



LOCAL BIODIVERSITY PLAN

2018/19 - 2023/24

Foreword

The City of Wanneroo contains a rich combination of natural assets throughout a diverse landscape of bushland, wetland and coastal areas. These contrasting aspects of our landscape are what make our City a unique and beautiful place to live. With the implementation of new biodiversity conservation strategies, outlined in the Local Biodiversity Plan, the City will continue to ensure protection and conservation of our precious biodiversity and secure a sustainable future.

Biodiversity is the variety of life on Earth. It includes all plants, animals and micro-organisms, the genes they contain as well as the ecosystems and natural process they are part of.

Biodiversity is one of our most precious natural assets. Every aspect of human life is sustained by the Earth's biodiversity, which means our natural resources must be conserved if they are to continue to support life on Earth. The City of Wanneroo is strongly committed to continuously improving the conservation of our local biodiversity through proactive and innovative approaches to environmental planning and sustainable land management. Located within the Southwest Australian Ecoregion, we are situated in one of the world's top 34 biodiversity hotspots and our natural environment comprises bushland, wetlands and coastal reserves of high biodiversity value.

This Local Biodiversity Plan is the result of collaborative and forward thinking to the overall protection, retention and management of our local biodiversity values. It outlines the direction we wish to take in conserving our local natural areas for future generations and for the sustainability and liveability of our community.

I wish to acknowledge the valued contributions to the development of this Local Biodiversity Plan.

Tracey Roberts
MAYOR

Table of Contents

1	Introduction.....	1
1.1	About this Document.....	1
1.2	Context.....	2
2	Biodiversity in the City of Wanneroo	5
2.1	Biodiversity Values	5
2.2	Threats to Biodiversity	14
2.3	Key Achievements in Biodiversity Protection	16
3	Biodiversity Protection and Retention	18
3.1	Natural Areas.....	18
3.2	Priority Local Natural Areas	19
3.3	Draft Green Growth Plan – Broad and Specific Commitments	19
4.4	Goals.....	23
4	Biodiversity Planning Precincts.....	27
4.1	Yanchep Two Rocks	27
4.2	Alkimos Eglinton.....	29
4.3	State Forest / Regional and National Parks	31
4.4	North East Wanneroo.....	33
4.5	South East Wanneroo.....	35
4.6	South West Wanneroo.....	38
5	Strategies for Biodiversity Protection	40
5.1	Planning	40
5.2	Local Government Process	40
5.3	Policy.....	41
5.4	Natural Resource Management.....	42
5.5	Partnerships.....	42
5.6	Community Engagement and Education	43
6	Implementation Plan	44
7	Continuous Improvement and Review	47
8	References.....	48
9	Glossary and Acronyms.....	50

10 Appendices 52

List of Tables

Table 1 – Vegetation Complexes within the City of Wanneroo 6

Table 2 – Summary of Vegetation Complexes and Protection within the City of Wanneroo..... 24

Table 3 – Priority of Vegetation Complexes for Protection and Retention within the City of Wanneroo 25

Table 4 – Remaining Vegetation within the Yanchep Two Rocks Biodiversity Planning Precinct..... 27

Table 5 – Remaining Vegetation within the Yanchep Two Rocks Biodiversity Planning Precinct..... 29

Table 6 – Remaining Vegetation within the State Forest / Regional and National Parks Biodiversity Planning Precinct 31

Table 7 – Remaining Vegetation within the Northeast Wanneroo Biodiversity Planning Precinct..... 33

Table 8 – Remaining Vegetation within the Southeast Wanneroo Biodiversity Planning Precinct 35

Table 9 – Remaining Vegetation within the Southwest Wanneroo Biodiversity Planning Precinct 38

Table 10 –Actions for the Local Biodiversity Plan 45

Table 12 – Significant Flora Species in the City of Wanneroo 53

Table 13 – Significant Fauna Species in the City of Wanneroo 54

Table 14 – Significant Ecological Communities in the City of Wanneroo 55

Table 15 – Geomorphic Wetlands within the City of Wanneroo..... 57

Table 16 – Wetland Management Categories 58

Table 17 – Ecological Criteria, Weightings and Datasets used in the Development of this Plan 59

Table 18 – Description of Vegetation Complexes within the City of Wanneroo 61

List of Figures

Figure 1 – Integrated Planning and Reporting Framework..... 2

Figure 2 – Vegetation Complexes in the City of Wanneroo..... 7

Figure 3 – Vegetation Density (indicative) across the City of Wanneroo.....	8
Figure 4 – Geomorphic Wetlands in the City of Wanneroo	11
Figure 5 – Karstic Features in the City of Wanneroo	12
Figure 6 – Local and Regional Ecological Linkages in the City of Wanneroo.....	13
Figure 7 – Vegetation Extent in the City of Wanneroo (including approved Local Structure Plan areas)	20
Figure 8 – Vegetation Extent in the City of Wanneroo (excluding approved Local Structure Plan areas)	21
Figure 9 – Priority Local Natural Areas in the City of Wanneroo.....	22
Figure 10 – Priority Local Natural Areas within the Yanchep-Two Rocks Biodiversity Planning Precinct.....	28
Figure 11 – Priority Local Natural Areas within the Alkimos Eglinton Biodiversity Planning Precinct.....	30
Figure 12 – Priority Local Natural Areas within the State Forest Regional and National Park Biodiversity Planning Precinct.....	32
Figure 13 – Priority Local Natural Areas within the Northeast Wanneroo Biodiversity Planning Precinct.....	34
Figure 14 – Priority Local Natural Areas within the Southeast Wanneroo Biodiversity Planning Precinct.....	37
Figure 15 – Priority Local Natural Areas within the Southwest Wanneroo Biodiversity Planning Precinct	39

List of Appendices

Appendix A – Significant Biodiversity Features within the City of Wanneroo

Appendix B – Geomorphic Wetlands within the City of Wanneroo

Appendix C – Ecological Criteria

Appendix D – Vegetation Communities within the City of Wanneroo

Appendix E – Biodiversity Planning Precincts Appendix F – East Wanneroo Broad and Specific Commitments

Appendix F – City of Wanneroo Broad and Specific Commitments

Appendix G – East Wanneroo Broad and Specific Commitments

1 Introduction

The City of Wanneroo is an expanding and thriving local government area on the northern fringe of the Perth metropolitan area. It covers an area of 683 square kilometres including 32 km of coastline and 36 suburbs, and is home to over 210,000 people. The population within the City of Wanneroo is expected to grow to over 350,000 people by 2036 and it is envisaged that it will become the most populated local government in Western Australia¹ within the next ten years.

The City of Wanneroo has long recognised its rich combination of diverse natural assets; from bushland to wetlands and unique coastal areas. Located on the Swan Coastal Plain of the Southwest Bioregion of Western Australia, the City of Wanneroo is located in a region that is globally recognised as one of the planet's major biodiversity hotspots². The biodiversity hotspot is known to support significant numbers of threatened flora and fauna, ecosystems and important wetlands, which, together with their unique biodiversity values, are a key component of our regions' culture, lifestyle and identity. Protecting the environment and these significant biodiversity values is one of the most challenging yet critical aspects of planning now and into the future, particularly in an area of facing rapid development and urban sprawl. Adequate protection is needed at a local and state level to protect, retain and manage the natural environment, and incorporate nature into the built environment for a more sustainable, liveable future.

Local government authorities play an important role in the protection and conservation of biodiversity. As land managers, land use planners, decision making authorities and developers, the City of Wanneroo plays an increasingly influential role in not only protecting biodiversity, but in engaging and educating the community in the value of biodiversity. The City of Wanneroo is strongly committed to maintaining and improving the conservation of our local biodiversity and with such rapid growth now and into the future, it is vital that we continue to plan and manage in a sustainable manner to protect our precious natural assets.

This *Local Biodiversity Plan 2018/19 – 2023/24* is a revision of the City's first Local Biodiversity Strategy adopted in 2011. This revision sets out a refined approach to the protection, retention and management of our natural assets to enable protection of the natural environment, conservation of local biodiversity, and engagement with the local community in the importance of biodiversity. The adoption of this plan represents the City's commitment to meet the community's expectations in protecting the environment for the benefit of future generations.

1.1 About this Document

In May 2011, the City of Wanneroo adopted the *Local Biodiversity Strategy 2011 – 2016*. The defining feature of the strategy was the identification of six biodiversity planning precincts covering the whole of the local government area, which provide a spatial guide for achieving the City's targets for the retention, protection and management of local natural areas. Proposed targets for protection of vegetation complexes within each biodiversity planning precinct were based on land zoning. Key actions for biodiversity planning included an amendment to the District Planning Scheme No. 2 to include a new local reserve classification, and the review and update of local planning policies relevant to biodiversity conservation.

This document, the *Local Biodiversity Plan 2018/19 – 2023/24* has been prepared following a revision of the targets, strategies and actions set out in the *Local Biodiversity Strategy 2011 – 2016*. It incorporates a revision to the extent of vegetation in the City of Wanneroo based on updated aerial imagery, outlines the City's achievements in biodiversity protection and conservation since the adoption of the *Local Biodiversity Strategy 2011 – 2016* and sets out a new direction for biodiversity protection based on prioritised local natural areas.

¹ City of Wanneroo 2013

² Southwest Australia Ecoregion Initiative 2006

This Local Biodiversity Plan was developed by 360 Environmental in consultation with the City of Wanneroo through collaborative working groups involving staff from multiple business units.

1.2 Context

This plan has been developed in accordance with the City of Wanneroo's strategic framework and relevant local, state and federal guidance, policy and legislation.

City of Wanneroo Strategic Direction

The City of Wanneroo operates in accordance with the Integrated Planning and Reporting Framework, which is outlined in **Figure 1**. The *Strategic Community Plan (2017/18 to 2026/27)* for the City of Wanneroo outlines the vision, aspirations and community objectives for the development of the City over the next ten years. Strategies relating to the natural environment and the built environment that are relevant to this Local Biodiversity Plan include:

- 3.1.1 - Minimising impacts of climate change;
- 3.2.1 - Maximising environmental value of beaches, nature reserves and parklands;
- 3.2.2 - Collaborating with relevant State agencies with a focus on the enhancement of the natural environment;
- 3.2.3 - Optimising retention of significant vegetation and habitat; and
- 3.4.4 - Improving local amenity by retaining and complementing natural landscapes within the built environment.

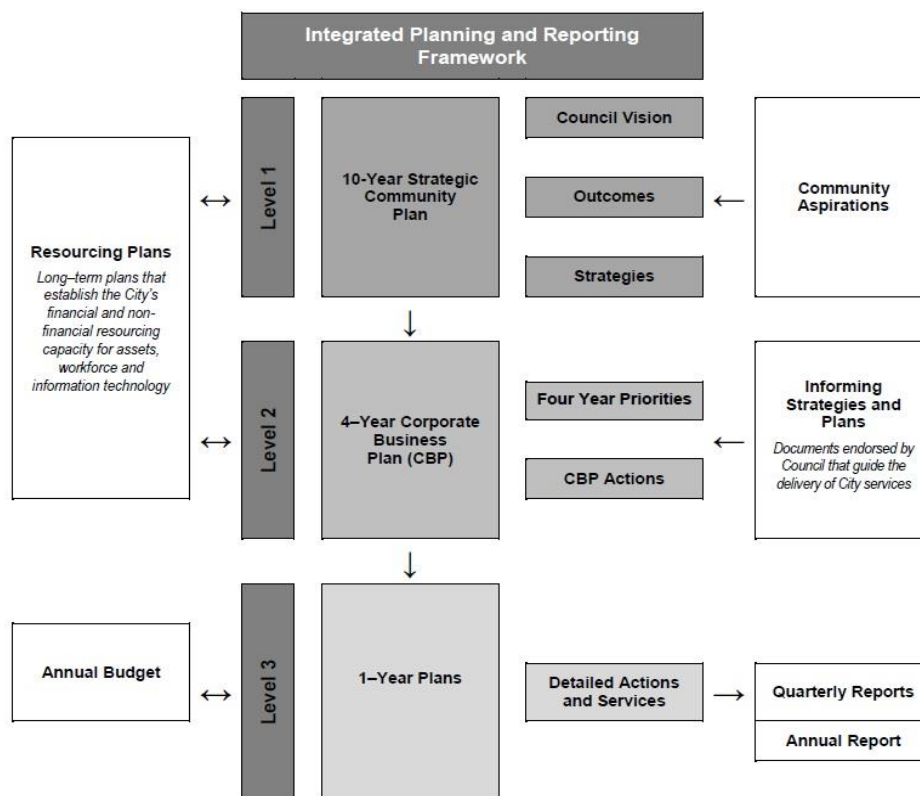


Figure 1 – Integrated Planning and Reporting Framework

The City of Wanneroo's *Corporate Business Plan 2016/17 19/20* sets four-year priorities that address the key objectives in the *Strategic Community Plan*. This Local Biodiversity Plan has been developed to support the City of Wanneroo's *Strategic Community Plan 2017/18 to 2026/27* and the *Corporate Business Plan 2016/17 – 19/20*.

Legislation

Federal Legislation

Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) provides for the assessment of actions which may significantly impact on a matter of national environmental significance. The matters of national environmental significance relevant to biodiversity include wetlands listed as Ramsar wetlands of international importance, nationally threatened flora and fauna species and communities listed under the EPBC Act, and migratory species listed under the EPBC Act. The Department of the Environment and Energy regulates the EPBC Act.

State Legislation

Environmental Protection Act 1986

The *Environmental Protection Act 1986* (EP Act) primarily applies to the protection of biodiversity through the Environmental Impact Assessment process and the refusal or modification of development proposals that are likely to have significant environmental impacts. Clearing of vegetation is also assessed under the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004* (the Clearing Regulations), which are established under the EP Act. Clearing permits are applied for under the Clearing Regulations and assessed by the Department of Water and Environment Regulation (or the Department of Mines and Petroleum for resource-related proposals).

Environmental assessments of scheme amendments (under the regional and local planning schemes) are carried out under Part IV of the EP Act which provides for the opportunity to assess the significant environmental impacts identified on land affected by the scheme amendment and prior to the land being rezoned.

The Environmental Protection Authority administers the EP Act and the Department of Environment Regulation (DER), which is soon to become the Department of Water and Environment Regulation.

Conservation and Land Management Act 1984

The *Conservation and Land Management Act 1984* (the CALM Act) includes provisions for the establishment and management of national parks, nature reserves, conservation parks and marine parks in Western Australia.

Wildlife Conservation Act 1950

The *Wildlife Conservation Act 1950* (the WC Act) is the primary State legislation directly protecting native flora and fauna in Western Australia. It contains general controls for the protection of all native species and is designed to protect rare and threatened flora and fauna species. The State recognises that the WC Act is inadequate and has, as a result of several years of drafting, passed the *Biodiversity Conservation Act 2016* (BC Act) in September 2016. The BC Act will eventually replace the WC Act however is only operative in parts as at December 2016. Biodiversity Conservation Regulations are likely to be in force by the end of 2017 which will include threatened species listings and controls. The WC Act and the BC Act are regulated by the Department of Biodiversity Conservation and Attractions.

Planning and Development Act 2005

The *Planning and Development Act 2005* (the PD Act) is the primary legislation setting out controls for the planning of the Perth metropolitan area and considers biodiversity as a planning consideration. The PD Act is the

head of power for the creation of the Metropolitan Region Scheme (MRS) which covers the entire Perth metropolitan region, and sets aside extensive areas for Regional Parks and Recreation.

Local Planning Scheme

District Planning Scheme No. 2

District Planning Scheme No. 2 (DPS No. 2) zones land within the City of Wanneroo, specifies where particular land uses are permitted and sets standards for development. All local planning schemes, including the City's DPS No. 2 need to be consistent with the MRS. All planning decisions within the City must be made in accordance with the provisions of DPS No. 2. A number of provisions supporting biodiversity conservation are included within DPS No. 2 including reserves, zoning provisions, development requirements, special controls and matters to be included in Structure Plans. Part 2 of DPS No. 2 relates to reserves and details the use and development of local reserves. Local reserves are depicted on the Scheme Map as follows:

- Parks and Recreation;
- Conservation; and
- Public Use.

Policy

State Planning Policies

The PD Act gives effect to State Planning Policies, some of which are relevant to the protection and management of biodiversity in the City of Wanneroo:

- State Planning Policy 2: Environment and Natural Resources Policy
- State Planning Policy 2.2: Gnangara Groundwater Protection
- State Planning Policy 2.4: Basic Raw Materials
- State Planning Policy 2.5: Rural Planning
- State Planning Policy 2.6: State Coastal Planning
- State Planning Policy 2.7: Planning in Bushfire Prone Areas
- State Planning Policy 2.8: Bushland Policy for the Perth Metropolitan Region
- State Planning Policy 2.9: Water Resources
- State Planning Policy 3: Urban Growth and Settlement
- Draft State Planning Policy 7: Design of the Built Environment

Local Planning Policies

Local Planning Policies are developed to provide further guidance as to how the provisions of the DPS No. 2 will be considered. The following Local Planning Policies are relevant to biodiversity conservation and protection for the City of Wanneroo:

- Local Planning Policy 4.1: Wetlands
- Local Planning Policy 4.13: Caves and Karstic Features
- Local Planning Policy 4.21: Coastal Assets
- Local Planning Policy 4.3: Public Open Space
- Local Planning Policy 4.4: Urban Water Management
- Local Planning Policy 4.8: Tree Preservation
- Local Planning Policy 4.9: Subdivision of Rural Zoned Land

2 Biodiversity in the City of Wanneroo

2.1 Biodiversity Values

Biodiversity can be described as the variety of all life forms. It includes organisms that occur on land, in the sea and in fresh water, and includes bacteria, viruses, fungi, plants, and invertebrate and vertebrate animals. Biodiversity encompasses the diversity of interactions different species and the ecosystems they inhabit as well as the diversity of processes that are performed by each species.

Biodiversity is important to humans as it provides four main 'ecosystem services' including:

- Provisioning services – the production of food, fibre and water;
- Regulating services – the control of climate and diseases;
- Supporting services – nutrient cycling and crop pollination; and
- Cultural services – such as spiritual and recreational benefits.

Through the provision of ecosystem services, biodiversity fosters economic development and promotes human wellbeing³. Tourism in Western Australia relies on natural assets and destinations while ecosystem services such as nutrient cycling and crop pollination support sustainable agricultural and business. The natural environment of the City of Wanneroo helps to create our unique sense of place and is intrinsically linked with the cultural values of the Noongar people of the south west region.

Vegetation

Native vegetation incorporates vascular plants and plants without a vascular system including mosses and lichens. Native vegetation, whilst contributing to biodiversity through provision of a significant number of plant species, is also important to biodiversity through the provision of food, shelter and habitat to native fauna and microorganisms.

The City of Wanneroo is located on the Swan Coastal Plain, which comprises fifteen vegetation complexes as mapped by Heddle *et al* in 1980. Of these fifteen vegetation complexes, twelve are mapped within the City of Wanneroo (**Figure 2**). The City of Wanneroo contains the only occurrences of the Pinjar Complex and the Karrakatta Complex – North in the Perth metropolitan region. It also contains a significant portion of the Karrakatta Complex – Central and South, which is in steep decline across the Swan Coastal Plain. A full description of the vegetation communities is provided in **Appendix D**.

The pre-European and current extent of each of the twelve vegetation complexes within the City of Wanneroo is described in **Table 1**. This table also depicts the extent of each vegetation complex excluding all natural areas within approved Local Structure Plans that are yet to be developed, as well as natural areas classified as Protected and Local Natural Area. For the purpose of this Local Biodiversity Plan, the extent of each vegetation complex, referred to in the remainder of this document, excludes all approved Local Structure Plans for accuracy given a majority of these areas will be cleared in the near future.

³ CSIRO 2015.

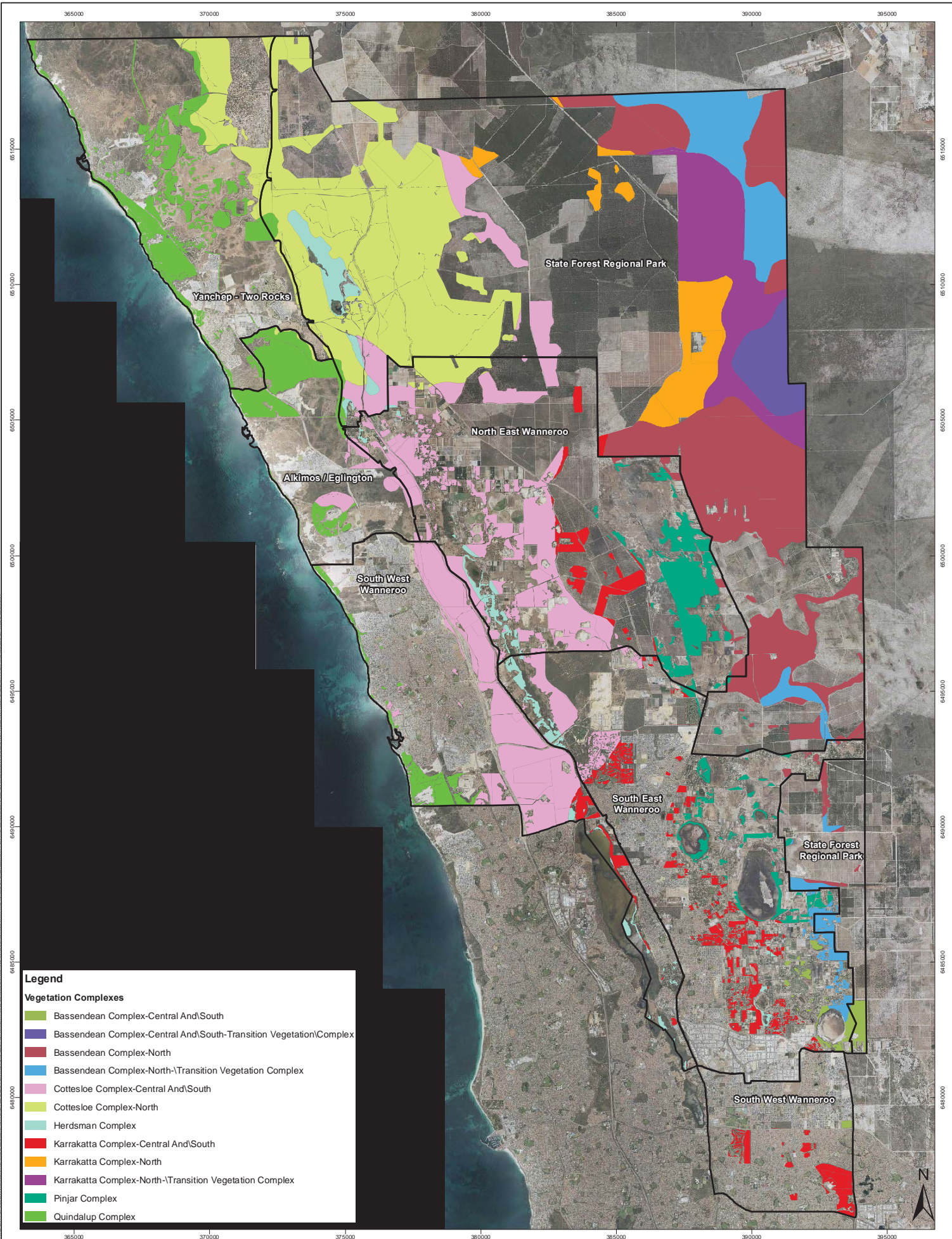
Table 1 – Vegetation Complexes within the City of Wanneroo

Vegetation Complex	Pre-European Extent in the City of Wanneroo (ha)	Current Extent 2017 (ha)	Current Extent in 2017 excl. approved LSP areas (ha)*	Current Protection 2017 (ha)**	Local Natural Area 2017 (ha)
Bassendean Dunes					
Bassendean Central and South	1,107	194	181	137	44
Bassendean Central and South Transition	623	621	621	621	0
Bassendean North	8,729	4,494	4,494	4,386	108
Bassendean North Transition	2,493	1,671	1,671	1,542	129
Spearwood Dunes					
Cottesloe Central and South	13,302	5,237	4,310	2,832	1,478
Cottesloe North	8,699	5,876	5,753	5,503	250
Karrakatta Central and South	10,340	1,474	1,130	697	433
Karrakatta North	5,153	1,094	1,094	995	99
Karrakatta North Transition	2,345	1,864	1,864	1,856	8
Quindalup Dunes					
Quindalup	8,722	4,919	2,207	1,024	1,183
Wetlands					
Herdsmen	1,494	618	617	489	128
Pinjar	4,893	1,014	1,012	803	209

* This number represents vegetation remaining in the City of Wanneroo and excludes all approved Local Structure Plan areas as at January 2017.

** Protection in this table represents areas Protected and Partially Protected. See **Table 2** for a further breakdown.

In addition to the vegetation complexes, vegetation density across the City of Wanneroo has also been considered. Infrared radiation data obtained from Landgate has been mapped for the entire surface within the City of Wanneroo (**Figure 3**). As each surface type reflects or absorbs a specified amount and wavelength of electromagnetic radiation from the infrared spectrum, this can provide an inferred indication of vegetation density. This is referred to as the spectral signature where vegetation absorbs infrared radiation due to the presence of chlorophyll and bare soil reflects this wavelength. When considering vegetation densities, this can be identified through different shades of infrared reflectance; the darker the red, the more absorbance of infrared radiation has occurred, resulting in an inferred high vegetation density. Similarly, the lighter the shade, the more infrared radiation has been reflected, suggesting bare soil or a surface exhibiting high reflectance, i.e. concrete. **Figure 3** shows the indicative vegetation density of all surfaces across the City of Wanneroo, which can be used in the process of determining vegetation qualities in conjunction with best practice flora and vegetation surveys.



Legend

Vegetation Complexes

- Bassendean Complex-Central And South
- Bassendean Complex-Central And South-Transition Vegetation Complex
- Bassendean Complex-North
- Bassendean Complex-North-Transition Vegetation Complex
- Cottesloe Complex-Central And South
- Cottesloe Complex-North
- Herdsman Complex
- Karrakatta Complex-Central And South
- Karrakatta Complex-North
- Karrakatta Complex-North-Transition Vegetation Complex
- Pinjar Complex
- Quindalup Complex



Legend

- Planning Precinct Boundaries

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2009
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2014
- © Western Australian Land Information Authority 2015

Note

1. Vegetation Complexes are inclusive of all areas reclassified as conservation under the District Planning Scheme amendment
2. All vegetation complexes reflect the remaining vegetation, excluding approved Local Structure Plan areas

360
environmental.com.au

people planet professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 16/06/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 500 1,000 2,000 3,000 4,000 5,000
Meters
1:125,000 @ A3

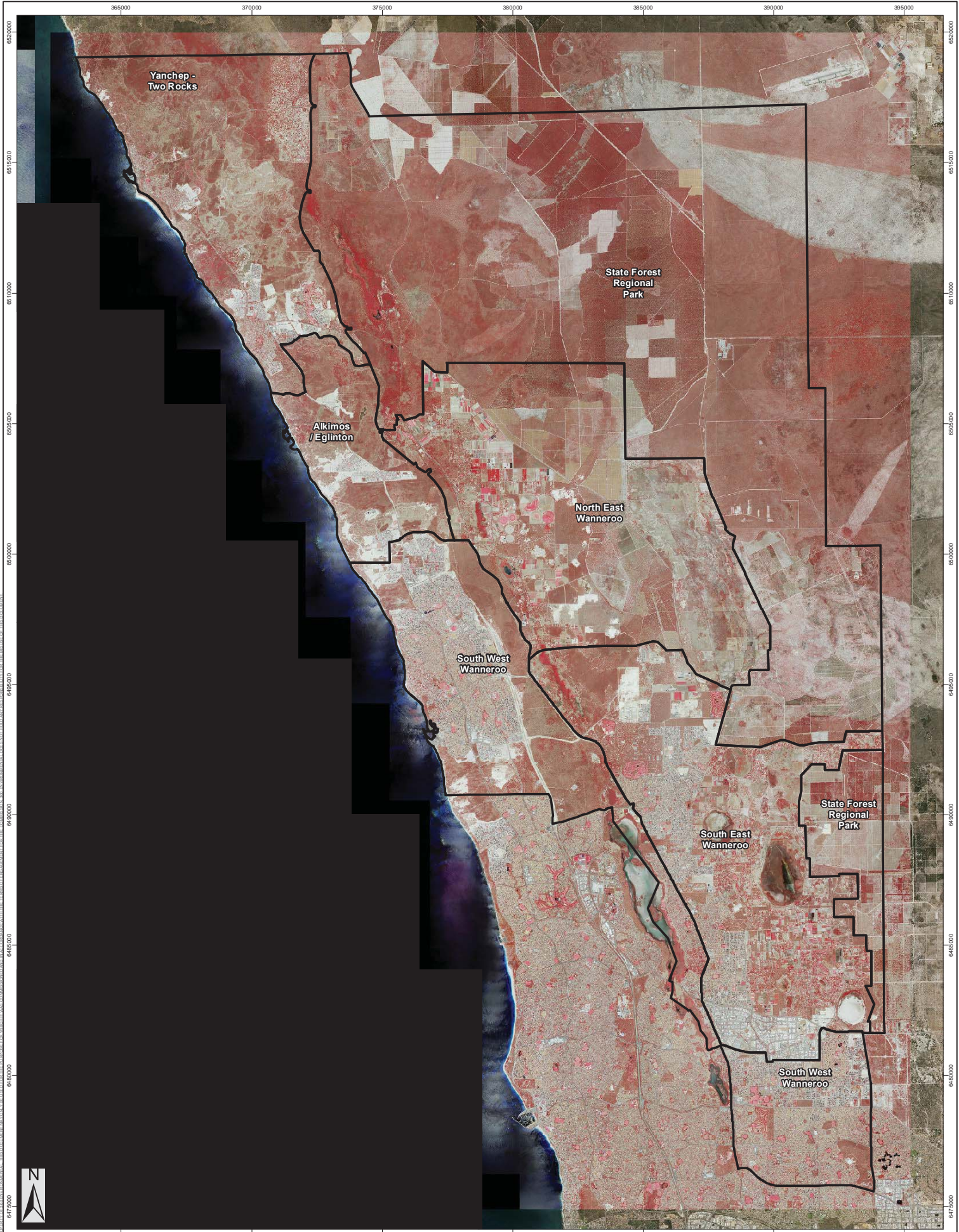
City of Wanneroo

**Local Biodiversity Plan
2018/19 – 2023/24**

Figure 2

**Vegetation Complexes in the
City of Wanneroo**

K:\Projects\814\PP11581 Wanneroo Local Biodiversity Strategy\Figures\Figure X - Vegetation Complexes (2016 Overview).mxd



Legend

Planning Precinct Boundaries

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED FROM LANDGATE 2009
- KARSTIC RISK SOURCED FROM COV 2017
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2017
- © Western Australian Land Information Authority 2017

360 environmental
 a 10 Beldonsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED TM	REVISION 01	DATE 12/06/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 750 1,500 3,000 4,500 6,000
 Meters
 1:130,000 @ A3

City of Wanneroo

Local Biodiversity Plan
 2018/19 – 2023/24

Figure 3

Vegetation Density (indicative) across the City of Wanneroo

K:\Projects\1\APPT\198\Wanneroo Local Biodiversity Strategy\Figures\Figure X - Vegetation Density (Full Extent).mxd

Threatened and Priority Ecological Communities

The City of Wanneroo supports a number of Threatened and Priority Ecological Communities with federal and state protection levels. Four Threatened Ecological Communities (TEC) are known to occur within the City of Wanneroo, one of which is listed as Critically Endangered and three of which are listed as Endangered under the EPBC Act:

- Shrublands on dry clay flats;
- Banksia Woodlands of the Swan Coastal Plain;
- Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain; and
- Sedgeland in Holocene dune swales of the southern Swan Coastal Plain.

Ten Priority Ecological Communities (PEC) are known to occur within the City, two of which are listed as Endangered under the WC Act and eight listed as Priority. A full list of the TECs and PECs known to occur within the City of Wanneroo are provided in **Appendix A**.

Rare and Priority Flora and Fauna

With such a diverse array of vegetation complexes and habitat types, the City of Wanneroo supports a significant number of rare and priority flora and fauna species both under the *Wildlife Conservation Act 1950* (WC Act) and the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

Flora

Forty-two rare and priority flora species are located within the City of Wanneroo, as listed in **Appendix A**. This includes two species listed under the EPBC Act and the WC Act, and 40 species listed under the WC Act. Key conservation significant flora species include:

- *Caladenia huegelii* (Grand spider orchid);
- *Eucalyptus argutifolia* (Yanchep mallee);
- *Marianthus paralius*; and
- *Dasymalla axillaris* (Foxglove).

Fauna

Twenty-seven rare and priority fauna species are located within the City of Wanneroo, as listed in **Appendix A**. This includes three species listed as Endangered and three species listed as Vulnerable under the EPBC Act, and one listed as Critically Endangered, three as Endangered and four as Vulnerable under the WC Act. Key conservation significant fauna species include:

- Loggerhead Turtle;
- Leatherback Turtle;
- Green Turtle;
- Baudin's Cockatoo;
- Forest Red-tailed Cockatoo; and
- Carnaby's Cockatoo.

Wetlands

The City of Wanneroo contains a chain of linear wetlands, circular wetlands and subterranean wetlands, some of which represent the last remaining freshwater wetland systems on the Swan Coastal Plain. Wetlands and the vegetation surrounding wetlands serve as an important breeding ground for local birds and a summer refuge for bird populations including trans-equatorial migratory wading birds.

The City of Wanneroo contains over 188 wetlands; 86 of which are classified as Conservation Category Wetlands (CCW), 46 Resource Enhancement Wetlands (REW) and 56 Multiple Use Wetlands (MUW). Key wetlands classified as CCW include Lake Joondalup, Lake Pinjar, Lake Mariginiup, Loch McNess, Gnaragara Lake, Nowergup Lake, Beenyup Swamp, Walluburnup Swamp, Wilgarup Lake and Lake Adams, which form part of a complex of wetlands extending north-south along the Swan Coastal Plain and comprise some of the oldest and last remaining freshwater wetland systems.

The wetlands within the City of Wanneroo are shown in **Figure 4**. A summary of wetland management categories are detailed in **Appendix B**.

Karsts and Caves

Karst is a term used to describe landscapes that are commonly characterised by closed depressions, subterranean drainage and caves. Karst landscapes are driven by the hydrological cycle and formed principally by solution of the rock, most commonly limestone (Department of Environment and Conservation 2012). Karst features are a key environmental characteristic in the City of Wanneroo due to the distribution of Tamala limestone where the weathering of Tamala results in karstic landform features including lakes and caves.

An extensive belt of karstic landforms including hundreds of caves runs in a north-west to south-west direction through Yanchep National Park in the vicinity of Loch McNess. These caves support known populations of stygofauna and critically endangered aquatic root mat communities.

The presence of caves and karsts has been investigated extensively over the decades⁴. A map detailing the known karst features is provided in **Figure 5**.

Coastal Areas

The City of Wanneroo's coastline stretches for 32 kilometres from Tamala Park (south of Mindarie) to Two Rocks in the north. Coastal vegetation has an important function in stabilising mobile dunes, which are necessary to provide natural protection from storms, rising sea levels associated with climate change and erosion. Foreshore areas along the coastline also provide for recreational areas and are under threat from housing and infrastructure development, as well as climate change impacts.

The City's coastline represents important regional conservation value and also provides an extensive ecological linkage characterised by coastal limestone cliffs and coastal heathland vegetation. The coastline also represents relict sand dune formations (the Quindalup dune system) occurring as beach ridges and a variety of dune types.

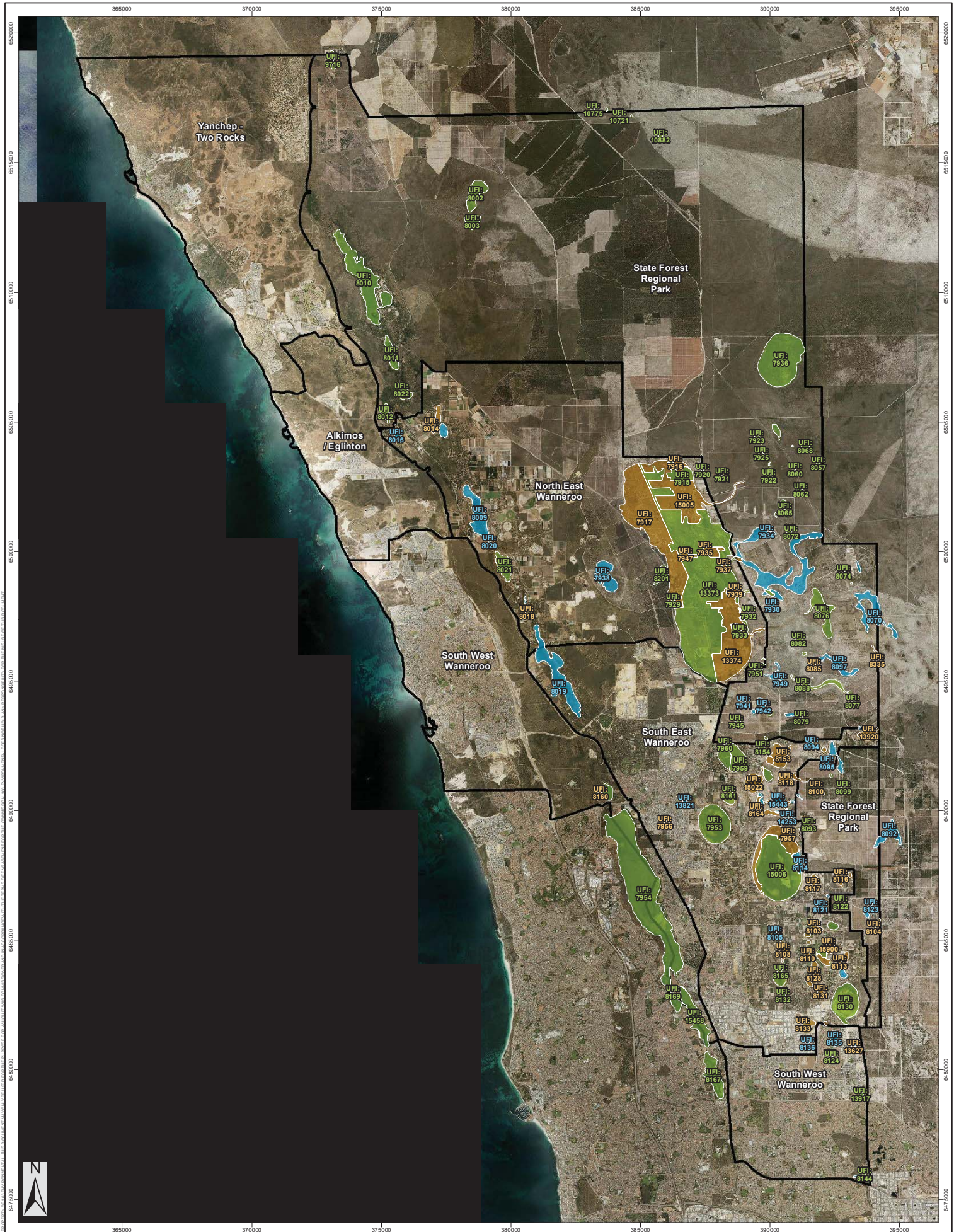
Compared to other foreshore areas further south, the coastline in the City of Wanneroo is relatively undeveloped. However, current and proposed developments for the future will see significant change in the northern corridor areas in the Alkimos-Eglinton and Yanchep-Two Rocks planning precincts.

Ecological Linkages

Local and regional ecological linkages have been identified for the City of Wanneroo. Ecological linkages facilitate the movement of wildlife and connect significant vegetation, habitat and landscape features. The local and ecological linkages within the City of Wanneroo generally run from north to south and east to west, linking continuous corridors of vegetation, the coastline and the national park inland.

In fragmented landscapes, ecological linkages are particularly important for maintaining biodiversity, allowing wildlife to move out of sites that become unsuitable, allowing recolonization of sites and preventing wildlife from becoming isolated in one bushland area. The local and regional ecological linkages within the City of Wanneroo are shown in **Figure 6**.

⁴ Department of Environment and Conservation 2012a.



Legend

- Planning Precinct Boundaries
- Geomorphic Wetlands**
 - Conservation
 - Resource Enhancement
 - Multiple Use

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED FROM LANDGATE 2009
- GEOMORPHIC WETLANDS SOURCED FROM DPRAW 2017
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2017
- © Western Australian Land Information Authority 2017

360
environmental.com.au

• people • planet • professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED	CHECKED	APPROVED	REVISION	DATE
MH	TM	TM	01	16/06/2017
HORIZONTAL DATUM		PROJECT NO		
GDA 1994 MGA Zone 50		1990		

0 750 1500 3000 4500 6000
Meters
1:130,000 @ A3

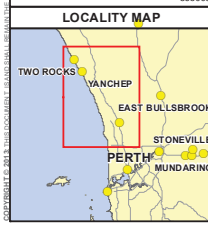
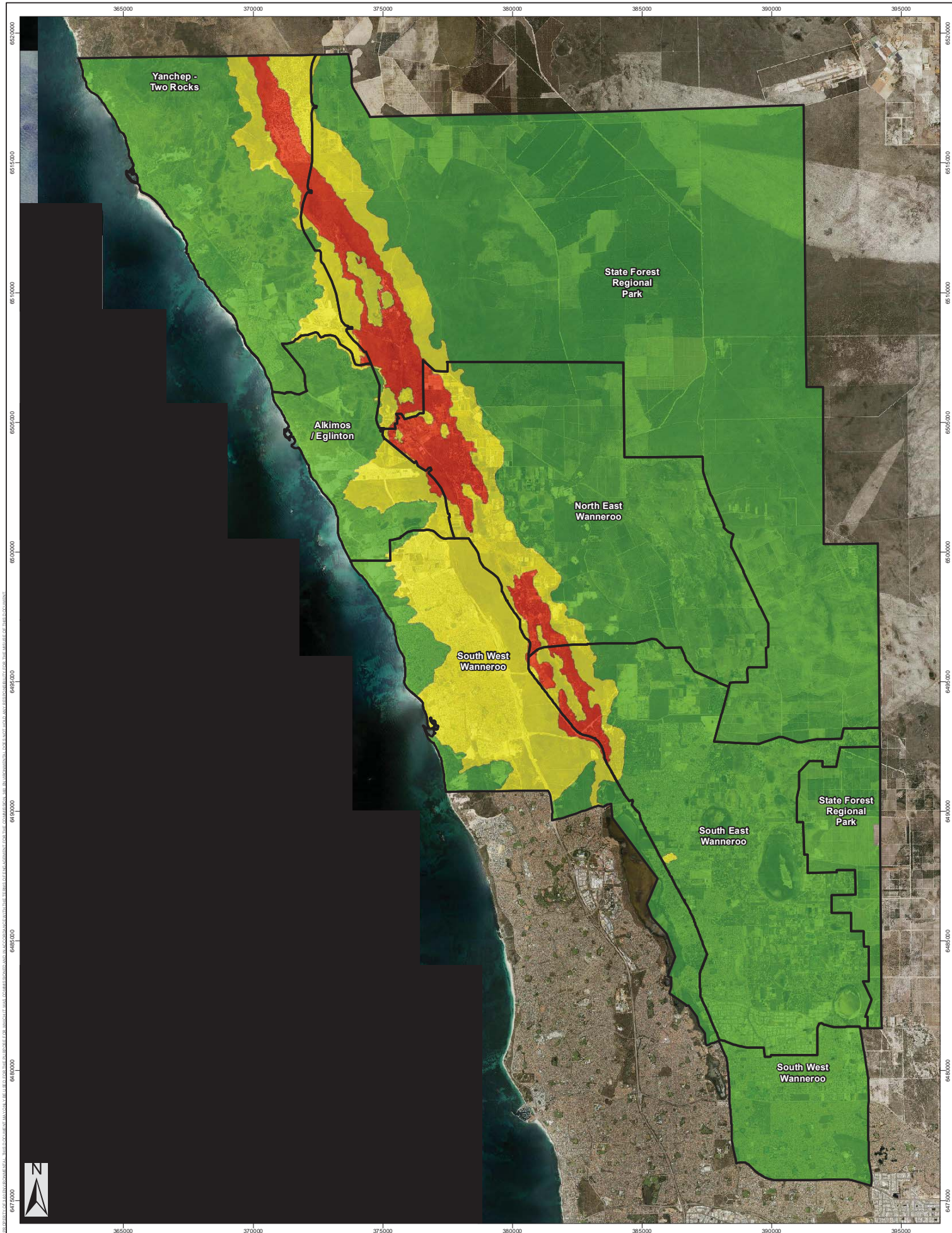
City of Wanneroo

Local Biodiversity Plan
2018/19 – 2023/24

Figure 4

Geomorphic Wetlands in the City of Wanneroo

Project: 03 APP1198 Wanneroo Local Biodiversity Strategy Figure 4 - Geomorphic Wetlands



Legend

- Planning Precinct Boundaries
- Karstic Risk**
 - High Risk
 - Medium Risk
 - Low Risk

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED FROM LANDGATE 2009
- KARSTIC RISK SOURCED FROM COV 2017
- AERIAL PHOTOGRAPHY SOURCED FROM LANDGATE 2017
- © Western Australian Land Information Authority 2017

360 environmental
 a 10 Beardonsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

people planet professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED TM	REVISION 01	DATE 12/06/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 750 1,500 3,000 4,500 6,000
 Meters
 1:130,000 @ A3

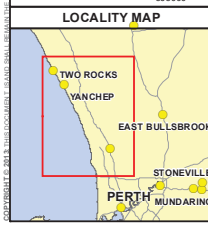
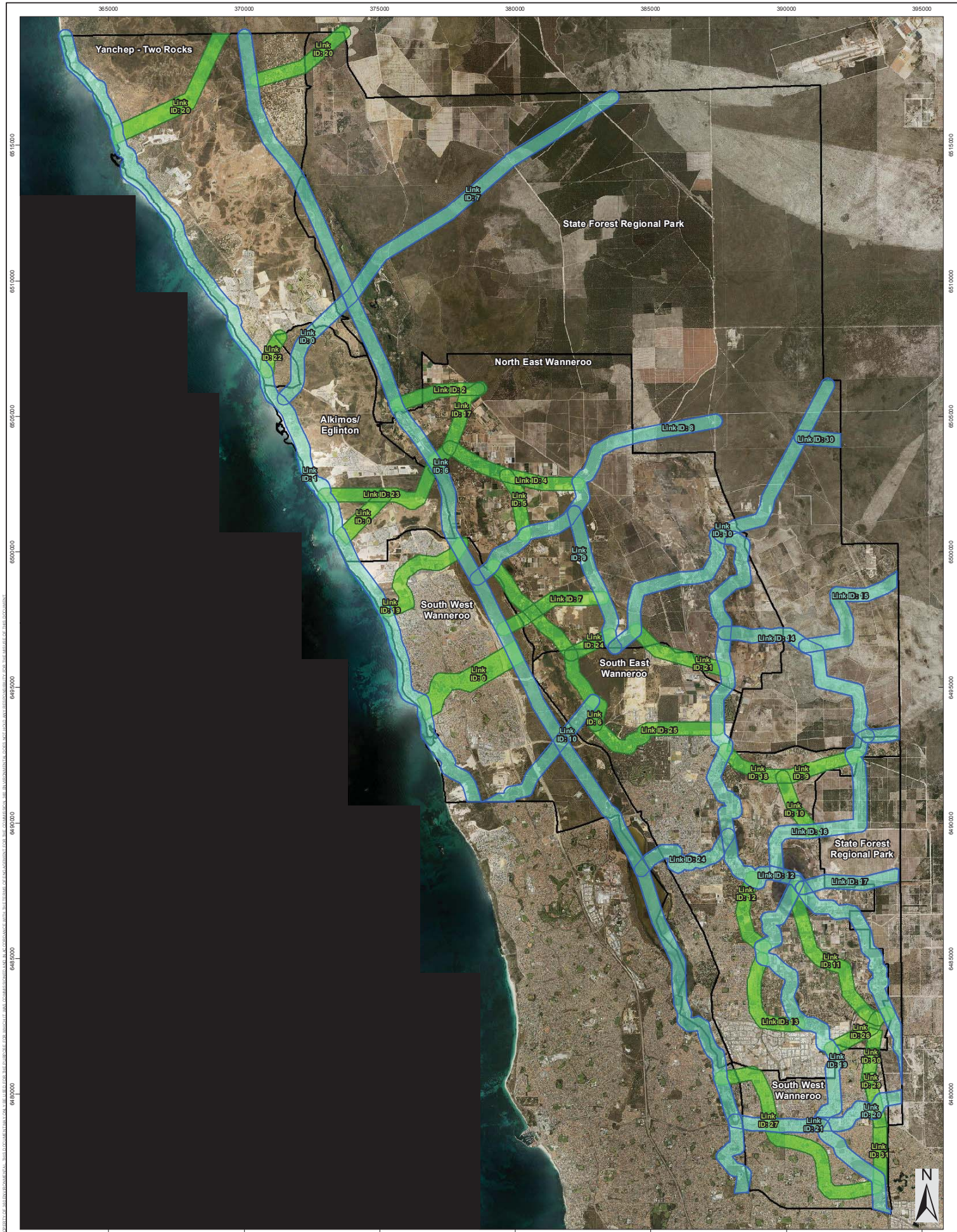
SLIP ENABLER

City of Wanneroo

Local Biodiversity Plan
 2018/19 – 2023/24

Figure 5
 Karstic Features in the City of Wanneroo

K:\Projects\9 APPT1990 Wanneroo Local Biodiversity Strategy\Figures\Figure 5 - Karstic Risk.mxd



Legend

- Planning Precinct Boundaries
- Major Roads
- Regional Ecological Linkages (2008)
- Local Ecological Linkages (2011)

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2009
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- © Western Australian Land Information Authority 2017

360 environmental solutions
 people planet professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 12/05/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50		PROJECT NO 1990		

0 750 1,500 3,000 4,500 6,000
 Meters
 1:125,000 @ A3

SLIP ENABLER

City of Wanneroo
 Local Biodiversity Plan 2018/19 – 2023/24

Figure 6
 Local and Regional Ecological Linkages in the City of Wanneroo

2.2 Threats to Biodiversity

The City of Wanneroo is experiencing rapid urbanisation and land-use change, which is resulting in loss of vegetation and threatening biodiversity. Key threats to biodiversity within the City of Wanneroo include:

- Clearing;
- Habitat fragmentation;
- Invasive species and pathogens;
- Bushfire;
- Uncontrolled access;
- Lack of awareness and
- Climate change.

Clearing and Land-Use Change

Land clearing for development is the biggest threat to biodiversity in the City of Wanneroo. Between 2001 and 2005, 1,192 ha of native vegetation was cleared⁵ and between 2011 and 2016, 1,450 ha was cleared. Land clearing causes habitat fragmentation, leading to an increasing number of isolated areas, which are then more vulnerable to the effects of climate change, disease and weed invasion. In the southwest of Western Australia, land clearing has specific implications on the natural environment, which includes:

- Salinisation of land and inland waters;
- Altered water regimes;
- Soil erosion;
- Eutrophication; and
- Increased greenhouse gas emissions⁶.

Land clearing within the City of Wanneroo is expected to increase with ongoing urban expansion as a result of population growth, which will require considered planning for long term sustainability and biodiversity protection.

Habitat fragmentation

Habitat fragmentation is a key threatening processes leading to the loss of biodiversity. When habitats become fragmented through land clearing, development and land use change, the spatial arrangement of natural areas across the landscape become critically important to maintain biodiversity⁷. The ability of native animals and plants to disperse across landscapes is affected, as is the ability of populations to re-colonise areas after a disturbance which generally results in the continued loss of species across the broader landscape long after initial clearing has occurred⁸.

Invasive Species

Pests and pathogens are a key threat to biodiversity in Western Australia causing a decline in native species populations due to changes to competition, predation, mortality or habitat degradation by introduced species⁹. Weeds often respond positively and rapidly to land or habitat disturbance, such as clearing, rubbish dumping, trampling and fire. Weeds create a number of issues for biodiversity within the City of Wanneroo including:

- Competition with native vegetation by inhibiting growth and displacing native species;
- Replacement of diverse native plant communities with more uniform weed communities;

⁵ Perth Biodiversity Project 2007.

⁶ WAPC 2011.

⁷ Cresswell and Murphy 2017.

⁸ Perth Biodiversity Project 2004.

⁹ Department of the Environment, Water, Heritage and Arts 2008.

- Inhibiting native plant regeneration through competition;
- Changing nutrient cycling of native communities;
- Altering soil acidity;
- Weeds may increase bushfire risk;
- Reduces resources available for fauna by altering the habitat; and
- Some weeds are poisonous to native fauna.

Pathogens such as *Phytophthora* Dieback and Marri Canker can lead to the death of endemic vegetation through altering the structure and floristics of natural areas. Dieback is the most widely known pathogen of bushland in Western Australia and is suited to the Bassendean Sands of the Swan Coastal Plain. Dieback is understood to have been introduced to the City of Wanneroo through off road vehicles and is known to occur in bushland to the east of Lake Gnangara¹⁰.

Bushfire

The frequency of bushfires within Western Australia has increased in the past decade as a result of altered fire regimes which is considered a major threat to native species population reduction and extinction. Fire regimes in Australia have been altered since European arrival and are now characterised as very large recurrent fires with shorter intervals between fires. Fires that are too intense will impact on the populations of sensitive species and fires that are too frequent will result in limited population recovery¹¹. The effects of bushfires on biodiversity within the City of Wanneroo includes:

- Reduction in native species and increased weed infestation;
- Reduction in success of re-sprouting of native plants after each fire;
- Significant reduction in above-ground material including leaf litter and logs, which are important habitats for native fauna species; and
- High mortality of native fauna species.

Altered Hydrology

Urbanisation has resulted in constructed roads and impervious surfaces with traditional piped drainage networks and altered topography, significantly altering the natural hydrological regime. Stormwater then flows through urban areas into natural waterways, bringing with it litter, chemicals, nutrient and sediments that impact on water quality in wetlands and waterways. With an increase in urban development there is an increase in stormwater flows, with greater potential for impact to water quality¹².

Lack of Awareness

Increasing knowledge and awareness of local biodiversity within the community is critical in improving sustainable behaviours and attitudes towards the natural environment. An aware community enables a sustainable and engaged community and many environmental issues require action by individuals and communities if they are to be addressed. The City of Wanneroo has an important role in promoting environmental awareness, engaging the community in biodiversity conservation and educating the public, schools, universities and businesses.

Uncontrolled Access

Uncontrolled access to natural areas for recreational activities such as trail bike riding and four-wheel driving are a major problem for the City of Wanneroo. People use vehicles in bushland and along the coast for transport and

¹⁰ City of Wanneroo 2008.

¹¹ Department of the Environment and Energy 2016.

¹² City of Wanneroo 2008.

recreational purposes which can cause significant damage to landscapes through physical removal of vegetation, soil compaction, introduction of Dieback, soil disturbance and disturbance to fauna. Uncontrolled pedestrian access within natural areas can lead to trampling of vegetation, disturbance of soil surfaces leading to erosion and reduction in aesthetic values of the natural landscape.

Climate Change

Climate change is a significant threat to biodiversity in Western Australia and specifically within the City of Wanneroo. The southwest of Western Australia is becoming a hotter and drier climate with more frequent and severe bushfires and extreme weather events¹³. Temperature changes in Wanneroo are in line with the Perth average of a 0.5°C increase, and projections indicate an increase of between 0.5°C and 2.1°C by 2030. Drought months are predicted to increase by 40% by 2030 and seasonal rainfall decline will continue to intensify. The impacts of climate change on biodiversity include:

- Reduced water availability in wetlands and other groundwater dependant ecosystems, and deterioration of water quality causing negative ecological impacts;
- Changes to wildlife migration patterns;
- Changes to critical seasonal timing of reproduction;
- Movement of species to areas of adequate rainfall causing a reduction in local biodiversity;
- Damage to natural areas causing hazards for wildlife; and
- Erosion and inundation of sensitive dune ecosystems threatening coastal biodiversity¹⁴.

2.3 Key Achievements in Biodiversity Protection

The City of Wanneroo has retained a strong commitment to the protection of biodiversity values through various planning mechanisms. Key achievements in planning and policy as set out in the previous Local Biodiversity Strategy 2011 – 2016 include an amendment to DPS No. 2, the development of a new caves and karstic features protection policy and the commencement of coastal hazard analysis and risk management planning.

Amendment to District Planning Scheme No. 2

Action 1.1: Amend District Planning Scheme No. 2 to include a ‘Conservation and Passive Recreation’ local reserve classification.

District Planning Scheme No. 2 (DPS No. 2) describes the zoning of land within the City of Wanneroo, specifying where particular land uses are permitted and sets standards for development. All planning decisions must be in accordance with DPS No. 2

Amendment No. 109 to DPS No. 2 resulted in the local reserve classification being expanded to include ‘Conservation’. Local Conservation Reserves retain areas of conservation whilst allowing community access for passive recreation activities such as walking and nature photography. The allocation of Conservation reserves will be balanced by other uses of public open space as it is recognised that other uses such as active recreation and drainage will require accommodation.

¹³ Department of Environment and Conservation 2012b

¹⁴ City of Wanneroo 2016.

Local Planning Policy 4.13: Caves and Karstic Features

Action 1.6: Develop new policies to better provide for biodiversity conservation as appropriate.

In December 2012, the City of Wanneroo adopted Local Planning Policy 4.13: Caves and Karstic Features, as a result of the endorsed actions as set out in the *Local Biodiversity Strategy 2011 – 2016*. The Caves and Karstic Policy applies to all planning proposals that affect or are affected by caves and karstic features and outlines the information required for the investigation and management of caves and karstic features to assist in the design and assessment of structure plans, subdivision applications and development applications. The overall objective of the policy is to conserve caves and karstic features for their geological, cultural and environmental values, and minimise risks to people and property in karst hazard areas.

Coastal Vulnerability Study and Hazard Mapping

Action 2.5: Develop a Management Plan for the Coastal Foreshore and/or review the existing management plan to encourage biodiversity retention and protection whilst also planning for the impact of recreation and a larger number of visitors to the coast, to guide local management plans and future land use.

The City's Coastal Management Plan (CMP) Part 1 was adopted by Council in 2011 and is a result of several enquiries and petitions regarding potential dog beach locations as well as the potential for the implementation of a horse beach in the City. The purpose of the CMP Part 1 was to address these issues and consolidate management practices along the City's coastline. Part 2 of the CMP will be prepared in the future and will look at addressing future community needs and land use planning requirements for the City's foreshore.

In 2015, the City of Wanneroo commenced the first stage of the Coastal Vulnerability Study and Hazard Mapping in response to the requirement to prepare a Coastal Hazard Risk Management and Adaptation Plan (CHRMAP) under *State Planning Policy 2.6 – State Coastal Planning Policy*. Prepared by specialist coastal engineers M P Rogers & Associates Pty Ltd, Stage 1 of the CHRMAP process – the coastal vulnerability assessment and hazard mapping component, has now been completed. This involved a risk assessment of the entire coastline within the City of Wanneroo from Tamala Park to Two Rocks, a summary of coastal processes and identification of cultural, environmental and built assets that may be exposed to coastal erosion and inundation through to 2120. A Coastal Vulnerability Assessment of Ecological Functions was also undertaken by EcoLogical Australia as part of this study, which determined that the following biodiversity values are vulnerable to changes along the coastline:

- Bush Forever Site 397 - high vulnerability;
- Conservation significant flora species:
 - *Marianthus parallus* (Threatened) – high vulnerability;
 - *Leucopogon maritimus* (Priority 1) – moderate vulnerability;
 - *Calandrinia oraria* (Priority 3) – moderate vulnerability;
- Conservation significant fauna species:
 - Carnaby's Cockatoo (*Calyptorhynchus latirostris*) – moderate vulnerability; and
 - Land Snail (*Bothriembryon perobesus*) – moderate vulnerability.

Stage 2 of CHRMAP has commenced with the completion of a community survey on the values that the community holds about the City's foreshore assets. A draft risk assessment plan and preliminary adaptation plan has also been completed and will be presented to Council in the 2017/18 financial year.

Part 2 of the City's Coastal Management Plan as well as Foreshore Management Plan Guidelines will be developed as a result of the findings of the CHRMAP.

3 Biodiversity Protection and Retention

3.1 Natural Areas

The term Natural Areas is used to describe any physical area that contains native species or ecological communities in a relatively natural state and hence contain biodiversity. Improved protection of natural areas is therefore essential to the retention of biodiversity across the landscape.

For the purpose of this Local Biodiversity Plan, the following terms are used to describe the natural areas within the City of Wanneroo:

- Local Natural Areas;
- Protected Natural Areas; and
- Partially Protected Natural Areas.¹⁵

Local Natural Areas are defined as all unprotected natural areas over which the City of Wanneroo can exercise the most control through its decision-making powers, policies and reserve management. Local Natural Areas include:

- Natural areas located on private property, which the City has some control over through Policy and decision making (such as planning approvals);
- Natural areas located in public or regional open space, managed by the City of Wanneroo but not fully recognised as being managed for the purpose of conservation¹⁶;
- State Government freehold land not zoned Parks and Recreation under the Metropolitan Region Scheme (MRS).

Local Natural Areas are the focus of this Local Biodiversity Plan as these areas represent the areas over which the City of Wanneroo can exercise the most control over in relation to protection, retention and management.

Protected Natural Areas are natural areas within the City of Wanneroo that are considered formally protected and include:

- Natural areas occurring on Crown land vested with the State Government, managed for conservation and zoned Parks and Recreation under the MRS;
- Natural areas occurring on Crown land vested with the City of Wanneroo and managed for the purpose of conservation; and
- Private land over which a conservation covenant is applied.

Partially Protected Natural Areas are all natural areas that exist outside of the natural areas defined above. Partially Protected Natural Areas are considered to have partial protection because they have some level of protection but the City of Wanneroo has limited opportunity to influence increasing the protection level, or the protection level will be enforced through planning decisions. Partially Protected Natural Areas include areas like Bush Forever sites and include:

- State Government freehold land zoned Parks and recreation under the MRS;
- Bushland areas in the State Forest; and
- Privately owned areas zoned Parks and Recreation under the MRS.

The extent of Local Natural Areas, Protected Natural Areas and Partially Protected Natural Areas across the City of Wanneroo are shown in **Figure 7** and **Figure 8**. The extent shown in **Figure 7** is inclusive of all areas within

¹⁵ As adapted from the Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region.

¹⁶ Full recognition would be the inclusion of the natural area in a regional open space or conservation public open space and vested for a purpose that includes conservation.

approved Local Structure Plans (as at January 2017) and the extent shown in **Figure 8** excludes these areas. A breakdown of the extent of the natural areas is provided in **Table 2**, which reflects the extent shown in **Figure 8**. Excluding natural areas that fall within approved Local Structure Plans (as shown in **Figure 8** and depicted across this Local Biodiversity Plan) provides a more accurate representation of the remaining extent of natural areas across the City of Wanneroo for the next five years and further into the future given a majority of these areas will be cleared for development.

3.2 Priority Local Natural Areas

The Local Natural Areas within the City of Wanneroo have been prioritised using a multi-criteria analysis based on a set of weighted ecological criteria (**Appendix C**). These ecological criteria were derived from the *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region* (WALGA, 2004) and incorporate biodiversity considerations including regional and local representation, connectivity, rarity, proximity to wetland and coastal systems, and climate change. Through a workshop with the City of Wanneroo, the ecological criteria were assigned factorial weightings between 0.1 and 1 based on their importance in biodiversity conservation and protection.

Through the use of ArcGIS, a multi-criteria analysis was performed on the Local Natural Areas within the City of Wanneroo using purchased and publically available datasets, and the agreed factorial weightings (**Appendix C**), to determine their ecological importance, and therefore priority for protection. The results of this analysis are provided in **Figure 9**, and are detailed for each Biodiversity Planning Precinct in **Section 5**.

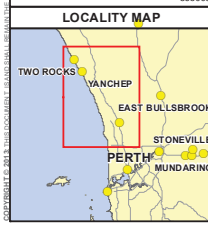
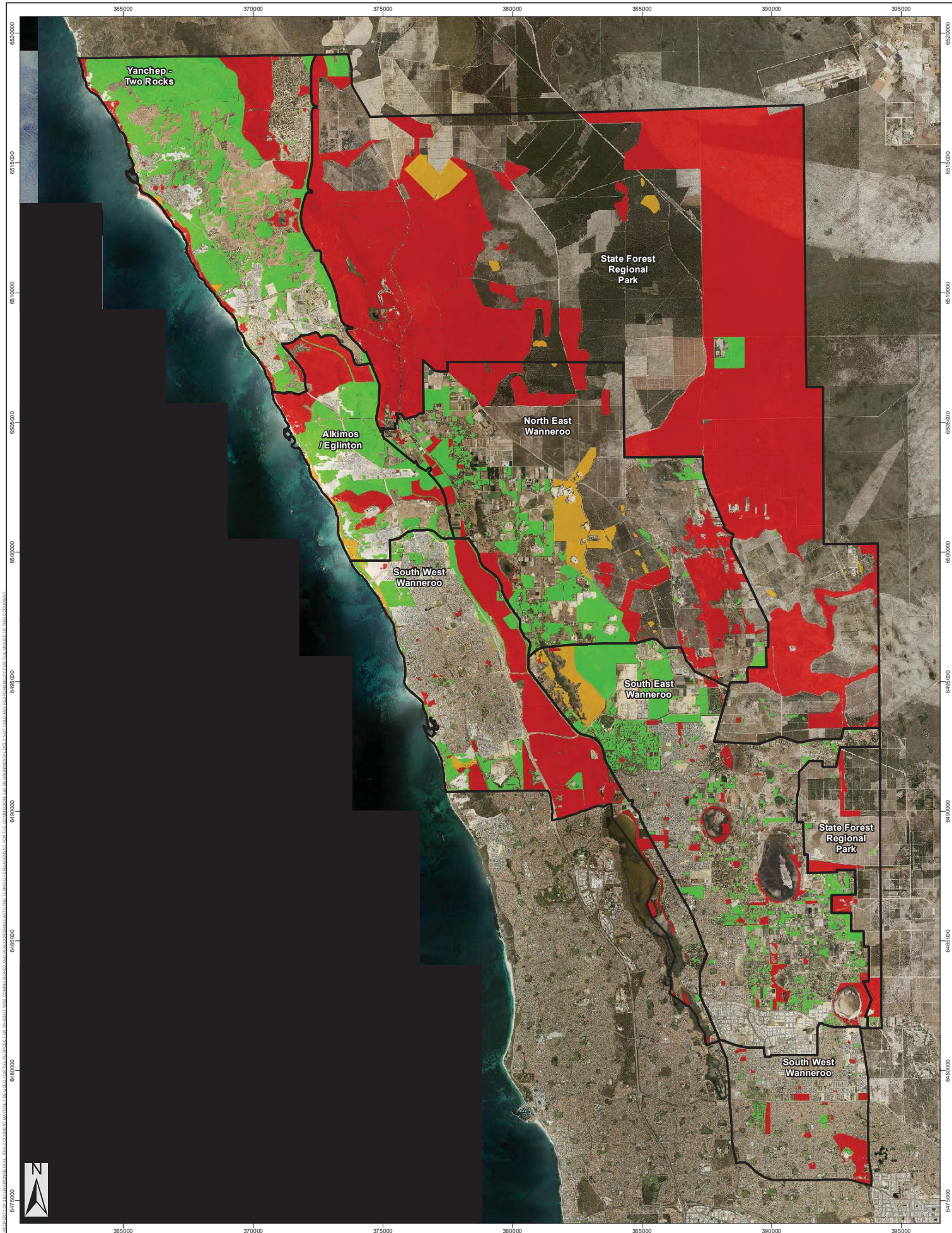
The intention of prioritising Local Natural Area is to determine areas where ecological value of Local Natural Areas are highest, and therefore areas where the City of Wanneroo should afford greater effort over the protection, retention, conservation and management of biodiversity. Highest priority areas are depicted by red in colour, which represent areas with a higher number of ecological values. Areas of lower priority are therefore shown in green.

It should be noted however, that the analysis does not take into consideration the **quality** of the vegetation in the Local Natural Area and that vegetation quality should be an additional consideration in all planning assessments. It should also be noted that priority should not *only* be afforded to areas of highest ecological value (i.e. those areas depicted in red), but to all remaining Local Natural Areas as far as reasonably practicable.

3.3 Draft Green Growth Plan – Broad and Specific Commitments

A key goal of the PPGGP is to use land use planning and development control process (for example Local Structure Plans, subdivisions, and Development Applications) to implement and deliver the broad and specific 'commitments' included throughout the PPGGP.

In this regard, the LBP will aim to use the information within the PPGGP to further refine the City's priority areas for protection. In the consideration of planning decisions, the LBP will be used in conjunction with the draft PPGGP to identify conservation opportunities through the planning and development control process.



Legend

- Planning Precinct Boundaries
- Vegetation Protection Levels**
 - Local Natural Area
 - Partial Protection
 - Protected

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2006
- VEGETATION PROTECTION SOURCED COV 2017
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- © Western Australian Land Information Authority 2017

360 environmental solutions
 a 10 Barendse St, West Leederville, 6007 WA
 t (08) 9388 8360 f (08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE $\pm 5m$ IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED TM	REVISION 01	DATE 12/06/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

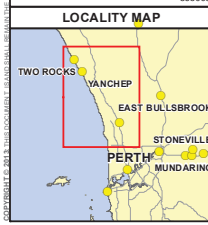
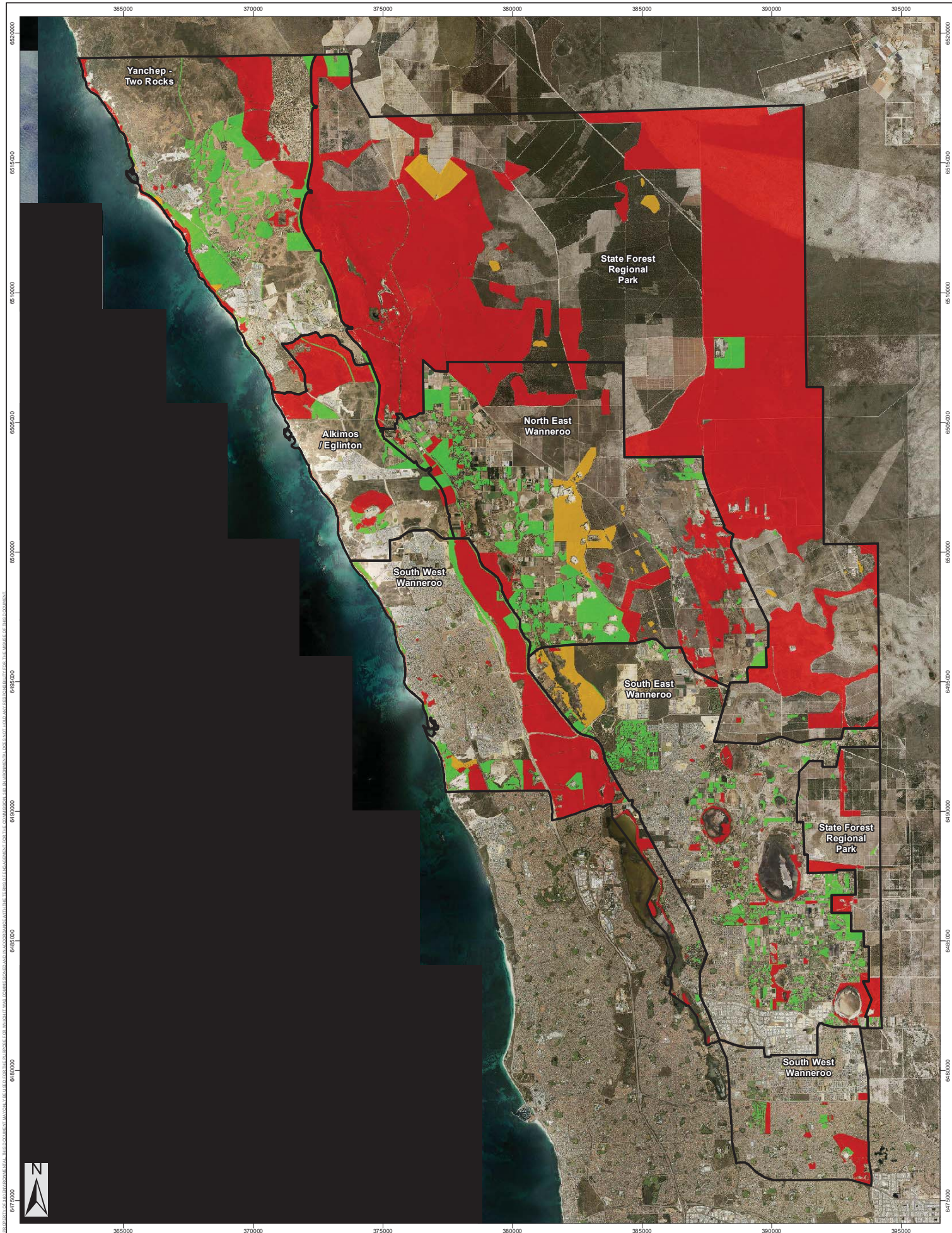
0 750 1,500 3,000 4,500 6,000
 Meters
 1:130,000 @ A3

SLIP ENABLER

City of Wanneroo
Local Biodiversity Plan
 2018/19 – 2023/24

Figure 7
Vegetation Extent in the City of Wanneroo (including approved Local Structure Plan areas)

K:\Projects\3 APP1\360 Wanneroo Local Biodiversity Strategy\Figures\Figure 7 - Vegetation Protection Levels (Excluding LSP).indd



Legend

- Planning Precinct Boundaries
- Vegetation Protection Levels**
 - Local Natural Area
 - Partial Protection
 - Protected

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2006
- VEGETATION PROTECTION SOURCED COV 2017
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- © Western Australian Land Information Authority 2017

360
 environmental
 a 10 Beardonsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED TM	REVISION 01	DATE 12/06/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

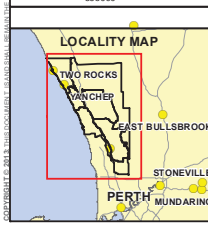
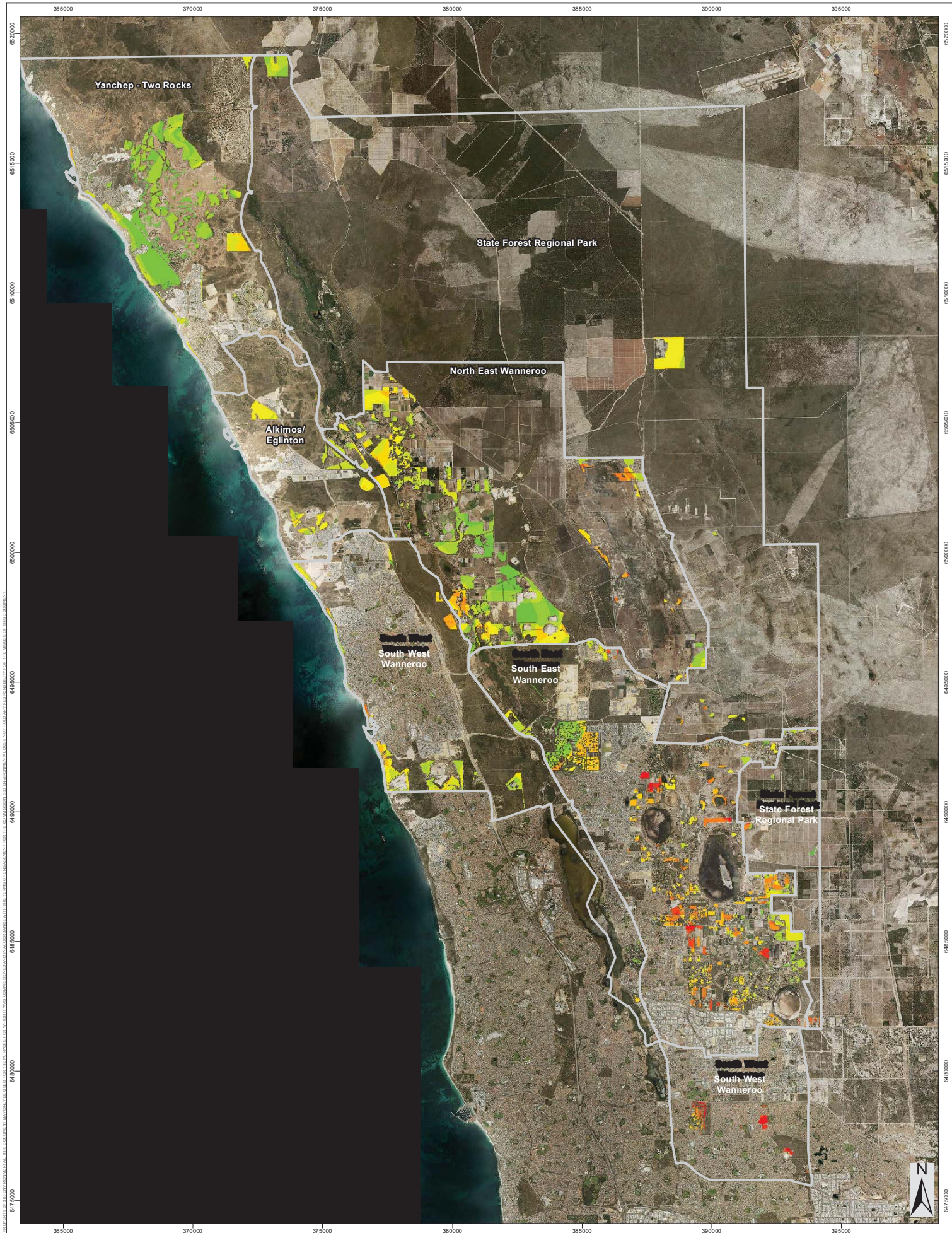
0 750 1,500 3,000 4,500 6,000
 Meters
 1:130,000 @ A3

SLIP ENABLER

City of Wanneroo
Local Biodiversity Plan
 2018/19 – 2023/24

Figure 8
Vegetation Extent in the City of Wanneroo (excluding approved Local Structure Plan areas)

K:\Projects\3 APP\198 Wanneroo Local Biodiversity Strategy\Figures\Figure 8 - Vegetation Protection Levels (Excluding LSP).indd



Legend

Planning Precinct Boundaries

Multiple Criteria Analysis - Factorial Weighting

High Priority: 9.95

Low Priority: 0.5

DATA SOURCES

• CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009

• LOCALITY MAP SOURCED LANDGATE 2006

• AERIAL PHOTOGRAPHY SOURCED LANDGATE 2014

© Western Australian Land Information Authority 2015

Notes

1. For the purposes of the multiple criteria analysis, all areas covered by the local structure plan have been omitted and only local natural areas (LNA) have been analysed

2. Railways and primary/regional road systems have also been omitted from the analysis



360 environmental
 a 10 Beardonsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

people planet professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 29/05/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 750 1,500 3,000 4,500 6,000
 Meters
 1:130,000 @ A3

City of Wanneroo

Local Biodiversity Plan

2018/19 – 2023/24

Figure 9

Priority Local Natural Areas in the City of Wanneroo

4.4 Goals

This Local Biodiversity Plan has a focus on long term goals for the protection, retention and management of biodiversity within the City of Wanneroo, as well as strengthening engagement with the community about the importance of biodiversity values. The goal setting process has been based on the remaining Local Natural Areas within the City of Wanneroo and the extent of the vegetation complexes comparable to pre-European extent.

The previous Local Biodiversity Strategy 2011 – 2016 set representation targets with an aim to protect a sample of each of the vegetation complexes across the Biodiversity Planning Precincts. However, after reviewing progress against these targets, it was agreed that the focus of conservation efforts over the next five years should be on areas of ecological priority with a broad goal for each vegetation complex, based on its natural range.

The biodiversity conservation goals are based on the national targets for biodiversity conservation as set out in *The National Objectives and Targets for Biodiversity Conservation 2001 – 2005* which aim to:

- Prevent clearing of ecological communities with **less than 30%** of the original extent remaining;
- Recover ecological communities with **less than 10%** of the original extent remaining; and
- Protect threatened species and ecological communities.

The State Government acknowledges that 30% representation of the original extent of each vegetation type is regarded as the threshold level below which species loss appears to accelerate exponentially at an ecosystem level, and 10% representation of the original extent of each vegetation type is regarded as the level representing 'endangered' (WAPC, 2011).

The pre-European and current representation of the twelve vegetation complexes within the City of Wanneroo together with a breakdown of Protected Natural Areas and Local Natural Areas are shown in **Table 2**.

Table 2 – Summary of Vegetation Complexes and Protection within the City of Wanneroo

Vegetation Complex	Pre-European Extent in the City of Wanneroo (ha)	Current Extent		Protected Natural Areas		Partially Protected Natural Areas		Local Natural Areas
		ha	%	ha	%	ha	%	
Bassendean Dunes								
Bassendean Central and South	1,107	181	16.3	137	12.4	0	-	44
Bassendean Central and South Transition	623	621	99.6	621	99.6	0	-	0
Bassendean North	8,729	4,494	51.4	4,373	50	13	0	108
Bassendean North Transition	2,493	1,671	67	1,542	61.9	0	-	129
Spearwood Dunes								
Cottesloe Central and South	13,302	4,310	32.4	2,324	17.5	508	3.8	1,478
Cottesloe North	8,699	5,753	66	5,268	60.6	235	2.7	250
Karrakatta Central and South	10,340	1,130	10.9	579	5.6	118	1.1	433
Karrakatta North	5,153	1,094	21.2	925	18	70	1.4	99
Karrakatta North Transition	2,345	1,864	79.5	1,856	79.1	0	-	8
Quindalup Dunes								
Quindalup	8,722	2,207	25.3	982	11.3	42	0.5	1,183
Wetlands								
Herdsmen	1,494	617	41.2	428	28.6	61	4.1	128
Pinjar	4,893	1,012	20.7	797	16.3	6	0.1	209

Table 3 prescribes a priority level for each vegetation complex within the City of Wanneroo in accordance with the objectives for biodiversity conservation as set out in *The National Objectives and Targets for Biodiversity Conservation 2001 – 2005*. These priorities have been assigned based on the regional and local representation of the vegetation complex and it's the level of protection within the City of Wanneroo. Priorities range from Critical to Low.

Table 3 – Priority of Vegetation Complexes for Protection and Retention within the City of Wanneroo

Vegetation Complex	Percentage of pre-European Extent Remaining in the Swan Coastal Plain	Percentage of pre-European Extent Remaining in the City of Wanneroo	Percentage of pre-European Extent Protected in the City of Wanneroo	Priority
Bassendean Central and South	27.7	16.3	12.4	High – Critical
Bassendean Central and South Transition	97.7	99.6	99.6	Low
Bassendean North	72.2	51.4	50	Low
Bassendean North Transition	91.4	67	61.9	Low
Cottesloe Central and South	35.2	62.4	17.5	Medium
Cottesloe North	69	66	60.6	Low
Karrakatta Central and South	23.9	10.9	5.6	Critical
Karrakatta North	37.7	21.2	18	High
Karrakatta North Transition	88.8	79.5	79.1	Low
Quindalup	55.4	25.3	11.3	High
Herdsmen	34.6	41.2	28.6	Medium
Pinjar	30.1	20.7	16.3	High

Legend

Critical	Less than 30% of original extent remaining regionally; Less than 10% of original extent remaining locally; Less than 10% Protected.
High	Greater than 30% of original extent remaining regionally; Less than 30% of original extent remaining locally; Less than 30% Protected.
Medium	Greater than 30% of original extent remaining regionally; Adequately represented locally; Less than 30% Protected.
Low	Adequately represented regionally; Adequately represented locally; Adequately Protected.

Goals

The goals for this Local Biodiversity Plan are to protect, retain and manage biodiversity values and engage with the community. The City will aim to achieve the following goals through the implementation of the Action Plan in Part 6:

Protection

- Protect all **Critical** and **High-Critical** vegetation complexes remaining within the City of Wanneroo as far as reasonably practicable;
- Protect high Priority Local Natural Areas as far as reasonably practicable; and
- Increase formal protection of the Quindalup vegetation complex;

Retention

- Reduce incidence of illegal clearing to retain biodiversity values;

- Retain as much quality vegetation in the Quindalup complex in good or better quality as far as reasonably practicable;
- Increase native vegetation coverage in built environment through planting of appropriate native and area-specific species;
- Increase coverage of native species within the built environment through planting and design; and
- Investigate a partnership with the national 2020 Vision program to join the commitment to increasing urban green spaces by 20% by 2020.

Management

- Significantly improve internal planning and assessment processes to include the proactive consideration of biodiversity values upfront in assessment process;
- Inclusion of multi-criteria analysis results in the City of Wanneroo's planning and assessment process; and
- Increase knowledge of vegetation quality across the City of Wanneroo to ensure retention of good or better quality vegetation as far as reasonably practicable.

Engagement

- Increase engagement with community groups and general public about local biodiversity values; and
- Increase broad environmental awareness across all levels of the community through the use of technological advancements to implement environmental awareness and education initiatives.

4 Biodiversity Planning Precincts

To effectively plan for the retention and protection of natural areas and biodiversity values, the City of Wanneroo has been divided into six biodiversity planning precincts. The selection of each biodiversity planning precinct has been based on similar land use or proposed future land uses. A map of the Biodiversity Planning Precincts is provided in **Appendix E**.

4.1 Yanchep Two Rocks

The Yanchep-Two Rocks Biodiversity Planning Precinct covers an area of 7,550 ha and its boundary was determined using the Yanchep-Two Rocks District Structure Plan (Structure Plan No. 43). The precinct covers the suburbs of Yanchep and Two Rocks and is bounded by the Yanchep National Park, the Wilbinga National Park (in the Shire of Gingin) and the coastline. The precinct is currently the subject of significant urban development and is due to undergo further development in the future.

Vegetation Complexes

The Yanchep-Two Rocks Biodiversity Planning Precinct comprises two vegetation complexes; Quindalup and Cottesloe North. Of all vegetation within the City of Wanneroo, a majority of the Quindalup complex is located within this precinct. Due to significant land development in the northern corridor of the City of Wanneroo, the coverage of the Quindalup complex has been reduced by over 3,000 ha, of which over 2,300 ha has occurred within this precinct. The extent of each complex within this precinct is detailed in **Table 4**.

Table 4 – Remaining Vegetation within the Yanchep Two Rocks Biodiversity Planning Precinct

Vegetation Complex	Pre-European Extent in this Precinct (ha)	Current Extent in this Precinct (ha)
Cottesloe North	1,680	701
Quindalup	5,390	1,175

Priority Local Natural Areas

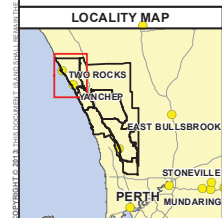
The total remaining native vegetation in the precinct is 1,876 ha, of which 1,076 ha represents Local Natural Area. The Priority Local Natural Areas within this precinct are shown in **Figure 10**, which demonstrates a relatively low to medium priority across the precinct. Key areas of medium priority include an area of the Two Rocks foreshore to the north of the Two Rocks marina, and two areas of land zoned Urban under DPS No. 2 that are not yet considered under the Local Structure Planning process. It is within these areas that proactive planning, policy and management will be afforded to protect as much good or better quality vegetation as possible.

Zoning

The majority of the precinct is zoned Urban Development and Development Control Area under DPS No. 2. A significant proportion of the precinct has already been accounted for under approved Local Structure Plans for residential development, and further residential development in this precinct is expected. Other zoning includes Parks and Recreation under the MRS, a small portion of Rural Community and General Industrial.

Actions and Opportunities

Areas of opportunity within this precinct include areas zoned Urban under DPS No. 2 that have not yet been considered through the Local Structure Planning process. Maximum good or better quality vegetation should be retained through proactive engagement with land developers, and through the planning approvals process. These areas are circled in red in **Figure 10**. Attention should also be focused on the section of foreshore north of the Two Rocks Marina which is shown to hold medium to high ecological value (**Figure 10**).



Legend

□ Planning Precinct Boundaries

Multiple Criteria Analysis - Factorial Weighting

● High Priority: 9.95

● Low Priority: 0.5

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2006
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2014
- Western Australian Land Information Authority 2015

Notes

- For the purposes of the multiple criteria analysis, all areas covered by the local structure plan have been omitted and only natural areas (LNA) have been analysed
- Railways and primary/regional road systems have also been omitted from the analysis

360 environmental solutions
 a 10 Beardonsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 24/05/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50		PROJECT NO 1990		

0 250 500 1,000 1,500 2,000
 Meters
 1:45,000 @ A3

City of Wanneroo

Local Biodiversity Plan
 2018/19 – 2023/24

Figure 10

Priority Local Natural Areas within the
Yanchep - Two Rocks Biodiversity
Planning Precinct

© Proprietary © APP1199 Wanneroo Local Biodiversity Strategy (2018/19) MCA Figure 24 - Multiple Criteria Analysis (Yanchep - Two Rocks) 2017

4.2 Alkimos Eglinton

The Alkimos-Eglinton Biodiversity Planning Precinct covers an area of approximately 2,660 ha and extends 3.5 km inland to the proposed future Mitchell Freeway with a coastal frontage of 7.5 km. It comprises the two suburbs of Alkimos and Eglinton. In a similar manner to the Yanchep Two Rocks precinct, the Alkimos-Eglinton precinct has undergone significant urban development with reduction in Local Natural Area primarily due to residential development.

The majority of the precinct is zoned Urban in the Metropolitan Region Scheme, with a large centre zone, an area accommodating a Water Corporation Waste Water Treatment Plant (WWTP) and large areas of regional open space.

Key developments currently under construction, or expected in the future in this precinct include:

- Extension of the Mitchell Freeway; and
- Urban development.

Vegetation Complexes

Four vegetation complexes are mapped within the Alkimos-Eglinton Biodiversity Planning Precinct; Cottesloe Central and South, Cottesloe North and Quindalup complexes, with a very small portion of the Herdsman complex (0.2 ha). The extent of each complex within this precinct is detailed in **Table 5**.

Table 5 – Remaining Vegetation within the Yanchep Two Rocks Biodiversity Planning Precinct

Vegetation Complex	Pre-European Extent in this Precinct (ha)	Current Extent in this Precinct (ha)
Cottesloe Central and South	677	163
Cottesloe North	2,200	15
Quindalup	2,257	716

Local Natural Area

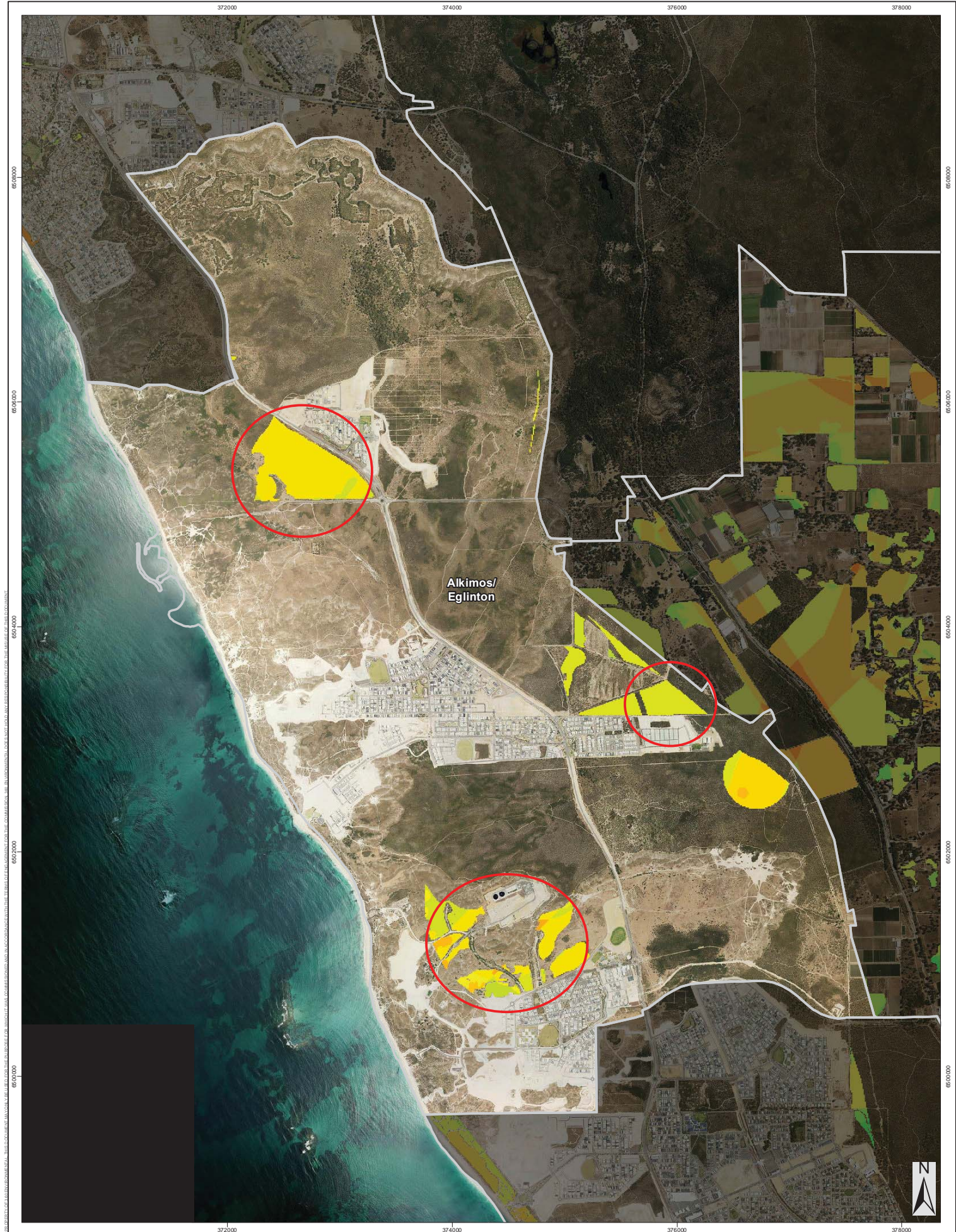
A total of 894 ha of native vegetation remains within the precinct, 226 ha of which represents Local Natural Area. **Figure 9** shows the remaining Local Natural Area within the Alkimos-Eglinton Biodiversity Planning Precinct and the priorities of these areas based on ecological criteria. **Figure 11** demonstrates a medium priority across the precinct with most of the Local Natural Area shown in yellow to orange.

Zoning

The majority of the precinct is zoned Urban Development under DPS No. 2. Other zoning includes Parks and Recreation and Public Purposes under the MRS.

Actions and Opportunities

Significant areas of opportunity exist within this precinct, representing areas zoned Urban under DPS No. 2 that have not yet been considered through the Local Structure Planning process where as much critical vegetation of the highest quality as possible must be retained. Additional opportunity areas where efforts should be focused include the areas of Local Natural Area around the proposed WWTP site. The Priority Local Natural Areas are shown in **Figure 11** and areas of opportunity circled in red.



Legend

- Planning Precinct Boundaries

Multiple Criteria Analysis - Factorial Weighting

- High Priority: 9.95
- Low Priority: 0.5

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2009
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2014
- Western Australian Land Information Authority 2015

Notes

- For the purposes of the multiple criteria analysis, all areas covered by the local structure plan have been omitted and only local natural areas (LNA) have been analysed
- Railways and primary/regional road systems have also been omitted from the analysis

360 environmental.com.au
 a 10 Beardonsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 24/05/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 150 300 600 900 1,200 1,500
 Meters
 1:30,000 @ A3

City of Wanneroo
Local Biodiversity Plan
2018/19 – 2023/24

Figure 11
Priority Local Natural Areas within the Alkimos Eglinton Biodiversity Planning Precinct

© Project 99 0 APP1930 Wanneroo Local Biodiversity Strategy Figures 11-15 | MCA Figure 44 - Multiple Criteria Analysis (Alkimos_Eglinton) 2017

4.3 State Forest / Regional and National Parks

The State Forest/Regional and National Parks Biodiversity Planning Precinct consists of mainly State Forest, Regional and National Parks. The precinct also contains small areas zoned General Rural under the DPS No. 2, most of which is Crown land where some protection can be assumed.

Vegetation Complexes

All twelve vegetation complexes mapped within the City of Wanneroo are located within the State Forest / Regional and National Parks precinct. The extent of each complex within this precinct is detailed in **Table 6**.

Table 6 – Remaining Vegetation within the State Forest / Regional and National Parks Biodiversity Planning Precinct

Vegetation Complex	Pre-European Extent in this Precinct (ha)	Current Extent in this Precinct (ha)
Bassendean Central & South	284	78
Bassendean Central & South	622	621
Bassendean North	8,096	4,421
Bassendean North – Transition	2,081	1,512
Cottesloe Central & South	1,906	422
Cottesloe North	6,704	4,816
Karrakatta Central & South	725	22
Karrakatta North	5,151	1,094
Karrakatta North Transition	2,346	1,865
Quindalup	71	69
Herdsmen	417	326
Pinjar	404	20

Local Natural Area

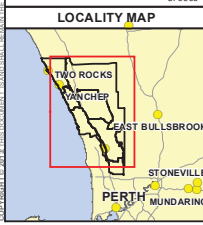
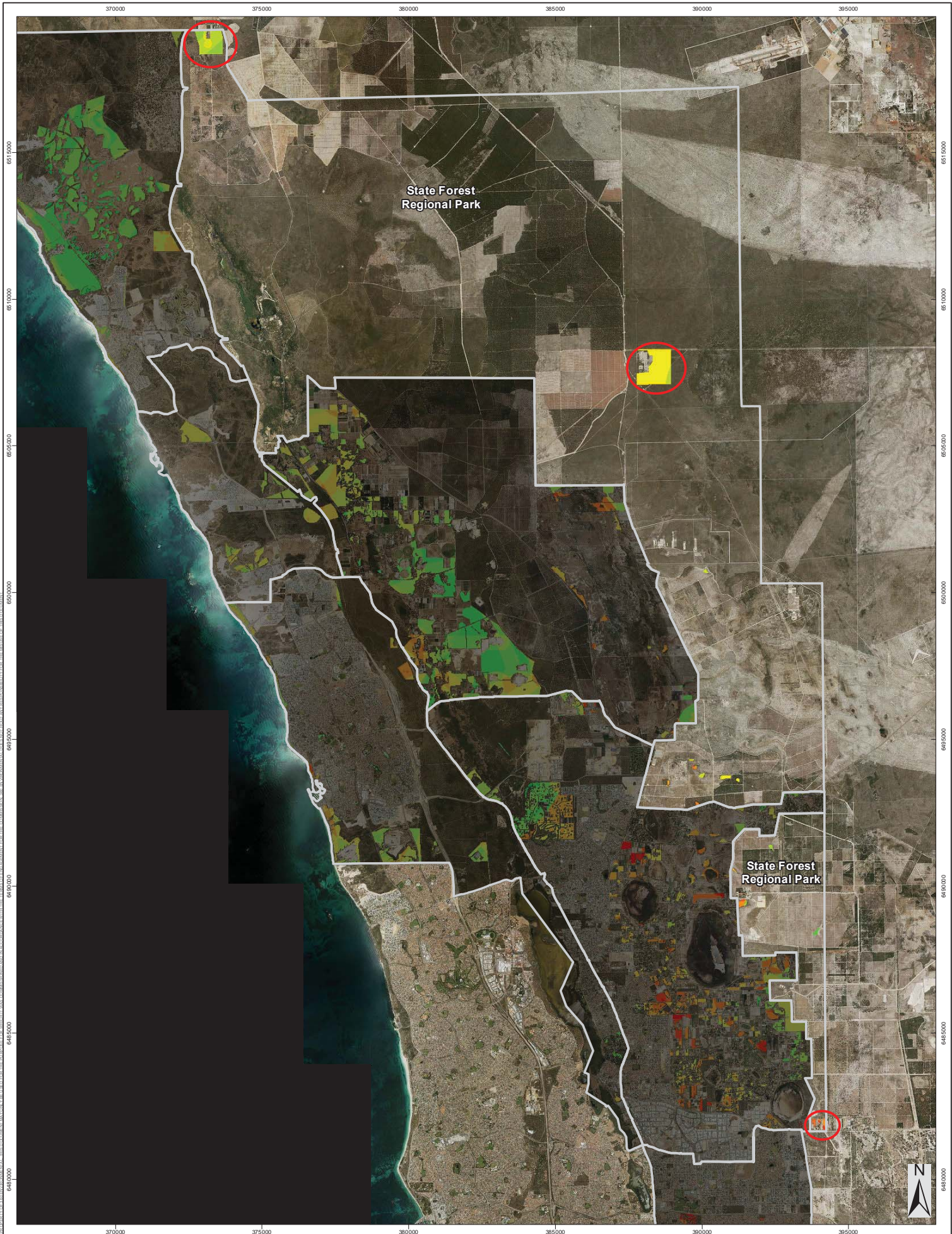
The total remaining native vegetation in the precinct is 15,220 ha, of which 207 ha represents Local Natural Area. **Figure 12** shows the Priority Local Natural Area within this precinct. A majority of this precinct remains as Protected Local Natural Area given it falls within Yanchep National Park and State Forest.

Zoning

The majority of the precinct is zoned State Forest and Parks and Recreation under the MRS. Other zoning includes Public Purposes under the MRS and General Rural under DPS No. 2.

Actions and Opportunities

Areas of opportunity for biodiversity protection and retention include a pocket of area zoned General Rural under DPS No. 2 and the Local Natural Area surrounding the Pinjar Power Station, which is zoned Public Purposes under the MRS and is known to comprise ecological values including Black Cockatoo habitat. Some high Priority Local Natural Area exists to the south of the precinct where protection efforts should be afforded.



Legend

- Planning Precinct Boundaries

Multiple Criteria Analysis - Factorial Weighting

- High Priority: 9.95
- Low Priority: 0.5

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2009
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2014
- © Western Australian Land Information Authority 2015

Notes

- For the purposes of the multiple criteria analysis, all areas covered by the local structure plan have been omitted and only local natural areas (LNA) have been analysed
- Railways and primary/regional road systems have also been omitted from the analysis

360 ENVIRONMENTAL
 a 10 Beardonsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 29/05/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50		PROJECT NO 1990		

0 625 1250 2500 3750 5000
 Meters
 1:115,000 @ A3

SLIP ENABLER

City of Wanneroo
Local Biodiversity Plan
2018/19 – 2023/24

Figure 12
Priority Local Natural Areas within the
State Forest Regional Park Biodiversity
Planning Precinct

© Copyright 2018 City of Wanneroo Local Biodiversity Strategy Figures 12-180 MCA Figure 12 - Multiple Criteria Analysis (State Forest Regional Park)

4.4 North East Wanneroo

The Northeast Wanneroo Biodiversity Planning Precinct comprises the suburbs of Carabooda, Pinjar and Nowergup and is largely characterised by land zoned for agricultural uses and State Forest. Due to the presence of a priority drinking water source area, much of the General Rural zone has been purchased by the State Government, assumed for protection as part of the Gngarara Sustainability Strategy.

Vegetation Complexes

Seven vegetation complexes are located within the Northeast Wanneroo Biodiversity Planning Precinct; Quindalup and Cottesloe North, the extent of which is shown in **Table 7**.

Table 7 – Remaining Vegetation within the Northeast Wanneroo Biodiversity Planning Precinct

Vegetation Complex	Pre-European Extent in this Precinct (ha)	Current Extent in this Precinct (ha)
Bassendean North	635	95
Cottesloe Central & South	5,226	1,845
Cottesloe North	320	221
Karrakatta Central & South	822	306
Quindalup	2	2
Herdsmen	555	125
Pinjar	2,363	732

Local Natural Area

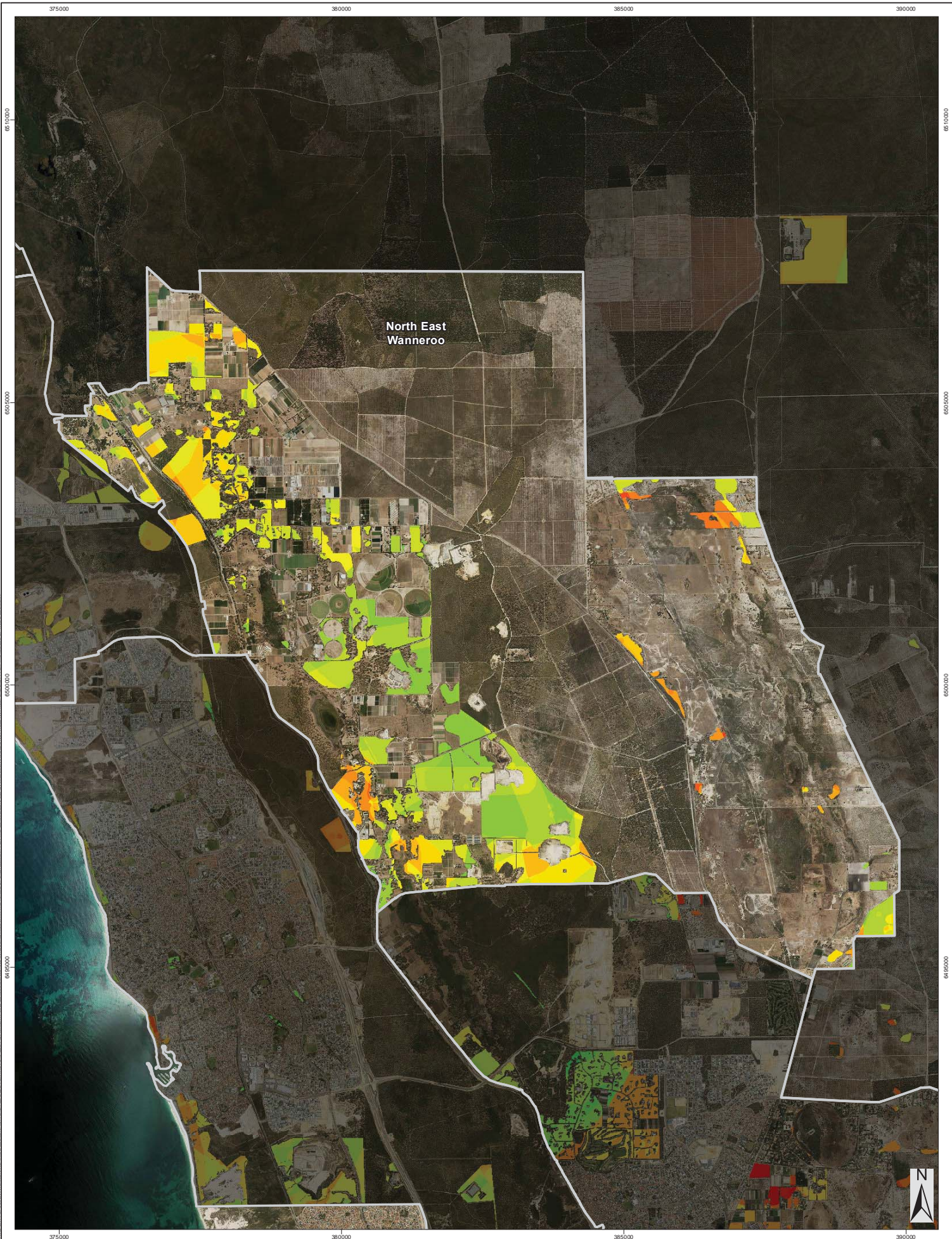
The total remaining native vegetation in the precinct is approximately 3,326 ha, of which 1,304 ha represents Local Natural Area. The Priority Local Natural Areas are shown in **Figure 13**, which demonstrates priorities ranging from low (green) to high (dark orange, red).

Zoning

The majority of the precinct is zoned Parks and Recreation and State Forest under the MRS. Most of the Local Natural Area falls within land zoned Rural Resource, General Rural and Special Rural under DPS No. 2.

Actions and Opportunities

Biodiversity retention and protection in this precinct may be achieved through landscape enhancement of the City's agricultural areas, as well as through careful consideration of priority local natural areas in future planning proposals.



Legend

- Planning Precinct Boundaries

Multiple Criteria Analysis - Factorial Weighting

- High Priority: 9.95
- Low Priority: 0.5

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2009
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2014
- © Western Australian Land Information Authority 2015

Notes

- For the purposes of the multiple criteria analysis, all areas covered by the local structure plan have been omitted and only natural areas (LNA) have been analysed
- Railways and primary/regional road systems have also been omitted from the analysis

360 ENVIRONMENTAL
 a 10 Beaudesey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 24/05/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 375 750 1,500 2,250 3,000
 Meters @ A3
 1:60,000

SLIP ENABLER

City of Wanneroo
Local Biodiversity Plan
2018/19 – 2023/24

Figure 13
Priority Local Natural Areas within the
North East Wanneroo Biodiversity
Planning Precinct

© Project 2018 0 APP1190 Wanneroo Local Biodiversity Strategy Figure 13 MCA Figure 5a - Multiple Criteria Analysis (North East Wanneroo)

4.5 South East Wanneroo

The Southeast Wanneroo Biodiversity Planning Precinct comprises the suburbs of Neerabup, Banksia Grove, Tapping, Mariginiup, Jandabup and Wanneroo through to Gnangara and Wangara. It consists of land already urbanised, land proposed for urbanisation and small-lot rural subdivisions. This area is the subject of the East Wanneroo Structure Plan planning process and the Neerabup Industrial Area and is due to undergo significant redevelopment in the near future. It also supports a number of Conservation category wetlands.

Vegetation Complexes

Seven vegetation complexes are located within the Southeast precinct; the extent of which are described in **Table 8**.

Table 8 – Remaining Vegetation within the Southeast Wanneroo Biodiversity Planning Precinct

Vegetation Complex	Pre-European Extent	Current Extent 2016 (ha)
Bassendean Central & South	559	94
Bassendean North	252	22
Bassendean North – Transition	409	159
Cottesloe Central & South	1,314	311
Karrakatta Central & South	4,816	492
Herdsmen	470	113
Pinjar	2,132	261

Local Natural Area

The total remaining native vegetation in the precinct is 1,452 ha, of which 860 ha represents Local Natural Area. The Local Natural Areas are shown in **Figure 14**, which demonstrates a significant number of areas of high to medium priority.

Much of the local natural area identified through the LBS correlates with broad and specific commitments identified in the draft PPGGP documentation. The draft PPGGP is proposing that the planning system be the vehicle for determining which of the broad commitment areas should end up being protected.

In the draft PPGGP, areas of broad and specific commitments indicate probable constraints to land use change and development, and will be dealt with through the planning process for the East Wanneroo Structure Plan area.

By identifying priority local natural areas that overlap and coincide with the broad and specific commitments, the LBP will assist in reducing some constraints to development and land use change by further refining environmental values in this area, meaning that the highest priority environmental values will be protected through the planning process.

The EPA, in its assessment reports on a number of Metropolitan Region Scheme amendments for this area, has said that it sees that the local planning scheme will be the instrument for giving this protection.

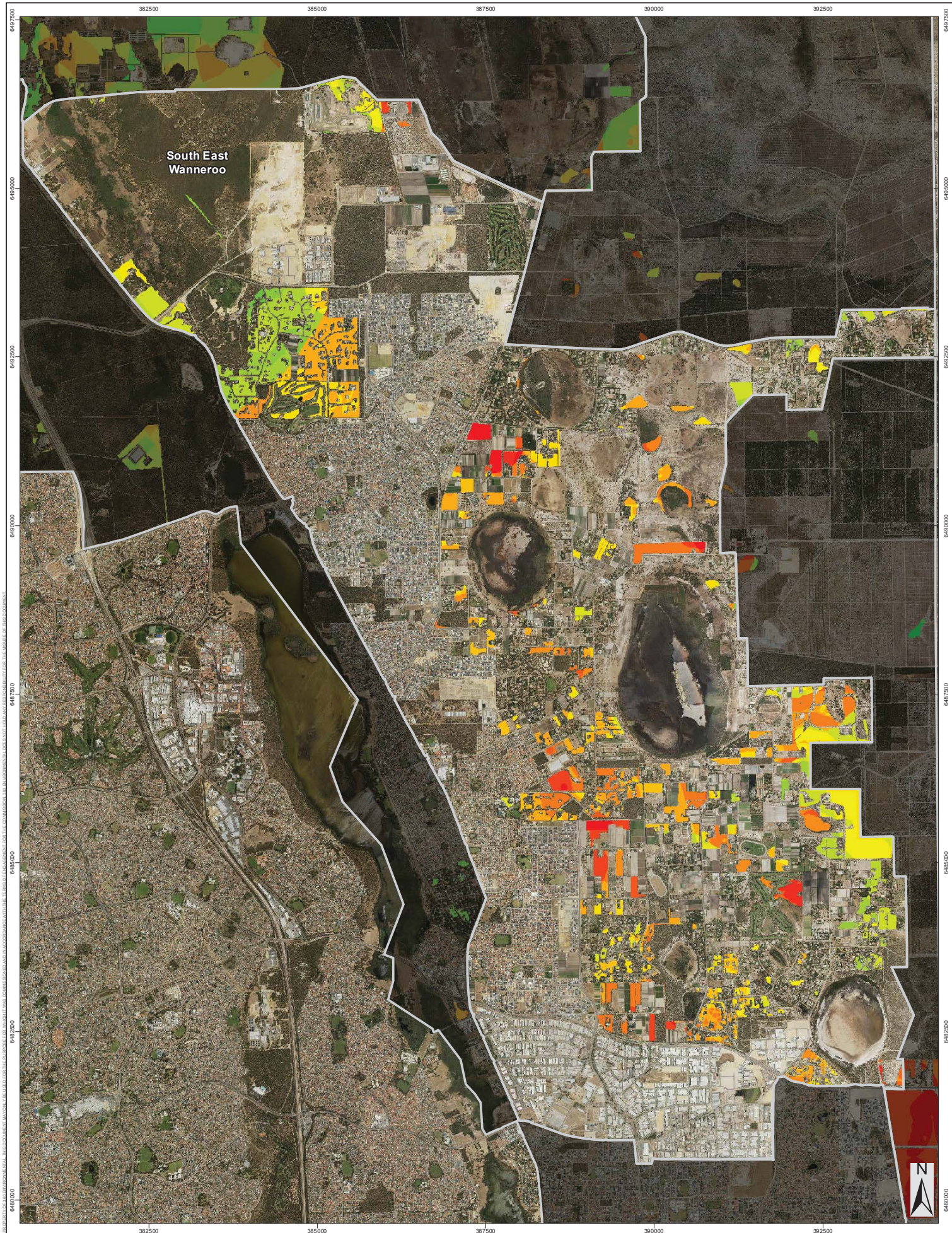
The proposed urban part of this area will be subject to district structure planning and subsequently local structure planning. During this process, the matter of determining which areas will need to be protected, and how, will need to be addressed in greater detail, taking into account not only the broad and specific commitments outlined in the draft PPGGP, but also the priority local natural areas identified in the LBP.

Zoning

The majority of the precinct is zoned Industrial Development, Rural Resource, Special Rural, General Rural and Urban Development under DPS No. 2.

Actions and Opportunities

Protection and retention of biodiversity in this precinct should focus on priority local natural areas and priority areas identified in the draft PPGP which would be identified through the planning process for the development of East Wanneroo.



Legend

□ Planning Precinct Boundaries

Multiple Criteria Analysis - Factorial Weighting

■ High Priority: 9.95

■ Low Priority: 0.5

DATA SOURCES

• CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
 • LOCALITY MAP SOURCED LANDGATE 2006
 • AERIAL PHOTOGRAPHY SOURCED LANDGATE 2014
 • © Western Australian Land Information Authority 2015

Notes

- For the purposes of the multiple criteria analysis, all areas covered by the local structure plan have been omitted and only local natural areas (LNA) have been analysed
- Railways and primary/regional road systems have also been omitted from the analysis

360
 environmental
 10 Bemondsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 24/05/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 250 500 1,000 1,500 2,000 2,500
 Meters
 1:50,000 @ A3

SLIP ENABLER

City of Wanneroo
Local Biodiversity Plan
 2018/19 – 2023/24

Figure 14
Priority Local Natural Areas within the
South East Wanneroo Biodiversity
Planning Precinct

4.6 South West Wanneroo

The Southwest Wanneroo Biodiversity Planning Precinct largely consists of developed areas. This precinct has limited scope for biodiversity protection and retention. However, opportunity exists in improving native vegetation within the built environment, and through future local structure planning processes. A majority of vegetation within this precinct is located within the Neerabup National Park, which the City of Wanneroo manages.

Vegetation Complexes

Five vegetation complexes are located within the Southwest Wanneroo precinct, the extent of which are described below in **Table 9**.

Table 9 – Remaining Vegetation within the Southwest Wanneroo Biodiversity Planning Precinct

Vegetation Complex	Pre-European Extent	Current Extent 2016 (ha)
Bassendean Central & South	265	10
Cottesloe Central & South	4,198	1,569
Karrakatta Central & South	3,189	310
Quindalup	1,069	246
Herdsmen	319	54

Local Natural Area

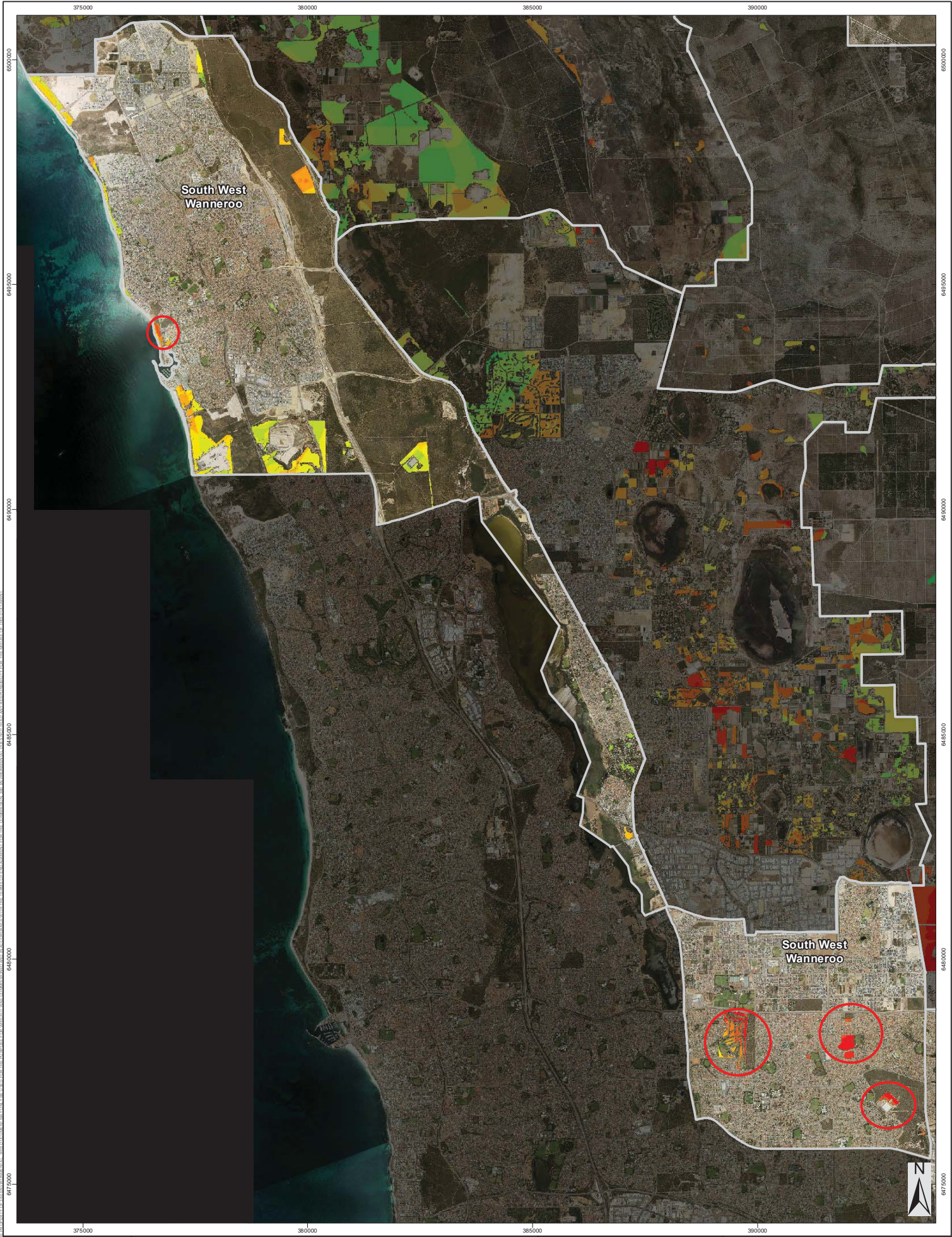
The total remaining native vegetation in the precinct is 2,189 ha, of which 396 ha represents Local Natural Area. The Local Natural Areas within the precinct are shown in **Figure 15**, which demonstrates areas of higher priority to the southeast of the precinct.

Zoning

The majority of the precinct is Parks and Recreation under the MRS, and Public Purposes, Residential and Urban Development under DPS No. 2.

Actions and Opportunities

Key opportunity areas for biodiversity protection include two reserves in Alexander Heights that are yet to be vested for conservation purposes. The Marangaroo Golf Course is depicted as a high priority area due to the presence of Karrakatta Central and South vegetation complex and its proximity to a Conservation Reserve, as well as the presence of Black Cockatoo foraging habitat.



Legend

□ Planning Precinct Boundaries

Multiple Criteria Analysis - Factorial Weighting

● High Priority: 9.95

● Low Priority: 0.5

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2009
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2014
- Western Australian Land Information Authority 2015

Notes

1. For the purposes of the multiple criteria analysis, all areas covered by the local structure plan have been omitted and only local natural areas (LNA) have been analysed
2. Railways and primary/regional road systems have also been omitted from the analysis

360 environmental.com.au
 a 10 Belmont St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED KC	REVISION 01	DATE 25/05/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 375 750 1,500 2,250 3,000
 Meters
 1:75,000 @ A3

City of Wanneroo

Local Biodiversity Plan
 2018/19 – 2023/24

Figure 15

Priority Local Natural Areas within the South West Wanneroo Biodiversity Planning Precinct

5 Strategies for Biodiversity Protection

The implementation of the strategies for the protection, retention and management of biodiversity values within the City of Wanneroo as listed in Table 10 are described in further detail below.

5.1 Planning

Utilise the planning system to maintain and protect the City's biodiversity assets.

5.1.1 District Planning Scheme No. 2 – Conservation and Passive Recreation

Further to the amendment to DPS No. 2 to expand the local reserve classification to include 'Conservation', it has been observed that some further refinement of internal processes is required to ensure the consistency of its implementation. This might involve a review of reserve classifications in all Local Structure Plans to identify and rectify any gaps, and ensure that the implementation of the amendment across all Local Structure Plans is consistent.

A review of management responsibilities across all State owned land is also required to ensure that Management Orders are up to date and consistent with reserve classifications, particularly for reserves classified as Conservation.

5.1.2 Building Envelopes

To reduce vegetation clearing in General Rural and Rural Resource zoned areas, particularly within the Northeast Wanneroo Biodiversity Planning Precinct (**Figure 13**), one potential planning mechanism that the City of Wanneroo could investigate is the implementation of protection zones through future Structure Planning and Subdivision processes. This could involve setting specific design parameters for development on a lot that would be marked on a development guide plan or a subdivision guide plan. Protection zones have the potential to conserve biodiversity values through minimising the clearing of native vegetation, minimising impact of development on waterways, retaining natural contours in the landscape, and protecting rural amenity. This could also be a mechanism that addresses bushfire management.

5.1.3 East Wanneroo and the Draft Green Growth Plan

It is critical that the results of this Local Biodiversity Plan and particularly the locations of medium to high Priority Local Natural Areas (**Figure 14**) are considered upfront in the rezoning and redevelopment of the East Wanneroo area within the Southeast Wanneroo Biodiversity Planning Precinct. The identification of priority areas in the LBP should be used in conjunction with the broad commitments identified through the draft Green Growth Plan in order to retain Priority Local Natural Areas.

5.2 Local Government Process

Strengthen internal processes to ensure highest consideration of biodiversity and environmental values in planning and assessment.

5.2.1 Revision of internal planning and assessment process

One of the key findings during the revision of the *Local Biodiversity Strategy 2011 – 2016* was the need for internal planning and assessment processes within the City of Wanneroo to be reviewed, updated and strengthened to ensure that biodiversity values are considered upfront in all processes, and that the process is set out in a clearly defined framework. A review needs to be undertaken which involves process mapping across all relevant business units within the City of Wanneroo who are involved in the planning and assessment of Local Structure Plans, Development Applications, Native Vegetation Clearing Permits, Management Plans and other planning documentation involving impact or alteration to the natural environment. This review would also involve significant internal education and formal mapped processes developed into an implementation framework or

guidance material, to clearly define the process, responsibilities and relevant business units. Focus should be on proactive consideration of biodiversity values, inclusion of the Priority Local Natural Area mapping as a result of this Local Biodiversity Plan, and vegetation quality data, as well as well-defined ArcGIS mapping and data management.

5.2.2 Illegal clearing

The City of Wanneroo experiences illegal clearing contributing to the loss of biodiversity values which needs to be actioned both internally and with State Government authorities. The preparation of a set of guidelines to provide guidance to landowners on revegetation of rural areas as a result of development should be investigated.

5.2.3 GIS Data

Maintaining a GIS system with up to date data is critical to successful planning and environmental management for any Local Government Authority and organisation. Through the development of this Local Biodiversity Plan it was evident that the City of Wanneroo would benefit from the collection and incorporation of flora and fauna survey data from developers, including vegetation quality assessment data, for storage in the ArcGIS database. Such data would enable more informed environmental planning and management for officers, and therefore enable a more proactive approach to protecting, retaining and managing Priority Local Natural Areas. The City of Wanneroo will also investigate the incorporation of the multi-criteria analysis results into the GIS system, and potentially for public viewing on the IntraMaps database.

5.3 Policy

Review, improve and align policies to incorporate protection and conservation of biodiversity values and the natural environment.

5.3.1 Local Biodiversity

Action 3.1 of **Table 10** discusses the potential for the development of a policy that addresses approaches to the retention of native vegetation through the planning process by ensuring that planning proposals consider the priorities for protection as identified in the LBP. Such a policy would also consider vegetation quality as well as Priority Local Natural Areas and vegetation extent across the City of Wanneroo to ensure that native vegetation protected or retained is of good or better quality, and is considered upfront in development and assessment processes for a best environmental outcome. Retaining a quantity of vegetation in a Public Open Space reserve might not necessarily be the best environmental outcome if that vegetation is of poor or degraded quality, therefore the policy should have focus on protection and retention of good or better quality vegetation as far as reasonably practicable.

5.3.2 Waste

In 2017, significant movements are being made locally and globally with respect to waste management. The City of Wanneroo has an opportunity to encourage innovative waste management initiatives through programs and policy, for example, banning plastic bags across the entire Local Government area. Reduction in waste, particularly plastic waste, will lead to environmental improvements locally and regionally, and significant change can be made at Local Government level.

5.4 Natural Resource Management

Maintain and enhance biodiversity assets through innovative land management projects.

5.4.1 Natural Areas Asset Management Plan

A Natural Areas Asset Management Plan (NAAMP) should be developed for the City of Wanneroo in accordance with the requirements of the Integrated Planning and Reporting Framework. A NAAMP would provide context, technical and policy framework for the management of all natural areas reserves within the City of Wanneroo. In a similar manner to other Local Government Authorities, the NAAMP would establish a consistent, holistic planning methodology to achieve and maintain a cohesive approach to the management of all natural areas across the City of Wanneroo. It would act as an overarching management document to individual management plans that relate to specific site conditions of reserves.

5.4.2 Bushland Assessment

An update of the Bushland Assessment should be investigated by the City to assess vegetation quality, in particular areas of conservation priority to ensure that those areas of good or better quality are afforded greater natural resource management effort and conservation, and /or priority for formal protection. Given vegetation quality was not able to be considered as part of the multi-criteria analysis to determine Priority Local Natural Areas, further consideration of vegetation quality needs to be undertaken. This could also involve the use of ArcGIS to store vegetation quality data and ensure that areas of high quality within the City of Wanneroo are mapped, understood and recognised.

5.5 Partnerships

Establish collaborative working partnerships with public and private organisations to enable strategic long term environmental outcomes.

5.5.1 Bushfire Planning and Management

With specific reference to land and bushfire management, it is apparent that the relationship between the City of Wanneroo and the Department of Fire and Emergency Services needs to be strengthened in order to achieve greater communication and collaboration on fire and conservation reserve management so that fire safety can be achieved while maintaining protection of our biodiversity values. This could involve regular informal meetings to discuss environmental issues, facilitate knowledge sharing and education across both organisations and potentially lead to improved management outcomes.

5.5.2 Working Relationships

By taking a collaborative approach to environmental planning and management with other Local and State Government agencies, the City of Wanneroo will be able to achieve greater environmental and sustainability outcomes. Bordered by the Shire of Gingin, the City of Swan, City of Joondalup and City of Stirling, all Local Government authorities essentially share and manage the same or similar environment. Collaboration with other Local Government agencies should improve resource efficiency, enable knowledge sharing and improve overall environmental management outcomes.

As with Local Government agencies, there should also be an emphasis on the development of proactive and collaborative, consultative relationships with land developers to encourage consideration and discussion of environmental issues upfront in the planning process. It is thought that through strengthening relationships with land developers that environmental issues and opportunities can be identified earlier in the planning and assessment process and greater achievements in conservation can result.

5.6 Community Engagement and Education

Engage and educate the community in programs and projects that increase knowledge and awareness in biodiversity.

5.6.1 Community Education Strategy

To continue to engage the community, improve attitudes and environmental awareness and increase environmental education, the City of Wanneroo should investigate the development and implementation of a Community Education Strategy. This would include a range of innovative and inclusive community education programs and initiatives including volunteer programs, programs similar to the Living Smart Program and initiatives involving local schools.

5.6.2 Community Participation in Data Collection

The City of Wanneroo in partnership with Quinns Rocks Environment Group (QREG) are currently implementing an interpretive signage project within reserves in the Quinns Rocks area including Gumblossom Reserve and the South Mindarie Trail, enabling community participation in data collection. The Gumblossom Reserve trail has been set up by the QREG in partnership with ClimateWatch, a citizen science initiative by Earthwatch Institute. Similar citizen mapping initiatives could be investigated for other reserves and areas within the City of Wanneroo to increase knowledge and participation among the local community in an innovative manner.

6 Implementation Plan

The strategies and actions to be investigated and implemented as a part of this plan are listed in **Table 10**. A priority has been set for each of the actions based on discussion with City of Wanneroo officers during workshops for this Local Biodiversity Plan and are described as follows:

High

– Action of greatest importance and likely to have significant and most immediate influence over protection of biodiversity values;

Medium

– Action of moderate importance and likely to be long term in nature and/or likely to have immediate influence with community; and

Low

– Action of lower importance which is considered to be of little to no relevance to a given Planning Precinct.

N/A

– The action is not applicable to the biodiversity precinct.

Table 10 –Actions for the Local Biodiversity Plan

Number	Action	Precinct						Approximate time frame (financial year)
		Yanchep - Two Rocks	Alkimos - Eglinton	State Forest – Regional and National Parks	Northeast Wanneroo	Southeast Wanneroo	Southwest Wanneroo	
1 - Planning - Utilise the planning system to maintain and protect the City's biodiversity assets.								
1.1	As part of the structure plan normalisation process, review reserve classifications in approved Local Structure Plans and ensure that Conservation Reserves are properly designated with the Conservation Reserve classification; and Amend Management Orders to include a Conservation and Passive Recreation Reserve Purpose for those reserves classified as 'Conservation' under District Planning Scheme No. 2.							2020/21 & ongoing
1.2	Investigate the inclusion of provisions into future Local Structure Plans and Subdivisions to establish protection zones in future Rural Residential and Rural Resource zoned areas to limit removal of native vegetation.							2020/21 & ongoing
1.3	When providing input into the planning of East Wanneroo, ensure that the Priority Natural Areas identified in the LBP are considered in order to retain environmental values of particular importance to the City.							2019/20
2 - Local Government Process – Strengthen internal processes and links to the City's Strategic Community Plan to ensure consideration of community expectations of biodiversity and environmental values in planning and assessment.								
2.1	Ensure that the City's internal planning and assessment process produces a clearly defined framework that incorporates vegetation complex data and priority local natural areas as key planning considerations.							2019/20
2.2	Establish guidelines to assist landowners with revegetation being carried out as a result of authorised or unauthorised development.							2021/22
2.3	Investigate the incorporation of flora and fauna survey data produced by developers through the planning and approvals process, into the City's internal GIS database in order to improve on ground Management of City reserves; and Investigate the incorporation of priority local natural area data and vegetation complex mapping into the City's GIS in order to better inform planning considerations where vegetation removal is proposed.							2019/20
3 - Policy - Review, improve and align City Policies, Strategies and Plans to incorporate protection and conservation of biodiversity values and the natural environment.								
3.1	Prepare a local planning policy that provides guidance on planning considerations that propose vegetation removal, and would ensure that priority areas for protection are considered throughout the planning process.							2019/20
3.2	Investigate an approach to waste minimisation and management by ensuring regular review of the City's Waste Policy.							Ongoing (biennially)
4 - Natural Resource Management – Maintain and enhance biodiversity assets through innovative land management projects.								
4.1	Develop and implement a Natural Area Asset Management Plan.							2019/20
4.2	Investigate implementing a review and update of the City's Bushland Assessment that looks at vegetation quality and biodiversity values of conservation reserves such as priority local natural areas identified in the LBP.							2019/20

Number	Action	Precinct						Approximate time frame (financial year)
		Yanchep - Two Rocks	Alkimos - Eglinton	State Forest – Regional and National Parks	Northeast Wanneroo	Southeast Wanneroo	Southwest Wanneroo	
5 - Partnerships – Establish collaborative working partnerships with public and private organisations to enable strategic long term environmental outcomes.								
5.1	Collaborate with the Department of Fire and Emergency Services to improve the relationship between bushfire planning and management and biodiversity conservation within the City.							2020/21 & ongoing
5.2	Investigate the establishment of collaborative working relationships with Local Government Authorities that share a boundary with the City (Swan, Gingin, Joondalup and Stirling) to improve long term strategic environmental and biodiversity management.							2020/21
6 - Community Engagement and Education – Engage and educate the community in programs and projects that increase knowledge and awareness of biodiversity.								
6.1	Develop a community education strategy or program educating residents in all aspects of sustainable living and environmental management including: <ul style="list-style-type: none"> o Wildlife and local biodiversity, o Community engagement with a focus on local schools; The importance of trees and the natural environment for health and wellbeing.							2020/21
6.2	Investigate enabling community participation and engagement in data collection in the City’s Conservation Reserves.							2022/23

* The types of resource implications can be described as follows:

- Resources required – Additional staffing and budget resources may be required to carry out the action.
- No additional resources – The action requires no additional resources and will be undertaken using existing City resources.

7 Continuous Improvement and Review

As a five year action plan, review of this Local Biodiversity Plan should be undertaken regularly to ensure the City of Wanneroo is achieving progress against the actions, and to maintain its relevancy. Reviews need to consider:

- An update of vegetation extent across the local government area to account for clearing of native vegetation each year;
- A review of the multi-criteria analysis to review priority areas including a review of ecological criteria and factorial weightings;
- Analysis of progress against the actions listed in the Action Plan;
- Review of existing and consideration of additional actions for the Action Plan contributing towards a progressive and sustainable direction for the City of Wanneroo.

It is envisaged that in 2024, this Local Biodiversity Plan will be fully revised and a Local Biodiversity Plan 2024/25 – 2029/30 be prepared and implemented.

8 References

City of Joondalup and Department of Conservation and Land Management (CALM) 2003. *Yellagonga Regional Park Management Plan 2003-2013*, Government of Western Australia.

City of Wanneroo, 2008. *City of Wanneroo Local Environment Plan 2009 – 2014*, Government of Western Australia.

City of Wanneroo, 2013. *Building a Future Together Strategic Community Plan 2013/14 – 2022/23*, Government of Western Australia.

City of Wanneroo, 2016, *Climate Change Adaptation and Mitigation Strategy 2016-2020*, Government of Western Australia.

Cresswell ID & Murphy HT, 2017. *Australia State of the Environment 2016: Biodiversity*, Independent Report to the Australian Government Minister for the Environment and Energy, Australian Government Department of the Environment and Energy, Canberra.

CSIRO (Commonwealth Scientific and Industrial Research Organisation) 2015. *Australian national outlook 2015: economic activity, resource use, environmental performance and living standards, 1970–2050*, CSIRO, Canberra.

Department of Environment and Conservation (DEC) 2012a. *Parks and Reserves of Yanchep and Neerabup management Plan 76*, Government of Western Australia.

Department of Environment and Conservation (DEC), 2012b. *Adapting to our changing climate*, Government of Western Australia.

Department of the Environment and Energy (DotEE) 2016. *Australia State of the Environment 2016; Biodiversity*, Commonwealth of Australia.

Department of the Environment, Water, Heritage and the Arts (DotEWA) 2008. *Assessment of Australia's Terrestrial Biodiversity 2008 – Chapter 5 Threats to Australian Biodiversity*. Commonwealth of Australia.

Department of Parks and Wildlife (DPaW) 2013. *A methodology for the evaluation of specific wetland types on the Swan Coastal Plain*, Western Australia. Government of Western Australia.

Hedde E.M., Loneragan O.W. and Havel J.J. (1980) *Vegetation of the Darling System*. IN: DCE 1980 Atlas of Natural Resources, Darling System, Western Australia. Department of Conservation and Environment, Perth, Western Australia.

Natural Resource Management Ministerial Council (NRMMC), 2010, *Australia's Biodiversity Conservation Strategy 2010-2030*, Department of Sustainability, Environment, Water, Population and Communities, Commonwealth of Australia.

Perth Biodiversity Project, 2004, *Local Government Biodiversity Planning Guidelines for the Perth Metropolitan Region*. Report authors: Del Marco, A., Taylor, R., Clarke, K., Savage, K., Cullity, J., and Miles, C., Perth.

Perth Biodiversity Project, 2007, *Local Government Biodiversity Planning Guidelines: Addendum to Chapter 26, July 2007*. WALGA, West Perth.

Perth Biodiversity Project, 2015, *Vegetation Statistics Statewide 2015 Full Report*, Western Australian Local Government Association (WALGA), Perth.

Southwest Australia Ecoregion Initiative, 2006. The Southwest Australia Ecoregion – Jewel of the Australian Continent. http://awsassets.wwf.org.au/downloads/wa006_swer_jewel_of_the_australian_continent_1apr06.pdf

Western Australian Planning Commission (WAPC), 2011. *Directions Paper on the Integration of NRM into Land Use Planning*. Government of Western Australia.

9 Glossary and Acronyms

Term / Acronym	Definition
BC Act	<i>Biodiversity Conservation Act 2016</i>
CALM Act	<i>Conservation and Land Management Act 1984</i>
CCW	Conservation Category Wetland
CHRMAP	Coastal Hazard Risk Management and Adaptation Plan
CoW	City of Wanneroo
DPaW	Department of Parks and Wildlife
DPS No. 2	District Planning Scheme No. 2
EP Act	<i>Environmental Protection Act 1986</i>
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
GIS	Geographical Information System
LBP	Local Biodiversity Plan
LBS	Local Biodiversity Strategy
LNA	Local Natural Area
LSP	Local Structure Plan
TEC	Threatened Ecological Community
PEC	Priority Ecological Community
Local Natural Areas	<p>All unprotected natural areas over which the City of Wanneroo can exercise the most control through its decision-making powers, policies and reserve management. Local Natural Areas include:</p> <ul style="list-style-type: none"> • Natural areas located on private property; • Natural areas located in public or regional open space, managed by the City of Wanneroo but not fully recognised as being managed for the purpose of conservation¹⁷; • State Government freehold land not zoned Parks and Recreation under the MRS. <p>Local Natural Areas are the focus of this plan as the City of Wanneroo can exercise the most control over these areas in relation to protection, retention and management.</p>
MRS	Metropolitan Region Scheme
MUW	Multiple Use Wetland
Partially Protected Natural Areas	<p>Natural areas that exist outside of the natural areas defined above. Partially Protected Natural Areas are considered to have partial protection because they have some level of protection but the City of Wanneroo has limited opportunity to influence increasing the protection level, or the protection level will be enforced through planning decisions. Partially Protected Natural Areas include areas like Bush Forever sites and include cover:</p> <ul style="list-style-type: none"> • State Government freehold land zoned Parks and recreation under the MRS; • Bushland areas in the State Forest; and • Privately owned areas zoned Parks and Recreation under the MRS.

¹⁷ Full recognition would be the inclusion of the natural area in a regional open space or conservation public open space and vested for a purpose that includes conservation.

Protected Natural Areas	Natural areas within the City of Wanneroo that are considered formally protected and include: <ul style="list-style-type: none"> • Natural areas occurring on Crown land vested with the State Government, managed for conservation and zoned Parks and Recreation under the MRS; • Natural areas occurring on Crown land vested with the City of Wanneroo and managed for the purpose of conservation; and • Private land over which a conservation covenant is applied.
Priority Local Natural Areas	Areas of Local Natural Area
PD Act	<i>Planning and Development Act 2005</i>
REW	Resource Enhancement Wetland
Vegetation Complex	A pattern of vegetation communities at a regional scale (as defined by Heddlé <i>et al.</i> 1980) that reflect the underlying landform and soil elements.
WAPC	Western Australian Planning Commission
WC Act	<i>Wildlife Conservation Act 1950</i>
WWTP	Waste Water Treatment Plant

10 Appendices

APPENDIX A – Significant Biodiversity Features within the City of Wanneroo

Significant Flora Species

Rare and Priority flora species known to occur within the City of Wanneroo are listed below in **Table 11**.

Table 12 – Significant Flora Species in the City of Wanneroo

Scientific Name	Protection status under the EPBC Act	Protection status under the WC Act
<i>Acacia benthamii</i>	-	Priority 2
<i>Adenanthos cygnorum</i> subsp. <i>chamaephyton</i>	-	Priority 3
<i>Amanita carneiphylla</i>	-	Priority 3
<i>Amanita wadulawitu</i>	-	Priority 2
<i>Baeckea</i> sp. <i>Limestone</i> (N. Gibson & M.N. Lyons 1425)	-	Priority 1
<i>Caladenia huegellii</i>	Endangered	Threatened
<i>Calandrinia oraria</i>	-	Priority 3
<i>Calectasia elegans</i>	-	Priority 2
<i>Conostylis bracteata</i>	-	Priority 3
<i>Conostylis pauciflora</i> subsp. <i>euryrhipis</i>	-	Priority 4
<i>Conostylis pauciflora</i> subsp. <i>pauciflora</i>	-	Priority 4
<i>Cyathochaeta teretifolia</i>	-	Priority 3
<i>Dampiera triloba</i>	-	Priority 3
<i>Dasymalla axillaris</i>	-	Threatened
<i>Drosera x sidjamesii</i>	-	Priority 1
<i>Eucalyptus argutifolia</i>	Vulnerable	Threatened
<i>Fabronia hampeana</i>	-	Priority 2
<i>Haloragis</i> sp. <i>Parrot Ridge</i> (G.J. Keighery 11563)	-	Priority 1
<i>Hibbertia spicata</i> subsp. <i>leptothea</i>	-	Priority 3
<i>Jacksonia gracillima</i>	-	Priority 3
<i>Jacksonia sericea</i>	-	Priority 4
<i>Lasiopetalum membranaceum</i>	-	Priority 3
<i>Lecania sylvestris</i>	-	Priority 2
<i>Lecania turicensis</i> var. <i>turicensis</i>	-	Priority 2
<i>Lepidium pseudotasmanicum</i>	-	Priority 4
<i>Leucopogon maritimus</i>	-	Priority 1
<i>Leucopogon</i> sp. <i>Yanchep</i> (M. Hislop 1986)	-	Priority 3
<i>Marianthus paralius</i>	-	Threatened
<i>Melaleuca</i> sp. <i>Wanneroo</i> (G.J. Keighery 16705)	-	Priority 1
<i>Pimelea calcicola</i>	-	Priority 3
<i>Pithocarpa corymbulosa</i>	-	Priority 3

<i>Placynthium nigrum</i>	-	Priority 3
<i>Poranthera moorokatta</i>	-	Priority 2
<i>Rinodina bischoffii</i>	-	Priority 2
<i>Sarcozona bicarinata</i>	-	Priority 3
<i>Sphaerolobium calcicola</i>	-	Priority 3
<i>Stenanthemum sublineare</i>	-	Priority 2
<i>Stylidium longitubum</i>	-	Priority 4
<i>Stylidium maritimum</i>	-	Priority 3
<i>Tetraria sp. Chandala (G.J. Keighery 17055)</i>	-	Priority 2
<i>Thelymitra variegata</i>	-	Priority 2
<i>Tripterococcus sp. Brachylobus (A.S. George 14234)</i>	-	Priority 4

Information sourced from: Department of Parks and Wildlife Threatened and Priority Flora Database search results for the City of Wanneroo Local Government Area dated 13 May 2017.

Significant Fauna Species

Rare and Priority fauna species known to occur within the City of Wanneroo are listed below in **Table 12**.

Table 13 – Significant Fauna Species in the City of Wanneroo

Scientific Name	Common Name	Protection status under the EPBC Act	Protection status under the WC Act
<i>Falco peregrinus macropus</i>	Peregrine Falcon	-	Schedule 7
<i>Isodon obesulus fusciventer</i>	Southern Brown Bandicoot	-	Priority 4
<i>Caretta caretta</i>	Loggerhead Turtle	Endangered; Marine; Migratory	Endangered
<i>Merops ornatus</i>	Rainbow Bee Eater	-	Schedule 5
<i>Hylaeus globuliferus</i>	Woolybush Bee	-	Priority 3
<i>Synemon gratiosa</i>	Graceful Sun Moth	-	Priority 4
<i>Neelaps calonotos</i>	Black Striped Snake	-	Priority 3
<i>Hurleya sp. (WAM642-97)</i>	Crystal Cave Crangonyctoid Amphipod	-	Critically Endangered
<i>Calyptorhynchus latirostris</i>	Carnaby's Cockatoo	Endangered	Endangered
<i>Ardea modesta</i>	Great Egret	Marine	Schedule 5
<i>Apus pacificus pacificus</i>	Fork-tailed Swift	Marine; Migratory	Schedule 5
<i>Calidris ruficollis</i>	Red-necked Stint	Marine; Migratory	Schedule 5
<i>Macropus Irma</i>	Western Brush Wallaby	-	Priority 4
<i>Oxyura australis</i>	Blue-billed Duck	-	Priority 4
<i>Plegadis falcinellus</i>	Glossy Ibis	Marine; Migratory	Schedule 5
<i>Austroconops mcmillani</i>		-	Priority 2

<i>Tringa glareola</i>	Wood Sandpiper	Marine; Migratory	Schedule 5
<i>Tringa nebularia</i>	Common Greenshank. Greenshank	Marine; Migratory	Schedule 5
<i>Tringa stagnatilis</i>	Marsh Sandpiper, Little Greenshank	Marine; Migratory	-
<i>Calyptorhynchus baudinii</i>	Baudin's Cockatoo, Long-billed Black Cockatoo	Vulnerable	Endangered
<i>Dermochelys coriacea</i>	Leatherback Turtle, Leathery Turtle, Luth	Endangered; Marine; Migratory	Vulnerable
<i>Puffinus carneipes</i>	Flesh-footed Shearwater, Fleshy- footed Shearwater	Marine; Migratory	Vulnerable
<i>Chelonia mydas</i>	Green Turtle	Vulnerable; Marine; Migratory	Vulnerable
<i>Hydromys chrysogaster</i>	Water Rat	-	Priority 4
<i>Calyptorhynchus banksii naso</i>	Forest Red-Tailed Black Cockatoo	Vulnerable	Vulnerable
<i>Delma concinna major</i>	Javelin Legless Lizard	-	Priority 1
<i>Pandion haliaetus (Pandion cristatus)</i>	Osprey	Marine; Migratory	Schedule 5

Information sourced from: Department of Parks and Wildlife Threatened and Priority Fauna Database search results for the City of Wanneroo Local Government Area dated 19 May 2017.

Significant Ecological Communities

Significant ecological communities known to occur within the City of Wanneroo are listed in **Table 13**.

Table 14 – Significant Ecological Communities in the City of Wanneroo

Ecological Community	Protection status under the EPBC Act	Protection status under the WC Act
Threatened Ecological Community		
Sedgelands in Holocene dune swales of the southern Swan Coastal Plain	Endangered	Critically endangered
Aquatic Root Mat Community Number 1 of Caves of the Swan Coastal Plain	Endangered	-
Banksia Woodlands of the Swan Coastal Plain	Endangered	Priority 3
Shrublands on dry clay flats	Critically endangered	Endangered
Priority Ecological Community		
<i>Melalueca huegelii</i> – <i>Melaleuca acerosa</i> shrublands on limestone ridges	-	Endangered
<i>Banksia ilicifolia</i> woodlands	-	Priority 2
<i>Banksia attenuata</i> woodlands over	-	Endangered

species rich dense shrublands		
Swan Coastal Plain <i>Banksia attenuata</i> – <i>Banksia menziesii</i> woodlands	-	Priority 3
Southern <i>Eucalyptus gomphocephala</i> – <i>Agonis flexuosa</i> woodlands	-	Priority 3
Quindalup <i>Eucalyptus gomphocephala</i> and/or <i>Agonis flexuosa</i> woodlands	-	Priority 3
Northern Spearwood shrublands and woodlands	-	Priority 3
Low lying <i>Banksia attenuata</i> woodlands or shrublands	-	Priority 3
Coastal shrublands on shallow sands	-	Priority 3
Acacia shrublands on taller dunes	-	Priority 3

Information sourced from: Department of Parks and Wildlife TEC PEC Database search results for the City of Wanneroo Local Government Area dated 13 April 2017.

APPENDIX B – Geomorphic Wetlands within the City of Wanneroo

Geomorphic Wetlands within the City of Wanneroo

The City of Wanneroo supports over 188 wetlands, 86 of which are categorised as Conservation, 46 as Resource Enhancement and 56 as Multiple-Use. A list of the key known wetlands within the City of Wanneroo and their relevant management categories are provided in **Table 14**.

Table 15 – Geomorphic Wetlands within the City of Wanneroo

Wetland Name	UFI	Biodiversity Planning Precinct	Classification	Management Category
Badgerup Lake	8165	South East Wanneroo	Sumpland	Conservation
Beenyup Swamp	8169	South West Wanneroo	Sumpland	Conservation
Beonaddy Swamp	8016	North East Wanneroo	Sumpland	Resource Enhancement
Bustard Landing	8098	State Forest Regional Park	Dampland	Conservation
Bustard North	8119	State Forest Regional Park	Dampland	Conservation
Bustard Swamp	8099	State Forest Regional Park	Dampland	Conservation
Camel Swamp	7938	North East Wanneroo	Dampland	Resource Enhancement
Carabooda Lake	8009	North East Wanneroo	Sumpland	Resource Enhancement
Coogee Swamp	8015	North East Wanneroo	Lake	Resource Enhancement
Gnangara Lake	8130	South East Wanneroo	Lake	Conservation
Hawkins Road Swamp	8093	South East Wanneroo; State Forest Regional Park	Sumpland	Conservation
Jandabup Lake	7957; 8114; 15006	South East Wanneroo	Lake	Conservation; Resource Enhancement; Multiple Use
Jinbup Swamp	7956	South East Wanneroo	Sumpland	Multiple Use
Lake Adams	7959; 7960	South East Wanneroo	Dampland	Conservation
Lake Joondalup	7954	South West Wanneroo	Lake	Conservation
Lake Pinjar	7915; 7916; 7917; 7929; 7931; 7933; 7935; 7937; 7939; 7947; 7948; 7948; 13373; 13374; 15005;	North East Wanneroo; State Forest Regional Park; South East Wanneroo;	Sumpland	Conservation; Multiple Use
Little Badgerup Lake	8132	South East Wanneroo	Sumpland	Conservation
Little Coogee Flat	7945	State Forest Regional Park	Dampland	Conservation
Little Coogee Swamp	7941	State Forest Regional Park	Dampland	Resource Enhancement
Little Dunderbar Swamp	8117	South East Wanneroo	Sumpland	Multiple Use
Little Mariginup	8161	South East Wanneroo	Sumpland	Conservation
Loch McNess	8010	State Forest Regional Park	Lake	Conservation
Mariginup Lake	7953	South East Wanneroo	Lake	Conservation
Mindarie Lake	8013	North East Wanneroo	Sumpland	Multiple Use
Neerabup Lake	8019	North East Wanneroo; South East Wanneroo	Sumpland	Resource Enhancement
Nowergup Lake	8021	North East Wanneroo	Lake	Conservation
Paul's Swamp	8159; 8160	South West Wanneroo	Sumpland	Conservation; Multiple Use
Pinesend Farm Swamp	8153	South East Wanneroo	Dampland	Multiple Use
Pippidiny Swamp	8012	State Forest Regional Park	Sumpland	Conservation
Snake Swamp	8116; 8135	South East Wanneroo; South West Wanneroo	Dampland	Multiple Use; Resource Enhancement
Wallubuenup Swamp	15458	South West Wanneroo	Sumpland	Conservation

Wilgarup Lake	8022	State Forest Regional Park	Sumpland	Conservation
Yonderup Lake	8011	State Forest Regional Park	Lake	Conservation

Information sourced from: Department of Parks and Wildlife Geomorphic Wetlands 2017 dataset.

Wetland Management Categories

A description of the wetland management categories are provided in **Table 15**.

Table 16 – Wetland Management Categories

Management Category	General Description	Management Objectives
C – Conservation	Wetlands support a high level of ecological attributes and functions.	To preserve and protect their existing conservation values through various mechanisms including: <ul style="list-style-type: none"> • Reservation in national parks, crown reserves and State owned land; • Protection under Environmental Protection Policies; and • Wetland covenanting by landowners. No development or clearing is considered appropriate. These are the most valuable wetlands and any activity that may lead to further loss or degradation is inappropriate.
R – Resource Enhancement / Rehabilitation Potential	Wetlands that may have been partially modified but still support substantial ecological attributes and functions.	To manage, restore and protect towards improving their conservation value. These wetlands have the potential to be restored or rehabilitated to Conservation category focusing on wetland functions, structure and biodiversity value.
M – Multiple Use	Wetlands with few important ecological attributes and functions remaining.	Use, development and management should be considered in the context of ecologically sustainable development and best management practice catchment planning through land care. Should be considered in strategic planning (e.g. drainage, land use planning).

Department of Parks and Wildlife, 2013.

APPENDIX C – Ecological Criteria

The ecological criteria used in determining priority Local Natural Areas are listed below in **Table 16**.

Table 17 – Ecological Criteria, Weightings and Datasets used in the Development of this Plan

Ecological Criteria	Dataset	Agreed weighting (0.1 – 1)*
Regional Representation		
Of an ecological community with only 1500 ha or 30% or less remaining in the IBRA sub-region	2013 extent of remnant vegetation by Heddle vegetation complex within the IBRA sub-region: <ul style="list-style-type: none"> Bassendean Complex - Central and South Karrakatta Complex - Central and South Pinjar Complex 	0.85
Of an ecological community with 90 - 100% of its original extent occurs within the LGA	2013 extent of remnant vegetation by Heddle vegetation complex within the IBRA sub-region: <ul style="list-style-type: none"> Pinjar Complex 	1
Vegetation within 50 m of Conservation Estate and/or Bush Forever Site	<ul style="list-style-type: none"> Bush Forever Sites DPaW Managed land National Parks Nature Reserves Conservation Parks CALM Act Reserves A Class Reserve 	0.3
ESA	<ul style="list-style-type: none"> DER Dataset – ESAs 	0.7
Large natural areas (between ≥ 2 ha and < 4 ha)	Remnant vegetation patches	0.5
Large natural areas (≥ 4 ha)	Remnant vegetation patches	0.9
Local Representation		
Of an ecological community with 1500 ha or less or 30% or less remaining in the LGA	2016 extent of remnant vegetation by Heddle vegetation complex within the City excluding all approved LSP areas: <ul style="list-style-type: none"> Bassendean Complex - Central and South Karrakatta Complex - Central and South Karrakatta Complex – North Quindalup Complex Pinjar Complex 	0.6
Of an ecological community with 1500 ha or less or 30% or less remaining in the LGA and $< 30\%$ formally protected	2016 extent of remnant vegetation by Heddle vegetation complex within the City excluding all approved LSP areas: <ul style="list-style-type: none"> Bassendean Complex - Central and South Karrakatta Complex - Central and South Karrakatta Complex – North Quindalup Complex Pinjar Complex 	0.7
Of an ecological community with 1500 ha or less or 30% or less remaining in the LGA and $< 10\%$ formally protected	2016 extent of remnant vegetation by Heddle vegetation complex within the City excluding all approved LSP areas: <ul style="list-style-type: none"> Bassendean Complex - Central and South Karrakatta Complex - Central and South 	0.8
Of an ecological community with 10%	2016 extent of remnant vegetation by	0.9

or less remaining in the LGA and <10% formally protected	Heddle vegetation complex within the City excluding all approved LSP areas: <ul style="list-style-type: none"> Karrakatta Complex - Central and South 	
Rarity		
Contains a Threatened Ecological Community	DPaW TEC PEC dataset dated 13 April 2017	1
Contains a Priority Ecological Community	DPaW TEC PEC dataset dated 13 April 2017	0.8
Vegetation within 50 m of a Threatened (Declared Rare) Flora (DRF)	DPaW Threatened and Priority Flora Database search results dated 13 May 2017	0.6
Vegetation within 50 m of a Priority Flora (1, 2, 3, 4)	DPaW Threatened and Priority Flora Database search results dated 13 May 2017	0.5
Vegetation within 50 m of Threatened and Specially Protected Fauna	DPaW Threatened and Priority Fauna dataset dated 19 May 2017	0.6
Vegetation within 50 m of Rare or Priority Fauna (1, 2, 3, 4)	DPaW Threatened and Priority Fauna dataset dated 19 May 2017	0.5
Contains significant habitat for significant fauna	Black Cockatoo foraging habitat	1
Maintaining Ecological Processes – Connectivity		
Vegetation within a Regional Ecological Linkage	Existing Regional Ecological Linkages dataset	1
Vegetation within a Local Ecological Linkage	Local Ecological Linkages dataset	1
Protection of Wetland, Coastal Dunes and their associated vegetation		
Within CCW or REW area and/or within 50 m of the wetland boundary	Geomorphic wetland mapping dataset	1
Climate Change		
Within 50 m of 2120 CHRMAP scenario	CHRMAP data provided to 360 by CoW	0.9
Other		
High and Medium Karst risk	CoW Dataset	1

* Factorial weighting was assigned based on collective agreement with City of Wanneroo officers through workshop process.

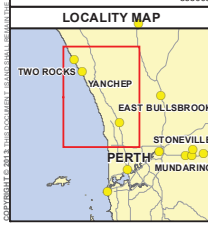
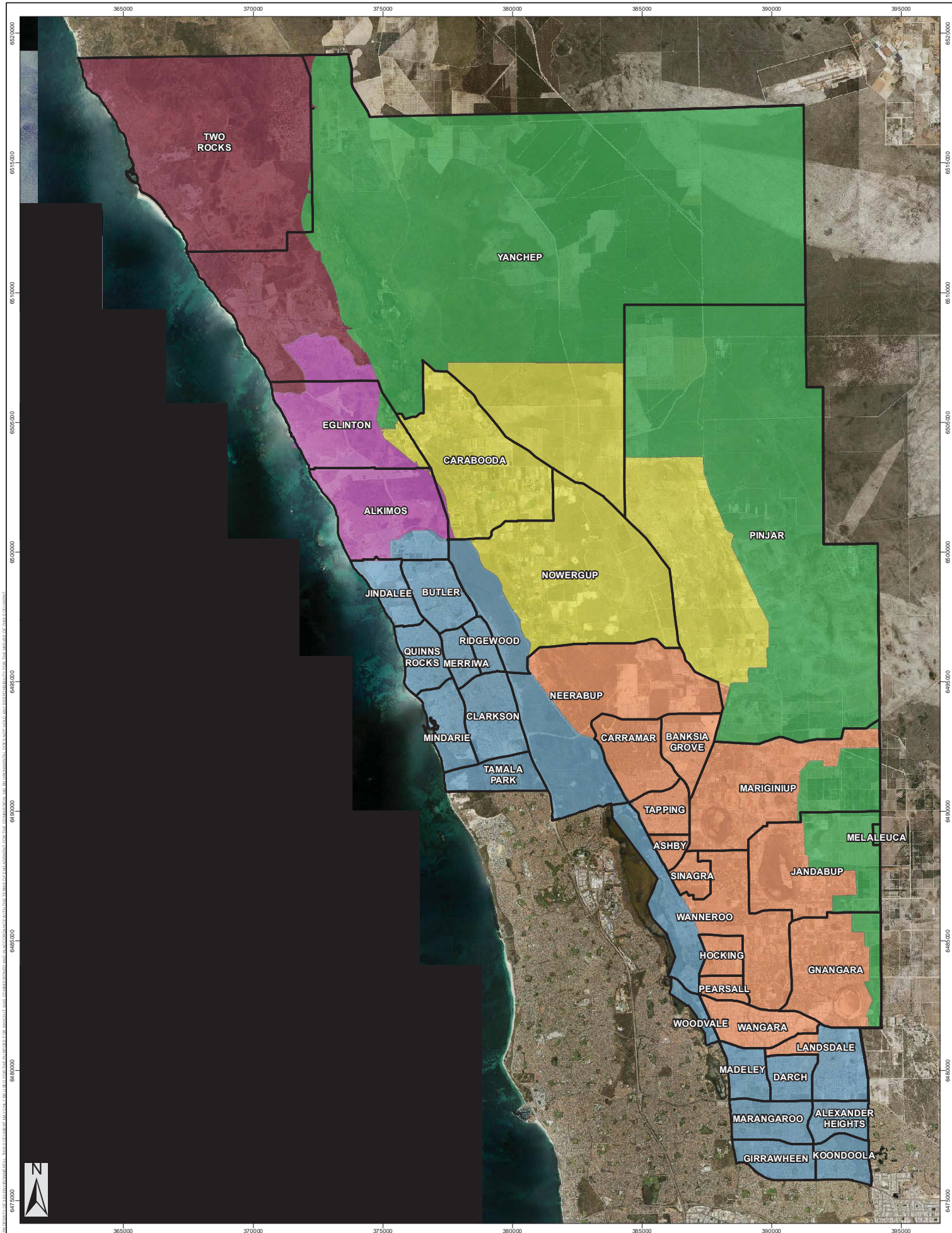
APPENDIX D – Vegetation Complexes within the City of Wanneroo

A description of the twelve vegetation complexes mapped within the City of Wanneroo is provided in **Table 17**.

Table 18 – Description of Vegetation Complexes within the City of Wanneroo

Vegetation Complex	Description
Bassendean Dunes	
Bassendean Complex - Central and South	Vegetation ranges from woodland of <i>Eucalyptus marginata</i> (Jarrah) - <i>Allocasuarina fraseriana</i> (Sheoak) - Banksia species to low woodland of Melaleuca species, and sedgelands on the moister sites. This area includes the transition of <i>Eucalyptus marginata</i> (Jarrah) to <i>Eucalyptus todtiana</i> (Pricklybark) in the vicinity of Perth.
Bassendean Complex – Central and South Transition	Woodland of <i>Eucalyptus marginata</i> (Jarrah) - <i>Corymbia calophylla</i> (Marri) with well-defined second storey of <i>Allocasuarina fraseriana</i> (Sheoak) and <i>Banksia grandis</i> (Bull Banksia) on the deeper soils and a closed scrub on the moister sites. The understorey species reflect similarities with the adjacent vegetation complexes.
Bassendean Complex – North	Vegetation ranges from a low open forest and low open woodland of Banksia species <i>Eucalyptus todtiana</i> (Pricklybark) to low woodland of Melaleuca species and sedgelands which occupy the moister sites.
Bassendean Complex – North Transition	A transition complex of low open forest and low woodland of Banksia species - <i>Eucalyptus todtiana</i> (Pricklybark) on a series of high sand dunes. The understorey species reflect similarities with both the Bassendean-North and Karrakatta-North vegetation complexes.
Spearwood Dunes	
Cottesloe Complex – Central and South	Mosaic of woodland of <i>Eucalyptus gomphocephala</i> (Tuart) and open forest of <i>Eucalyptus gomphocephala</i> (Tuart) - <i>Eucalyptus marginata</i> (Jarrah) - <i>Corymbia calophylla</i> (Marri); closed heath on the Limestone outcrops.
Cottesloe Complex – North	Predominantly low open forest and low woodland of <i>Banksia attenuata</i> (Slender Banksia) - <i>Banksia menziesii</i> (Firewood Banksia) - <i>Eucalyptus todtiana</i> (Pricklybark); closed heath on the Limestone outcrops.
Karrakatta Complex – Central and South	Mosaic of woodland of <i>Eucalyptus gomphocephala</i> (Tuart) and open forest of <i>Eucalyptus gomphocephala</i> (Tuart) - <i>Eucalyptus marginata</i> (Jarrah) - <i>Corymbia calophylla</i> (Marri); closed heath on the Limestone outcrops.
Karrakatta Complex – North	Predominantly low open forest and low woodland of Banksia species - <i>Eucalyptus todtiana</i> (Pricklybark), less consistently open forest of <i>Eucalyptus gomphocephala</i> (Tuart) - <i>Eucalyptus todtiana</i> (Pricklybark) - Banksia species.
Karrakatta Complex – North Transition	A transition complex of low open forest and low woodland of Banksia species - <i>Eucalyptus todtiana</i> (Pricklybark) on the transition zone of a series of high sand dunes between Bassendean-North and Karrakatta-North.
Quindalup Dunes	
Quindalup Complex	Coastal dune complex consisting mainly of two alliances - the strand and fore-dune alliance and the mobile and stable dune alliance. Local variations include the low closed forest of <i>Melaleuca lanceolata</i> (Rottnest Teatree) - <i>Callitris preissii</i> (Rottnest Island Pine), the closed scrub of <i>Acacia rostellifera</i> (Summer-scented Wattle) and the low closed <i>Agonis flexuosa</i> (Peppermint) forest of Geographe Bay.
Wetlands	
Herdsmen Complex	Sedgelands and fringing woodland of <i>Eucalyptus rudis</i> (Flooded Gum) - Melaleuca species.
Pinjar Complex	Vegetation ranges from woodland of <i>Eucalyptus marginata</i> (Jarrah) - Banksia species to a fringing woodland of <i>Eucalyptus rudis</i> (Flooded Gum) - <i>Melaleuca preissiana</i> (Moonah) and sedgelands.

Heddle *et al.* 1980.



Legend

- Suburb Boundaries
- Planning Precinct Boundaries
- Alkimos / Eglinton
- North East Wanneroo
- South East Wanneroo
- South West Wanneroo
- Slate Forest Regional Park
- Yanchep - Two Rocks

DATA SOURCES

- CADASTRAL BOUNDARY SOURCED FROM LANDGATE 2009
- LOCALITY MAP SOURCED LANDGATE 2006
- SUBURB BOUNDARIES SOURCED PSMA 2017
- AERIAL PHOTOGRAPHY SOURCED LANDGATE 2017
- © Western Australian Land Information Authority 2017

360 environmental solutions
 a 10 Berrymondsey St, West Leederville, 6007 WA
 t(08) 9388 8360 f(08) 9381 2360
 www.360environmental.com.au

● people ● planet ● professional

NOTE THAT POSITIONAL ERRORS MAY BE >5M IN SOME AREAS

CREATED MH	CHECKED TM	APPROVED TM	REVISION 01	DATE 12/06/2017
HORIZONTAL DATUM GDA 1994 MGA Zone 50			PROJECT NO 1990	

0 750 1,500 3,000 4,500 6,000
 Meters
 1:130,000 @ A3

City of Wanneroo

Local Biodiversity Plan
 2018/19 – 2023/24

Appendix E
 Biodiversity Planning Precincts a

©\Project2018\0\APP1990 Wanneroo Local Biodiversity Strategy\Figures\1990 Figure X - Biodiversity Planning Precincts and Suburbs.mxd



City of Wanneroo

23 Dundebur Road, Wanneroo, WA 6065

Locked Bag 1, Wanneroo, WA 6946

T (08) 9405 5000 F (08) 9405 5499

After Hours 1300 13 83 93

E enquiries@wanneroo.wa.gov.au

wanneroo.wa.gov.au

