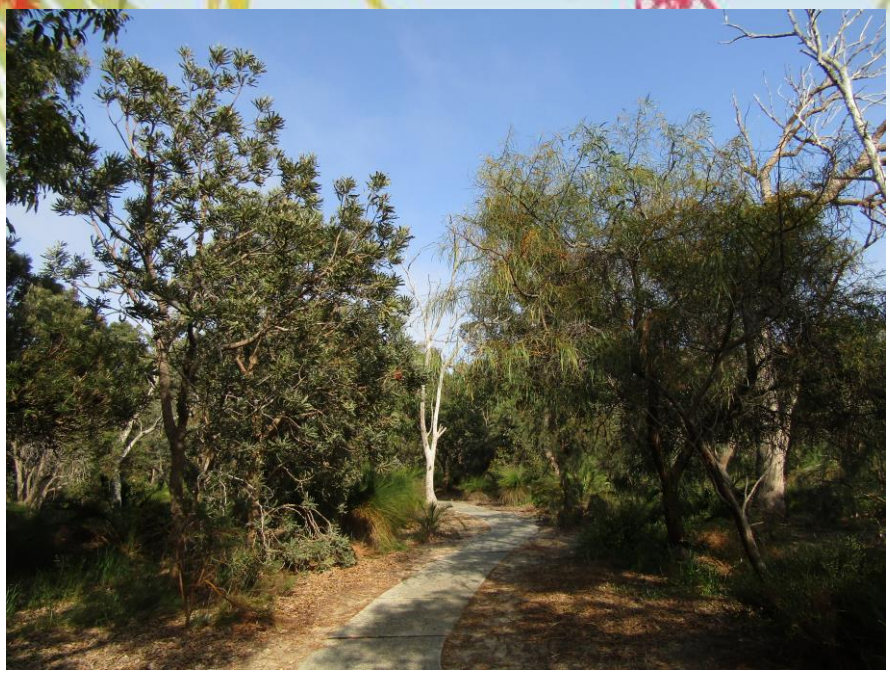
City of Melville



City of Melville

North West Reserves

Strategic Management Plan

April 2020

Executive Summary

North West Reserves are comprised of Harry Sandon, Wal Hughes and Ern Stapleton Reserve within the City of Melville. This North West Reserves Management Plan updates the North-West Reserves Strategic Management Plan 2014-2019.

Assets in terms of flora and ecological communities recorded in the North West Reserves during the 2019 survey included:

- a total of 76 habitat trees as well as existing bird and bat boxes
- A total of 126 flora species from 37 families
- seven flora species designated 'at-risk' by the City of Melville
- three vegetation types identified within the North West Reserves, namely:
  - Jarrah, Marri and *Banksia* Woodland this vegetation is consistent with the threatened ecological community Banksia Woodlands of the Swan Coastal Plain and is listed as containing the TEC (DBCA, 2020)
  - Flooded Gum Woodland
  - Marri Woodland.

North West Reserves provide dryland habitat for an array of fauna species particularly reptiles and birds with a total of 40 fauna species recorded including:

- 14 invertebrate species
- nine reptiles, with the Priority 3 *Lerista lineata* recorded in Ern Stapleton
- one introduced mammal
- 16 birds.

Several threats are present within the North West Reserves during the spring 2019 survey including:

- a total of 46 introduced flora species identified with four very high and 18 high impact weeds present
- fire located at Ern Stapleton
- Physical disturbances by humans including dumped garden waste, children's cubby and a hole dug into the ground
- habitat loss recorded as reduced cover of native vegetation
- feral animal (Domestic Cat) recorded at all three reserves.

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

- undertake weed control of Very High and High impact weeds
- repair two bird boxes with holes in them in Wal Hughes
- revegetate areas proposed in Table 5 and Figure 9 and 10 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) to prepare a site-specific Management Plan for the North West Reserves, in accordance with the City of Melville's *Natural Areas Asset Management Plan* (NAAMP). The North West Reserves are comprised of the Harry Sandon, Wal Hughes and Ern Stapleton reserves.

1.1 Background

The North West Reserves Strategic Management Plan 2020 updates the North-West 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 three North West Reserves, which include:

- 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 three North West Reserves.

1.4 Database

The North West Reserves (Figure 1) are comprised of three reserves including:

- Harry Sandon Park – public open space
- Wal Hughes Reserve – public open space
- Ern Stapleton Reserve- parks and recreation

These reserves are located in the suburb of Attadale, within the City of Melville, approximately 10 km south-west of the Perth CBD (Table 1).

Table 1: North West Reserves, City of Melville

Reserve Name	Reserve Number	Total Reserve Area
Harry Sandon	Lots 2 and 8550	4.19 ha
Wal Hughes	Lot 8720	1.53 ha
Ern Stapleton	Lot 5557	0.72 ha

Figure 1:

North West Reserves - Harry Sandon, Ern Stapleton and Wal Hughes

Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94

2 Assets

2.1 Reserve Ratings

The North West Reserves have been assigned overall ratings under the City's NAAMP framework. The priority ratings categories allow public spaces and parks in the City of Melville to be prioritised in terms of management and resources. These are:

- Harry Sandon – 3
- Wal Hughes – 3
- Ern Stapleton – 3.

These ratings have been reduced from previous ratings of 2 for Wal Hughes and Ern Stapleton and 1 for Harry Sandon. These changes reflect the increase in categories for ratings of public spaces and parks from 4 to 5 categories, now ratings are scored from 1 highest to 5 lowest.

2.1.1 Bush Forever

Harry Sandon Reserve is listed as a Bush Forever Site 226, the other two reserves are not listed as bush forever areas (Government of Western Australia, 2000). Harry Sandon meets three of a potential seven criteria for Bush Forever Sites (Table 2).

Table 2: Bush Forever Criteria, North West 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 28 Spearwood *Banksia attenuata* or *B. attenuata – Eucalyptus* woodlands
Rarity	▪ significant bird species are known to occur in the area with the Rainbow Bee-eater which is listed as Migratory species under the EPBC Act 1999 ▪ locally significant flora *Conospermum triplinervium*
Criteria not relevant to determination of regional significance, but which may be applied when evaluating areas having similar values	▪ the area provides habitat for native fauna species ▪ it provides local ecological linkages to nearby reserves in terms of fauna movement

2.1.2 Ecological Linkages

Ecological linkages provide refuge for fauna to move between natural bushland areas, therefore increasing the size of the available fauna habitat and increases genetic diversity of species present. Although the North West Reserves are not part of a regional ecological linkage, they are in close proximity to one that follows the Swan River acting as a local linkage and play an important role for local fauna movement in this area. The North West Reserves are listed as a local linkage identified in *Towards Establishing a Green Network* (Zelinova, 2014).

The distances between the three North West Reserves range from 270 m – 750 m, and the distance to vegetation along the regional ecological linkage along the Swan River foreshore is 380 m. These are relatively small separation distances and allow for fauna movement of mobile species such as birds, bats and insects. As birds and insects are the main pollinators for flora in Australia this is also beneficial for flora species in these areas and assists with increased genetic diversity of plants. This in turn makes them more resistant to disease, fires, climate change and other local threatening processes (WALGA and Perth Biodiversity Project, 2004).

2.2 Site Assets

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

2.2.1 Ecological Communities

2.2.1.1 Vegetation Complex

The North West 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. Three vegetation types were recorded during the spring 2019 survey and are detailed in Table 3 and shown in Figure 2 and 3 for each North West Reserve.

The vegetation type Jarrah, Marri and *Banksia* Woodland is representative of the threatened ecological community (TEC) Banksia Woodlands of the Swan Coastal Plain, this community is listed as endangered under the EPBC Act 1999 (Cwlth). This vegetation type covers 1.6 ha within Wal Hughes, 2.5 ha within Harry Sandon and 0.7 ha within Ern Stapleton. All three areas have the community structure for the TEC but as Ern Stapleton is smaller than the other it does not have the same level of protection under the EPBC act 1999 (Cwlth) and would need to be enhance to Excellent vegetation condition to meet the patch size and criteria requirements.

Table 3: Vegetation types, North West Reserves

Type	Description	ES	HS	WH	Photograph
Jarrah, Marri and *Banksia* Woodland	This vegetation community is comprised of *Corymbia calophylla* (Marri), *Eucalyptus marginata* (Jarrah) and mixed *Banksia* species over a middle story of mixed native shrubs including *Xanthorrhoea preissii* with an understory of weed grasses and herbs. This area is considered to be the threatened ecological community Banksia Woodlands of the Swan Coastal Plain	X	X	X	
Flooded Gum Woodland	This vegetation community is comprised of *Eucalyptus rudis* (Flooded Gum) over an understory of introduced grasses and Whiteflower Fumitory (*Fumaria capreolata*).			X	

Type	Description	ES	HS	WH	Photograph
Marri Woodland	This vegetation community is comprised of *Corymbia calophylla* (Marri) over *Jacksonia furcellata* and *Xanthorrhoea preissii* with an understory of weedy grasses and sparse native sedges.		X		

Figure 2:
Vegetation Types
North West Reserves - Ern Stapleton

Client :City of Melville
Date: 1/04/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94

0 25 50 m

N

Figure 3:
Vegetation Types
North West Reserves - Wal Hughes and Harry Sandon

Client: City of Melville
Date: 1/04/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94

0 100 200 m

N

2.2.2 Fauna Habitat

The North West Reserves provide important habitat for native fauna at a local level. They provide additional habitat for fauna that utilise the nearby regional ecological linkage particular mobile fauna such as birds and bats. A review of the Western Australian Local Government Association (WALGA) Environmental Planning Tool indicated that all three 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 three reserves contained preferred food source flora species for threatened black cockatoos including Marri, Jarrah, Banksia species and Hakea species.

Large native habitat trees with a diameter at breast height (DBH) over 60 cm were recorded across the North West Reserves (Table 4, Figure 5 and 6). 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 76 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 (Figure 4) were recorded in each reserve and are shown in Figure 7 and 8.

Table 4: Habitat trees with DBH > 60 cm in North West Reserves

Species	Ern Stapleton	Wal Hughes	Harry Sandon	Total
Banksia attenuata (Slender Banksia)	0 alive, 1 dead			**1**
Corymbia calophylla (Marri)	7 alive, 5 dead	7 alive, 0 dead	39 alive, 0 dead	**58**
Eucalyptus marginata (Jarrah)	1 alive, 5 dead	5 alive, 1 dead		**12**
Eucalyptus rudis (Flooded Gum)		5 alive, 0 dead		**5**
Total	**19**	**18**	**39**	**76**

Figure 4: Left: Bird box at Harry Sandon, Right: Bat box at Harry Sandon Reserve

Fauna habitat site indices for large habitat trees from 2005 to 2019 are shown in Table 5 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 North West Reserves over time.

Table 5: 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	17	10	Maintained (assumed unchanged)
	Dead native tree		2	2	

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

Figure 5:
Habitat trees
North West Reserves - Ern Stapleton

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

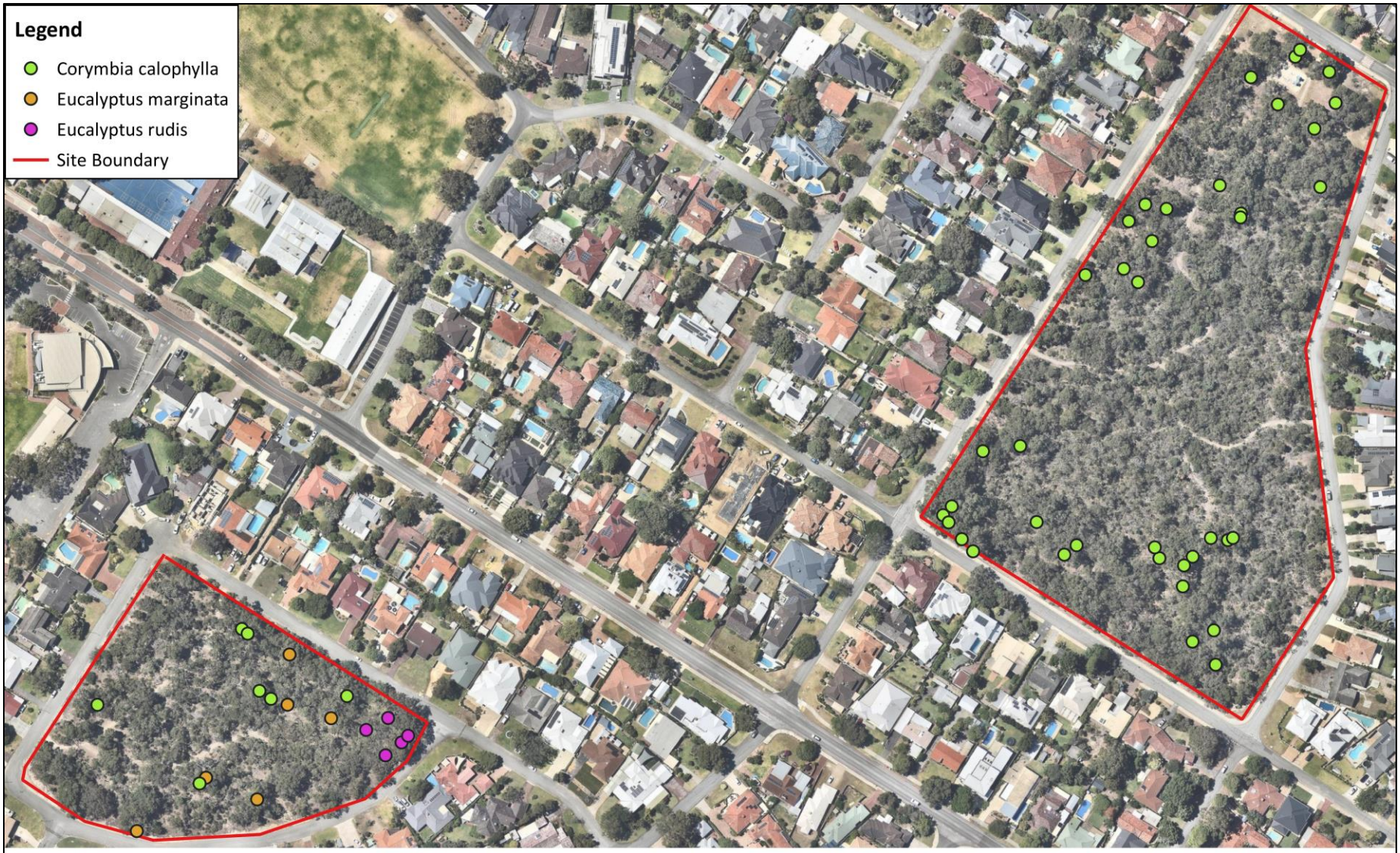


Figure 6:
Habitat trees
North West Reserves - Wal Hughes and Harry Sandon

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

0 100 200 m

N

Figure 7:

Bird and Bat Box Locations
North West Reserves - Harry Sandon

Figure 8:

Bird and Bat Box Locations
North West Reserves - Wal Hughes

Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94

2.2.3 Wetlands

Wetlands are areas that experience permanent, seasonal or intermittent waterlogging or inundation by water (DBCA, 2020b). No natural waterways or wetlands occur within the North West Reserves, with all threes comprising of dryland vegetation. Depth to ground water within the reserves ranges from:

- 3.8 to 5.5 m within Harry Sandon Park
- 7.5 to 14.5 m within Wal Hughes Reserve
- 5 to 12 m within Ern Stapleton Reserve.

Harry Sandon Park is the lowest lying reserve and contains vegetation including Marri (*Corymbia calophylla*) and Spearwood (*Kunzea glabrescens*) that usually grow in dune depressions or near wetland areas where the soil contains more moisture. These species are considered transitional vegetation that occurs between wetland and dryland areas. Wal Hughes contains one corner of the reserve that is lower lying and vegetated by Flooded Gum which is usually adjacent to waterways or wetlands meaning prior to residential clearing there may have been a nearby wetland or dampland, as these trees are known to occur in areas that receive seasonal inundation.

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 the Act, it is an offence for anyone to excavate, destroy, damage, conceal or in any way alter an Aboriginal site without the Minister's permission.

No registered Aboriginal heritage sites are present within the North West Reserves (Department of Planning Lands and Heritage (DPLH), 2020a). A review of European heritage places listed under the *Heritage of Western Australia Act 1990* indicated none are present within the North West Reserves (DPLH, 2020b).

2.2.5 Community Interest

The North West Reserves 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 9 and 10). Recreational areas in the form of playgrounds are present at Harry Sandon and Ern Stapleton.

Community groups are active within the North West reserves. The community group the Friends of Harry Sandon made up of local residents assist the City in the management and monitoring of the Park. Friends of Wal Hughes conduct annual planting events and other restoration work.

Potential revegetation sites within each reserve is shown in Figures 9 and 10, and areas sizes are listed in Table 6. These sites have been identified as locations for potential revegetation due to the high level of bare ground. Some areas have been identified as only requiring understory revegetation.

Table 6: Revegetation proposed for the North West Reserves

Revegetation Proposed	Wal Hughes	Harry Sandon	Ern Stapleton
Yes	878 m^2	1229 m^2	None
Yes - understorey only	4725 m^2	7190 m^2	3307 m^2

Figure 9:
Community Interest
North West Reserves - Harry Sandon and Wal Hughes

Figure 10:
Community Interest
North West Reserves - Ern Stapleton

2.2.6 Reference Sites

Reference sites present within the North West 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 consisting of Funnel traps and flywire.

2.3 Species

Native flora, fauna and weed species were identified as well as some potentially planted species that may not be endemic (naturally occurring) within the reserves.

2.3.1 Native Flora

A targeted flora assessment was undertaken in spring 2019. A total of 126 species from 37 families were identified within the North West Reserves during the spring 2019 flora survey. No threatened or priority flora species were recorded. Examples of species found are shown in Figure 11, flora species identified are listed in Appendix 3.

Seven 'at-risk' flora species as identified by the City were recorded with their counts shown in Table 7. No individual of *Nuytsia floribunda* were recorded during the flora survey in 2019, with only one plant previously recorded in 2013, which was not a viable population. Even though this is not an at-risk species for the local government area, this species is considered locally significant as it has become extinct from all three North West Reserves and would normally be present within the Jarrah Banksia Marri Woodland. The only means of reinstating this species will be through revegetation using locally sourced seed or tubestock.

Anigozanthos humilis (Catspaw)

Dampiera linearis (Common Dampiera)

Billardiera fusiformis (Australian Bluebell)

Pterostylis ectypha

Schoenus clandestinus

Drosera erythrorhiza (Red Ink Sundew)

Figure 11: Examples of native flora recorded in the North West Reserves

Table 7: At-risk flora species

At-risk Species	1996-2004	2005-2013	2013-2019	Assets 2013-2019
Conospermum triplinervium (Tree Smokebush)	No quantitative data	1 plant (HS)	8 plants (minimum) (HS)	Increased by 7
Loxocarya cinerea	-	-	3 (HS) 2 (ES)	Total 5 individuals
Isolepis marginata (Coarse club-rush)	-	-	1 (ES)	Total 1 individual
Drosera stolonifera (Leafy Sundew)	-	-	2 (HS)	Total 2 individuals
Caesia micrantha (Pale Grass-lily)	-	-	1 (ES) 3 (HS)	Total 4 individuals
Billardiera fraseri (Elegant Pronaya)	-	-	1 (ES) 5 (HS)	Total 6 individuals
Babingtonia camphorosmae (Camphor Myrtle)	-	-	18 (HS) 1 (WH)	Total 19 individuals

HS-Harry Sandon, WH-Wal Hughes, ES-Ern Stapleton

2.3.2 Native Fauna

The North West Reserves provide dryland habitat for an array of fauna species particularly reptiles and birds with a total of 40 fauna species recorded. A targeted level 2 flora survey was undertaken to assess the presence/absence of at-risk species within the North West Reserves. 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 reserves from 21 October to 07 November 2019.

Fauna observed within the North West Reserves included:

- 14 invertebrate species
- nine reptiles
- one mammal
- 16 birds

Examples of the species observed are shown in Figure 12 and a complete species list in Appendix 4.

Grey Fantail (*Rhipidura albiscapa*)

Green-head Ant (*Rhytidoponera metallica*)

Western Three-lined Skink (*Acritoscincus trilineatus*)

*Domestic Cat (*Felis catus*)

Burton's Legless Lizard (*Lialis burtonis*)

Perth Slider (*Lerista lineata)* P3

Figure 12: Examples of fauna observed within the North West Reserves

2.3.2.1 Mammals

No native mammals were recorded for the North West Reserves with one introduced species Domestic Cat (*Felis catus*) captured on motion activated cameras.

2.3.2.2 Bats

Bats were observed within two bat boxes in Harry Sandon Park, as this was during the day and the bats were not captured, the species were not able to be determined. A further bat survey was undertaken during the night stalk with a recording device (Echo Meter Touch 2 Pro) used to record and catalogue bat calls, however no bats were recorded so species could not be positively determined. However, due to the habitat present and the fact the bats were roosting alone it is most likely to be the White-striped Free-tailed Bat (*Austronomus australis*), which is one of two bat species indicated to have been previously recorded in this location according to NatureMap (DBCA, 2020a).

2.3.2.3 Birds

Birds observed within the North West Reserves are listed in Appendix 4. A total of 17 different species were observed and of these five are introduced species. Birds that are classified 'at-risk' by the City are shown in Table 8 and are compared to the numbers recorded for the previous management plan. The migratory species Rainbow Bee-eater *(Merops ornatus)* listed under the EPBC Act 1999 (Cwlth) was recorded within Harry Sandon Reserve.

Table 8: At-risk bird species

Values	Birds	Presence 1996-2004	Presence 2005-2013	Presence 2013-2019	Assets 2013-2019
Very High Listed under the EPBC Act 1999 (Migratory)	Rainbow Bee-eater (*Merops ornatus*)	No data	Confirmed 2012	Confirmed 2019	Maintained
Very High Listed under the EPBC Act 1999 (threatened)	Carnaby's Cockatoo (*Calyptorhynchus latirostris*)		Confirmed 2012	Assumed present (recorded in neighbouring reserves)	Assumed maintained
	Forest Red-tailed Black Cockatoo (*Calyptorhynchus banksii naso*)		Confirmed 2013	Assumed present (recorded in neighbouring reserves)	Assumed maintained
High Listed by WAPC as habitat specialist with reduced populations on Swan Coastal Plain	Yellow-rumped Thornbill (*Acanthiza chrysorrhoa*)	Confirmed 1999	Confirmed 2012	Absent 2019	Not assessible, assumed unchanged
High Listed by Birdlife Australia as wide-ranging with reduced populations on the Swan Coastal Plain	New Holland Honeyeater *(Phylidonyris novaehollandiae*)	Confirmed 1999 & 2003		Absent 2019, although seen in nearby reserves	Not assessible, assumed unchanged
	Western Wattlebird (*Anthochaera lunulata*)	Confirmed 1999		Absent 2019	Not assessible, assumed unchanged
Low Bushland dependent species	Tree Martin (*Hirundo nigricans*)	Assumed present (not confirmed)		Absent 2019	Not assessible
	Red-capped Parrot (*Platycercus spurius*)	Confirmed 1999	Absent 2012	Absent 2019	1 not assessible
	Australian Ringneck (*Platycercus zonarius*)			Confirmed 2019	

2.3.2.4 Reptiles

Reptiles observed within the North West Reserves are listed in Appendix 4. A total of nine different species were observed with no introduced species recorded. Reptiles that are classified as 'at-risk' by the City are shown in Table 9 and are compared to the numbers recorded for the previous management plan.

Table 9: At-risk reptile species

Values	Reptiles	Presence 1996-2004	Presence 2005-2013	Presence 2013-2019	Assets 2013-2019
Very High Listed under the Biodiversity Conservation Act 2016 (WA) as a Priority 3 species	Perth Slider (*Lerista lineata*)	Confirmed 1999 ES and WH	Not recorded	Confirmed 2019 ES, assumed present WH	Maintained assumed unchanged
Low Bushland dependent species	Bobtail (*Tiliqua rugosa rugosa*)	Confirmed 1999 for ES and WH, Assumed present for HS	Absent for ES, confirmed for WH 2013 and HS 2012	Absent for ES, Confirmed for WH and HS 2019	1 not maintained, 2 maintained
	Long-tailed Ctenotus (*Ctenotus australis*)	Confirmed for HS 1999	Confirmed HS 2012	Not confirmed 2019	1 not assessible assume unchanged
	Western Pale-flecked Morethia (*Morethia lineoocellata*)	Confirmed all reserves 1999	Confirmed HS 2012, no data other reserves	Not Confirmed 2019	3 not assessible, assume unchanged
	Morethia obscura Southern Pale-Flecked Morethia	Confirmed all reserves 1999	Confirmed HS, No data WH and ES	Confirmed all 3 reserves 2019	3 Maintained
	Aprasia repens Worm Lizard	Confirmed WH and HS 1999	Confirmed HS 2012, No data WH	Not Confirmed 2019	2 not assessible assume unchanged

2.3.2.5 Invertebrate

Invertebrates observed within the North West Reserves are listed in Appendix 4. A total of 14 different species were observed with one introduced species recorded. None of the invertebrates observed are considered to be at-risk species (Appendix 4).

3 Threats

Threats present within the North West 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 within the North West Reserves in the form of:

- children's cubby
- a hole dug within the reserve boundary (ES)
- dumped garden waste

Locations of these disturbance events are shown in Appendix 2. No signs of trampling/informal tracks were observed within the North West Reserves.

3.2 Fire

Records provided by the City of Melville indicate two fires have occurred within the North West reserves in the last six years (Table 10), including:

- two small scrub and grass fires on 3 and 5 June 2019 at Ern Stapleton Reserve (DFES, personal communications), evidence was observed during the 2019 survey along the south west border of Ern Stapleton Reserve (Figure 13, Appendix 2).

Table 10: Fire Indices

Impact	Fires	Extent of Fires 2005-2013	Extent of Fires 2014-2019	Threats
High Potential for local extinctions of ground dwelling species	Large Fires	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	1 ha	<1 ha (two incidences)	Contained

Figure 13: Signs of recent fire, Ern Stapleton Reserve

3.3 Weeds

A total of 46 introduced flora species were identified during the spring 2019 survey undertaken by Natural Area botanists, Sharon Hynes and Tshering Chekey (Figure 14). 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 9, most weeds were rated High or Low impact.

**Jacaranda mimosifolia* **Whiteflower Fumitory (*Fumaria capreolata*)

Figure 14: Examples of introduced flora species

Individual weed species are rated as Very High and High within each reserve according the City's prioritisation of their impact (Table 11). The extent of weed infestation for each reserve is classified in Tables 12 to14, where they have been assessed as widespread (highlighted pink) or localised. Density weed maps of these Very High and High weeds species or groups are provided in the Weed Map section.

All other medium (perennial) and low (annual) priority weeds were recorded and assessed as localised within Harry Sandon Reserve. Ern Stapleton Reserve had widespread infestations of low impact annual weeds, with Whiteflower Fumitory (*Fumaria capreolata*), Common Sowthistle (*Sonchus oleraceus*) and Smooth Cats-ear (*Hypochaeris glabra*) making up significant components of this weed cover category. Ern Stapleton also had one widespread medium impact perennial weed Geraldton Carnation Weed (*Euphorbia terracina*) with all other perennial weeds being assessed as localised. Wal Hughes Reserve only had one widespread infestation of the low impact

annual weed Whiteflower fumitory (*Fumaria capreolata*) with the rest of the annual and perennial weeds assessed as localised infestations.

Table 11: Number of Weed Species in Each Impact Category

Impact	Number of Species
Very High	4
High	18
Medium	8
Low	16
Total	**46**

Table 12: Extent of infestation within Ern Stapleton

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	Yes	Widespread
Lachenalia reflexa	Yellow Soldiers	Very High	3	N/A	N/A	No	Localised
Annual Clumping Grasses – *Ehrharta longiflora* – *Lolium rigidum*		High	5	N/A	N/A	Yes	Widespread
Trees and Shrubs – *Olea europaea* – *Washingtonia filifera*		High	7	N/A	N/A	Yes	Widespread
Ferraria crispa	Black Flag	High	5	N/A	N/A	Yes	Widespread

Table 13: Extent of infestation within Harry Sandon

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	3	No	No	No	Localised
Ehrharta calycina	Perennial Veldt Grass	Very High	18	No	Yes	Yes	Widespread
Lachenalia reflexa	Yellow Soldier	Very High	4	No	No	No	Localised
Schinus terebinthifolia		Very High	2	No	No	No	Localised
Annual Clumping Grasses – *Avena barbata* – *Avena fatua* – *Briza maxima* – *Bromus diandrus* – *Ehrharta longifolia*		High	27	Yes	Yes	Yes	Widespread
Perennial Running Grasses – *Cynodon dactylon* – *Stenotaphrum secundatum*		High	4	No	No	No	Localised
Clumping Geophytes – *Ferraria crispa* – *Freesia alba x leichtlinii*		High	15	No	Yes	Yes	Widespread

Species or Group	Common Names	Priority	Count	Area >20 Grid Points	Area >2 ha	Area >50% of Reserve	Extent
– *Gladiolus caryophyllaceus* – *Gladiolus undulatus*							
Trees and Shrubs – *Acacia longiflora* – *Brachychiton populneus* – *Olea europaea* – *Washingtonia filifera* – *Yucca* sp.		High	9	No	No	No	Localised

Table 14: Extent of infestation within Wal Hughes

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	N/A	N/A	No	Localised
Ehrharta calycina	Perennial Veldt Grass	Very High	11	N/A	N/A	Yes	Widespread
Lachenalia reflexa	Yellow Soldiers	Very High	5	N/A	N/A	No	Localised
Annual Clumping Grass – *Briza maxima* – *Ehrharta longiflora*		High	9	N/A	N/A	Yes	Widespread
Clumping Geophytes – *Freesia alba x leichtlinii* – *Gladiolus caryophyllaceus* – *Gladiolus undulatus*		High	3	N/A	N/A	No	Localised
Trees and Shrubs – *Brachychiton populneus* – *Olea europaea* – *Washingtonia filifera*		High	7	N/A	N/A	No	Localised

3.4 Habitat Loss

The North West Reserves are isolated pockets of bushland surrounded by housing and roads, there is limited means for safe fauna movement between the three reserves, with habitat loss occurring between these reserves. Habitat loss has occurred in each of the three reserves and can be assessed through the percentage of bare ground and can be used over time to establish trends. The percentage of bare ground for each reserve is shown in Figures 15 and 16. 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. To maximise success of tubestock survival, it is recommended to undertake revegetation in conjunction with weed control activities.

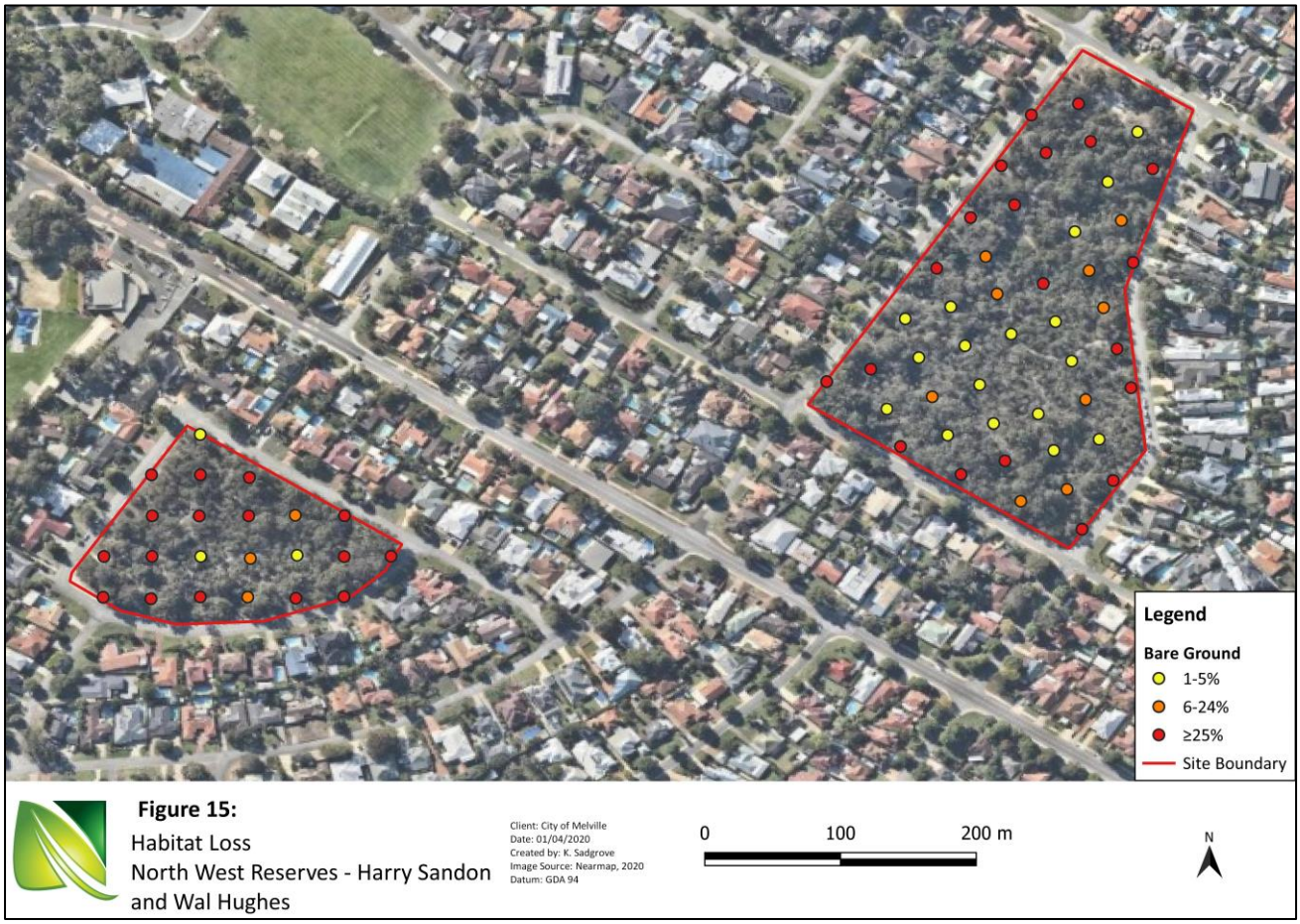


Figure 15:
Habitat Loss
North West Reserves - Harry Sandon and Wal Hughes

Figure 16:
Habitat Loss
North West Reserves - Ern Stapleton

3.5 Feral Animals

Introduced (feral) animals impact flora and fauna through predation, competition for food resources and shelter, spreading disease and destroying habitat. A total of six feral fauna species were recorded during the 2019 fauna survey undertaken by NACMS. This included one invertebrate, one mammal (Figure 17) and four bird species. Feral fauna species found in 2019 and the comparison to those found previously in the North West Reserves are shown in Tables 15.

Figure 17: Feral animal (domestic cat) within Ern Stapleton Reserve

Table 15: Feral Animal Extent/ Occurrences 2005-2019 and Indices

			Occurrence			
Impacts	**Feral Animal Species**	**Impact Rating**	**Occurrence 1996-2004**	**2005-2013**	**2019**	**Threat 2019**
Mammals	Domestic Cat (*Felis catus*)	Very High	No data	Confirmed no dates	Confirmed 2019: >3 occurrence	Maintained
	European Rabbit (Oryctolagus cuniculus)			Present HS 2012, Absent ES and WH 2012: >1 occurrence	Absent 2019	Reduced
	European Red Fox (Vulpes vulpes)			Assumed absent 2013	Absent 2019	Maintained
	House Mouse (Mus musculus)	Low		Confirmed 2012	Not confirmed, assumed present	Change not assessible, assume unchanged
Birds	Feral Rock Pidgeon (*Columba livia*)	Low	No data	Absent	Confirmed HS 2019	1 increased, 3 maintained, 1 change not assessible, assume unchanged
	Laughing Dove (*Streptopelia senegalensis*)			Confirmed 2012	Confirmed HS 2019	
	Laughing Kookaburra (*Dacelo novaeguineae*)			Confirmed 2012	Not confirmed, assumed present	
	Rainbow Lorikeet (*Trichoglossus haematodus*)			Confirmed 2012	Confirmed ES, HS and WH 2019	
	Spotted Turtle Dove (*Streptopelia chinensis*)			Confirmed 2012	Confirmed HS 2019	
Invertebrate	European Honey Bee (*Apis mellifera*)	High	No data	>10 hives 2005-2013	Not confirmed (no hives observed), assumed present, bees observed	Reduced
	Cabbage Butterfly (*Pieris rapae*)	Low		Confirmed 2009	Not confirmed, assumed present	1 maintained, 1 change not assessible, assume unchanged
	Portuguese Millipede (*Ommatoiulus moreleti*)			Confirmed 2012	Confirmed ES, HS and WH 2019	

3.6 Diseases, Pathogens and Pests

Phytophthora cinnamomi (Dieback) has been identified within Harry Sandon only by Terratree in 2018 (Figure 20). The other two reserves tested negative and their maps are shown in Appendix 2. North West Reserves contain several species of plants which are susceptible to dieback and is likely to be present in these reserves including *Banksia* spp. *Allocasuarina* spp., *Xanthorrhoea* spp., and *Hibbertia* spp.

The presence of Marri Canker was observed on Marri trees within the Harry Sandon Reserve (Figure 18, Appendix 2). With three trees showing reduced health and a couple of dead trees present in the area. Canker is a fungal disease which cause lesions on stems and can result in plants becoming stunted (City of Melville 2019). Disease and pathogen indices are shown in Table 16.

Figure 18: Canker present on Marri, Harry Sandon Reserve

Scale was also observed predating on a *Kunzea glabrescens*. (Figure 19) within the Harry Sandon Reserve (Appendix 2). Scale are sap sucking insects which can affect plant health and can result in plants becoming more susceptible to other pests and diseases.

Figure 19: Scale present on *Kunzea glabrescens*, Harry Sandon Reserve

Figure 20: Dieback recorded within harry Sandon Reserve (Terratree, 2018)

Table 16: Disease and Pathogen Indices

Impact	Diseases and Pathogens	Extent 2004	Extent 2013	Extent 2019	Threat 2019
Very High Key threatening process under EPBC Act 1999	*Phytophthora cinnamomi* Dieback	No data	Unknown	Present extent unknown	Not contained
Medium Native species capable of moderate modification of structure and composition of flora by killing multiple species	*Armillaria luteobubalina* Honey Fungus			Not found	Change not assessible
Low Affects Marri trees and can stunt their growth and cause decreased vigour	*Quambalaria coyrecup* Marri Canker			Present	Not contained

3.7 Stormwater

Stormwater is not directed into the North West Reserves although a drain outlet was observed within Harry Sandon Reserve (Appendix 2).

3.8 Reticulation

No reticulation is present within the North West Reserves bushland areas.

3.9 Acid Sulfate Soils

Acid sulphate soils are naturally occurring 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 North West Reserves Harry Sandon and the Ern Stapleton (north east corner) are classified as Moderate to High Risk of acid sulphate soils occurring within 3 m of natural soil occurrence (DWER 2020a). No risk has been assigned to Wal Hughes Reserve. Acid sulfate soils indices are shown in Table 17.

Table 17: Acid Sulfate Soils Indices

Impact	Potential Initiation of ASS reactions	Occurrence 1996-2004	Occurrence 2005-2013	Occurrence 2014-2019	Threats 2014-2019
Very High An occurrence of could result in the reserve being listed as a contaminated site under the Contaminated Sites Act 2003	Excavations below the minimum level of the watertable	No data	0	0	2 Prevented assumed unchanged
	Groundwater extraction resulting in lowering of minimum level watertable		0	0	

3.10 Climate Change

Climate change within the south-west of Western Australia is expected to cause more frequent and intense weather events, decreasing rainfall, rising sea levels, and increasing temperatures. These changes are likely to increase the potential for erosion during storm events and associated strong

winds and increased water stress on plants due to rising temperatures and decreasing rainfall. Water stress has the potential to lead to changes in vegetation types and complexes which has the potential to affect the fauna that these vegetation associations support. There is also a potential for an increase in the stress on groundwater dependant species due to the changing climate. City of Melville has undertaken a risk assessment to establish climate change risks within the Melville area which was used to develop a Climate Change Adaptation Plan.

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 (2019).

4.1.1 Key Performance Indicators (KPIs)

Leading indicators and trends in threats indicate (for the life of a reserve management plan) (Table 19):

- 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.

Infrastructure found on site was consistent with what was recorded for the previous management plan (Table 18), with the exception of an additional bin recorded at Wal Hughes off the western track entrance of Layola Way and at Ern Stapleton off Daniel Street near the playground. Two bench seats within Wal Hughes have been removed with the vegetation area allowed to regenerate.

Table 18: Infrastructure extent and numbers

Infrastructure	ES	WH	HS	Total
Playground	1		1	2
Formal Tracks	205 m	115 m	975 m	1,295 m
Seats	1	2 (removed)	4	5
Tables			1	1
Bins	1 (additional)	1 (additional)	2	4
Signs	3	3	5	11
Fences	0 m	325 m	1,015 m	1,340 m
Bird boxes	0	2	5	7
Bat boxes	0	0	5	5

4.1.2 Leading Indicators

Leading indicators are associated with changes in the density/ abundance/ extent/ occurrences of threats. The levels of acceptable changes are determined in the framework established in the NAAMP as summarized in Table 19 and applied in Tables 20 and 21.

Table 19: 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

Objective	Leading Indicator	Applicable When
		▪ 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 20: Objectives for Weed species in the North West 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 ▪ Common Lantana	0%	Not present on site
Eliminate	**Very High**	▪ Soldiers (*Lachenalia reflexa*) ▪ Bridal Creeper ▪ *Schinus terebinthifolia*	7-30% <5% 0%	Recorded at 3 grid points ES, 5 in WH and 4 in HS 1 plant recorded in WH and 3 in HS Not recorded in North West Reserves
	High	▪ Annual Clumping Grasses ▪ Trees and Shrubs ▪ Perennial Running Grasses ▪ Clumping Geophytes	>50% <5% <5% >50%	Widespread at all 3 reserves 9 trees/shrubs at HS, 7 at WH and 7 at ES 2 species at HS >50% for HS and ES, 13% for WH
Contain	**Very High**	▪ Perennial Veldt Grass	>50%	Widespread for all 3 reserves, difficult to eliminate in short term and widespread in reserves
Manage	**Medium**	All other perennial weeds	<5->50%	Majority localised in all 3 reserves, except Geraldton Carnation Weed >50% in Ern Stapleton
	Low	All other annual weeds	<5->50%	Majority localised in all 3 reserves, except Whiteflower Fumitory >50% in WH

Table 21: Objectives for all other threats in the North West 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
		Feral Animals (bees)	Absent – remove beehives within 10 working days of observation
		Feral Animals (rabbits)	Absent – implement control 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
Contain	**Very High**	Feral Animals (cats)	Present – implement controls within 10 working days of observation in accordance with the City's guidelines

Objective	Impact	Threat	Comments
		Habitat loss	Limit fragmentation of bushland within the reserves by not installing additional pathways. Revegetation of areas with >25% weed cover or bare ground can increase native cover and enhance habitat.
	High	Fire (repeat)	DFES confirmed two incidences of small scrub/grass fires at Ern Stapleton occurring on 3 and 5 June 2019). Evidence of the fires was found on site visit during this survey event. Limit fires burning in the same location within the bushland in consultation with the Department Fire and Emergency Services
	Medium	Physical disturbance	Present – hole dug in ES. Limit public access into bushland through the use of soft barricades such as planting as and brush mattressing in open areas
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 and Canker)	Present and therefore cannot be prevented. Cannot be eliminated and very difficult to contain, as boundary of Dieback unknown. Monitoring can occur to with dieback testing undertaken to determine the extent of Dieback within the reserves. Management can occur through the application of Phosphite and maintaining thick tree canopy and leaf litter to reduce soil temperatures. Replacement of susceptible species with resistant ones during revegetation, if planting success of the susceptible species is unsuccessful. There are no current management for Canker it just needs to be monitored and revegetation of Marris undertaken if trees senesce.
	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.

Objective	Impact	Threat	Comments
		Human impact	Monitor for and manage any dumped garden waste or cubby construction to protect native flora on site.

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 22 and applied to the North West reserves in Table 23 for species and 24 for other site assets.

Table 22: 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) ▪ 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 23: Goals for species

Goal	Priority	Asset	No. of Reserves	Comments
Enhance	**High**	Conospermum triplinervium	1	Plant number have increase from 1 to 8 plants since 2013, further monitoring and revegetation of this species is recommended where they currently exist at HS. This is to maintain a viable self-sustainable population, with all previously planted tubestock matured and producing seed.

Goal	Priority	Asset	No. of Reserves	Comments
		Nuytsia floribunda	0	This species was not recorded during the 2019 monitoring with only 1 individual previously recorded in 2013 and is considered currently extinct for the reserves and will need to be replaced via direct seeding or revegetation using tubestock. As this species is semi-parasitic it will require a host species such as *Acacia pulchella* or *Conostylis* species which are found in all three Reserves.
Maintain Species	**High**	Loxocarya cinerea	2	Maintain the population through maintenance of habitat and weed control, as this species cannot be grown from seed.
		Isolepis marginata	1	Maintain the population through maintenance of habitat and weed control.
		Drosera stolonifera	1	Maintain the population through maintenance of habitat and weed control. Sourcing tubestock would be difficult as most nurseries don't grow it.
		Caesia micrantha	2	Maintain the population through maintenance of habitat and weed control.
		Billardiera fraseri	2	Maintain the population through maintenance of habitat and weed control.
		Babingtonia camphorosmae	2	Maintain the population through maintenance of habitat and weed control. This population in HS is self-sustaining and currently does not require revegetation of this species, revegetation using this species in Wal Hughes is recommended
	Very High	Lerista lineata	1	Maintain the population in ES through maintenance of habitat and reduction of disturbances such as fire, excavation and trampling of vegetation. Revegetation of low shrub cover in open areas and retention of leaf litter will protect this species. Retention of leaf litter can be done in a mosaic pattern across the reserve to reduce fire fuel load.
Monitor	**Low**	Eucalyptus rudis	1	This species is groundwater dependent and may give an early indication if groundwater levels are too low in the area, if signs of decline of this species is observed then investigations into groundwater levels may need to be undertaken.
		Kunzea glabrescens	1	This species is groundwater dependent and may give an early indication if groundwater levels are too low in the area, if signs of decline of this species is observed then investigations into groundwater levels may need to be undertaken.

Goal	Priority	Asset	No. of Reserves	Comments
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.
		Calyptorhynchus banksii naso	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.
		Merops ornatus	0	Confirm is this migratory species is still utilising the NW reserves for nesting, it is likely they are due to them being recorded in nearby reserves on the Swan River within Melville. This species prefers open areas of sand or lawn to build their nesting burrows.
	Low	Bats	1	Confirm species of bats present at HS

Table 24: Goals for Sites

Goal	Priority	Asset	Comments
Enhance	**Very High**	Marri Jarrah Banksia Woodland (TEC)	Enhance the vegetation condition to Excellent through revegetation of understorey species and replacement of dead Banksias which do not appear to be recruiting well naturally, to enable this reserve to meet the patch size and condition required by this TEC to be protected under the EPBC Act 1999 (Cwlth), which is a minimum of 0.5 ha in Excellent condition. Due to constant trampling by local community, weed presence and repeat fires this area may need to be fenced to achieve an excellent vegetation condition.
	Medium	Proposed revegetation sites	Revegetate areas proposed in Table 5 and Figures 9 and 10, in accordance with the standard of rehabilitation in the NAAMP. As the Reserves consist of the TEC Banksia Woodlands of the Swan Coastal Plain, both HS and WH qualify for the patch size and condition to be federally protected, as ES is smaller than 1 ha it would need to be enhanced to excellent condition before it qualified for referral under the EPBC Act 1999.
Maintain	**High**	Ecological Communities: Marri Jarrah Banksia Woodland Eucalyptus rudis Woodland Marri Woodland	Ecological communities are to be maintained through weed control and revegetation, as well as management of threats within the reserves. Particularly the Marri Jarrah Banksia Woodland As this vegetation type is a TEC. The area of Eucalyptus rudis Woodland has a high weed cover that will need to be controlled prior to revegetation of this area.

		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.
	Medium	Community interest site and amenities (Playgrounds, formal tracks, fencing, bins, bird boxes and 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. Two bird boxes with holes in them require repair at Wal Hughes.
	Low	Reference sites- 2019 fauna trap locations	
Monitor	**Low**	All assets	Monitoring of all assets should occur in accordance with the City's policies and guidelines outline in the NAAMP.

5.0 Weed Maps

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


Legend
Sydney Golden Wattle
Kurrajong <5%
Olive <5%
Cotton Palm <5%
Yucca sp.<5%
Site Boundary
Woody Weeds
North West Reserves - Harry Sandon and Wal Hughes
Client :City of Melville
Date: 09/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94
0
100
200 m
N

Woody Weeds
NW Reserves - Ern Stapleton

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

0 20 40 m

N

Lachenalia reflexa distribution
North West Reserves - Wal Hughes and Harry Sandon

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

0 50 100 m

N

Lachenalia reflexa distribution
North West Reserves - Ern Stapleton

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

0 25 50 m

N

Geophyte distribution
North West Reserves - Ern Stapleton

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

Geophyte distribution
North West Reserves - Wal Hughes and Harry Sandon

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

0 50 100 m

N

Annual clumping grass - distribution
North West Reserves - Ern Stapleton

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

0 25 50 m

N

Annual clumping grass - distribution
North West Reserves - Wal Hughes and Harry Sandon

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

0 50 100 m

N

Perennial clumping grass - distribution
North West Reserves - Ern Stapleton

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

Perennial clumping grass - distribution
North West Reserves - Wal Hughes and Harry Sandon

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

0 50 100 m

N

Perennial running grass - distribution
North West Reserves - Harry Sandon

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

0 25 50 m

N

6.0 References

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Appendix 1 – Fauna Trap Locations

Fauna Trap Locations
North West Reserves - Wal Hughes

Client: City of Melville
Date: 23/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94

0 50 100 m

Fauna Trap Locations
North West Reserves - Ern Stapleton

Client: City of Melville
Date: 24/03/2020
Created by: K. Sadgrove
Image Source: Nearmap, 2020
Datum: GDA 94

0 25 50 m

N

Reference Site: Fauna trap locations

North West Reserves	Trap Locations				
	Trail Camera	**Cage**	**Elliot**	**Funnel**	**Trap Line**
Ern Stapleton (1)	-32.0221036 115.8001048	-	-32.0221665 115.8004488	-	-32.0221235 115.8004565
(2)	-	-	-32.0221693 115.8004579	-	-
Wal Hughes (1)	-32.0281349 115.8025376	-32.0281190 115.8020943	-32.0282711 115.8035803	-32.0282685 115.8035528	-32.0281275 115.8021135
(2)	-	-	-32.0281719 115.8020618	-32.0283191 115.8034234	-
Harry Sandon (1)	-32.0259164 115.8084458	-32.0261955 115.8082383	-32.0262307 115.8082517	-	-32.0261955 115.8082383
(2)	-32.0271671 115.8073961	-32.0268282 115.8074443	-32.0268470 115.8074386	-	-32.0268589 115.8074440

Appendix 2 – Disturbance and Dieback

Disturbance
North West Reserves - Wal Hughes and Harry Sandon

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

0 25 50 m

N


386800
386900
387000
6455800
Legend
Sample Locations
Negative
P. cinnamomi
Phytophthora sp.
Dieback Occurrence
Uninfested
Uninterpretable
Excluded
Infested
Google Satellite
Project Location
Wal Hughes Reserve (West)
City of Melville Dieback Assessment
N
Datum: GDA 1994
Projection: MGA Zone 50
Scale: 1: 1,100
Date: 31/03/2018
Prepared: K. Jennings
Project #: T18001
Expiry: 23/02/2018
Checked: J. Grehan
Figure 4
Review:
Revision: Rev A
Terratree

Legend

Sample Locations
- Negative
- P. cinnamomi
- Phytophthora sp.

Dieback Occurrence
- Uninfested
- Uninterpretable
- Excluded
- Infested

Google Satellite

Project Location

Ern Stapleton Reserve (West)

City of Melville Dieback Assessment

N

Datum: GDA 1994
Projection: MGA Zone 50

Scale: 1: 750

Date: 31/03/2018	Prepared: K. Jennings	Project #: T18001
Expiry: 23/02/2018	Checked: J. Grehan	
Figure 2	Review:	Terratree
	Revision: Rev A	

Appendix 3 – Flora Species Lists

Native Flora Marri Jarrah Banksia Woodland				
Species Name	**Ern Stapleton Reserve**	**Harry Sandon Reserve**	**Wal Hughes Reserve**	**At-risk**
Acacia cyclops	x			
Acacia huegelii		#	x	
Acacia pulchella	x	x	x	
Acacia saligna	x	x	x	
Acacia stenoptera		x	x	
Adenanthos cygnorum		x		
Agonis flexuosa	x	x		
Allocasuarina fraseriana	x	x	x	
Amphipogon turbinatus		x		
Amyema miquelii		x		
Anigozanthos humilis		x		
Anigozanthos manglesii		#		
Astroloma small		x		
Austrostipa flavescens		#		
Babingtonia camphorosmae		x	x	x
Banksia attenuata	x	x	x	
Banksia dallanneyi			x	
Banksia grandis		x	x	
Banksia ilicifolia		x		
Banksia menziesii	x	x	x	
Banksia nivea		x		
Baumea juncea		x		
Billardiera fraseri	x		x	x
Bossiaea eriocarpa		x	x	
Burchardia congesta	x	x	x	
Caesia micrantha	x	x	x	x
Caladenia flava		x	x	
Caladenia latifolia			x	
Callitris preissii			x	
Calothamnus rupestris			#	
Calytrix flavescens		x	x	
Chamaescilla corymbosa	x	x		
Conospermum triplinervium		x		x
Conostephium pendulum	x		x	
Conostylis aculeata		x		
Conostylis candicans	x		x	
Conostylis juncea		x		

Species Name	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve	At-risk
Corymbia calophylla	x	x	x	
Corynotheca micrantha	x	x	x	
Dampiera linearis		x		
Darwinia sp.	#			
Dasypogon bromeliifolius		x	x	
Daviesia divaricata			x	
Daviesia nudiflora		x	x	
Daviesia physodes		x		
Desmocladus fasciculatus		x	x	
Desmocladus flexuosa	x	x	x	
Dianella revoluta	x	x	x	
Diuris sp.		x	x	
Drosera erythrorhiza		x		
Drosera stolonifera		x		
Enchylaena tomentosum	#	x		
Eremaea pauciflora	#			
Eremaea purpurea	#			
Eryngium pinnatifidum		x	x	
Eucalyptus marginata			x	
Gastrolobium capitatum	x	x		
Gompholobium tomentosum	x	x	x	
Guichenotia ledifolia			#	
Hakea prostrata		x		
Hardenbergia comptoniana	x	x	x	
Hemiandra pungens		x		
Hibbertia cuneiformis		x		
Hibbertia huegelii		x		
Hibbertia hypericoides	x	x	x	
Hovea trisperma	x	x	x	
Hybanthus calycinus	x	x	x	
Hypocalymma robustum	x	x	x	
Hypolaena exsulca		x		
Isolepis marginata	x			x
Jacksonia furcellata	x	x	x	
Jacksonia sternbergiana	x	x	x	
Kennedia prostrata		x		
Kunzea baxterii	#			
Kunzea glabrescens		#		
Laxmannia squarrosa		x		
Lechenaultia floribunda	x			
Lechenaultia linarioides		x		

Species Name	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve	At-risk
Lepidosperma (round stem smooth)		x		
Lepidosperma squamatum	x	x	x	
Leucopogon propinquus	x	x		
Lomandra caespitosa		x	x	
Lomandra hermaphrodita	x	x	x	
Lomandra micrantha	x		x	
Lomandra preissii		x		
Lomandra suaveolens	x	x	x	
Loxocarya cinerea	x	x		x
Luzula meridionalis		x		
Lyginia imberbis	x			
Macrozamia riedlei	x	x	x	
Melaleuca huegelii			#	
Melaleuca systena		#		
Mesomelaena pseudostygia	x	x	x	
Microtis media	x	x	x	
Monotaxis sp.		x		
Native grass species		x		
Neurachne alopecuroidea		x		
Opercularia vaginata		x		
Orthrosanthus laxus			x	
Patersonia occidentalis		x		
Persoonia saccata			x	
Petrophile axillaris			#	
Petrophile linearis	x	x		
Petrophile macrostachya			x	
Philotheca spicata		x	x	
Phyllanthus calycinus		x		
Pimelea rosea	x	x		
Poranthera microphylla	x	x		
Pterostylis vittata		x		
Ptilotus polystachyus		x	x	
Pyrorchis nigricans		x		
Rhagodia baccata	x			
Scaevola canescens	x	x	x	
Scaevola repens		x		
Schoenus clandestinus		x		
Sowerbaea laxiflora		x	x	
Spyridium globulosum		x		
Stirlingia latifolia	x	x	x	
Stylidium brunonianum		x		

Species Name	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve	At-risk
Synaphea spinulosa		x	x	
Tetraria octandra	x	x	x	
Thysanotus manglesianus	x	x	x	
Thysanotus sparteus	x	x	x	
Trachymene pilosa		x	x	
Tricoryne elatior			x	
Verticordia sp.	#			
Brachyscome iberidifolia		x		
Xanthorrhoea brunonis	x	x	x	
Xanthorrhoea preissii	x	x	x	
Xanthosia huegelii	x	x		

Marri Woodland

Species Name	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve	At-risk
Acacia pulchella		x		
Acacia saligna		x		
Allocasuarina fraseriana		x		
Amyema miquelii		x		
Anigozanthos manglesii		#		
Austrostipa flavescens		#		
Banksia attenuata		x		
Banksia menziesii		x		
Billardiera fraseri		x		x
Bossiaea eriocarpa		x		
Brachyscome iberidifolia		x		
Burchardia congesta		x		
Caesia micrantha		x		
Caladenia flava		x		
Chamaescilla corymbosa		x		
Conostylis aculeata		x		
Conostylis juncea		x		
Conostylis setigera		x		
Corymbia calophylla		x		
Dampiera linearis		x		
Dasypogon bromeliifolius		x		
Desmocladus flexuosa		x		
Dianella revoluta		x		
Diuris sp.		x		
Drosera stolonifera		x		x
Enchylaena tomentosum		x		

Species Name	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve	At-risk
Eryngium pinnatifidum		x		
Gastrolobium capitatum		x		
Gompholobium tomentosum		x		
Hakea prostrata		x		
Hardenbergia comptoniana		x		
Hemiandra pungens		x		
Hibbertia cuneiformis		x		
Hibbertia huegelii		x		
Hibbertia hypericoides		x		
Hovea trisperma		x		
Hypocalymma robustum		x		
Jacksonia furcellata		x		
Jacksonia sternbergiana		x		
Kennedia prostrata		x		
Kunzea glabrescens		x		
Laxmannia squarrosa		x		
Lepidosperma round stem smooth		x		
Lomandra caespitosa		x		
Lomandra hermaphrodita		x		
Loxocarya cinerea		x		x
Macrozamia riedlei		x		
Mesomelaena pseudostygia		x		
Microtis media		x		
Neurachne alopecuroidea		x		
Opercularia vaginata		x		
Patersonia occidentalis		x		
Philotheca spicata		x		
Phyllanthus calycinus		x		
Pimelea rosea		x		
Poranthera microphylla		x		
Pterostylis vittata		x		
Scaevola canescens		x		
Sowerbaea laxiflora		x		
Spyridium globulosum		x		
Stirlingia latifolia		x		
Stylidium brunonianum		x		
Synaphea spinulosa		x		
Tetraria octandra		x		
Thysanotus manglesianus		x		
Thysanotus sparteus		x		
Trachymene pilosa		x		

Species Name	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve	At-risk
Xanthorrhoea preissii		x		
Xanthosia huegelii		x		
Flooded Gum Woodland				
Acacia saligna			x	
Banksia menziesii (planted)			x	
Caladenia latifolia			x	
Eucalyptus rudis			x	
Jacksonia furcellata			x	

Planted/Dubious Origin
X Present

Weed Species **Marri Jarrah Banksia Woodland**			
Species Name	**Ern Stapleton Reserve**	**Harry Sandon Reserve**	**Wal Hughes Reserve**
*Acacia iteaphylla**		x	
*Acacia longifolia**		x	
*Asparagus asparagoides**		x	X
*Avena fatua**		x	
*Briza maxima**		x	x
*Bromus diandrus**		x	
*Conyza sumatrensis**	x		
Cyperus sp.*	x		
*Disa bracteata**		x	x
*Ehrharta calycina**	x	x	x
*Ehrharta longiflora**	x	x	x
*Ferraria crispa**	x	x	
*Freesia alba x leichtlinii**		x	x
*Fumaria capreolata **	x		x
*Galium murale**	x		
*Gladiolus caryophyllaceus**		x	x
*Gladiolus undulatus**	x	x	x
*Heliophila pusilla**		x	
*Jacaranda mimosifolia**	x		
*Lachenalia reflexa**	x	x	x
*Lolium rigidum**	x		
*Lysimachia arvensis**		x	
*Monoculus monstrosus**	x		
*Olea europaea**	x	x	x
*Oxalis purpurea**	x		

Species Name	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve
*Romulea rosea**			x
*Solanum nigrum**	x		
*Stellaria media**	x		
*Stenotaphrum secundatum**		x	x
*Washingtonia filifera**	x	x	x
Marri woodland			
*Acacia longifolia**		x	
*Asparagus asparagoides**		x	
*Avena barbata**		x	
*Cynodon dactylon**		x	
*Disa bracteata**		x	
*Ehrharta calycina**		x	
*Ehrharta longiflora**		x	
*Ferraria crispa**		x	
*Fumaria capreolata**		x	
*Gladiolus caryophyllaceus**		x	
*Gladiolus undulatus**		x	
*Heliophila pusilla**		X	
Lachenalia reflexa		x	
*Lysimachia arvensis**		x	
*Olea europaea**		x	
*Schinus terebinthifolius**		x	
*Washingtonia filifera**		x	
*Yucca sp.**		x	
Flooded Gum Woodland			
*Ehrharta longiflora**			x
*Eucalypt sp.** (foreign)			x
*Fumaria capreolata**			x

Appendix 4 – Fauna Species List

Family	Species Name	Common Name	At-risk	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve
Invertebrates						
Acrididae	*Goniaea* sp.	Gumleaf Grasshopper Nymph				X
Armadillidiidae	*Armadillidium vulgare*	Rolling slater			X	X
Blattidae	*Periplaneta americana*	American Cockroach				X
Blattidae	*Drymaplaneta shelfordi*	Cockroach			X	
Blattidae		Cockroach			X	
Chrysomelidae		Leaf Beetle				X
Formicidae		Ant		X		
Gnaphosidae	*Scotophaeus* sp.	Spider		X		
Julidae	**Ommatoiulus moreletii*	Portuguese Millipede		X	X	X
Philosciidae		Forktail Slater			X	
Pisauridae		Nursery Web Spider			X	X
Sparassidae	*Delena cancerides*	Huntsman Spider			X	
Tenebrionidae	*Ecnolagria aeneoviolacea*	Metallic Tene Beetle			X	
Tettigoniidae		Bush Cricket		X		
Reptiles						
Pygopodidae	*Lialis burtonis*	Burton's Legless Lizard			X	
Scincidae	*Ctenotus fallens*	West-coast Laterite Ctenotus			X	
Scincidae	*Cryptoblepharus buchananii*	Snake-eyed Skink		X		
Scincidae	*Hemiergis quadrilineata*	Two-toed earless skink			X	
Scincidae	*Lerista elegans*	Elegant Slider				X
Scincidae	*Lerista lineata*	Perth Slider	VH	X		
Scincidae	*Menetia greyii*	Common Dwarf Skink		X		
Scincidae	*Morethia obscura*	Shrubland Morethia Skink	L	X	X	X
Scincidae	*Tiliqua rugosa*	Bobtail Lizard			X	X

Family	Species Name	Common Name	At-risk	Ern Stapleton Reserve	Harry Sandon Reserve	Wal Hughes Reserve
Birds						
Anthochaera	*Anthochaera carunculata*	Red Wattlebird		X	X	X
Artamidae	*Cracticus tibicen*	Australian Magpie		X	X	X
Artamidae	*Cracticus torquatus*	Grey Butcherbird		X		X
Cacatuidae	*Cacatua roseicapilla*	Galah		X	X	X
Cacatuidae	**Cacatua tenuirostris*	Eastern Long Billed Corella				
Campephagidae	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike			X	
Columbidae	**Columba livia*	Feral Rock Pigeon			X	
Columbidae	**Streptopelia chinensis*	Spotted Turtle-Dove			X	
Columbidae	**Streptopelia senegalensis*	Laughing Turtle-Dove			X	
Corvidae	*Corvus coronoides*	Australia Raven			X	X
Meliphagidae	*Lichmera indistincta*	Brown Honeyeater			X	
Meropidae	*Merops ornatus*	Rainbow Bee-Eater	VH		X	
Pachycephalidae	*Pachycephala rufiventris*	Rufous Whistler			X	
Psittacidae	*Platycercus zonarius*	Australian Ringneck	L		X	
Psittacidae	**Trichoglossus haematodus*	Rainbow Lorikeet		X	X	X
Rhipiduridae	*Rhipidura leucophrys*	Willie Wagtail			X	
Rhipiduridae	*Rhipidura albiscapa*	Grey Fantail			X	
Mammals						
Felidae	**Felis catus*	Domestic Cat		X	X	

*Introduced species (highlighted red)
Risk: VH – Very High, L - Low