

Department of Water and Environmental Regulation, (2020a), *Acid Sulphate Soil Risk Map 50K*, accessed April 2020 from: https://nationalmap.gov.au/

Government of Western Australian, (2000), Bush Forever, Volume 2, Government of Western Australia, Perth, Western Australia.

Government of Western Australia, (2020). Heritage Council. Accessed March 2020 via http://inherit.stateheritage.wa.gov.au/Public/

Heddle, E., Loneragan, O., and Havel, J, (1980), Vegetation Complexes of the Darling System Western Australia. In Atlas of Natural Resources - Darling System, Western Australia (pp. 37 - 72), Department of Conservation and Environment, Western Australia.

Western Australian Local Government Association (WALGA), (2020), Environmental Planning Tool – Environmental Considerations, accessed October 2019 via http://lbp.asn.au/module/enviro#map

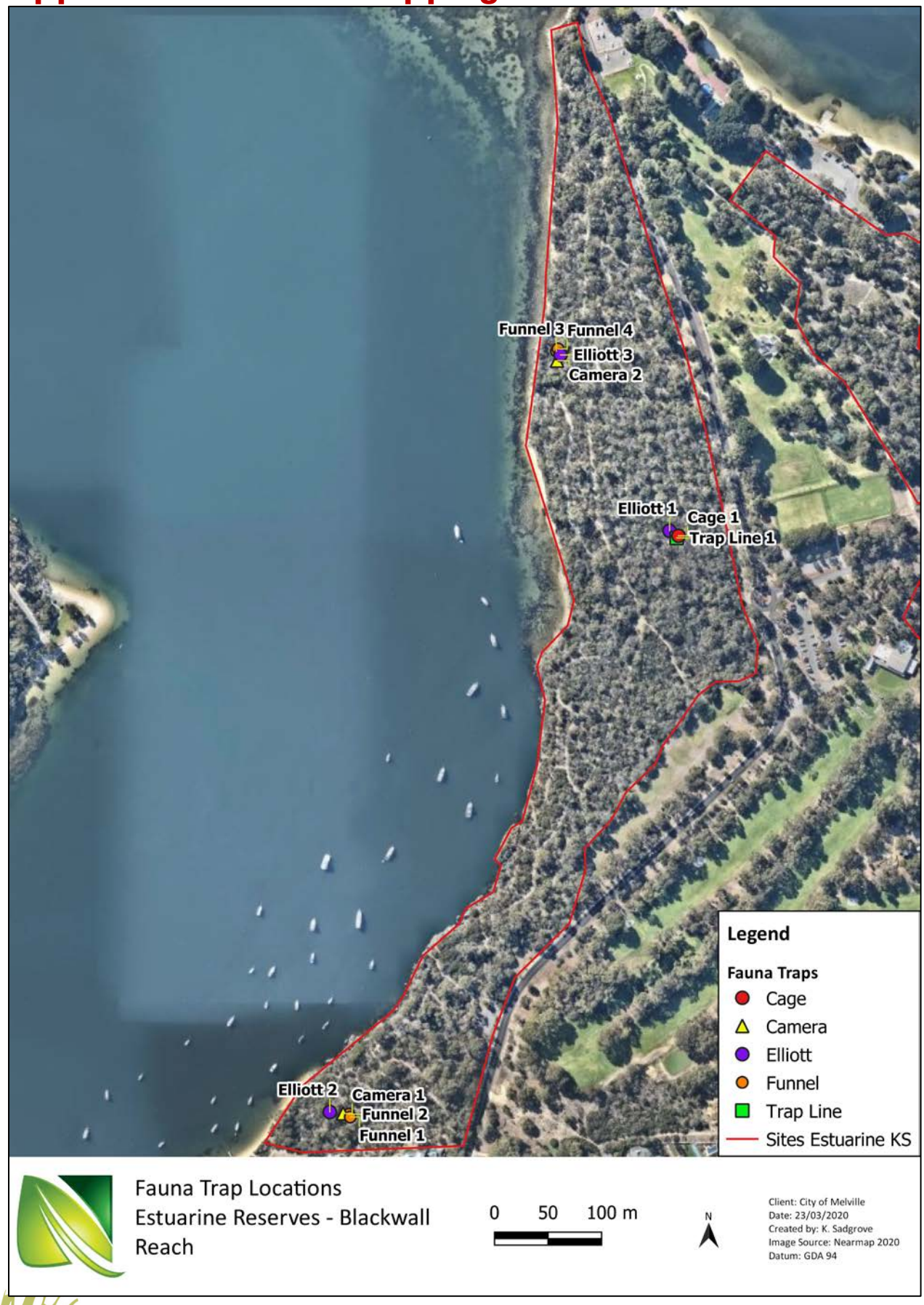
Waters A., (2011), City of Melville – Strategic Natural Areas Asset Management Plan 2011, report by Woodgis Environmental Assessment and Management for the City of Melville, Western Australia.

Western Australian Local Government Association (WALGA), (2010), *Native vegetation extent by vegetation complexes for each Local Government in Perth and Peel*, Retrieved June 2016 from: http://lbp.walga.asn.au/Publications.aspx.

Western Australian Local Government Association (WALGA), (2013), *Native vegetation on the Swan Coastal Plain*. Retrieved June 2016 from: http://pbp.walga.asn.au/Home.aspx.

Woodgis, (2017). *Estuarine Reserves Strategic Management Plan Supplement 2017-2019.* Unpublished report.

Appendix 1 – Fauna Trapping Locations




Legend
Fauna Traps
Cage
Camera
Elliott
Trap Line
Sites Estuarine KS
Elliott 1
Cage 1
Trap Line1
Camera 1
Elliot 2
Trap Line 2
Fauna Trap Locations
Estuarine Reserves - Jeff Joseph
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N


Legend
Fauna Traps
Cage
Camera
Elliott
Funnel
Trap Line
Sites Estuarine KS
Trap Line 1
Elliott 1
Camera 1
Funnel 2
Cage 1
Funnel 1
Funnel 2
Elliott 1
Elliott 2
Cage 1
Trap Line 2
Camera 2
Funnel 1
Elliott 2
Cage 2
Trap Line 1
Camera 1
Fauna Trap Locations
Estuarine Reserves - Attadale FS
and Point Walter
Client: City of Melville
Date: 24/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
100
200 m
N

Appendix 2 – Disturbance


Legend
Armillaria
Old fire
Site Boundary
Disturbance Activities
Estuarine Reserves - Attadale FS
and Point Walter
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0 50 100 m
N


Legend
Recent fire
Site Boundary
Disturbance Activities
Estuarine Reserves - Jeff Joseph Reserve
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N


Legend
Armillaria
Children's cubby
Erosion - drain outlet
Rubbish - old mattress
Rubbish
Site Boundary
Disturbance Activities
Estuarine Reserve - Blackwall Reach
0 50 100 m
N
Client: City of MJelville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap 2020
Datum: GDA 94


Legend
Informal Track
Site Boundary
Informal Paths/Tracks
Estuarine Reserves - Blackwall Reach
0 50 100 m
N
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap 2020
Datum: GDA 94


Legend
Informal Track
Site Boundary
Informal Paths/Tracks
Estuarine Reserves - Attadale FS
and Point Walter
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
200
400 m
N


Legend
Informal Track
Site Boundary
Informal Paths/Tracks
Estuarine Reserves - Jeff Joseph
Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
50
100 m
N

Appendix 3 – Flora Species List

Native Species Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park	At Risk
Ficinia Sedgeland						
Acacia rostellifera	x		x			
Baumea juncea	x					
Casuarina obesa	x					
Cyperus gymnocaulos	x					x
Dodonaea hackettiana	x					
Ficinia nodosa	x		x			
Gahnia trifida	x					
Grevillea crithmifolia			#			
Hakea varia			#			
Jacksonia sternbergiana			x			
Juncus kraussii	x					
Melaleuca cuticularis			x			
Melaleuca rhaphiophylla	x					
Microtis media	x					
Senecio sp.	x					
Mixed Woodland						
Acacia lasiocarpa			x			
Acacia rostellifera			x			
Acacia saligna			x			
Agonis flexuosa			#			
Amyema linophylla			x			x
Banksia sessilis			#			
Baumea juncea			x			
Bolboschoenus caldwellii			x			
Centella asiatica			x			
Conostylis candicans			x			
Ficinia nodosa			x			
Gahnia trifida			x			
Grevillea crithmifolia			x			
Hakea varia			x			
Hardenbergia comptoniana			x			
Juncus kraussii			x			
Lepidosperma gladiatum			x			
Melaleuca rhaphiophylla			x			
Spinifex hirsutus			x			
Suaeda australis			x			
Mixed Sedgeland						
Acacia lasiocarpa			x			
Acacia rostellifera			x			
Acacia saligna			x			
Agonis flexuosa			#			
Apium prostratum			x			x
Banksia sessilis			#			
Baumea juncea			x			
Bolboschoenus caldwellii			x			

Native Species Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park	At Risk
Centella asiatica			x			
Conostylis candicans			x			
Ficinia nodosa			x			
Gahnia trifida			x			
Grevillea crithmifolia			x			
Hakea varia			x			
Hardenbergia comptoniana			x			
Juncus kraussii			x			
Lepidosperma gladiatum			x			
Melaleuca rhaphiophylla			x			
Spinifex hirsutus			x			
Suaeda australis			x			
Marri Jarrah Banksia Woodland						
Acacia cyclops		x		x		
Acacia pulchella				x		
Acacia saligna				x		
Agonis flexuosa		x		x		
Allocasuarina fraseriana				x		
Allocasuarina humilis				x		
Banksia attenuata		x		x		
Banksia dallanneyi		x		x		
Banksia grandis				#		
Banksia menziesii				x		
Banksia sessilis		x		x		
Burchardia congesta				x		
Caesia micrantha				x		x
Caladenia flava				x		
Caladenia latifolia				x		
Callitris preissii				x		
Conostylis candicans				x		
Corymbia calophylla		x		x		
Corynotheca micrantha				x		
Daviesia triflora				x		
Desmocladus flexuosa				x		
Dianella revoluta				x		
Diuris sp.				x		
Drosera erythrorhiza				x		
Drosera stolonifera				x		x
Eryngium pinnatifidum				x		
Eucalyptus marginata		x		x		
Gompholobium tomentosum		x		x		
Hakea prostrata				x		
Hardenbergia comptoniana		x		x		
Hibbertia cuneiformis				x		
Hybanthus calycinus				x		
Isolepis marginata				x		x
Isotropis sp.				x		

Native Species Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park	At Risk
Jacksonia furcellata		x		x		
Jacksonia sternbergiana		x				
Lepidosperma sp.				x		
Leucopogon propinquus		x		x		
Lomandra caespitosa		x		x		
Lomandra hermaphrodita		x		x		
Lomandra suaveolens				x		
Loxocarya cinera				x		
Luzula meridionalis				x		
Lyginia imberbis				x		
Macrozamia riedlei		x		x		
Mesomelaena pseudostygia		x		x		
Microtis media				x		
Petrophile linearis				x		
Petrophile macrostachya				#		
Pimelea rosea				x		
Pterostylis vitatta				x		
Ptilotus polystachyus				x		
Scaevola canescens				x		
Schoenus clandestinus				x		
Sowerbaea laxiflora				x		
Spyridium globulosum		x				
Stirlingia latifolia				x		
Tetraria octandra				x		
Thysanotus manglesianus		x		x		
Thysanotus patersonii				x		
Thysanotus sparteus				x		
Xanthorrhoea brunonis				x		
Xanthorrhoea preissii		x		x		
Casuarina obesa Woodland						
Acacia cochlearis	x					
Acacia cyclops	x					
Acacia rostellifera		x				
Agonis flexuosa		x				
Amyema linophylla	x					
Banksia nivea	x					
Banksia sessilis	x	x				
Baumea juncea	x					
Bolboschoenus caldwellii	x					
Calothamnus quadrifidus	x					
Calothamnus rupestris	#					
Casuarina obesa	x	x				
Centella asiatica	x					
Clematis pubescens		x				
Comesperma integerrimum	x					
Cyperus gymnocaulos	x					x
Dianella revoluta	x	x				
Dodonaea hackettiana	x					x

Native Species Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park	At Risk
Eucalyptus gomphocephala		x				
Ficinia nodosa	x					
Gahnia trifida	x	x				
Grevillea crithmifolia	#					
Hakea prostrata	x					
Hardenbergia comptoniana	x					
Hypocalymma angustifolium	x					
Isolepis sp.	x					
Jacksonia sternbergiana	x					
Juncus kraussii	x	x				
Juncus pallidus	x					
Lepidosperma gladiatum		x				
Melaleuca huegelii	x					
Melaleuca rhaphiophylla	x					
Melaleuca systena	x					
Microtis media	x					
Olearia axillaris	x					
Rhagodia baccata subsp. *baccata*		x				
Senecio condylus	x					
Sporobolus virginicus	x					
Mixed Coastal Shrubland						
Acacia rostellifera		x				
Acacia xanthina		X				x
Acanthocarpus preissii		x				
Agonis flexuosa		x				
Alogyne huegelii		#				x
Alyxia buxifolia		x				x
Banksia sessilis		x				
Calothamnus quadrifidus		x				
Diplopeltis huegelii		x				x
Eremophila glabra		x				
Hakea trifurcata		#				
Hemiandra glabra		x				
Lechenaultia linarioides		x				
Lobularia maritima		x				
Lupinus cosentinii		x				
Macrozamia riedlei		x				
Melaleuca systena		x				
Scaevola anchusifolia		x				x
Scaevola crassifolia		x				
Templetonia retusa		x				
Thysanotus manglesianus		x				
Tricoryne elatior		x				
Xanthorrhoea preissii		x				
Melaleuca Woodland						
Acacia cyclops	x					

Native Species Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park	At Risk
Acacia rostellifera	x					
Acacia saligna	x				x	
Banksia littoralis					x	
Banksia menziesii	x					
Banksia prionotes	#					
Baumea juncea	x				x	
Beaufortia squarrosa	#					x
Caladenia latifolia	x				x	
Centella asiatica					x	
Dodonaea hackettiana	x					
Eremophila glabra	x					
Eucalyptus rudis	x				x	
Ficinia nodosa					x	
Gahnia trifida					x	
Hakea varia	x					
Juncus kraussii subsp. *australiensis*					x	
Juncus pallidus	x				x	
Lepidosperma gladiatum					x	
Lobelia anceps	x					
Melaleuca cuticularis	x					
Melaleuca rhaphiophylla	x				x	
Microtis media	x					
Olearia axillaris	x					
Rhagodia baccata	x				x	
Scaevola crassifolia	x					
Templetonia retusa	x					
Typha orientalis					x	
Tuart Woodland						
Acacia cyclops				x		
Acacia pulchella				x		
Acacia rostellifera		x				
Acanthocarpus preissii		x				
Agonis flexuosa		x		x		
Allocasuarina humilis		x				
Allocasuarina lehmanniana				x		
Austrostipa elegantissima				x		
Banksia attenuata		x				
Banksia sessilis		x		x		
Caladenia flava				x		
Caladenia latifolia				x		
Callitris preissii				x		
Calothamnus quadrifidus		x		x		
Calothamnus rupestris		#		#		
Clematis pubescens		x				
Conostylis candicans		x				
Dianella revoluta		x				
Diuris sp.				x		
Dodonaea hackettiana		x				x

Native Species Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park	At Risk
Eucalyptus gomphocephala		x		x		
Gompholobium tomentosum				x		
Grevillea crithmifolia				x		
Grevillea thelemanniana				x		
Grevillea vestita		x		#		
Hake prostrata		x				
Hakea trifurcata				x		
Hardenbergia comptoniana				x		
Hibbertia racemosa		x				
Isolepis marginata		x				x
Jacksonia furcellata		x		x		
Jacksonia sternbergiana				x		
Lechenaultia linarioides		x		x		
Lepidosperma gladiatum		x				
Lepidosperma scabrum		x				
Lomandra hermaphrodita		x		x		
Lomandra maritima				x		
Macrozamia riedlei		x		x		
Melaleuca huegelii				x		
Melaleuca systena				x		
Melaleuca trichophylla				x		x
Mesomelaena pseudostygia		x		x		
Petrophile linearis				x		
Pimelea rosea		x				
Rhagodia baccata				x		
Scaevola canescens				x		
Scaevola crassifolia				x		
Scaevola nitida				#		
Sowerbaea laxiflora		x		x		
Templetonia retusa		x				
Thysanotus arenarius		x		x		
Thysanotus manglesianus		x		x		
Trachymene pilosa		x				
Tricoryne elatior		x		x		
Xanthorrhoea preissii		x				
Banksia prionotes Tuart Woodland						
Acacia pulchella				x		
Acacia saligna				x		
Acanthocarpus preissii				x		
Agonis flexuosa				x		
Austrostipa flavescens				x		
Banksia prionotes				x		
Banksia sessilis				x		
Caesia micrantha				x		x
Calothamnus quadrifidus				x		
Conostylis candicans				x		

Native Species Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park	At Risk
Corynotheca micrantha				x		
Dianella revoluta				x		
Eucalyptus gomphocephala				x		
Gompholobium tomentosum				x		
Hakea prostrata				x		
Hardenbergia comptoniana				x		
Jacksonia furcellata				x		
Lepidosperma squamatum				x		
Macrozamia riedlei				x		
Melaleuca cuticularis				#		
Ptilotus polystachyus				x		
Scaevola canescens				x		
Thysanotus arenarius?				x		
Thysanotus manglesianus				x		
Tricoryne elatior				x		
Xanthorrhoea preissii				x		
Peppermint Woodland						
Acacia rostellifera		x				
Acanthocarpus preissii		x				
Agonis flexuosa		x				
Allocasuarina humilis		x				
Banksia attenuata		x				
Banksia sessilis		x				
Calothamnus quadrifidus		x				
Calothamnus rupestris		x				
Clematis pubescens		x				
Dianella revoluta		x				
Eucalyptus gomphocephala		x				
Hakea prostrata		x				
Hibbertia racemosa		x				
Jacksonia furcellata		x				
Lechenaultia linarioides		x				
Lepidosperma scabrum		x				
Lomandra hermaphrodita		x				
Macrozamia riedlei		x				
Mesomelaena pseudostygia		x				
Pimelea rosea		x				
Rhagodia baccata		x				
Sowerbaea laxiflora		x				
Templetonia retusa		x				
Thysanotus arenarius		x				
Thysanotus manglesianus		x				
Trachymene pilosa		x				
Tricoryne elatior		x				

Native Species Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park	At Risk
Xanthorrhoea preissii		x				

Weed Species Name	Attadale Foreshore Reserve	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
Ficinia Sedgeland					
*Arctotheca calendula**	x				
*Avena barbata**	x				
*Beach Evening Primrose**	x				
*Brassica tournefortii**	x				
*Bromus diandrus**	x				
*Conyza bonariensis**	x				
*Conyza sumatrensis**	x				
*Cynodon dactylon**	x				
*Ehrharta calycina**	x		x		
*Ehrharta longiflora**	x				
*Euphorbia terracina**	x				
*Fumaria capreolata**	x				
*Galium murale**	x				
*Gladiolus undulatus**	x				
*Heliophila pusilla**	x				
*Hordeum leporinum**	x				
*Hypochaeris glabra**	x				
*Lachenalia reflexa**	x				
*Lagurus ovatus**	x				
*Lolium rigidum**	x				
*Lupinus cosentinii**	x				
*Medicago polymorpha**	x				
*Melilotus indicus**	x				
*Moraea flaccida**	x		x		
*Oxalis pes-caprae**	x				
*Pelargonium capitatum**	x		x		
*Petrorhagia dubia**	x				
*Pseudognaphalium luteoalbum**	x				
*Raphanus raphanistrum**	x				
*Solanum nigrum**	x				
*Sonchus oleraceus**	x				
*Trachyandra divaricata**	x				
*Trifolium campestre**	x				
*Typha orientalis**	x				
*Urospermum picroides**	x				
*Ursinia anthemoides**	x				
*Vicia sativa**	x				
Mixed Woodland					
*Casuarina glauca**			x		
*Conyza sumatrensis**			x		
*Cupressus sempervirens**			x		
*Cynodon dactylon**			x		
*Freesia alba x leichtlinii**			x		

Weed Species Name	Attadale Foreshore Reserve	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
*Fumaria capreolata**			x		
*Lactuca serriola**			x		
*Oxalis pes-caprae**			x		
*Polygala myrtifolia**			x		
*Solanum nigrum**			x		
*Sonchus oleraceus**			x		
*Tetragonia decumbens**			x		
*Trachyandra divaricata**			x		
*Typha orientalis**			x		
*Washingtonia filifera**			x		
Mixed Sedgeland					
*Cenchrus clandestinus**			x		
*Oenothera drummondii**			x		
*Carex divisa**			x		
*Casuarina glauca**			x		
*Conyza sumatrensis**			x		
*Cynodon dactylon**			x		
*Ehrharta calycina**			x		
*Conyza bonariensis**			x		
*Gladiolus undulatus**			x		
*Hypochaeris glabra**			x		
*Lactuca serriola**			x		
*Lupinus cosentinii**			x		
*Medicago polymorpha**			x		
*Moraea flaccida**			x		
*Oxalis pes-caprae**			x		
*Pelargonium capitatum**			x		
*Pseudognaphalium luteoalbum**			x		
*Schinus terebinthifolius**			x		
*Tetragonia decumbens**			x		
*Trachyandra divaricata**			x		
*Typha orientalis**			x		
*Wahlenbergia capensis**			x		
*Watsonia meriana**			x		
Marri Jarrah Banksia Woodland					
*Acacia iteaphylla**				x	
*Arctotheca**				x	
*Avena barbata**		x		x	
*Brachychiton populneus**				x	
*Brassica tournefortii**		x		x	
*Briza maxima**				x	
*Briza minor**				x	
*Bromus diandrus**				x	
*Bromus hordeaceus**				x	
*Cenchrus clandestinus**				x	
*Conyza bonariensis**				x	
*Cynodon dactylon**				x	
*Ehrharta calycina**		x		x	
*Ehrharta longiflora**				x	

Weed Species Name	Attadale Foreshore Reserve	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
*Eragrostis curvula**				x	
Erodium botrys				x	
*Euphorbia peplus**		x		x	
*Euphorbia terracina**		x		x	
*Ferraria crispa**		x		x	
*Freesia alba x leichtlinii**				x	
*Fumaria capreolata**		x		x	
*Galium morale**				x	
*Gladiolus caryophyllaceus**				x	
*Hibbertia scandens**				x	
*Hordeum leporinum**				x	
*Hypochaeris glabra**		x		x	
*Lachenalia reflexa**		x		x	
*Lagurus ovatus**				x	
*Lolium rigidum**				x	
*Lupinus cosentinii**				x	
*Medicago polymorpha**				x	
*Melinis repens**				x	
*Monoculus monstrosus**				x	
*Moraea flaccida**				x	
*Olea europaea**		x		x	
*Oxalis pes-caprae**				x	
*Pelargonium capitatum**		x		x	
*Petrorhagia dubia**				x	
*Plumeria sp.**				x	
*Raphanus raphanistrum**				x	
*Romulea rosea**				x	
*Schinus terebinthifolius**				x	
*Silene gallica**				x	
*Sonchus oleraceus**		x		x	
*Stellaria media**		x			
*Stenotaphrum secundatum**				x	
*Trifolium campestre**				x	
*Urospermum picroides**		x		x	
*Ursinia anthemoides**				x	
*Vicia sativa**		x			
*Vulpia myuros**				x	
*Wahlenbergia capensis**				x	
*Watsonia meriana**				x	
Casuarina obesa Woodland					
Arctotheca calendula	x				
*Asparagus asparagoides**	x				
*Brassica tournefortii**	x				
*Briza minor**	x				
*Bromus diandrus**	x				
*Carex divisa**	x				
*Cirsium vulgare**	x				
*Cotula turbinata**	x				
*Cynodon dactylon**	x				
*Ehrharta calycina**		x			

Weed Species Name	Attadale Foreshore Reserve	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
*Ehrharta longiflora**	x	x			
*Euphorbia peplus**	x	x			
*Ferraria crispa**		x			
*Fumaria capreolata**	x	x			
*Galium morale**	x				
*Hordeum leporinum**	x				
*Hypochaeris glabra**	x	x			
*Lachenalia reflexa**		x			
*Lactuca serriola**	x				
*Lolium rigidum**	x	x			
*Malva parviflora**	x				
*Medicago polymorpha**	x				
*Melilotus indicus**	x				
*Moraea flaccida**	x				
*Oxalis pes-caprae**	x	x			
*Petrorhagia dubia**		x			
*Pseudognaphalium luteoalbum**	x				
*Romulea rosea**	x				
*Schinus terebinthifolius**	x				
*Sonchus oleraceus**	x	x			
*Symphyotrichum squamatum**	x				
*Tetragonia decumbens**		x			
*Trifolium campestre**		x			
*Urospermum picroides**	x	x			
Mixed Coastal Shrubland					
*Arctotheca calendula**		x			
*Asparagus asparagoides**		x			
*Avena barbata**		x			
*Brassica tournefortii**		x			
*Briza maxima**		x			
*Ehrharta calycina**		x			
*Ehrharta longiflora**		x			
*Erodium botrys**		x			
*Euphorbia peplus**		x			
*Euphorbia terracina**		x			
*Ferraria crispa**		x			
*Fumaria capreolata**		x			
*Galium morale**		x			
*Hypochaeris glabra**		x			
*Lachenalia reflexa**		x			
*Lolium rigidum**		x			
*Lupinus cosentinii**		x			
*Lysimachia arvensis**		x			
*Malva parviflora**		x			
*Olea europaea**		x			
*Oxalis pes-caprae**		x			
*Schinus terebinthifolius**		x			
*Sonchus oleraceus**		x			
*Trifolium campestre**		x			

Weed Species Name	Attadale Foreshore Reserve	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
*Urospermum picroides**		x			
Vulpia myuros		x			
Melaleuca Woodland					
*Agapanthus praecox**	x				
*Allium triquetrum**	x				
*Arctotheca calendula**	x				x
*Asparagus asparagoides**	x				
*Atriplex prostrata**	x				
*Avena barbata**	x				
*Brassica tournefortii**	x				
*Briza minor**	x				
Callistemon sp*					x
*Casuarina pauper**					x
*Cirsium vulgare**	x				
*Conyza bonariensis**	x				
Cynodon dactylon					x
*Cyperus tenuiflorus**					x
*Ehrharta calycina**	x				
*Ehrharta longiflora**	x				
Eucalyptus sp*					x
*Euphorbia cyathophora**	x				
*Euphorbia peplus**	x				
*Euphorbia terracina**	x				x
*Ferraria crispa**	x				
*Fumaria capreolata**	x				
*Galium morale**	x				
*Gladiolus undulatus**	x				x
*Hypochaeris glabra**	x				
*Lachenalia reflexa**	x				x
*Lactuca serriola**	x				
*Lantana camara**	x				
*Leptospermum laevigatum**	x				
*Lolium rigidum**	x				
*Lomandra longifolia**	x				
*Lotus angustissimus**	x				
*Lysimachia arvensis**	x				
*Malva parviflora**	x				
*Medicago polymorpha**	x				
*Melaleuca quinquenervia**					x
*Monopsis debilis**	x				
*Oxalis pes-caprae**	x				x
*Pelargonium capitatum**	x				
*Petrorhagia dubia**	x				
*Pseudognaphalium luteoalbum**	x				
*Ranunculus muricatus**	x				
*Romulea rosea**	x				
*Schinus terebinthifolius**	x				x
*Solanum nigrum**	x				
*Sonchus oleraceus**	x				x

Weed Species Name	Attadale Foreshore Reserve	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
*Stellaria media**	x				
*Stenotaphrum secundatum**	x				
*Symphyotrichum squamatum**	x				x
*Urospermum picroides**	x				
*Vicia sativa**	x				
Tuart Woodland					
*Acacia iteaphylla**		x			
*Arctotheca calendula**		x		x	
*Atriplex prostrata**		x			
*Avena barbata**		x		x	
*Brassica tournefortii**		x		x	
*Bromus diandrus**		x		x	
*Casuarina glauca**				x	
*Cotula turbinata**		x			
*Cynodon dactylon**				x	
*Ehrharta calycina**		x		x	
*Ehrharta longiflora**		x		x	
*Eucalyptus sp.**		x			
*Euphorbia peplus**		x		x	
*Euphorbia terracina**		x		x	
*Ferraria crispa**		x		x	
*Flaxleaf Fleabane**		x		x	
*Fumaria capreolata**		x		x	
*Galium morale**		x		x	
*Heliophila pusilla**		x			
*Hordeum leporinum**				x	
*Hypochaeris glabra**		x		x	
*Lachenalia reflexa**		x		x	
*Lactuca serriola**		x		x	
*Lagurus ovatus**				x	
*Lantana camara**		x			
*Lolium rigidum**		x		x	
*Lupinus cosentinii**		x		x	
*Medicago polymorpha**		x		x	
*Monoculus monstrosus**		x			
*Olea europaea**		x		x	
*Oxalis pes-caprae**		x		x	
*Pelargonium capitatum**		x		x	
*Petrorhagia dubia**		x		x	
*Raphanus raphanistrum**				x	
*Schinus terebinthifolius**				x	
*Senecio vulgaris**		x			
*Silene gallica**		x		x	
*Solanum nigrum**		x		x	
*Sonchus oleraceus**		x		x	
*Stellaria media**		x		x	
*Tetragonia decumbens**		x			
*Trifolium campestre**		x		x	
*Urospermum picroides**		x		x	
*Ursinia anthemoides**		x		x	

Weed Species Name	Attadale Foreshore Reserve	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
*Vulpia myuros**		x			
*Watsonia meriana**		x			
Banksia prionotes Tuart Woodland					
*Ehrharta longiflora**				x	
*Ferraria crispa**				x	
*Wahlenbergia capensis**				x	
*Arctotheca calendula**				x	
*Sonchus oleraceus**				x	
*Conyza bonariensis**				x	
*Urospermum picroides**				x	
*Silene gallica**				x	
*Euphorbia terracina**				x	
*Trifolium campestre**				x	
*Brassica tournefortii**				x	
*Olea europaea**				x	
*Ehrharta calycina**				x	
*Euphorbia peplus**				x	
*Plumbago auriculate**				x	
*Pelargonium capitatum**				x	
*Hypochaeris glabra**				x	
*Oxalis pes-caprae**				x	
*Ursinia anthemoides**				x	
*Fumaria capreolata**				x	
*Raphanus raphanistrum**				x	
*Lolium rigidum**				x	
Peppermint Woodland					
*Arctotheca calendula**		x			
*Avena barbata**		x			
*Brassica tournefortii**		x			
*Bromus diandrus**		x			
*Ehrharta calycina**		x			
*Ehrharta longiflora**		x			
*Eucalyptus sp.**		x			
*Euphorbia peplus**		x			
*Ferraria crispa**		x			
*Fumaria capreolata**		x			
*Galium morale**		x			
*Hypochaeris glabra**		x			
*Lactuca serriola**		x			
*Lolium rigidum**		x			
*Lysimachia arvensis**		x			
*Monoculus monstrosus**		x			
*Olea europaea**		x			
*Petrorhagia dubia**		x			
*Schinus terebinthifolius**		x			
*Silene gallica**		x			
*Sonchus oleraceus**		x			
*Stellaria media**		x			
*Trifolium campestre**		x			
*Urospermum picroides**		x			

Weed Species Name	Attadale Foreshore Reserve	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
*Ursinia anthemoides**		**x**			
*Vulpia myuros**		**x**			

planted/dubious

x present

* weed

Appendix 4 – Fauna Species List

Family	Species Name	Common Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
Invertebrates							
Julidae	**Ommatoiulus moreletii*	Portuguese Millipede			X		
Armadillidiidae	*Armadillidium vulgare*	Rolling slater	X				
Acrididae	*Coryphistes ruricola*	Bark Mimicking Grasshopper				X	
Blattidae	*Drymaplaneta shelfordi*	Cockroach	X	X			
Anisolabididae	*Gonolabis michaelseni*	Native Earwig			X		
Limacidae	*Lehmannia valentiana*	Threeband Garden Slug			X		
Anostostomitidae	*Leponosandrus lepismoides*	Cricket	X		X		
Salticidae	*Maratus pavonis*	Peacock Spider		X			
Pisauridae	*Megadolomedes australianus*	Giant Water Spider		X			
Formicidae	*Myrmecia vindex*	Bull Ant		X			
Philosciidae	*Philoscia muscorum*	Common Striped Woodlouse			X		
Blattidae	*Platyzosteria circumducta*	Bordered Woodland Cockroach		X		X	
Porcellionidae	*Porcellionides pruinosus*	Woodlouse	X		X		
Formicidae	*Rhytidoponera metallica*	Green Head Ant			X		
Gnaphosidae	*Scotophaeus* sp.	Spider		X			
Folcidae	*Smeringopus pallidus*	Daddy Long-Leg Spider				X	
Carabidae		Ground Beetle				X	

Family	Species Name	Common Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
Cicadellidae		Cicada	X				
Coccinellidae		Lady Bird Beetle Nymph	X				
Lamponidae		White-tailed Spider			X		
Miridae		Mirid Bug	X				
Pisauridae		Nursery Web Spider	X	X	X	X	
Scutelleridae		Jewel Beetle		X			
Reptiles/ Amphibians							
Scincidae	*Acritoscincus trilineatus*	Western Three-Lined Skink			X		
Gekkonidae	*Christinus marmoratus*	Marbled Gecko			X		
Scincidae	*Cryptoblepharus buchananii*	Snake-eyed Skink	X			X	X
Scincidae	*Ctenotus fallens*	West-coast Laterite Ctenotus	X	X		X	
Myobatrachidae	*Heleioporus eyrei*	Moaning Frog					X
Scincidae	*Hemiergis quadrillineata*	Two-toed earless skink	X				X
Scincidae	*Lerista elegans*	Elegant Slider			X		
Scincidae	*Lerista lineata*	Perth Slider		X			
Scincidae	*Morethia obscura*	Shrubland Morethia Skink				X	
Scincidae	*Tiliqua rugosa*	Bobtail Lizard	X	X		X	
Birds							
Cacatuidae	**Cacatua tenuirostris*	Eastern Long Billed Corella		X		X	X
Columbidae	**Columba livia*	Feral Rock Pigeon		X			

Family	Species Name	Common Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
Halcyonidae	**Dacelo novaeguinea*	Laughing Kookaburra	X	X		X	X
Columbidae	**Streptopelia chinensis*	Spotted Turle-Dove		X	X		
Columbidae	**Streptopelia senegalensis*	Laughing Turtle-Dove		X	X		X
Psittacoidea	**Trichoglossus haematodus*	Rainbow Lorikeet	X	X	X	X	X
Acanthizidae	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill					X
Accipitridae	*Accipiter fasciatus*	Brown Goshawk				X	
Anatidae	*Anas superciliosa*	Pacific Black Duck		X			
Anhingidae	*Anhinga novaehollandiae*	Australasian Darter		X			
Anthochaera	*Anthochaera carunculata*	Red Wattlebird	X	X	X	X	X
Psittacidae	*Barnardius zonarius*	Australian Ringneck		X			X
Cacatuidae	*Cacatua roseicapilla*	Galah	X	X	X	X	X
Cacatuidae	*Cacatua sanguinea westralensis*	Little Corella		X	X		X
Cacatuidae	*Calyptorhynchus banksii naso*	Forest Red-tailed Black-Cockatoo					X
Campephagidae	*Coracina novaehollandiae*	Black faced Cuckoo Shrike			X	X	X
Corvidae	*Corvus coronoides*	Australia Raven	X	X		X	X
Artamidae	*Cracticus tibicen*	Australian Magpie	X	X	X	X	X
Anatidae	*Cygnus atratus*	Black Swan			X		
Meliphagidae	*Gavicalis virescens*	Singing Honeyeater	X	X			
Monarchidae	*Grallina cyanoleuca*	Magpie Lark			X		X

Family	Species Name	Common Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
Haematopodidae	*Haematopus longirostris*	Pied Oystercatcher			X		
Recurvirostridae	*Himantopus himantopus*	Black-winged Stilt			X		
Hirundinidae	*Hirundo neoxena*	Welcome Swallow	X	X	X		X
Laridae	*Larus novaehollandiae*	Silver Gull		X	X		
Meliphagidae	*Lichenostomus virescens*	Singing Honeyeater					X
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater	X	X	X		X
Meropidae	*Merops ornatus*	Rainbow Bee-Eater		X		X	
Strigidae	*Ninox boobook*	Australian Boobook		X			X
Accipitridae	*Pandion cristatus*	Eastern Osprey					X
Pardalotidae	*Pardalotus striatus*	Striated Pardalote		X			X
Pelecanidae	*Pelecanus conspicillatus*	Australian Pelican			X		
Phalacrocoracidae	*Phalacrocorax sulcirostris*	Little Black Cormorant		X			
Phalacrocoracidae	*Phalacrocorax varius*	Pied Cormorant		X	X		
Meliphagidae	*Phylidonyris niger*	White-cheeked honeyeater	X	X		X	
Meliphagidae	*Phylidonyris novaehollandiae*	New Holland Honeyeater			X		X
Podargidae	*Podargus strigoides*	Tawny Frogmouth		X			
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail		X	X		X
Acanthizidae	*Smicrornis brevirostris*	Weebill					X
Columbidae	*Spilopelia*	Laughing Turtle-	X	X			

Family	Species Name	Common Name	Attadale Foreshore	Blackwall Reach	Jeff Joseph Reserve	Point Walter Reserve	Troy Park
	senegalensis	Dove					
Anatidae	*Tadorna tadornoides*	Australian Shelduck					X
Ardeidae	*Threskiornis molucca*	Australian White Ibis					X
Scolopacidae	*Tringa brevipes*	Grey-tailed Tattler		X			
Scolopacidae	*Tringa hypoleucos*	Common Sandpiper			X		
Mammals							
Felidae	**Felis catus*	Domestic Cat		X	X	X	
Muridae	**Mus musculus*	House Mouse					
Leporidae	**Oryctolagus cuniculus*	Rabbit		X	X	X	
Muridae	**Rattus rattus*	Black Rat		X	X	X	X
Muridae	**Rattus norvegicus*	Brown Rat					
Canidae	**Vulpes Vulpes*	European Red Fox					
Vespertilionidae	*Chalinolobus gouldii*	Gould's Wattled Bat					X
Vespertilionidae	*Chalinolobus morio*	Chocolate Wattled Bat					X
Phalangeridae	*Trichosurus vulpecula*	Common Brushtail Possum		X		X	

*Introduced species (highlighted red and listed first)