



CITY OF ROCKINGHAM

Community Plan Strategy

Urban Forest Strategy
2025 - 2030



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Alternative Formats

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Community Engagement

Admin use only: Please select all special interest groups that may be interested in this strategy. Groups selected will be notified using Rock Port.

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| <input type="checkbox"/> Aboriginal and Torres Strait Islanders | <input checked="" type="checkbox"/> New Community Plan Strategies |
| <input type="checkbox"/> Arts and Events | <input checked="" type="checkbox"/> New Infrastructure Projects |
| <input checked="" type="checkbox"/> Coastal and Marine Environment | <input checked="" type="checkbox"/> Planning and Development |
| <input type="checkbox"/> Community Development | <input type="checkbox"/> Roads and Footpaths |
| <input type="checkbox"/> Community Safety | <input checked="" type="checkbox"/> Safety Bay / Shoalwater Foreshore Revitalisation Masterplan |
| <input type="checkbox"/> Disability Access and Inclusion | <input type="checkbox"/> Seniors Facilities and Activities |
| <input type="checkbox"/> Economic Development | <input type="checkbox"/> Sporting Clubs and Facilities |
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Disability Access and Inclusion

Admin use only: Please consider identify the elements from the City’s current Disability and Inclusion Plan (DAIP) and identify those that are relevant to, or will be impacted by this strategy as per the table below. If you would like to discuss the impacts and relevance of the DAIP to your strategy, please contact the Manager Community Capacity Building.

The Seven Outcome Areas of the DAIP	Will the Key Element be impacted by this strategy? “Y” or “N”	If “Y”, please explain how the actions under this element will be impacted by this strategy
1. Access to City services and events	N	
2. Access to City buildings and facilities (including outdoor spaces)	N	
3. Access to information	N	
4. Access to quality service from City staff	N	
5. Access to equal complaints procedures	N	
6. Access to participation in public consultation	N	
7. Access to City employment opportunities	N	

Acknowledgment of Country

Ngala kaaditj moondang-ak kaaradjiny nidja boodja, Binjareb wer Whadjuk Nyoongar moort, wer baalabang kalyogool dandjoo boodja, kep wer moort. The City of Rockingham acknowledges the Traditional Owners and Custodians of this land, the Binjareb and Whadjuk, Nyoongar* peoples and their continuing connection to the land, waters and community. We pay our respects to all members of Aboriginal communities and their cultures; and to Elders past and present.

** While Nyoongar is identified as a single, spoken language there are up to 14 different dialects and variations in both pronunciation and in the spelling of many words such as: Nyoongar, Whadjuk and Binjareb. Additionally, where the City uses the term Aboriginal it is intended to encompass all Aboriginal and Torres Strait Islander people.*

The above translation has been provided from Noongar Boodja Language Cultural Aboriginal Corporation.

Consultant Acknowledgement

The City would like to acknowledge Arbor Carbon and Good Canopy for their work in developing the Strategy.

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Vision

Our vision is a resilient, sustainable urban forest in Rockingham that enhances ecological, social, and economic well-being. By expanding the tree canopy and engaging the community, we aim to create a greener, healthier, and more connected environment for future generations.

Drivers for Change

The City's primary drivers for increasing urban greening and tree canopy cover are:

- Mitigating Urban Heat Island Effect
- Enhancing Community Health and Well-being.
- Boosting Biodiversity and Ecosystem Services
- Increasing Public Safety
- Climate Change Adaptation
- Economic Benefits

Canopy Targets

City Managed Land Target 24.5%
(up from 17.9%)

City Wide Aspirational Target 16.5%
(up from 13.7%)

Key Elements

1. Protect and Value
2. Expand, Increase and Integrate
3. Monitor, Manage and Maintain
4. Collaborate, Educate, Incentivise and Advocate

1. Executive Summary

Urban forests are defined as the collection of trees, shrubs, and other vegetation in and around urban areas and encompass all the trees and vegetation within a city, parks, streets, private properties, and other green spaces (DPLH et al., 2018). The urban forest consists of both canopy cover (vegetation over 3m in height) and other vegetated areas, including grassed areas, gardens and small trees.

The urban forest is critical to the sustainability of urban areas by:

- Maintaining habitats and biodiversity;
- Reducing ambient temperatures and the 'heat island' effect of urban developments;
- Contributing to cleaner air and water; and
- Improving resident's health and quality of life.

For some time, the City has acknowledged the importance of the urban forest through plans to implement planting programs and other initiatives, most recently through its *Greening Plan* adopted in 2017. Since that time, the City has planted 16,496 trees into public open space (POS) and streetscapes, supported the planting of 83,059 plants by volunteers through community planting days, planted 217,531 saplings in City managed conservation reserves, and given away 57,000 seedlings for planting through the Native Plants Giveaway initiative, and planted 5,086 trees through the Winter Street Tree Planting Program.

As at January 2024, the urban forest covers approximately 37.3% of the City's land area, consisting of canopy cover (13.7%) with other vegetated areas (23.6%). 62.7% of the City's land area is not vegetated, including roads, built up areas, cleared land and infrastructure.

The City's urban forest and canopy cover is located across a range of land, both City managed and private, including:

City of Rockingham

- Public open space;
- Local roads/streets and some regional roads;
- Community and public purpose sites;
- Environmental Land managed by the City; and
- Limited freehold land.

State Government agencies (not under City Management)

- Regional reserves, including conservation areas;
- Regional roads, rail and other transport infrastructure;
- Service infrastructure such as reticulated water, waste water and electricity;
- Public purpose reserves, including schools and other education facilities; and
- Strategic government landholdings, including future urban and industrial development areas.

Private landholdings

- Residential;
- Commercial;
- Industrial; and
- Rural and Rural Residential

These areas present different opportunities to improve the City's urban forest. From the City's perspective, it has the greatest opportunity to improve canopy cover through additional planting, primarily in public open space and streetscapes. It can also seek to improve canopy cover within regional (conservation) reserves through advocacy with the relevant management authority.

Over a number of decades, Rockingham has experienced significant urban growth, the majority of which is located within greenfield development in the form of planned housing communities. The expansion of the urban footprint over former undeveloped and agricultural land has resulted in the City's canopy being reduced consistent with all other growth local government authorities. As a result, the challenges facing the City are very different to other 'established' local governments which typically also have increased residential lot sizes which aids tree preservation.

Given the State Government's oversight of the planning framework, in terms of planning requirements and approvals, it is also important that the City advocate for change that brings better outcomes for tree retention. For existing and proposed urban development areas, the City's influence is restricted to seeking tree retention through applying and supplementing its planning framework and through incentives (where appropriate).

The Urban Forest Strategy is prepared in this knowledge and seeks to minimise loss of vegetation where possible, and provide for additional planting where appropriate.

In order to continue to support, protect and improve the City's urban forest, the Urban Forest Strategy comprises the following key elements (*to be displayed as an infographic*):

- 1. Protect and Value:** Protecting and valuing the urban forest is fundamental to ensuring its longevity and viability. This principle emphasises the importance of preserving existing trees and recognising their ecological, economic, and social benefits. Trees take many decades to provide notable canopy cover, and as such, targets cannot be achieved without increased focus on existing tree preservation.
- 2. Expand, Increase and Integrate:** Expanding the urban canopy with an integrated approach is essential for enhancing the environmental and social benefits that the urban forest provides to the community. This principle focuses on increasing tree planting, particularly in under-represented areas, to ensure equitable access to green spaces. Integrating urban forestry into broader urban planning, capital works and development processes is vital for creating sustainable, liveable cities.

- 3. Monitor, Manage and Maintain:** Effective management and maintenance of the urban forest is crucial for sustaining its health and maximising its benefits. Managing trees as assets and employing best practice urban forestry techniques will ensure the longevity of the urban forest. Investing in a tree inventory and developing a comprehensive tree maintenance program that includes regular inspections, maintenance schedules, and risk assessments is essential for proactive management.
- 4. Collaborate, Educate, Incentivise and Advocate:** Raising awareness of the benefits of trees across the community can drive change. Bringing the community along for the journey, and establishing a strong relationship with the community, will improve how efficiently and successfully the City can deliver on these urban forest goals. Incentive schemes can encourage residents, businesses, and developers to plant and maintain trees. Community engagement programs that involve residents in tree planting, care, and monitoring activities can build a sense of ownership and responsibility for the urban forest.

Given the time taken for planting to mature and achieve canopy cover, the Strategy contains both short term implementable actions, and longer-term aspirations.

While the City does not have direct management control over the majority of its district, with much of it contained within private land or State managed crown land, the Urban Forest Strategy has identified that the greatest opportunities for increasing canopy cover lie within the City's streets and public open space.

While this is the primary focus of the Urban Forest Strategy, with an aim to increase cover in these spaces collectively from 17.9% to 24.5%, more than half of the potential to improve canopy is within land under the control of private landowners or State agencies. The Urban Forest Strategy seeks to address these areas primarily through advocacy, incentives and additional controls, which if successful could contribute to an overall improvement in the City's canopy cover from 13.7% to 16.5% over the next 20 years.

Public Open
Space and
Streetscapes

46.4%

Environmental

17.2%

Development
Zones

17.1%

Private
Landholdings
(ie Residential/
Commercial)

19.3%



5. Strategic Objective

The strategic objective and vision of the Urban Forest Strategy 2025-2030:

Achieve a resilient, sustainable urban forest in Rockingham that enhances ecological, social, and economic well-being. By expanding the tree canopy and engaging the community, we aim to create a greener, healthier and more connected environment for future generations.

The Urban Forest Strategy 2025-2030 aims to achieve the following aspirations of the City of Rockingham Strategic Community Plan (2023-2033):

Aspiration 2 – Natural Environment

2. Sustainable and natural green spaces

- Preserve and enhance biodiversity
- Improve community open spaces
- Improve amenity
- Increase canopy

Aspiration 3 – Built Environment

2. Plan for sustainable growth

- Balance growth while maintaining the identified natural environment
- Create safe community places to live, recreate and work

A number of Community Plan Strategies inform these outcomes:

- *Environmental Protection Strategy (2023)*
- *Natural Area Conservation Strategy (2017)*
- *Public Open Space Community Plan Strategy (2020)*
- *Planning Policy 3.1 .1 Rural Land Strategy (2020)*
- *Bushfire Risk Management Plan (2023)*
- *Sustainability Strategy (2020)*
- *Local Planning Strategy*
- *Bushland Management Plan*
- *Tamworth Hill Swamp Management Plan*
- *Reserve Prioritisation Report.*

2.1 Greening Plan 2017

The Urban Forest Strategy supersedes the City of Rockingham *Greening Plan* (2017) which had five Green Goals. These Goals are outlined below along with actions that have been achieved.

 <p>Improve the trajectory of the City's green cover</p>	<ul style="list-style-type: none"> - The City achieved planting 15,000 trees in streetscapes and POS, which has improved the trajectory of the City's urban canopy cover. - The City has completed its <i>Environmental Planning Strategy</i> and <i>Public Open Space Strategy</i>. - The City is currently investigating the introduction of a Tree Protection Local Planning Policy to protect trees on private property, and has provisions in the <i>Town Planning Scheme No. 2</i> enabling formal protection of trees and vegetation on Rural, Special Rural and Special Residential zoned land.
 <p>Encourage community involvement in urban greening</p>	<ul style="list-style-type: none"> - The City undertakes planting programs such as the Winter Street Tree Planting program, partners with Perth NRM (Natural Resource Management) for community planting days, and provides native plant giveaways every year, in order to drive community engagement in urban greening. - The City has employed an Environmental Education Officer who will drive improved community outreach and involvement.
 <p>Protect and maintain the City's green assets</p>	<ul style="list-style-type: none"> - On City managed land, tree removals are controlled via a 'Tree Removal Request' which ensures greater scrutiny. - The City is currently working on populating the City's Street Tree Inventory management system through Authority.
 <p>Plant the right tree in the right place</p>	<ul style="list-style-type: none"> - All tree planting that has taken place has had tree selection, installation and maintenance consistent with the Greening Plan's 'Greening Principles'. - The City reviews the outcomes of each planting season, however, there is an opportunity to formalise this.
 <p>Ensure a diverse urban forest</p>	<ul style="list-style-type: none"> - The City detailed a number of actions relating to this goal, including reviewing the species planted to ensure it was considered diverse, develop a baseline species diversity ratio, and subsequently monitor these numbers.

2017 – 2025 What have we done¹

- 15,000 trees planted in Public Open Space and street scapes between 2017 and 2022.
- Since 2022 1,496 street trees planted as part of the WALGA Urban Canopy Grants.
- 134 community planting days, 83,059 plants, 4,767 volunteers
- 217,531 saplings planted in City managed conservation reserves.
- 627ha of conservation reserves managed by the City of Rockingham
- 5,086 trees planted in verges as part of the City's Winter Street Tree Planting Program
- 57,000 seedlings given away as part of the City's native plants giveaway.
- 445 POS areas managed

¹ An administrative edit has been made to this page.

6. Background

3.1 What is an Urban Forest

Urban forests are defined as the collection of trees, shrubs, and other vegetation in and around urban areas and encompass all the trees and vegetation within a city, parks, streets, private properties, and other green spaces (DPLH et al., 2018).

It is a crucial component of sustainable urban development, providing numerous benefits that improve land value and enhance the quality of life for city residents, through maintaining biodiversity, mitigating climate change, and improving public health. They contribute to cleaner air and water, provide habitat for wildlife, historic, cultural and spiritual connections to land and offer recreational and aesthetic values. Urban forestry is the practice of managing and planning the flora and fauna within these urban ecosystems to maximise their contributions to the ecological, social, and economic health of urban communities (Miller et al., 2015).



3.1.1 Indigenous History, Land Use and Connection with Vegetation

The Rockingham municipality is located on both the Gnaala Karla Boodja (GKB) Aboriginal Corporation and Whadjuk Aboriginal Corporation Indigenous Land Use Agreement Regions of the Southwest Native Title Settlement.

Given the many plentiful resources in the area, particularly around the lake system, the land and water have sustained many people over thousands of years. The Indigenous history and land use in Rockingham are deeply intertwined with the cultural and ecological landscapes maintained by the Binjareb and Whadjuk Nyoongar peoples. These Indigenous communities have historically managed the land through practices such as cultural burning and sustainable harvesting, which have shaped the local vegetation and biodiversity. For example, cultural burning has been a crucial technique for managing forested areas, promoting the growth of specific plant species, and enhancing the availability of resources for both humans and wildlife. These practices not only supported the ecological balance but also

reinforced the cultural connections to the land. The City is currently developing the next *Reconciliation Action Plan* (RAP) which will launch in 2025.

Rockingham is traversed by several significant Aboriginal trails and ecological corridors. These pathways have been used for generations and hold immense cultural and ecological importance.

- Nyoongar Coastal Trail
- Lake Richmond and Surrounding Bushland
- Point Peron Peninsula
- Tamworth Hill Swamp and Adjacent Bushland

These traditional Aboriginal trails and corridors are vital for maintaining cultural heritage and ecological integrity. Integrating these pathways into contemporary conservation and urban planning efforts can enhance cultural preservation, support biodiversity, and strengthen ecological connectivity in Rockingham.



3.1.2 Climate

Rockingham experiences a Mediterranean climate characterised by hot, dry summers and mild, wet winters. Summers typically see temperatures ranging from 25°C to 35°C with minimal rainfall, making these the warmest and driest months. Winters are cooler with temperatures between 10°C and 20°C and significant rainfall. Plants in Rockingham experience the most significant climate stress during the hot, dry summer months due to the lack of rainfall and high temperatures, which can lead to drought conditions and increased water demand.

3.1.3 Wetlands

Rockingham is home to several ecologically critical wetlands, including Lake Richmond, Lake Coo롱up, and Lake Walyungup, which provide essential habitats

for diverse flora and fauna, contribute to groundwater recharge, and support overall ecosystem health (Urban Bushland Council WA Inc., 2024). These wetlands face threats from urbanisation, industrial development, and climate change. Reinforcing these wetlands with ecological corridors through urban and industrial spaces is vital. Such corridors enhance connectivity between fragmented habitats, allowing wildlife to migrate, disperse, and maintain genetic diversity. They also mitigate the impacts of urbanisation by providing natural buffers that improve water quality, reduce flooding, and promote biodiversity, ensuring the resilience and sustainability of Rockingham's natural landscapes (Davies et al., 2017)

3.1.4 Soils and Topography

Rockingham exhibits a diverse range of soils and topography, reflecting its coastal and inland environments (Figure 1). The plant and animals that live here have adapted to living in very extreme conditions, including constant exposure to prevailing winds and sand blasting.

The Quindalup dune system is the dominant soil type along the coast. The Quindalup soils are white limey sands which occur near the coast, and form the most recent dunes along the coastline. Five additional soil types run roughly parallel to the coast inland from the Quindalup soils, including the Cottesloe complex-central and south, Karrakatta complex-central and south, Serpentine River complex, Dardanup complex and Bassendean complex-central and south. In addition, there are localised pockets of herdsman and Yoongarillup soil complexes (Beard, 1990).

These soils are highly permeable and nutrient-poor, supporting vegetation such as coastal heath, shrublands, and banksia woodlands (Keighery & Gibson, 1993).

These soils are all associated with unique vegetation and ecosystem compositions including:

- Woodland and open forest and closed heath (Cottesloe Complex-Central and South)
- Open forests and woodland (Karrakatta Complex-Central and South)
- Closed scrub and fringing woodland (Serpentine River Complex)
- Mosaic of vegetation types from adjacent complexes (Dardanup Complex)
- Woodland to low woodland and sedgeland (Bassendean Complex-Central and South).

Topographically, Rockingham encompasses flat coastal plains and gently undulating inland areas. The coastal plain is predominantly flat and low-lying, with elevations ranging from sea level to about 20 meters. Inland areas feature slightly more varied topography, with gentle slopes and low hills part of the Swan Coastal Plain. These areas include ancient dune systems and remnant wetlands, influencing land use and ecological habitats.

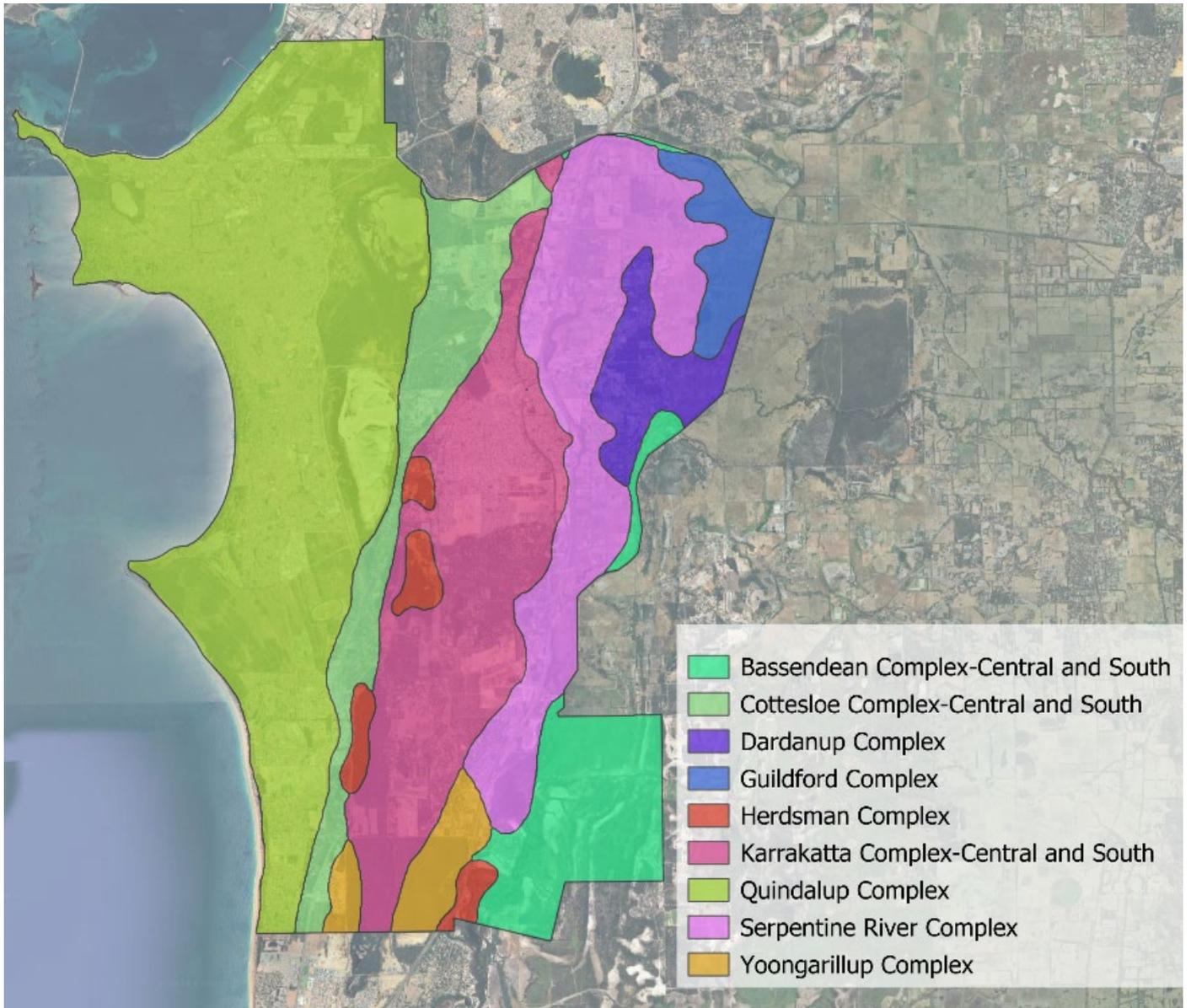


Figure 1: Soil complexes present throughout the City of Rockingham

3.1.5 Rockingham Bush Forever Sites

The Bush Forever program is a strategic plan initiated by the State Government to protect and conserve regionally significant bushland within the Perth metropolitan area. This program identifies and preserves areas of natural vegetation to maintain biodiversity, support native flora and fauna, and provide ecological connectivity across urban landscapes.

In Rockingham, notable Bush Forever sites include:

- Bush Forever Site 356 - Lake Walyungup and Lake Coo loongup. These sites provide critical habitats for native species and enhance ecological corridors, contributing to the overall ecological health and resilience of the region.
- Bush Forever site 358 - Lake Richmond and adjacent bushland: This site is significant for its wetland and terrestrial habitats, supporting diverse bird species and unique thrombolite structures.
- Bush Forever Site 355 - Point Peron and surrounding bushland: This area contains coastal dune systems, limestone cliffs, and diverse vegetation types, providing habitat for a variety of native wildlife.
- Bush Forever Site 349 - Tamworth Hill Swamp and adjacent bushland: This site includes wetland and upland habitats, supporting various bird species and significant native vegetation.
- Bush Forever Site 377 – Becher Point Wetlands: the site is recognised as being of international importance under the Ramsar Convention on Wetlands. The sedgeland s of the site are listed as a threatened ecological community under the Commonwealth Environment Protection and Biodiversity Conservation Act 1999.

3.2 Urban Heat Island Analysis

3.2.1 What is Urban Heat?

Since 1910, average surface temperatures in Australia have risen by more than 1.4°C, with this trend accelerating in recent decades (Bureau of Meteorology 2022). This general warming trend has resulted in more frequent heatwaves, extreme summer heat, and reduced nighttime cooling. Long-term temperature studies indicate that extreme monthly maximum temperatures in Australia have increased from occurring 2% of the time in the past (1951-1980) to 12% of the time in the more recent period (2003-2017) (Bureau of Meteorology 2022). A similar trend is observed for unusually warm monthly minimum temperatures (nighttime temperatures).

Heatwaves have significant impacts on the environment and the community, with impacts on people's health and wellbeing, economic productivity, urban wildlife and ecosystems, and urban infrastructure and services. Certain sections of the community are more vulnerable to the impacts of heatwaves, including the elderly, people with disabilities, families with young children, low-income households, culturally and linguistically diverse communities, outdoor workers, indigenous communities, obese and overweight people and those living in rural and isolated

communities (AECOM 2017). Heatwaves are already a leading cause of human death in Australia (Borchers Arriagada et al. 2020).

The urban heat island effect (UHIE) refers to the occurrence where urban areas experience a high temperature compared to the surrounding, more rural areas and/or those that have higher proportional vegetation cover (e.g. nature reserves, low density residential land) (Figure 2). Man-made materials such as concrete, asphalt, brick and rooftop materials, as well as soil compacted by urban development, are highly impervious, and therefore absorb much more heat than pervious surfaces such as vegetation. These materials also retain the heat for longer, therefore limiting their ability to cool down over night. The UHIE is more pronounced during hot weather.

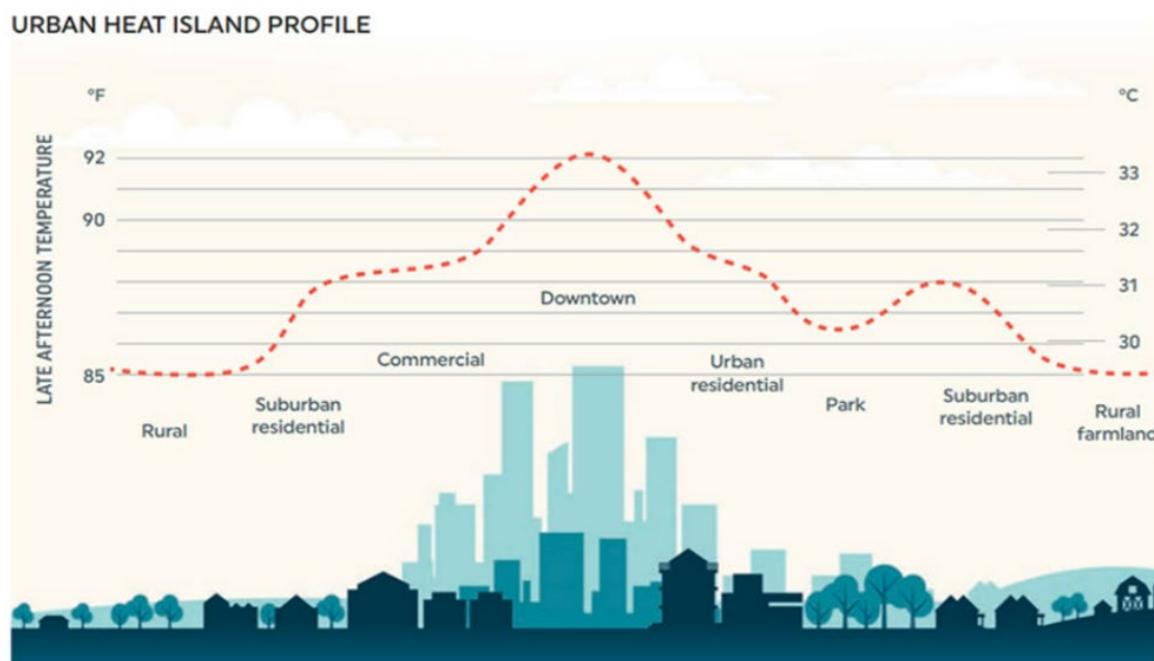


Figure 2: Urban Heat Island Profile

Urban heat and heatwaves are a significant and growing issue for Rockingham (Figure 3). Recent summer weather patterns, along with projected increases in the frequency, intensity and duration of extreme weather events including heatwaves, will put pressure on the community and its assets. The UHIE will also have consequences in the environment, including heat stress on trees and other vegetation, water resources becoming more scarce, impacts on wildlife, and will result in increased energy and water usage to cool homes of an increasing population, contributing to the cycle.

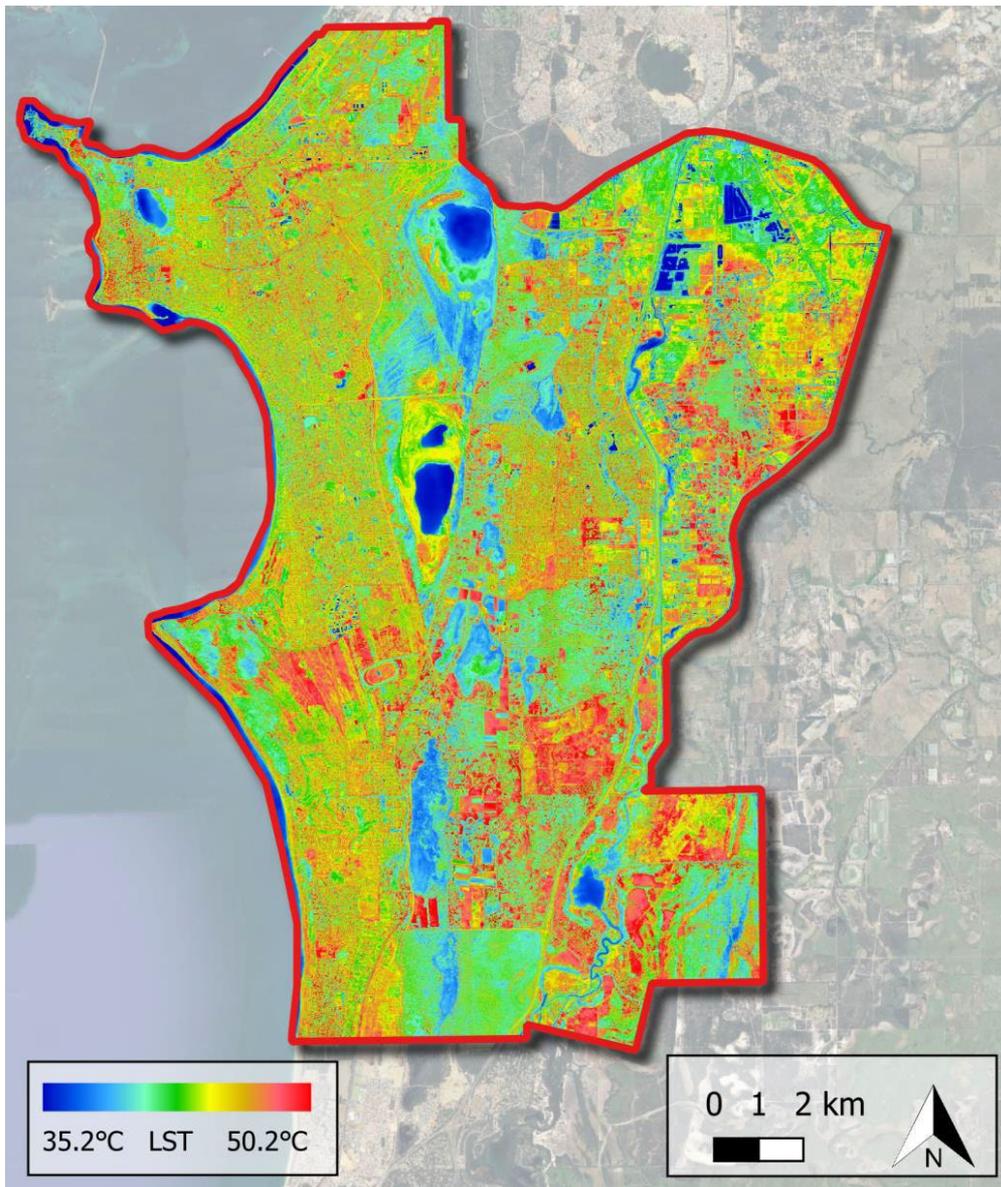


Figure 3: Land Surface Temperature City of Rockingham January 2024.

A number of approaches exist to adapt to increasing urban heat. Increasing canopy cover, adapting buildings and infrastructure to be made with materials that prevent heat from being absorbed, considering water sensitive design in urban areas, and providing refuge from heat are the main methods. Increasing green cover is a principle underpinning this Urban Forest Strategy, and will contribute to lowering the urban heat island effect.

3.2.2 Urban heat island identification throughout the City

Identifying heat islands is a key first step to addressing the UHIE in Rockingham and therefore mitigating the effects.

ArborCam land surface temperature data was acquired concurrently with canopy cover data on the 12th of January 2024. The maximum air temperature on the day of acquisition was 36.1°C (bom.com.au, Station number 009256, Garden Island HSF). UHIs ranged between 47 and 50°C, and cool zones ranged between 36 and 40°C.

The majority of UHIs were large expanses of cleared land particularly in the south-east of the City (Figure 4). One particularly significant UHI was an area of land cleared for the purpose of sand mining in Karnup, which is zoned development and will form part of the Karnup District Structure Plan. The average LST of this UHI was 48°C. Just north of here, in Baldivis, an area of land partially developed and partially undergoing development was identified as an UHI (47°C). The zone consists of land cleared for development and recently developed lots and streetscapes with little established vegetation. Other UHIs include large areas of bare earth or dead vegetation (e.g. turf) scattered throughout the urban area.

Coastal areas generally experience more moderate temperatures than inland areas due to the higher heat capacity of the ocean, which means it takes longer to heat up and cool down. Factors such as building density and the presence of green space can influence how effectively the ocean can cool surrounding urban environments.

Cool zones throughout the City were mostly waterbodies and areas of dense vegetation, such as Lake Cooloongup and surrounding bushland, which was 39°C.

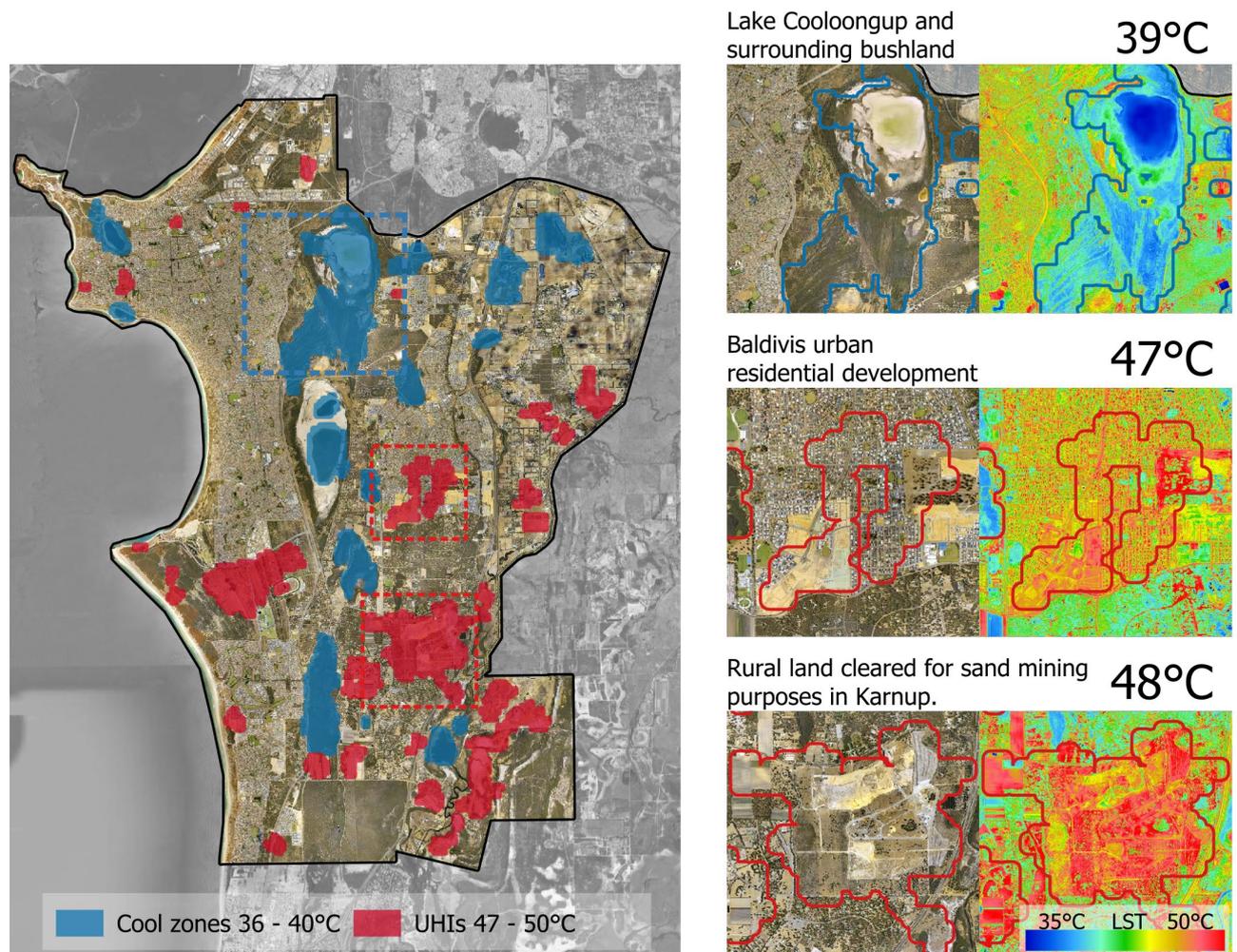


Figure 4: Hot and cool spots identified throughout Rockingham

3.2.3 Temperature of Suburbs

Trees and vegetation are known to have significant cooling effects. Within the City, leafier suburbs tend to be cooler than suburbs with a lower proportion of canopy cover (Figure 5).

In the case of the City, the coolest suburbs (Cooloongup, Peron and Waikiki) also have large water bodies. While the amount of canopy and green space is important, so too is the distribution of these spaces, if urban heat is to be adequately mitigated across the whole City.

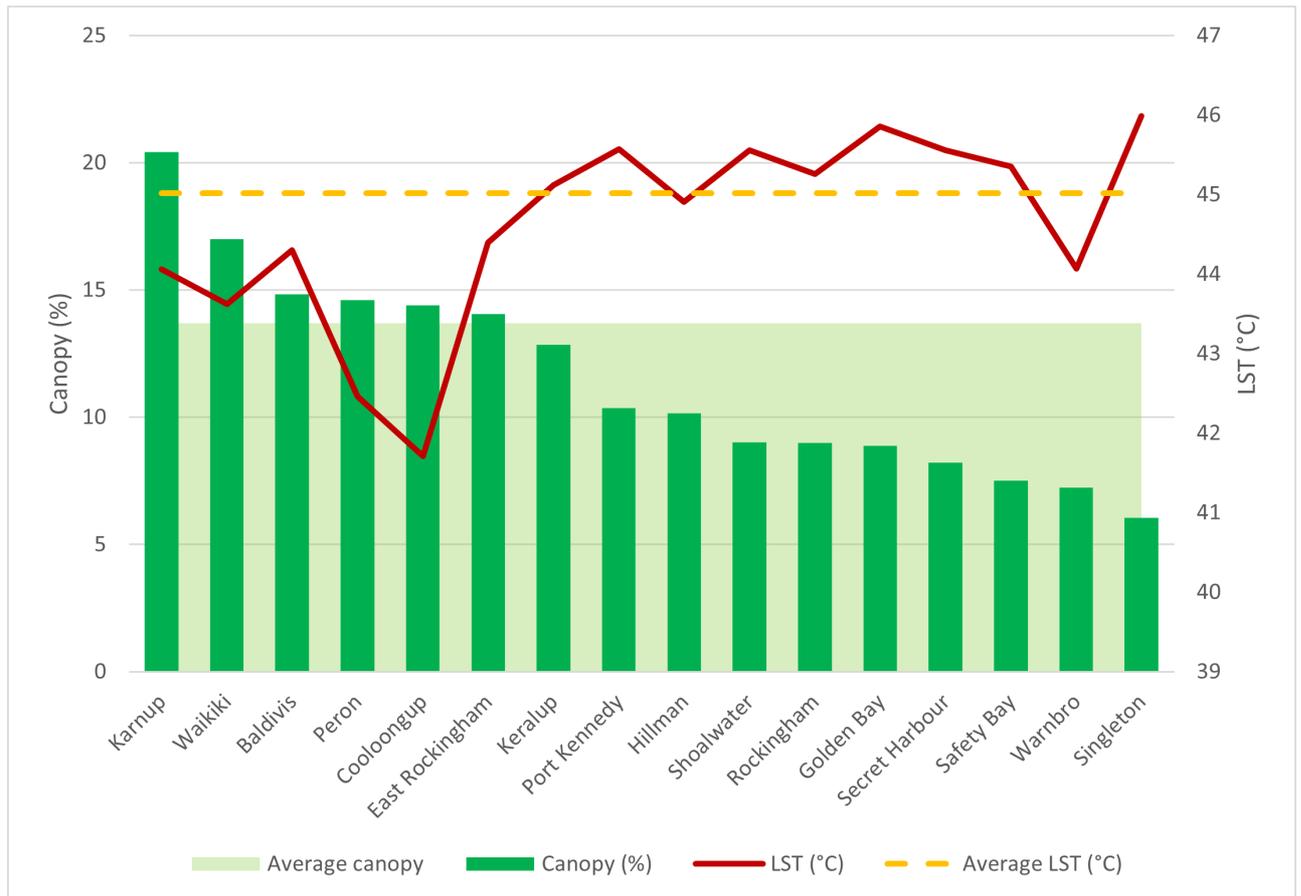


Figure 5: The correlation of canopy cover and land surface temperature (LST); indicating increased LST with decreasing canopy cover.

3.3 Benefits of the Urban Forest and Drivers for Change

Trees play a significant role in providing ecosystem ‘services’ such as air and water filtration, shading, providing habitat for animals, producing oxygen, carbon sequestration, and nutrient cycling. They also serve as a connection between people and nature.

Every living organism benefits from a well-established urban forest; wildlife have improved access to food and shelter, communities that benefit from increased recreational opportunities, improved air and water quality, and property owners enjoy a more comfortable environment and the potential for increased property value.

3.3.1 Environmental Benefits

Enhancing Biodiversity and Ecological Services: Urban forests enhance biodiversity by providing habitats for various species of birds, insects, and other wildlife, which is crucial for maintaining ecosystem services like pollination, pest control, and nutrient cycling (Marselle et al., 2019). By selecting a diverse range of native and climate-resilient species, urban forestry can create robust ecosystems that support a wide array of flora and fauna.

Reducing the urban heat island effect: Expanding the urban tree canopy can significantly reduce the urban heat island effect, a phenomenon where urban areas experience higher temperatures than their more natural surroundings due to the abundance of heat-absorbing surfaces. Increasing tree cover helps to cool cities by providing shade and releasing moisture into the air (Roloff 2016).

Carbon Sequestration and Greenhouse Gas Mitigation: Vegetation plays an important role in mitigating greenhouse gases by converting carbon dioxide into stored carbon (Nowak 1993). Urban trees make a significant contribution to reducing carbon dioxide levels.

Improved Air Quality: Trees improve air quality by absorbing gaseous pollutants such as nitrogen and sulphur dioxides and producing oxygen, reducing air pollution, which consequently reduces the incidence of many diseases, including cardiovascular disease, respiratory diseases, asthma, mental diseases and more (Dwyer et al. 1992; Brack et al. 2002).

Water Cycling and Erosion: Urban forests play a role in intercepting, filtering, and absorbing rainfall, thereby reducing stormwater flows (Xiao et al. 1998, Kuehler et al. 2017) (Figure 6). This reduces runoff and the amount of pollutants entering waterways and helps maintain the stability of water volume within the water cycle. Furthermore, the roots of these plants provide structure to the soil, reducing erosion. Strong canopy and understory also act as a barrier against strong winds, further reducing soil erosion and improving the **liveability** of an area.

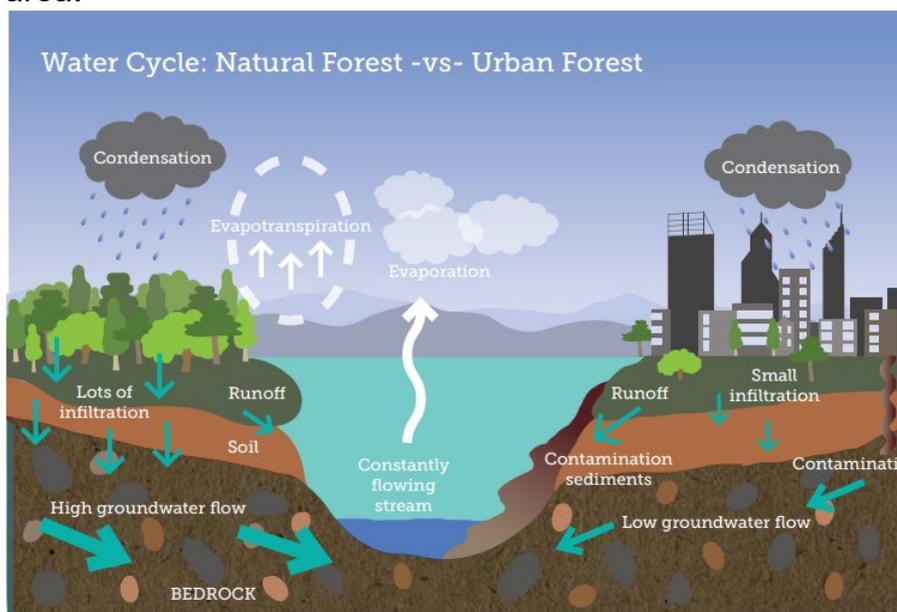


Figure 6: Water cycle

3.3.2 Health and Wellbeing Benefits

Aboriginal Heritage and Connection: The identity and traditions of Aboriginal people are deeply connected to the land, a relationship that was especially profound before colonisation, with the landscape carefully managed and shaped by those who depended on it.

Community identity and sense of place: Trees and green spaces significantly enhance the aesthetic value of neighbourhoods. Urban trees and green spaces provide common areas for community members to gather, fostering social interactions and strengthening community bonds, which research indicates can significantly enhance social cohesion and community ties (Sullivan et al., 2004).

Aesthetic value: Many people consider trees and other types of vegetation to be visually pleasing. It inspires people to work towards preserving and enhancing the urban forest for future generations (Dwyer *et al.* 1991, Chapin and Knapp).

Improved Physical and Mental Health: Urban forests positively impact the mental health and overall wellbeing of residents. Studies have found that exposure to community gardens or green spaces led to a decrease in incidence and severity of depression (South *et al.* 2018, Bratman *et al.* 2015).

Urban forests also have a positive benefit on physical health by affecting the autonomous nervous system and reducing chronic stress, as shown by Egorov *et al.* (2017). There has also been a link demonstrated between healthy ecosystems and a healthy human microbiome (von Hertzen *et al.* 2015).

Heat and sun protection: Australia has one of the highest rates of skin cancer in the world caused by exposure to Ultra Violet radiation (UVR). Shade from trees can reduce exposure to UVR (Heisler and Grant (2000), Grant *et al.* (2007), and Bowler (2010b). Urban forests and vegetation also have a cooling effect, lowering temperatures inside and outside shaded buildings, thus reducing heat-related illnesses and deaths, as demonstrated in research by Donovan *et al.* (2013).

Traffic calming and crime reduction: Tree and vegetation near the road edge significantly help calm traffic, reducing vehicle speeds and improve safety for pedestrians and cyclists (W. E. Marshall & Garrick, 2011). Larger tree canopies that extend over the street are associated with fewer injury/fatal crashes as well as fewer crashes, compared to roadside clear zones (A. J. Marshall et al., 2019). The presence of trees and well-maintained green spaces is associated with lower crime rates by encouraging more "eyes on the street," increasing surveillance, and reducing stress (Kuo & Sullivan, 2001).

Accessible green spaces encourage regular use of public areas, including commerce, increasing informal social control and reducing opportunities for criminal activities (Cohen et al., 2008; Wolfe & Mennis, 2012).

3.3.3 Economic Benefits

Reduced Energy Costs: Canopy shading can help to mitigate heat effects and decrease the reliance on artificial cooling. Previous research has found that increasing tree coverage will lead to savings in residential cooling costs (McPherson and Rowntree 1993, City of Melbourne 2014, Ko 2018). This benefit is becoming increasingly important with the rise in global temperatures due to climate change.

Improving Property Value: One of the most consequential impacts of urban forests and canopy cover, for landowners, is the direct relationship to property values (C. Konijnendijk et al., 2005, Ewane et al., 2023).

Urban Jobs: Urban forestry creates job opportunities in areas that might otherwise have limited employment generation. These jobs are produced through activities related to the maintenance and enhancement of urban trees, as well as through the various benefits provided by urban forests (Miller et al., 2015).

3.4 Urban Forest Challenges

Rockingham faces several significant challenges in its efforts to protect and enhance urban green spaces and expand tree canopy cover. These challenges impact the resilience, health, and growth of the urban forest. Some of the primary issues include:

3.4.1 Environmental Challenges

Climate Change: Urban trees are vulnerable to the effects of climate change, including increased temperatures, drought, altered precipitation patterns, and more frequent extreme weather events.

Urban Heat: Heatwaves have significant impacts on the environment and the community, with effects on people's health and wellbeing, economic productivity, urban wildlife and heat stress on existing trees.

Pests and Diseases: Trees in urban environments are susceptible to various pests and diseases, which can spread rapidly and cause significant damage.

Water Security: One of the biggest challenges for the urban forest is the availability of water for tree establishment.

Soil Health: Urban areas often have poor and disturbed soils, which can hinder tree growth and health. Rockingham is particularly impacted by low nutrient sandy soil with poor highly permeable water holding capacity.

Physical Constraints: Streetscapes are often the most difficult location to plant trees due to lack of space and competition with other infrastructure. Verge widths, particularly in newer developed areas are insufficient to support large trees. Existing streetscapes lack planting space due to footpaths, driveways, overhead power lines etc.

Tree establishment: Tree planting conditions in Rockingham are unforgiving. Poor soils combined with high heat and low rainfall means establishing trees is challenging.

3.4.2 Operational Challenges

Resourcing: Urban forestry programs require significant funding for planting, maintenance, and proactive management.

Species Selection and Prioritisation: Many small tree species are planted in locations where large trees can be supported. Tree planting sites are sometimes decided by which residents have requested new trees not necessarily strategic objectives such as heat mitigation or social vulnerability.

Processes: Effective management of urban trees requires coordination between various departments, utilities, and community groups.

Community Engagement: There can be a lack of public understanding or appreciation of the benefits of urban trees, leading to resistance to planting and preservation efforts.

3.4.3 Privately managed land Challenges

Lack of Tree Protection Laws: Western Australia lacks comprehensive tree protection laws, making it difficult for the City to regulate the removal of trees on private land and influence tree canopy.

Reduced Space for Trees on Private Land: Urban densification is leading to reduced space for trees on private space and street environments as land is increasingly taken up for buildings and infrastructure, limiting opportunities for tree planting and growth.

Impacts on Tree Health from Development: Construction activities in the area can severely impact the health of existing trees through root damage, soil compaction, changes in drainage patterns, and physical injury to trunks and branches, leading to increased tree stress and mortality.

Clearing of existing tree to facilitate urban growth: Rockingham is experiencing significant urban growth, the majority of which is located within greenfield development in the form of planned housing communities. This urban growth should be underpinned by a framework for retaining and enhancing urban greening to ensure future communities can thrive in comfortable environments with green infrastructure playing a vital role in the health, social framework and economic sustainability of a successful City. As the urban landscape evolves, so does the importance of fostering a green, sustainable and resilient community and the City has a role to advocate for better outcomes.

3.5 Responsibilities



Figure 7: Tree canopy contribution and land ownership in the City of Rockingham

3.5.1 City of Rockingham

The City holds a significant responsibility in the management of the urban forest and the equitable provision of its benefits.

The **management of trees on public land** (under the City's control) is the responsibility of the City. Resourcing of the management of green space including tree planting and maintenance is guided by Service Delivery Team Plans and the City's *Corporate Business Plan*.

3.5.2 State Government Agencies

The City has a large proportion of environmental land (reserves) which contributes greatly to the overall canopy. Some of these reserves are managed by the City under a management order from the state government, whereas others are managed by the agencies such as the Department of Biodiversity Conservation and Attractions.

The state government is also responsible for the identification of new urban land and for the planning framework that regulates urban development.

Elements of the planning framework and other mechanisms for the protection include:

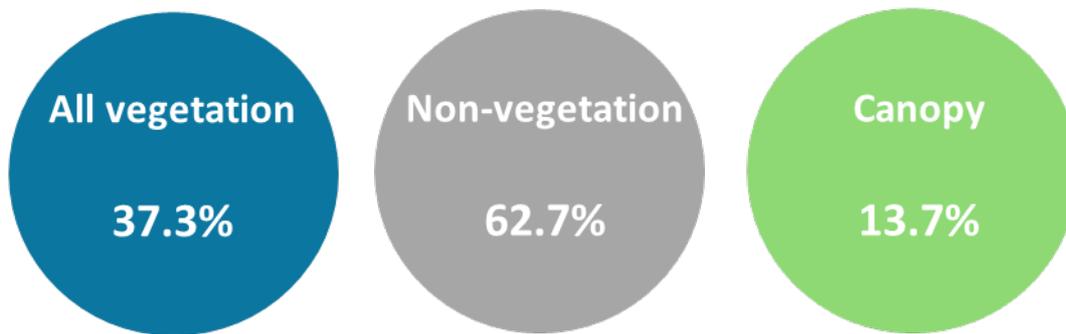
- Liveable Neighbourhoods
- Residential Design Codes
- *Environmental Protection (Native Vegetation Clearing) Regulations*
- *Environmental Protection and Biodiversity Conservation Act*

3.5.3 Private Landowners

In Western Australia, the general **absence of legal protections for trees on private land** significantly undermines efforts to preserve and manage the urban forest. Advocating for stronger state-level legislation is crucial to safeguard trees on private land, ensuring a sustainable and resilient urban environment for future generations.

The City is currently investigating the introduction of a Tree Protection Policy to protect trees on private property, and has provisions in the *Town Planning Scheme No. 2* enabling formal protection of native trees and vegetation on Rural, Special Rural and Special Residential land.

3.6 Current Situation



On a City-wide basis, Rockingham has a canopy coverage (vegetation over 3m) of 13.7% with overall vegetation coverage of 37.3% (refer to Figure 8).

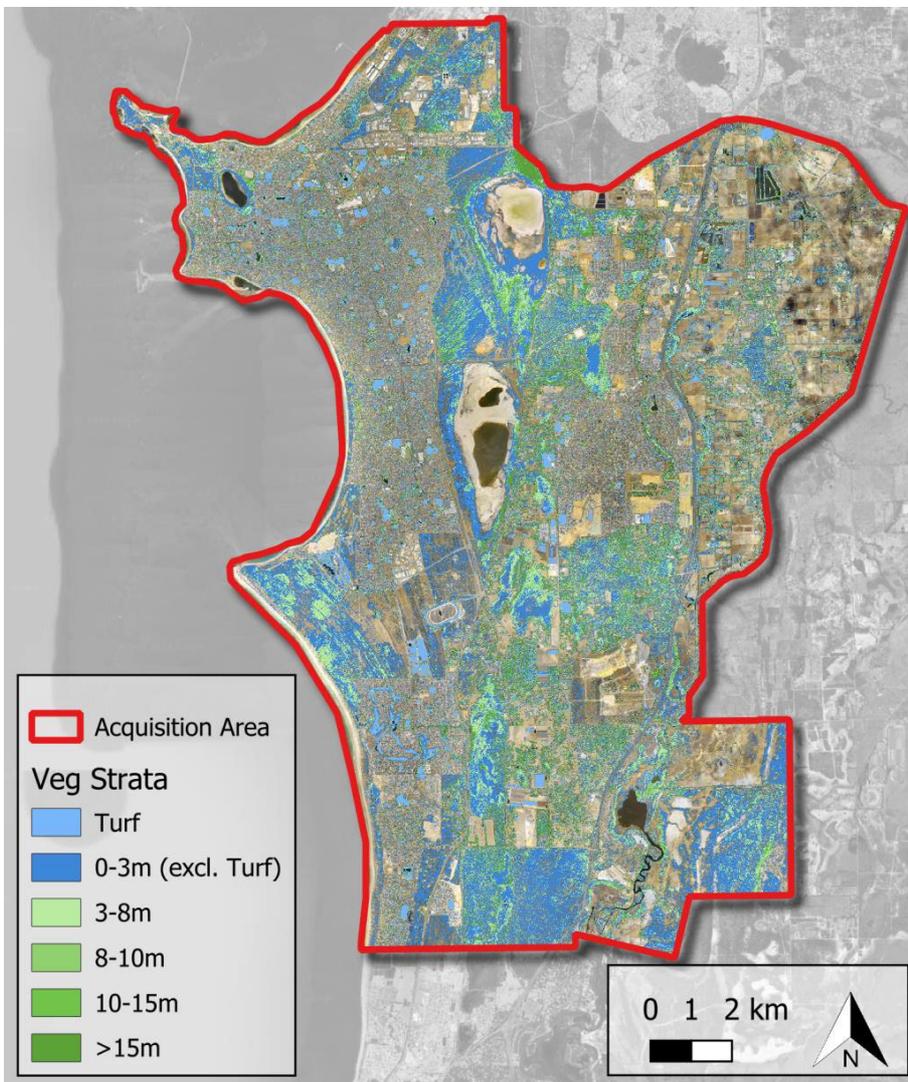


Figure 8: Height stratified vegetation across the City.

3.6.1 The Study Area and Data Acquisition

High-resolution airborne imagery was acquired over the City in January 2024.

This data was processed to produce high-resolution RGB imagery (Figure 9A), false colour composite imagery (Figure 9B), a height stratified vegetation cover data set (Figure 9C), daytime land surface temperature (°C) (Figure 9D) and vegetation condition index (Figure 9E) across the entirety of the City.

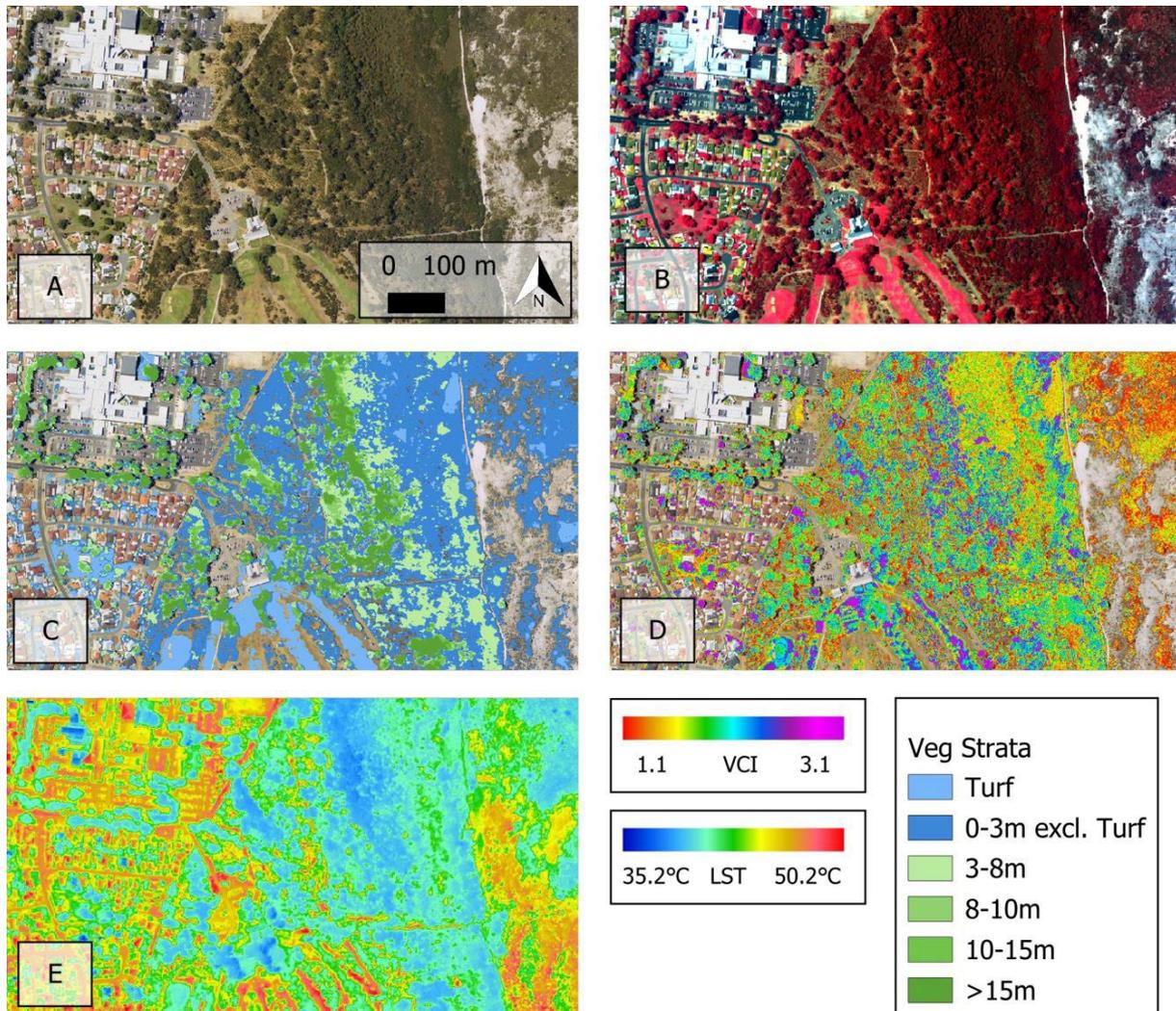


Figure 9A high-resolution RGB imagery; 9B false colour composite imagery; 9C height stratified vegetation cover data set; 9D daytime land surface temperature (°C); 9E vegetation condition index.

3.6.2 Methodology for Calculating Canopy

Height stratified vegetation cover was calculated for each suburb, land use classification, total public open space area, total road area and across the City as a whole.

In accordance with the *Better Urban Forest Planning (2018)* prepared by the Department of Planning, Lands and Heritage, **canopy cover is classified as vegetation three metres or more in height.**

All living vegetation less than three metres in height is classified as non-canopy vegetation. This includes turf, grass, shrubs and small trees.

Non-vegetation includes asphalt, concrete and other building materials, as well as bare earth, sand and dead grass.

Land use zones have been determined for the entire City using the City's Town Planning Scheme No.2 and cadastral datasets (Figure 10) (see Appendix A for the method of development of these land use zones).

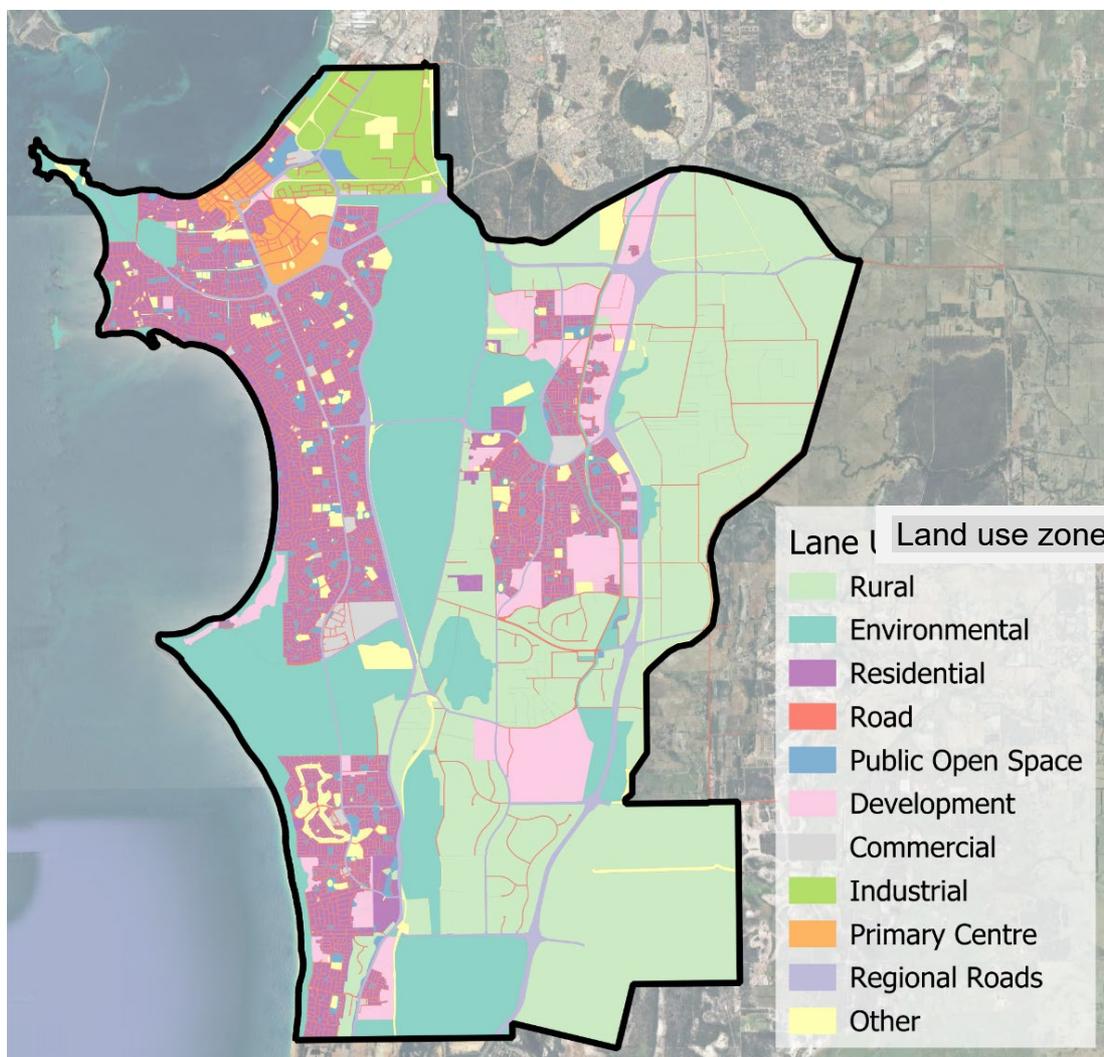


Figure 10: Land use zones categorised from the Town Planning Scheme.

3.6.3 Current Canopy Cover

3.6.3.1 City Wide

Nearly two thirds (62.7%, 15,730.8 ha) of the City is non-vegetated surfaces, such as buildings, roads, exposed soil and dead grass (Figure 11). The remaining 37.3% (9143.1 ha) of land area was covered in vegetation. Canopy covered 13.7% (3,355.5 ha) of the City, while non-canopy vegetation covered 23.6% (5,788 ha).

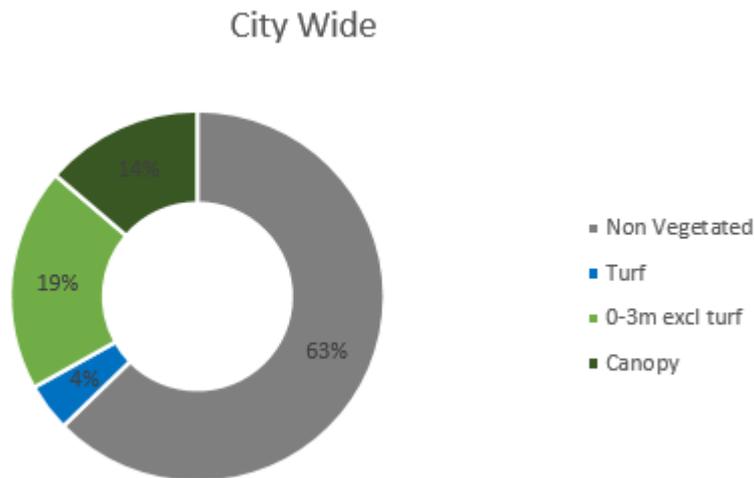


Figure 11: City wide canopy

Environmental land and rural land are the largest land use zones in the City, together making up 58% of the City land area. Together, they contribute 74% of the City's total canopy (1,164.8 ha and 1,308.9 ha each). The contribution of each land use zone to the city wide canopy cover are provided in Figure 12 and discussed further below.

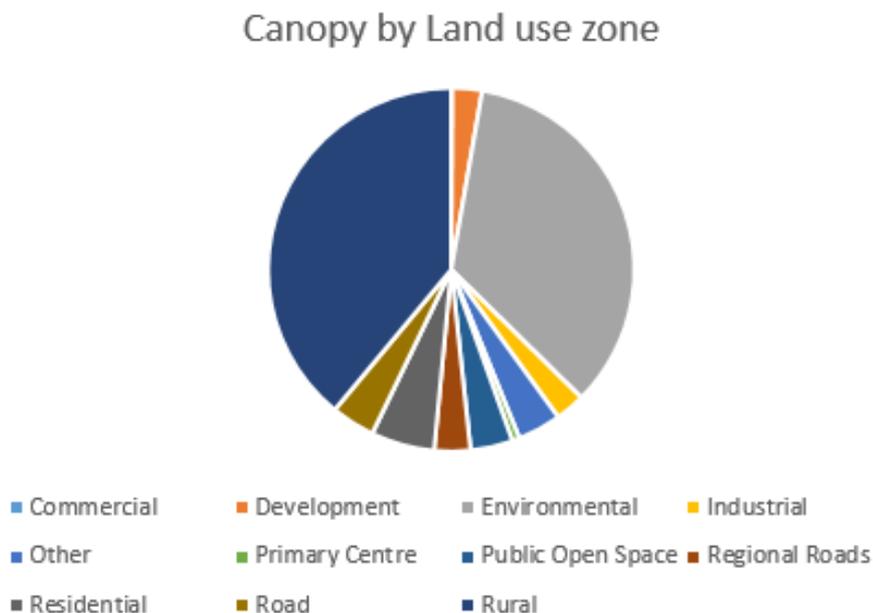


Figure 12: contribution of each land use zone to City wide canopy cover.

3.6.3.2 By Suburb

In terms of proportional canopy cover, Karnup had the highest canopy cover (20.4%) followed by Waikiki (17%). The City of Rockingham has a large proportion of rural and environmental land, which impacts the canopy cover for particular suburbs more than others.

The majority of Karnup is classified as rural or environmental, and it includes large areas of remnant vegetation, such as the Paganoni Swamp and Anstey Swamp and their adjacent bushland.

A large portion of Waikiki is the bushland that is part of Lake Walyungup and Lake Cooloongup, also reserved for environmental purposes.

Proportional canopy cover of each suburb is presented in Table 1 and Figure 13.

Table 1: Proportional canopy cover of suburbs, in area (ha) and percent.

Suburbs	Area (ha)	Canopy area (ha)	Canopy %
Baldivis	8717.4	1293.8	14.8
Cooloongup	1129.0	162.5	14.4
East Rockingham	870.0	122.4	14.1
Golden Bay	452.5	40.1	8.9
Hillman	189.1	19.2	10.1
Karnup	3225.8	658.7	20.4
Keralup	2207.8	283.6	12.8
Peron	183.6	26.8	14.6
Port Kennedy	2317.9	240.2	10.4
Rockingham	1278.2	115.0	9.0
Safety Bay	467.1	35.1	7.5
Secret Harbour	664.5	54.6	8.2
Shoalwater	249.2	22.5	9.0
Singleton	371.2	22.5	6.1
Waikiki	1023.7	174.0	17.0
Warnbro	1165.6	84.3	7.2
Total	24512.7	3355.2	13.7

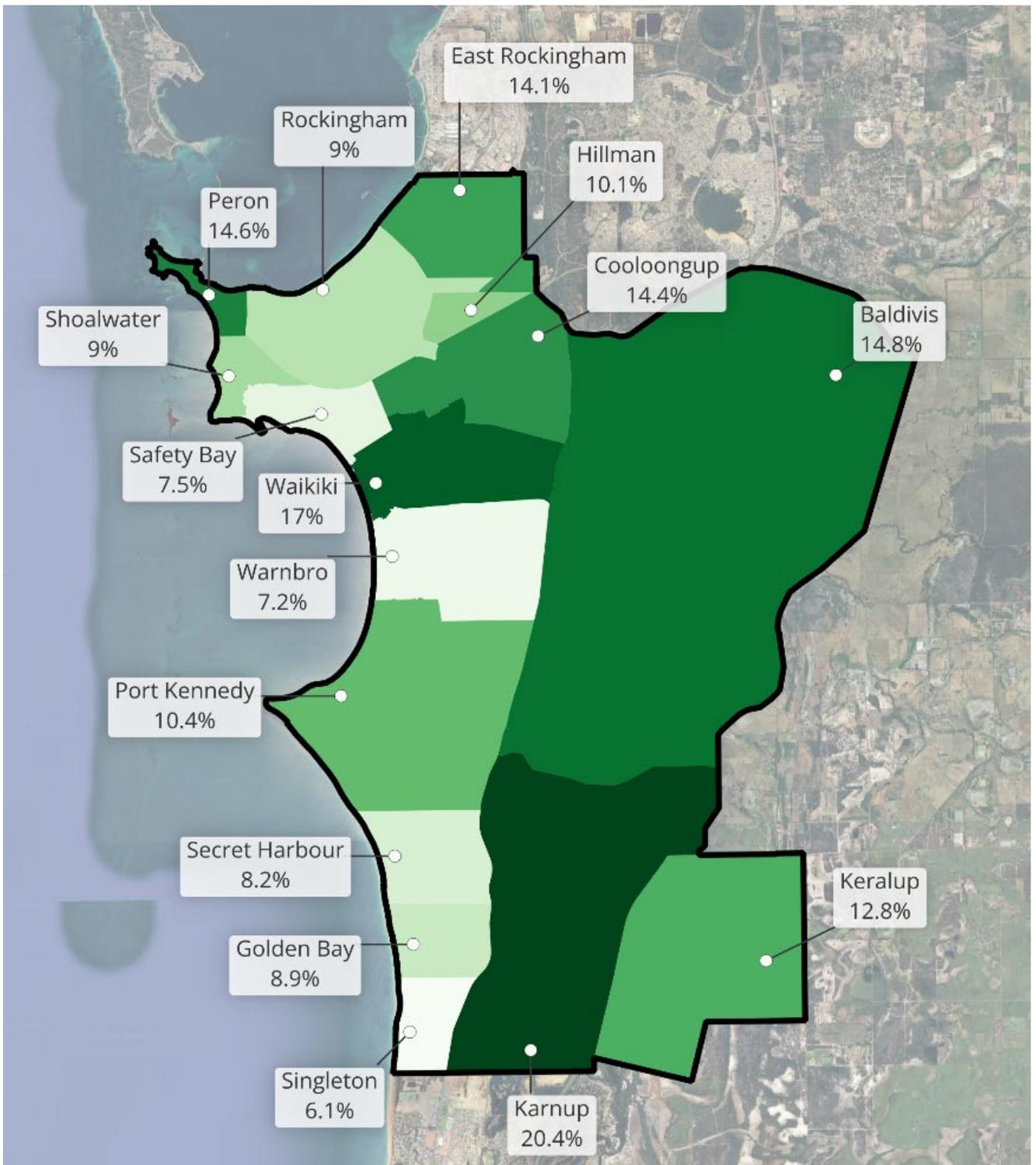


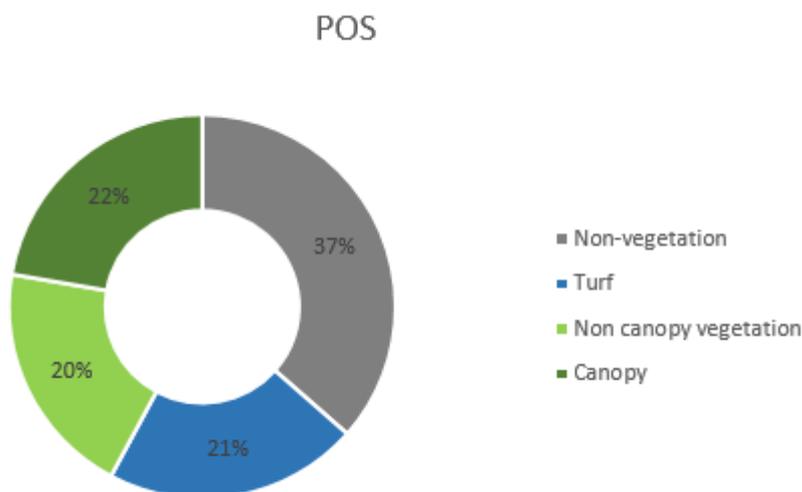
Figure 13: Proportional canopy cover of suburbs, the darker green indicates higher relative canopy cover percentage.

3.6.3.3 City Managed Land

For the purposes of this Strategy, 'City Managed Land' refers to Public Open Space (POS) and Roads.

Public Open Space

Over a third of POS consists of non-canopy vegetation including turf (21.3%) and vegetation between 0 and 3m in height (19.9%). Another third (36.5%) is non-vegetated surfaces, this includes playgrounds, buildings, footpaths as well as bare earth and soil. The remainder is canopy (vegetation over 3m in height) (22.3%).



Although POS has high proportional canopy cover (22.3%), as it only makes up 2.3% of the total City area, it therefore contributes 3.7% (125.5 ha) of canopy to the City's total.

Roads

There is 1651.2ha of road in the City of Rockingham the majority of which is non-vegetation (77.9%).

Of the remaining land area, 6.6% is turf, 7.7% is non-canopy vegetation and 7.9% is canopy. Of this non-vegetated land, a large portion has been identified for planting within streetscapes as outlined under Available Planting Space.

3.6.3.4 Private Land (not under City management)

Private land is any land on which the City do not have control over with regards to planting and/or retention of trees. As the City has less capacity to influence the outcomes for canopy in these land use zones, they have been included in the aspirational targets for the City's canopy as a whole but have not been included in the canopy targets and planting program outlined for implementation by the City.

The Proportional Canopy of each land use is provided in Table 2, and in Figure 14.

Land Use Zone	Area (ha)	Canopy area (ha)	Canopy %
Commercial	244.9	3.4	1.4
Development	1474.0	87.9	6.0
Industrial	725.2	88.6	12.2

Other	1047.2	129.4	12.9
Strategic Centre	277.6	21.6	7.8
Regional Roads	998.0	106.9	10.7
Residential	3213.5	188.6	5.9
Rural	8618.0	1308.9	15.2

Table 2 - Proportional Canopy Cover by Land Use

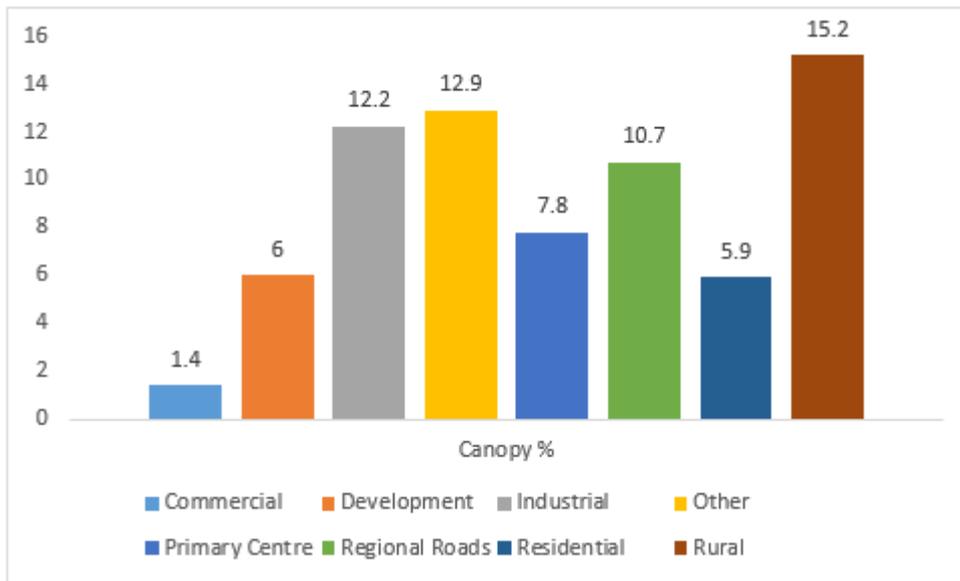


Figure 14 - Proportional Canopy Cover for Privately Land

Environmental Land

Environmental Land (reserves) is one of the largest land use zones within the City and contributes 34.7% (1,164.8ha) to the City's overall canopy. 20.4% of Environmental Land is canopy, which along with POS is a higher proportional cover than the City average of 13.7%.

Much of the City's environmental land consists of wetlands and waterbodies which contribute to urban cooling, however, do not support increased canopy.

The majority is managed by the Department of Biodiversity and Conservation under the *Rockingham Lakes Regional Park Management Plan 2010*.

Approximately 10% (627 ha) is maintained by the City under a management agreement from the DBCA. These are managed via other relevant Environmental Management Plans and as such are not included in canopy cover targets for City managed land within this Strategy.

>insert figure showing Environmental land across the city and those reserves under City management<

Residential

Residential land, contributes 5.6% (188.6 ha) of canopy cover to the City's total, as it makes up a large proportion of the total City area (13%, 3,213.4 ha).

The majority of residential land is non-vegetated (77.6%), 14.9% is non-canopy vegetation, 4.1% is turf and the remaining 5.9% is canopy.



Rural

Rural land is one of the largest land use classes in the City. It contributes 1,308.9 ha (39%) to the City's total canopy.

Over half of rural land is non-vegetated (65.9%), much of which would be made up of bare paddocks where the pasture has dried during the summer months. 18.8% is non-canopy vegetation (including turf) and the remaining 15.2% is canopy.



Development

Development refers to those areas that are identified for urbanisation under Town Planning Scheme No.2 (see Figure 3). Many of these areas have been historically cleared (i.e. the sand quarry on Stakehill road in Karnup) and/or already cleared for development, and as such do not contribute greatly to the City's canopy only accounting for 2.6%. While these areas may experience some improvement in canopy cover following planting undertaken by developers, incorporating specific requirements into Liveable Neighbourhoods would ensure the best possible outcome.

Areas that were under investigation for urban development, including North-East Baldivis and Karnup District Structure Plan area, at the time analysis was being undertaken were not considered and may have impact on the City's ability to achieve aspirational targets in the long term. It is noted that North-East Baldivis was historically cleared for agricultural purposes and tree planting and revegetation as part of the urban development process may ultimately result in an increase in canopy cover for that area. The Karnup District Structure Plan area is more heavily vegetated, however, the extent of clearing that will occur at this time is unknown until planning and environmental approval processes are completed. Again, the best outcome for canopy cover in future urban areas would be ensured by the inclusion of requirements relating to tree protection and planting in Liveable Neighbourhoods.

Strategic (City) Centre

The City's Strategic Centre is predominantly non-vegetated surfaces (75.2%) such as buildings, etc. 17% is non-canopy vegetation (including turf) and 7.8% is canopy.

The Strategic Centre is the subject to separate structure planning, which includes provisions for increasing canopy and planting within streetscapes, as such it has not been included in this Strategy.



Commercial and Industrial

Industrial land has a proportional canopy cover of 12.6% which is marginally lower than the City wide average but is higher than many of the other privately managed land uses. Commercial land is much lower at just 1.4%, this is due to the fact that the majority of land zoned commercial consists of non-vegetated surfaces.

Regional roads

Regional roads have a proportional canopy cover of 10.7%, as expected the majority of this land use zone is made up by non-vegetated surfaces (roads) (72.4%).

Other

Land uses under the 'Other' classification are made up primarily of community and public purpose infrastructure such as schools, hospitals and other community and cultural uses. Canopy accounts for 12.9% of these areas while non-canopy vegetation (including turf) makes up 19.6%.

Tree Diversity

In the urban forest context, maintaining genetic diversity is an important way to promote a healthy and resilient urban forest (Santamour 1990). Maintaining genetic diversity is a function of the number of families, genera, and species present, as well as how those taxa are spatially distributed across the community.

Over 40% of City planting between 2017 and 2023 have been in the genus *Eucalyptus* (Figures 15 and 16). A further 19% were *Agonis* (e.g. *Agonis flexuosa*, also known as wonil or the WA peppermint), and 13.4% *Callistemon* (e.g. *Callistemon* 'Kings Park Special', also known as bottlebrush). Another 6% were *Corymbia*, such as marri (*Corymbia callophylla*) and red flowering gum (*C. ficifolia*). All four of these genera include species that are native to Western Australia and the Rockingham region.

These genera are all from the Myrtaceae family, meaning that 81% of recently planted trees have been from this family. The majority of trees endemic to the area belong to this family, and they are well adjusted to Rockingham's environmental conditions.

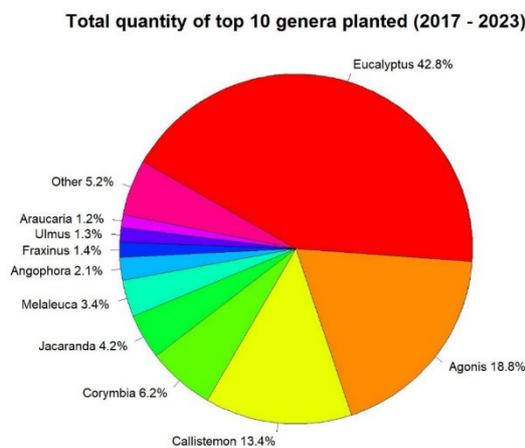


Figure 15: Top ten genera of trees planted between 2017 and 2023

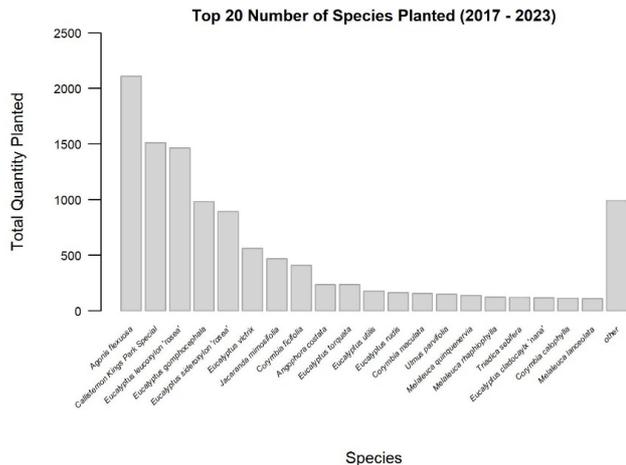


Figure 16: Top Twenty species of trees planting between 2017 and 2023

3.6.4 Available Planting Space

Analysis of available planting space (APS) was undertaken to identify land available for planting trees and increasing canopy cover. APS was determined as areas identified as ‘grass’ or ‘bare earth’ in the aerial imagery, limited by numerous factors, including the area shape and size, and assets such as powerlines and lighting poles, water infrastructure, distance to road intersections and playing fields, which were excluded. General clearances of services used in the analysis were those outlined in *Austrroads – Guide to Road Design, Part 6B: Roadside Environment (AGRD06B-09)* and *Utility Providers- Code of Practice- for Western Australia*.

Note that the APS layer does not take into consideration passive surveillance requirements or limitations relating to speed limits approaching intersections. These and other limitations (i.e.. underground power) are site specific and may need to be assessed on a case-by-case basis.

The resulting APS dataset identified many verges, median strips and other road spaces with no canopy cover, and the space available for one or more trees (Figure 17). This APS data was used to calculate canopy cover targets for Streetscapes and POS that form the basis for the City’s recommended planting program.



Figure 17: Available planting space (APS) as well as limiting factors used to determine areas of APS.

A large proportion of public open space (POS) was classified as APS (36.5%) (Figure 18). Considering that **playing fields were excluded from the analysis**, this indicates that over a third of POS is currently turf used for other purposes, dry grass or bare earth, and presents an opportunity for increasing vegetation. These areas also present opportunities for improving tree diversity via the inclusion of Miyawaki or ‘pocket forests’. These forests are ideal in urban environments as they are fast growing and create dense, biodiverse mini forests even on small sites.

The entire APS within POS is not proposed to be planted, instead it is proposed to increase the proportional canopy cover within POS by 20% over the next 10 years, ensuring that other land-uses are considered when selecting planting locations within POS.

There were also a large proportion (16.7%) of streetscapes considered APS, indicating a lot of available planting space within verges and median strips.

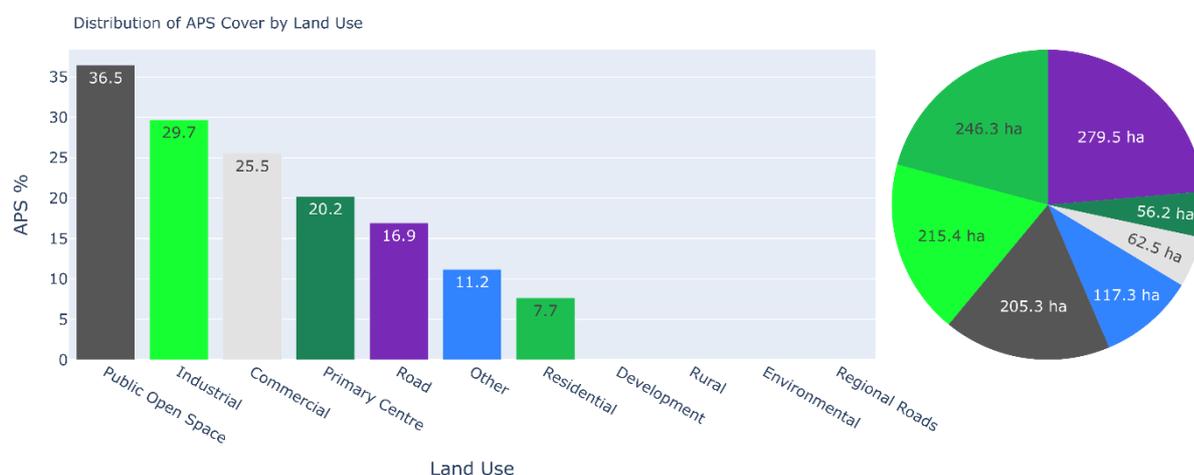


Figure 18: Land cover classification proportion (%) (left) and hectare coverage (right) of the Land Use Zones. Note that Development, Rural, Environmental and Regional Roads were excluded from the analysis.

7. The Way Forward

The Strategy will be underpinned by four (4) Key elements and Goals that will derive the actions that are aimed at achieving the canopy cover aspirations.



Protect the existing urban forest and apply a valuation framework

Key Element 1: Protect and Value

Protecting and valuing the ‘urban forest’ is fundamental to ensuring its longevity and viability. This Principle emphasises the importance of preserving existing trees and recognising their ecological, economic and social value. Trees take many decades to provide notable canopy cover and as such, targets cannot be achieved without increased focus on existing tree preservation.

Goal 1.1 Value Public Trees

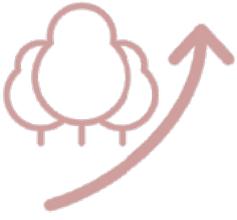
A comprehensive tree valuation framework enables the quantification of tree benefits, including air quality improvement, stormwater management, and property value enhancement, to better guide investment and protection efforts.

Goal 1.2 Protect Public Trees

Protecting the existing urban forest is a critical step for ensuring its sustainability. Mature street and park trees provide valuable ecological, economic, and social benefits, which cannot be replaced by new plantings in the short term. Managing urban trees poses challenges that can put these valuable assets at risk. Without careful management and maintenance, Rockingham may experience a decline in canopy cover due to unnecessary tree loss. By defining how the City will manage their tree assets and committing to their improved management acknowledges the inherent value of the City’s established trees.

Goal 1.3 Protect Private Trees

Implementing a tree protection policy is crucial for safeguarding mature trees on private land and preserving Rockingham’s overall canopy cover. This goal focuses on developing and ensuring private trees are protected and valued. Additionally, advocating for stronger tree protection regulations at the state level will reinforce local efforts, providing broader support and legal frameworks to protect trees and foster a community culture of tree stewardship across both public and private spaces.



Expand the urban forest and increase tree canopy cover with an integrated approach

Key Element 2: Expand, Increase and Integrate

Expanding the urban canopy with an integrated approach is essential for enhancing the environmental and social benefits to the community. This Principle focuses on increasing tree planting to ensure equitable access to green spaces. Integrating urban forestry into broader urban planning, capital works and development processes is vital for creating sustainable, liveable cities.

Goal 2.1 Increase Canopy on Public Land

The City of Rockingham acknowledge the importance of planting trees to improve our urban environment and have an established successful tree planting program that achieves approximately 3000 trees per year. However, to meet established tree canopy targets the City will need to increase efforts. Tree planting initiatives should be prioritised in areas with low canopy cover and high urban heat island effects, contributing to climate resilience and improved quality of life.

Goal 2.2 Integrate Delivery of this Plan and Urban Forest Programs

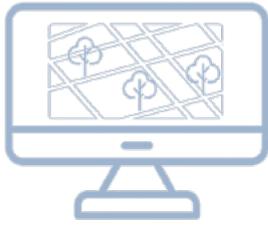
To maximise the impact of urban forest initiatives, this goal seeks to integrate and align efforts across City departments, fostering collaboration and a unified approach to urban forest management. Establishing a cross-departmental working group will facilitate coordination and ensure that capital projects consistently support urban forestry objectives. All parts of the City should be actively seeking to incorporate tree planting in their projects, where possible. Integrated project delivery leads to greater cost efficiencies and improved services for the community.

Goal 2.3 Improve conditions for Tree Planting

Addressing the challenges of poor sandy soils with low water-holding capacity is essential for establishing a resilient urban forest. This goal focuses on improving soil conditions to support healthy tree growth through sustainable soil management. Integrating water-sensitive urban design (WSUD) principles, such as passive irrigation, into all City projects further supports tree health by maximising water efficiency in these challenging soil conditions, creating a stronger foundation for successful tree establishment and long-term canopy growth.

Goal 2.4 Improve Canopy Outcomes on Development Sites

Embedding urban forestry principles into development guidelines ensures that new developments include sufficient green space and tree planting, promoting a greener urban landscape. Collaborations with developers and communities can support tree planting and maintenance efforts on both public and private lands.



Proactively manage the City's tree assets, monitor changes in canopy cover and apply best practice maintenance principles

Key Element 3: Monitor, Manage, and Maintain

Effective management and maintenance of the urban forest is crucial for sustaining its health and maximising its benefits. Managing trees as assets and employing best practice urban forestry techniques will ensure the longevity of the asset. Investing in a tree inventory and developing a comprehensive tree maintenance program that includes regular inspections, maintenance schedules and risk assessments is essential for proactive management.

Goal 3.1 Develop a Robust Tree Inventory and Proactive Maintenance Program

A comprehensive and well-maintained tree inventory is the foundation of effective urban forest management. This goal identifies the need to create and maintain a detailed inventory of all City-managed trees, including streets and parks. Integrating this inventory with the City's asset management system enables a proactive approach to maintenance, ensuring timely inspections, risk assessments, and responsive care. A dedicated Tree Asset Officer will oversee inventory establishment and a forward-planning maintenance program to address high-target areas, enhancing the resilience and longevity of the urban forest.

Goal 3.2 Enhance Operational Efficiency

Establishing a clear and efficient framework for managing public trees is essential for sustaining the urban forest. This goal focuses on streamlining all tree-related processes, from customer requests and inspections to planting and removal protocols, to create a cohesive management approach. By developing standard operating procedures based on best practices, the City can ensure consistent, reliable, and high-quality care of its tree assets while enhancing transparency and accountability in public tree management.

Goal 3.3 Implement an Urban Forest Monitoring and Reporting Framework

Consistent and accurate monitoring and reporting are vital for tracking canopy cover and urban forest health against the City's canopy cover targets. This goal aims to establish a comprehensive framework for monitoring canopy cover and tree planting efforts, with regular aerial canopy and vegetation cover collection to assess progress and trends over time. By setting clear KPIs and performance metrics, the City can evaluate urban forestry initiatives, use data to drive improvements, and report transparently to stakeholders through the City's reporting framework.



Drive change through collaboration with community and incentivise tree planting and protection

Key Element 4: Collaborate, Educate, Incentivise and Advocate

Raising awareness of the benefits of trees across the community can drive change. Bringing the community ‘along for the journey’ and establishing a strong relationship with the community will improve how efficiently and successfully the City can deliver on its goals. Incentive schemes can encourage residents, businesses, and developers to plant and maintain trees. Community engagement programs that involve residents in tree planting, care, and monitoring activities can build a sense of ownership and responsibility for the urban forest.

Goal 4.1: Raise Public Awareness of the Benefits of Urban Trees

Educating the community on the value of trees to enhance public support and promote urban forestry awareness will lead to a greater acceptance and positivity towards trees. This goal is aimed at creating campaigns and resources to inform residents about the environmental, health, and social benefits of trees.

Goal 4.2 Strengthen Community Engagement and Stewardship

Building a sense of community ownership over the urban forest is key to its sustainability. This goal focuses on engaging residents in hands-on urban forest activities and encouraging responsibility for local green spaces.

Goal 4.3 Implement Incentive Programs to Encourage Tree Planting and Care

Providing incentives encourages active participation in urban forestry, motivating residents, businesses, and developers to plant and maintain trees. This goal focuses on offering rewards and recognition for urban forestry contributions.

Goal 4.4 Collaborate with Research Organisations and Groups

Collaborating with research organisations and groups to identify novel ways of improving tree management and solutions to challenges will position Rockingham as leaders in the urban forestry space.

Goal 4.5 Advocate for Increased State Government Engagement

Environmental land is one of the largest land use zones within the City and contributes 38% to the City's overall canopy, however the majority of this land is not managed by the City. As such it is necessary for the City to advocate to the state government to improve outcomes within these reserves.

8. Measuring success

Setting canopy cover targets is crucial as they establish criteria for assessing the Strategy's success over time. These targets highlight essential metrics that can be reliably measured to gauge progress.

In the context of urban forests, targets often focus on the extent and distribution of canopy cover, which serves as a valuable indicator of the environmental, well-being, and amenity benefits provided by the urban forest. The setting these targets, however, involves balancing the ambition for increased canopy cover with what is realistically achievable within a given timeframe. The full impact of planting new trees on urban canopy cover is usually observed only 10-20 years after planting.

Aspirational canopy cover targets have been developed based on Land Use. These targets are considered what is achievable in the long term and address privately managed land zones as well as City managed land zones. A detailed method of how the canopy cover targets were determined is presented in Appendix C.

A set of canopy cover targets for City managed land zones have been provided that align with the City's current resources and capacity to increase canopy cover over the duration of this Strategy.

The targets assume a 20-year strategy period, with all planting taking place in the first 10 years in order to realise canopy cover by the 20-year mark.

It is important to note that the target numbers:

- Do not consider growth of existing trees;
- Do not consider tree removal/death;
- Do not consider survival rate of newly planted trees; and
- Are for supply and installation of trees only, and do not consider maintenance, watering, City labour and admin costs associated with an increased planting program.

City Managed Target

The City has an ability to increase canopy cover on City managed land, including public open space and streetscapes.

The canopy cover targets are for the 20-year period of the Strategy, with planting occurring in the first 10 years. Tree numbers and costs are provided as an annual figure in Table 4.

The canopy cover target for City managed land (public open space and streetscapes) over the next 20 years is **24.5%** (from 17.9%).

This target is based on planting 100% of available planting space on streetscapes, and increasing canopy cover on public open space by 20% (excluding playing fields).

Table 4: Canopy cover targets on Public Open Space and Streetscapes.

Land Use	Current canopy (%)	Target canopy (%)	Increase in Canopy Cover (ha)	No. of Trees	Cost
Public Open Space	22.3	29.0	37.8	757	\$104,577
Streetscape	7.9	22.9	248.2	4,964	\$487,857
TOTAL	17.9	24.5	286.1	5,721	\$592,434

City-wide Aspirational Canopy Cover Targets

The City-wide aspirational canopy cover target is **16.5%** (from 13.7%) over the next 20 years.

Under the current regulations, there is no mechanism in place to increase canopy cover on privately managed land. The City’s influence is generally restricted to development controls, local environmental plans (LEPs), community education and engagement, and indirect methods like tree giveaway programs. The effects of these policies on canopy cover may take considerable time to manifest. Thus, targets for increasing canopy cover should be viewed with a long-term perspective, however, for government policy evaluation and adaptive management, more frequent milestone assessments are necessary for land managed by the City.

As detailed above, the City is currently investigating the introduction of a Tree Protection Policy to protect trees on private property.

The methodology for developing the aspirational canopy cover target is outlined in Appendix B.

Key Elements and Goals



PROTECT AND VALUE

Protect the existing green infrastructure and apply a valuation framework



EXPAND, INCREASE AND INTEGRATE

Expand the urban forest and increase tree canopy cover with an integrated approach



MONITOR, MANAGE AND MAINTAIN

Proactively manage Council's tree assets, monitor changes in canopy and apply best practice maintenance principles



COLLABORATE, EDUCATE AND INCENTIVISE

Drive change through collaboration with community and incentivise tree planting and protection

Key to achieving the City's vision and targets is a clear plan on how to achieve them. The urban forest principles are underpinned by strategic goals and actions outlined below.

To ensure the implementation of this Plan, the City will align these goals and actions with the capabilities and resources required to establish and sustain them. These actions will be integrated into operations at all levels of the City, noting that canopy cover targets will not be achieved by planting trees alone, but by also retaining and maintaining the existing urban forest and canopy.

This Plan presents priorities and actions for a 10 year period. The Strategy will be subject to a mid-term review after 5 years and full review after 10 years.

Stage One – High Priority (deliver within first 1-2 years)

This stage is essential as it delivers a significant impact to the organisation, establishing foundational elements or key initiatives that directly drive success. Actions here are critical for immediate focus to build momentum toward overall objectives.

Stage Two – Medium Priority (deliver within 3-5 years)

This stage supports the broader mission by enhancing organisational effectiveness through targeted contributions. These actions reinforce primary initiatives, adding strength to critical areas while enabling balanced and sustainable growth.

Ongoing - Throughout the term of the strategy

This priority involves continuous efforts crucial for sustaining and adapting organisational practices over time. These actions are implemented regularly to ensure steady progress, adaptability, and reinforcement of the organisation's core values and long-term commitments.

6. Risk Management

Risk	#1329	An outbreak of the Polyphagous Shot-Hole Borer (PSHB) <i>Euwallacea fornicatus</i> has occurred within the Perth metropolitan area. PSHB is a beetle native to Southeast Asia. PSHB can severely damage/kill host trees by excavating tunnels in trees in which they cultivate a <i>Fusarium</i> fungus. This fungus disrupts the vascular system of the host tree preventing the transport of water and nutrients. PSHB is likely to reach the City's boundaries within the next 6 -12 months.	
Overall risk level	Extreme	Impact area	The environment
Action Required	Ongoing communications with DPIRD in relation to quarantine, management and other actions. As of July 2025. no PSHB has been detected within the City.		
	Training for staff on how to identify and respond to potential outbreaks		
	Participate in Polyphagous Shot-Hole Borer Working Group.		
Risk	Lack of diversity in the urban forest presents a significant risk to the City's canopy in the event that a certain species become susceptible to the impacts of disease or changes in the environment (i.e. PSHB).		
Overall risk level	Medium	Impact area	The environment
Action Required	Utilise the Species matrix to plant a diverse range of species.		
Risk	Unauthorised impacts to City owned trees (i.e. street trees and POS)		
Overall risk level	Medium	Impact area	The environment
Action Required	Investigate a tree financial valuation framework using an industry recognised valuation methodology.		
	Investigate mechanisms for the application of penalties that can be applied where unauthorised tree damage occurs to trees on public land.		
Risk	There is limited ability to ensure the protection and provision of trees as part of greenfield and infill developments within Residential, Development, Commercial and Industrial zoned land.		
Overall risk level	Medium	Impact area	The environment
Action Required	Continue to progress the adoption of the Tree Protection Policy to protect trees on private Land.		
Risk	Under the State Planning Framework, there is no requirement for subdivisions to include planting of street trees.		
Overall risk level	Medium	Impact area	The environment

Action Required	Advocate to the Western Australian Planning Commission to include a standard condition for the provision of street trees in residential subdivisions.		
Risk	Improper management of trees posing a risk to public safety and property.		
Overall risk level	High	Impact area	Personal health and safety
Action Required	Formalise existing documentation on how the City protects and maintains its tree assets and align with best practice tree asset management principles		
	Implement an industry recognised quantified tree risk assessment safety management system.		
	Establish a risk based approach to public tree maintenance considering identification of high risk trees and proactive inspection programs.		

7. Implementation Plan: Actions

7.1 Protect and Value

Protecting and valuing the urban forest is fundamental to ensuring its longevity and viability. This principle emphasises the importance of preserving existing trees and recognising their ecological, economic, and social benefits. Trees take many decades to provide notable canopy cover, as such targets cannot be achieved without increased focus on existing tree preservation.

No	Task	Type	Cost	Team	Commence	Complete
Goal 1.1 Value Public Trees						
1.1.1	Investigate a tree financial valuation framework using an industry recognised valuation methodology.	New	Officer Time	Parks Services	2026	2028
1.1.2	Investigate mechanisms for penalties to be applied as a deterrent unauthorised tree damage occurs to trees on public land.	New	Officer Time	Strategic Planning and Environment / Parks Services	2026	2028
Goal 1.2 Protect Public Trees						
1.2.1	Formalise existing documentation on how the City protects and maintains its tree assets.	New	Officer Time	Parks Services	2026	2028
Goal 1.3 Protect Private Trees						
1.3.1	Advocate that the State Government introduce stronger tree protection regulations and policies on private land and greenfield developments.	New	Officer Time	Strategic Planning and Environment	2026	2028
1.3.2	Investigate the adoption of the Tree Protection Policy to assist in the protection of trees on private land.	Ongoing	Officer Time	Strategic Planning and Environment	2026	2028

7.2 Expand, Increase and Integrate

Expanding the urban canopy with an integrated approach is essential for enhancing the environmental and social benefits that the urban forest provides to the community. This principle focuses on increasing tree planting, particularly in under-represented areas, to ensure equitable access to green spaces. Integrating urban forestry into broader urban planning, capital works and development processes is vital for creating sustainable, liveable cities.

No	Task	Type	Cost pa	Team	Commence	Complete
Goal 2.1 Increase Canopy on Public Land						
2.1.1	Implement 10-year tree planting program (see Section 5). Street tree planting to align with the street tree prioritisation framework (see Street Tree Planting Plan).	Ongoing	\$592,434	Parks Services	2026	2035
2.1.2	Undertake ground truthing of tree planting sites across Public Open Space and street scapes.	Ongoing	\$60,000	Parks Services	2026	2035
2.1.3	Investigate opportunities for pocket/ micro ('Miyawaki') forests within Public Open Space.	New	Officer Time	Strategic Planning and Environment / Asset Services	2027	2030
Goal 2.2 Integrate delivery of this Plan and Urban Forest Programs						
2.2.1	Establishing a cross-departmental working group to monitor implementation of the Strategy.	New	Officer Time	Strategic Planning and Environment	2026	2027
Goal 2.3 Improve Conditions for Tree Planting						
2.3.1	Ensure tree planting programs consider soil composition and health to support strong, resilient and healthy trees.	New	Officer Time	Parks Services	2026	2035
2.3.2	Integrate Water Sensitive Urban Design principles (such as passive irrigation for trees) into all new City projects, upgrades and streetscapes works.	Ongoing	Officer Time	Infrastructure Project Delivery	2026	2035
Goal 2.4 Improve Canopy Outcomes on Development Sites						
2.4.1	Develop a Guideline for developers to provide minimum standards for tree planting and establishment (sub-division and in-fill).	New	Officer Time	Land Development Infrastructure	2026	2028

2.4.3	Advocate to the Western Australian Planning Commission to include standard conditions for the provision of street trees, and the planting of trees in POS, in residential subdivisions.	New	Officer Time	Land Development Infrastructure / Strategic Planning and Environment	2026	2028
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7.3 Monitor, Manage and Maintain

Effective management and maintenance of the urban forest is crucial for sustaining its health and maximising its benefits. Managing trees as assets and employing best practice urban forestry techniques will ensure the longevity of the urban forest. Investing in a tree inventory and developing a comprehensive tree maintenance program that includes regular inspections, maintenance schedules, and risk assessments is essential for proactive management.

No	Task	Type	Cost	Team	Commence	Complete
Goal 3.1 Develop a Robust Tree inventory and Proactive Maintenance Program						
3.1.1	Implement an industry recognised, quantified tree risk assessment safety management system to be utilised in the City's approach to public tree maintenance.	New	Officer Time	Parks Services	2026	2027
3.1.2	Investigate the development of a tree asset inventory for trees on City management land with priority for new trees planted under the Urban Forest Strategy.	Ongoing	Officer Time	Strategic Asset Management / Parks Services	2026	2035
3.1.3	With funding allocated in the 2025/26 Budget, appoint an Urban Forestry Officer to manage the implementation of the Urban Forest Strategy including the management of the tree asset inventory database.	Ongoing	Existing Budget	Parks Services	2027	2030
Goal 3.2 Enhance Operational Efficiency						
3.2.1	Undertake a review of operational tree planting methodologies to determine the most effective and cost efficient delivery of this Strategy.	Ongoing	Officer Time	Parks Services	2026	2027
Goal 3.3 Implement an Urban Forest Monitoring and Reporting Framework						
3.3.1	Develop a monitoring and reporting framework for tree canopy and planting efforts, incorporating two-yearly aerial canopy and vegetation cover acquisition.	Ongoing	Existing Budget	Strategic Planning and Environment	2026	2035

7.4 Collaborate, Educate, Incentivise and Advocate

Raising awareness of the benefits of trees across the community can drive change. Bringing the community along for the journey and establishing a strong relationship with the community will improve how efficiently and successfully the City can deliver on these urban forest goals. Incentive schemes can encourage residents, businesses, and developers to plant and maintain trees. Community engagement programs that involve residents in tree planting, care, and monitoring activities can build a sense of ownership and responsibility for the urban forest.

No	Task	Type	Cost	Team	Commence	Complete
Goal 4.1: Raise Public Awareness of the Benefits of Urban Trees						
4.1.1	Develop a range of educational materials to improve awareness of tree benefits.	Ongoing	Officer Time	Strategic Planning and Environment	2026	2027
Goal 4.2 Strengthen Community Engagement and Stewardship						
4.2.1	Continue the annual 'Native Plants Giveaway', providing free native plants for residents to plant on private land	Ongoing	Existing Budget	Strategic Planning and Environment	2026	2035
4.2.2	Undertake community tree planting programs, involving residents in their neighbourhoods and parks.	New	\$20,000 pa	Strategic Planning and Environment	2027	2035
4.2.3	Develop a 'School's Tree Planting Initiative' to provide learning opportunities on the benefit of tree for school children and to assist with tree planting and increasing canopy on education land.	New	Officer Time	Strategic Planning and Environment	2027	2030
Goal 4.3 Implement Incentive Programs to Encourage Tree Planting and Care						
4.3.1	Implement landowner environmental management grants program as per the Environmental Protection Strategy.	Ongoing	Existing Budget	Strategic Planning and Environment	2026	2027
Goal 4.4 Advocate for increased state government engagement						
4.4.1	Advocate to State Government for a review and update of the Rockingham Lakes Regional Park Management Plan incorporating additional planting where appropriate.	New	Officer time	Strategic Planning and Environment	2026	2027

4.4.2	Advocate to State Government for increase management (weed control, rehabilitation planting) for the Rockingham Lakes Regional Park.	New	Officer time	Strategic Planning and Environment	2026	2027
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8. Stakeholder Engagement

The development of the Urban Forest Strategy involved targeted engagement with internal stakeholders and community representatives to ensure a well-rounded approach to addressing Rockingham's urban forest needs and priorities. These engagements provide insights from both internal stakeholders and community representatives, helping to shape a balanced and sustainable approach to Rockingham's Urban Forest Strategy.

Key Stakeholders invited to participate	Contributed ? (Yes/No)	Engagement method used
Manager Strategic Planning and	Yes	Internal Staff Workshop
Coordinator Sustainability & Environment	Yes	
Environmental Planning Officer	Yes	
Bushfire Mitigation Supervisor	Yes	
Manager Parks Services	No	
Tree Management Supervisor	Yes	
Coordinator Statutory Planning	Yes	
Manager Statutory Planning	Yes	
Senior Landscape Architect	Yes	
Manager Major Planning Projects	Yes	
Environmental Supervisor, Parks Services	Yes	
Coordinator Strategic Asset Management	Yes	
Natural Area Technical Officer, Parks Services	Yes	
Parks Technical Officer, Parks Services	Yes	
Senior Economic Development Officer, Economic Development and Tourism	Yes	
Environmental Advisory Committee Members	Yes	Environmental Advisory Committee meeting

Internal Staff Workshop

To understand current challenges and organisational capacity for delivering urban forest and canopy outcomes, a facilitated internal workshop was conducted with staff from various departments. This workshop identified key focus areas for improvement, these have been used to develop goals and actions.

- Tree Planting better focus on planting location and ensuring tree establishment.
- Tree Maintenance
- Tree Asset Management and Inventory
- Data Management and Systems Integration
- Resourcing and Budgeting

Rockingham Environmental Advisory Committee

As part of the consultation for this plan, City staff engaged with the Rockingham Environmental Advisory Committee. Key focus areas raised by the committee included:

- Targeting educational efforts at schools and involving students in planting activities.
- Collaborating with local content creators to raise broader community awareness.
- Addressing community concerns about tree maintenance, particularly related to the impact from Corellas.
- Emphasising the shading benefits of trees for homes and energy efficiency.
- Prioritising tree planting in Public Open Spaces and verges.
- Providing community resources and guides on tree care.
- Considering smaller trees and shrubs where appropriate.
- Ensuring that species selection considers survivability, structural integrity, maintenance needs, and includes both native and non-native options.
- Incorporating irrigation needs into the site selection criteria.

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Appendix A – Development of Land Use boundary and source of boundaries

The Land Use boundaries used to determine canopy cover, available planting space statistics, and canopy cover targets, was developed from the Town Planning Scheme No. 2 (TPS). The table below provides the mapping of each TPS2 classification to Land Use category. In addition to the TPS, streetscapes were isolated from the Cadastre.

Table 5: GIS boundaries used to develop the Land Use boundary, their sources and description.

TPS classification	Land Use classification
Civic & Cultural	Other
Civic and Cultural	Other
Commercial	Commercial
Community Purposes	Other
Development	Development
District Town Centre	Commercial
General Industry	Industrial
Light Industry	Industrial
Other Regional Roads	Regional Roads
Parks and Recreation	Environmental
Port Kennedy Business Enterprise	Commercial
Strategic Centre Campus	Other
Strategic Centre City Centre	Strategic Centre
Strategic Centre City Living	Strategic Centre
Strategic Centre Urban Living	Strategic Centre
Strategic Centre Urban Village	Strategic Centre
Strategic Centre Waterfront Village	Strategic Centre
Primary Regional Roads	Regional Roads
Public Open Space	Public Open Space
Public Purposes	Other
Public Purposes (High School)	Other
Public Purposes (Hospital)	Other
Public Purposes (Special Uses)	Other
Public Purposes (WAWA)	Other
Public Purposes (WSD)	Other
Railways	Other
Residential	Residential
Rural	Rural
Service Commercial	Commercial
Special Commercial	Commercial
Special Industry	Industrial
Special Residential	Residential
Special Rural	Rural

Special Use	Other
Unzoned	Other
Waterways	Other

Table 6: Other boundaries and their use.

Source file	Boundary	Classification feature	Use	Modifications
Local Planning Scheme - R Codes (DPLH-070) (ArcGIS REST Server)	Residential codes	R code number	Canopy cover targets	N/A
Cadastra_SLIP.shp (City provided)	Cadastral/lot	land_type	Land tenure and analysis requiring lot boundaries	Where features overlapping, flattened to single feature
StructurePlan_LandUse.shp (City provided)	Structure Plans	LandUse	Used to categorise the Development land use category for use in canopy cover targets	N/A

Appendix B – Aspirational canopy cover target development method

Different methods to develop canopy cover targets have been tailored to suit Rockingham, dependent on land use type. These methods are adapted from other Councils and techniques developed by ArborCarbon, and are outlined below.

Land Use Classification	Canopy Cover Target
Environmental (Parks and Recreation)	Increase of 10% on current canopy cover
Commercial	Bringing each lot up to mean canopy cover# for all commercial zones.
Development*	Assume all vegetation cleared and then apply targets based on land use (provided in structure plans). Use Land Use targets from established part of the City.
Industrial	Bringing each lot up to mean canopy cover for industrial zones
Open Space	Increase of 20% (excluding sports fields) on current canopy cover
Other	No change
Residential*	Bringing each lot to the mean for that Rcode. If no Rcode, bring to the mean of all those with no Rcode.
Rural	No change
Strategic Centre	Bringing each lot up to mean canopy cover for Strategic Centre zones
Regional Roads	No change
Streetscape	Based on available planting space on verges

The current canopy cover within each cadastral lot and road segment was determined along with the mean value within each Land Zone. All lots which were below the current mean value for their respective Land Zone were identified as having potential for canopy increase. The canopy cover target was determined by adjusting the canopy cover of all lots with potential to increase canopy to match the current Land Zone mean. The total canopy area was then summed to calculate the new mean for all precincts which was used as the baseline canopy target. The intention of this approach is to set a target which falls within the current range of typical values observed in the City and therefore within the capacity of land and expectations of the community to support the additional tree canopy.

This approach is particularly useful for forecasting likely canopy outcomes following greenfield development sites. This analysis shows that residential development of these sites is likely to have a net positive impact on tree canopy cover once the properties and new trees are established. However, this should not be interpreted as a reason for complacency, as the targets represent substantial increase on the current residential canopy cover, and will be challenging to achieve, without policy action. Furthermore, changes in LPS and housing trends can greatly affect outcomes for the urban forest

A granular breakdown of current canopy cover and target canopy cover for each R-code is presented below,

RCode	Total area (ha)	Current Canopy Cover (%)	Target Canopy Cover (%)
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No rcode	205.1	25.5	33.1
R10	12.6	5.1	8.0
R12.5	3.0	0.0	0.1
R15	89.6	10.3	14.7
R17.5	4.4	1.5	2.5
R20	2285.2	4.3	6.5
R25	96.7	0.5	1.0
R30	151.3	2.1	3.5
R35	1.9	1.7	2.7
R40	173.4	3.8	5.8
R5	17.1	15.2	20.0
R5/20	149.6	10.6	15.1
R50	4.2	1.5	2.3
R60	9.9	0.6	1.1
R80	8.9	0.3	0.5

A granular breakdown of current canopy cover and target canopy cover for each Development area land use zone is presented below,

Development Land Use	Total area (ha)	Current CanpyCover (%)	Target Canopy Cover (%)
Commercial	12.6	2.6	4.1
Environmental	18.5	0.8	24.5
No Structural Plan	834.8	6.2	14.0
Other	41.0	5.5	14.6
Public Open Space	99.6	9.7	30.0
Residential	467.5	5.1	10.1

Appendix C - Inventory data capture fields

The table below outlines the ideal data fields for collection when undertaking an inventory. They are arranged by 1) Location Details; 2) Tree attributes; and 3) Tree Maintenance. An asterisk (*) against a field suggests that this is essential/ minimum requirement data that should be captured.

LOCATION DETAILS	Type of data to be entered
Asset Number*	<i>Free entry</i>
Status	<i>Current / removed</i>
House No*	<i>Free text entry</i>
Street*	<i>Load all streets in Council Area</i>
Suburb*	<i>Load all Suburbs in Council Area</i>
Maintenance Precinct	<i>Pre-determined</i>
Land use	Park/ Street/ Reserve/ Carpark/ Property
Park/ reserve/ carpark name	<i>Load all parks and reserves in LGA</i>
GPS Location*	X, Y Coordinates and/or Lat/long
Planting scenario	Grass/ concrete pit/ other
Soil Type	<i>Free entry</i>
Soil compacted	Yes/ No
Soil Moisture	<i>Free entry</i>
Power lines	None/ ABC/ LV/ HV
Surrounding infrastructure damage	Yes/ No
Photo	Attach
TREE ATTRIBUTES	
Botanical Name*	<i>Species look up values to be provided</i>
Height (m)*	<i>Free entry</i>
Canopy width (m)*	<i>Free entry</i>

Height to base of canopy (m)	<i>Free entry (needed for i-tree assessment)</i>
Percentage canopy missing (%)	<i>Free entry (needed for i-tree assessment)</i>
Diameter Breast Height (DBH)*	<i>Free entry</i>
Diameter at Base (DAB)	<i>Free entry</i>
Age*	Young/ Semi Mature/ Mature/ Over Mature
Visual Condition*	Good/ Fair/ Poor/ Very Poor/ Dead
Structure*	Very poor/ poor/ fair/ good/ has failed
Defects*	Included bark/ previous branch failure/ epicormic growth/ bracket fungi/ mechanical damage/ cavity (decay)/ split or crack/ hanger/ crossing branches/ dead wood/ excessive kino or resin
Pest and disease*	Termites/ borer/ wax scale/ stink bug/ sooty mould/ leaf chewing insect/ sap sucking insect/ myrtle rust/ Polyphagous shot-hole borer
Hollows or nests	Yes/ No
Habitat tree (artificial hollows installed)	Yes/ No
Useable Life Expectancy (ULE)*	Zero/ up to 5/ 6 to 10/ 11 to 20/ 21 to 50/ over 50
Whipper snipper damage	Yes/ No
RISK ASSESSMENT*	Use your organisation's adopted tree risk methodology (Below are the required fields for QTRA)
Target	1 to 6
Size	Property/ 1 to 4
Probability of Failure	1 to 7
Risk of Harm Value	<i>Formula value linked to above</i>

TREE MAINTENANCE	
Tree maintenance required	None/ Annual inspection/ Branch pick up / Broken branch/ hanger/ Crossing branches/ Canopy lift (footpath/road)/ Property clearance/ Climbing inspection required/ Codominant reduction / Create habitat tree (stag)/ Deadwood/ Epicormic removal/ Formative prune/ Remove stakes/ Remove guards/ Remove Concrete or Asphalt/ Remove tree/ Remove tree (retain logs)/ Stem injection/ Pest management/ Tree base maintenance required (mulch etc)/ Remove bee hive/ stump removal
Tree maintenance priority	1 – Emergency (within 1 hr), 2 – 24hrs, 3 – 1 week, 4 – 1 month, 5 – 3 months, 6 – 12 months
OTHER FIELDS	
Comments	<i>Free entry</i>
Inspected by	<i>Free entry</i>
Inspected date	<i>Free entry</i>
Tree planted date (if known)	<i>Date format xx/xx/xxx</i>
Root Barrier Installed	<i>Yes/ No</i>
Nomination for significant tree register	<i>Yes/ No</i>