Urban Forest Strategy

Part 2 (technical)

2023-2043

City of Kalamunda

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Acknowledgment of Country

We respectfully acknowledge the Traditional Owners, The Whadjuk Noongar People, as the Custodians of this land. We also pay respect to all Aboriginal community Elders, past and present, who have resided in the area and have been and continue to be an integral part of the history of this region.

Mayor's Message

I am pleased to present the City of Kalamunda Urban Forest Strategy. This strategy has been developed in consultation with the community, Traditional Owners, environmental consultants and the City's Kalamunda Environmental and Sustainability Advisory Committee (KESAC).

The City of Kalamunda boasts a unique and diverse natural environment that attracts locals, visitors from Perth, and others to enjoy its serene beauty and lush bushland.

Our vision is for the urban forest to be valued as an intrinsic feature of our urban landscape, fostering a healthy and prosperous community.

The urban forest includes trees and shrubs in an urban area, such as individual trees, street trees, green spaces, and the surrounding vegetation and soil. Urban forests are often the most extensive green infrastructure in cities, providing vital ecosystem services like air pollution reduction and stormwater management.

Our draft Strategy aims to ensure healthy tree canopy levels into the future, achieving 30% canopy coverage in urbanand rural areas by 2043. We'll focus on three main environments (Swan Coastal Plain, Darling Scarp, and Darling Plateau) and propose specific actions to reach our targets.

We are grateful to have 40 volunteer "Friends Groups" who gift their time and skills to restore our bushland and control weeds. The community's efforts to preserve the urban forest are crucial. We must all do our part by planting trees, working together to meet development requirements, and sharing a common vision. Together, we can make a difference and bring our Kalamunda Clean and Green Local Environment Strategy to life.

Cr Margaret Thomas

Mayor

Vision

The City of Kalamunda is committed to an environmentally sustainable future. At a time of growing population, business, rural industry, and infrastructure, coupled with a changing climate, the City is challenged to protect our 'clean and green environment.' The City is committed to protecting and growing its urban forest canopy for the well-being of our residents, enterprise, and ecosystems.

The vision statement was prepared in consultation with the Urban Forest Working Group, a subgroup of the Kalamunda Environment and Sustainability Advisory Committee (KESAC). The statement reflects the community sentiment expressed in the Kalamunda Clean and Green Local Environment Strategy (2019) and the Kalamunda Advancing 2031 Strategic Community Plan.

Vision for the City of Kalamunda's Urban Forest

The City of Kalamunda's diverse urban forest is valued as an intrinsic feature of our evolving City and will be managed and enhanced to provide a resilient place for people, enterprise and ecosystems to flourish.

Executive Summary

Introduction

As a growing and changing community, the City of Kalamunda is committed to balancing growth and development while protecting our precious natural environment.

Described collectively as 'urban forest', this vital asset includes canopy cover from trees on public and private land.

The City of Kalamunda's Urban Forest Strategy (UFS) guides the City in designing, managing, and improving the urban forest to protect and grow the urban forest canopy for the wellbeing of our residents, enterprise, and ecosystems.

Leafy cover from tree canopy benefits our entire City. From protecting our environment, purifying our air quality, providing homes for birds and animals, and playing a vital role in carbon sequestration; to our social, psychological, and recreational wellbeing, reducing the "urban heat island effect" through natural shading and cooling effects, reducing utility costs, and increasing property values; community benefits are vast and varied.

To realise these benefits to the community, economy and environment, the City aspires to achieve a target overall urban canopy cover across the City of 30% by 2043. This target aligns with international best practice targets for canopy cover.

Strategy and scope

This Urban Forest Strategy defines the urban forest as all trees greater than 3m in height that occur within the City of Kalamunda except for:

- Trees within the Perth Airport locality; and,
- Trees on land reserved as state forest, national parks, and regional parks.

This scope enables the strategy to focus on regions within the City's sphere of influence. To achieve 30% canopy cover across seven land use category areas (defined on page 21) a 3% increase is needed, totalling approximately 324ha of canopy cover (3% of 10,812ha).

Broadly, the goals of the UFS are based on the pillars to Protect, Grow, Engage, and Investigate. This provides a holistic and strategic approach to achieving our target.

The UFS builds on the actions the City already takes to protect and enhance the City's urban forest, including Local Planning Scheme No. 3, Local Planning Policy 33 - Tree Retention (LPP33), and newly drafted policies including the Draft Local Biodiversity Strategy and Draft Local Planning Scheme 4.

The UFS seeks to review, improve, and build on existing tree planting programs, such as annual street planting, planting of trees in public parks, tree planting as part of capital works projects and by Friends Groups, annual plants for residents and commemorative tree planting, while identifying new opportunities to protect and enhance the urban forest.

It recognises that protecting and enhancing the City's urban forest is a shared responsibility between government agencies, the City, and the community.

Beyond the target of 30% canopy cover, the UFS includes shorter-term goals to protect and grow the City's urban forest and engage the community to care for and contribute to the City's urban forest.

Monitoring and reporting on our shared success

A Monitoring and Evaluation Program (MEP) will track progress against targets and monitor progress to success, allowing for adjustments to be made throughout the UFS' implementation. The MEP will be developed by the internal working group.

Urban canopy data collected from the Department of Planning, Land, and Heritage (DPLH) Urban Monitor program for Year 2020 is proposed to be the baseline year of data for this UFS. It is expected this data will be updated by DPLH every two years and will be analysed to see the change in canopy cover for trees >3m in height.

Reporting will be undertaken annually, with results provided with following years' annual action plans.

The UFS will be reviewed every four years to analyse changes in the urban canopy and determine if the UFS needs to be adjusted to address any new issues or actions that have not been effective.

The Hales

Tree retention and planting at the Hales in Forrestfield is anticipated to achieve a 7% increase in canopy cover at maturity.

Introduction

1.1 Background

Before European settlement, the area now known as the City of Kalamunda was densely covered in native forest, woodlands and shrublands; natural ecosystems supporting a variety of plant and animal species and providing a range of environmental, economic, health and wellbeing benefits to local people, enterprise and ecosystems.

The Whadjuk people have occupied the land in its natural state for thousands of years, moving through the local area and using native vegetation in a sustainable manner. The Whadjuk people lived off the bush, however the large jarrah trees across the City of Kalamunda remained virtually untouched (Kalamunda and Districts Historical Society 2018).

The Kalamunda Townsite was gazetted in 1902 and quickly became a tourism destination. Advertised as a 'health resort', City folk travelled to Kalamunda to experience nature, fresh air and a change of climate.

In 1918 most people living in the district worked in the timber and orchard industries, on the railway or quarrying (Kalamunda and Districts Historical Society 2018). There are no longer any working timber mills within the City, however many private and commercial orchards operate.

Over time, the City's natural environment has changed considerably from clearing native vegetation, including mature trees, for rural practices and urban development.

The City faces a challenge in its future growth to ensure residents can live in cool, green, shaded suburbs and be surrounded by nature while urban density is increasing, and temperatures are rising due to climate change.

The City has an important influence on the "urban forest" (as defined in Section 1.2), through direct management, planning controls, education and participating in greening initiatives. This Urban Forest Strategy (UFS) aims to ensure the City's urban forest will be protected, managed and enhanced to provide a resilient place for people, enterprise and ecosystems to flourish into the future.

1.2 What Is An Urban Forest?

An "urban forest", as defined in Better Urban Forest Planning (WAPC 2018), refers to all vegetation growing within an urban environment, which is divided into two categories:

1. The understory such as shrubs hedges up to three metres.

2. The canopy which is any vegetation above three metres.

While understory vegetation is critically important, urban forest strategies generally focus on the tree canopy. Tree canopy cover is one of the most important measures for shading, cooling, and neighbourhood amenity and is the focus of the UFS. The City's Local Biodiversity Strategy (in Draft) considers native vegetation, including understorey vegetation.

The City's definition of the urban forest canopy excludes e national parks, state forest and regional parks (except Ray Owen Reserve which forms part of Mundy Regional Park) as these distinct areas are relatively separate from the urban environment and are not managed by the City of Kalamunda.

Including these State-managed areas in this Strategy would also skew urban canopy data, given their vast sizes.

Similarly, the Perth Airport locality has been excluded from this Strategy as the City has limited ability to influence this Commonwealth land.

Rural lands don't strictly meet the general definition of 'urban forest', however as they play an important role in the City's urban forest, these lands are guided by the City's strategic planning framework.

Definition

This Urban Forest Strategy defines the urban forest as:
All trees greater than 3m in height that occur within the City of Kalamunda except for:

- trees within the Perth Airport locality; and,
- trees on land reserved as state forest, national parks, and regional parks.

1.3 Purpose of the Urban Forest Strategy

The Urban Forest Strategy (UFS) provides a roadmap for the City to design, manage and improve the urban forest to protect and grow the urban forest canopy for the wellbeing of our residents, enterprise, and ecosystems.

The UFS considers the strategic and holistic management of the City's urban forest, addressing both public and private land as well as different land uses. The UFS identifies goals and objectives to protect and grow the urban forest and the specific, measurable actions needed to achieve these.

Additionally, the UFS prioritises actions through an annual action plan, which monitors and reports on the success of the actions and enables review and continual improvement of the UFS to achieve the urban forest goals.

The UFS includes an overall urban canopy cover target for the City of 30% which aligns with the international best practice benchmark for urban canopy cover. This is a long-term, target the City will strive to meet.

This target is a measure of total tree canopy cover >3m in height (by area) across the total area of the land use categories (10,812ha) defined in Section 1.2. To achieve 30% canopy cover across seven identified land use category areas (defined on page 21), a 3% increase is needed, totalling approximately 324ha of canopy cover (3% of 10,812ha).

This equates to over 85,000 medium sized trees at maturity (assuming cover of approximately 38m2 per tree). This figure may be impacted by other canopy loss or gain.

Beyond the target of 30% canopy cover, the UFS includes shorter-term goals and objectives to protect and grow the City's urban forest and engage the community to care for and contribute to the City's urban forest.

Implementing staged actions, monitoring progress, reviewing and improving the UFS periodically will help achieve the goals and actions. This process is outlined in Section 7.

The shorter-term goals are:

Protect

Protect the City's urban forest on public and private land.

Grow

Grow the urban forest on public and private land through new tree plantings to maximise the scial, economic, and environmental benefits of trees and urban greening.

Engage

Engage with community, research institutions, schools, government, and private sector to care for the urban forest and broaden the understanding of the benefits it provides.

Investigate

Investigate new resourcing and research opportunities to enable further investment in on-ground actions using best practice science to manage and grow the urban forest.

1.4 What has the City done so far?

The UFS builds on the actions the City already takes to protect and enhance the City's urban forest.

On 13 December 2022, the City adopted Local Planning Policy 33 - Tree Retention (LPP33). The purpose of LPP33 is to carefully consider the need for removing trees of a particular size and maturity and minimise the removal and impacts to these trees through the planning and development process. LPP33 also seeks to increase canopy cover with planting provisions for new developments increasing the State R-Code requirements for lots coded R25 or lower. LPP 33 provides a balanced approach to tree retention through the inclusion of exemptions for tree removal (such as exemptions for tree removal required to comply with the City's Fire Hazard Reduction Notice), and also provisions for replacement tree planting for approved, unavoidable tree removal.

The City's current Local Planning Scheme No.3 (LPS 3) requires native vegetation not be damaged, destroyed or removed unless in accordance with relevant State legislation, acts, regulations, and guidelines.

Draft Local Planning Scheme 4. will include more comprehensive provisions for vegetation protection and enhancement, including rehabilitation, rather than simply referring to other environmental legislation. The City is currently developing this new scheme.

New design guidelines being implemented by the City will assist with replanting of trees in new developments. For or example Local Planning Policy 19 (LPP19) – Maddington Kenwick Strategic Employment Area (MKSEA) Design Guidelines specifies minimum landscaping areas within private property as well as tree planting requirements in car parking areas and road verges.

The City is also in the process of preparing a final Draft Local Biodiversity Strategy identifying actions to better protect and enhance local natural areas within the City of Kalamunda.

As well as developing policies and local laws to protect the natural environment, the City facilitates programs which create and enhance the urban forest, including:

1. Annual street tree planting (e.g. Hale Road, Wattle Grove)
2. Planting of trees within public parks (e.g. Lincoln Road Reserve, Forrestfield)
3. Planting of trees with Friends Groups within local natural areas (Woodlupine Brook)
4. Tree planting as part of the City's capital works projects (e.g. Central Mall, Kalamunda Town Centre)
5. Annual Plants For Residents program
6. Annual commemorative tree planting.

The UFS seeks to review, improve, and build on existing tree planting programs and identify new opportunities to protect and enhance the urban forest.

1.5 Urban Forest Planning

Managing urban forests is a shared responsibility between government, community, enterprise (developers, business, industry) and other public institutions (e.g. schools and hospitals). All sectors in some way contribute to, and benefit from the urban forest on both public and private land.

As understanding of the importance of the urban landscape increases, so too does the value placed on its preservation (Table 1). This UFS reflects modern thinking about tree canopy as a critical part of urban infrastructure.

Table 1: Traditional vs Modern urban forest approach (North Sydney Council, 2011)

Traditional Tree Management	Modern Urban Forest Approach
Trees as ornaments	Trees viewed as critical infrastructure
Focus on individual trees	Focus on overall canopy cover and forest
Trees treated with lower priority	Trees have equal priority to other urban infrastructure such as roads and services
Trees do not have any monetary or economic value	Economic value of forest recognised and valued
Focus on small and ornamental species	Focus on larger longer lived canopy trees
Individual tree management	Overall forest management
Aesthetics-based design only	Ecological-based design
Legal boundaries determine tree management	Urban forest seen as a continuous resource regardless of ownership boundaries

Sustainable urban forest management encompasses maintaining biodiversity, productivity, regenerative capacity, while realising the environmental, social and economic benefits leafy canopies provide to communities.

Within WA, legal advice and recent case law on the protection of trees confirms tree removal can be considered "development" under the Planning and Development Act 2005, requiring planning approval. To regulate and guide the protection and growth of urban canopy, many local governments are seeking to include provisions within local planning schemes and develop local planning policies to protect and replace trees.

Western Australian Local Government Association (WALGA) established an Urban Forest Working Group, comprising various local governments that are advocating for greater protection, management, and growth of urban forest. The City is actively involved in this working group.

1.6 Strategic Context

This UFS will guide and shape future urban forest management decisions to align with the City's overall strategic framework (Plate 1). The Strategy will direct the City's future urban forest protection, management and growth, Local Planning Policy 33 and other planning policies and management plans associated with Urban Forest.

These documents will inform developing the annual implementation action plan which identifies the actions prioritised for that period, targets and performance indicators and the required resources. The Strategy also directs how the City works with residents and businesses to manage trees on private land.

The City has prepared a Climate Change Action Plan (CCAP) acknowledging the role of the UFS in reducing urban heat island affect. The urban heat island affect refers to the higher temperatures occurring in those built-up areas with less trees and shade and a higher proportion of hard, dark surfaces which retain and radiate heat. The CCAP includes sustainable development as a key focus area.

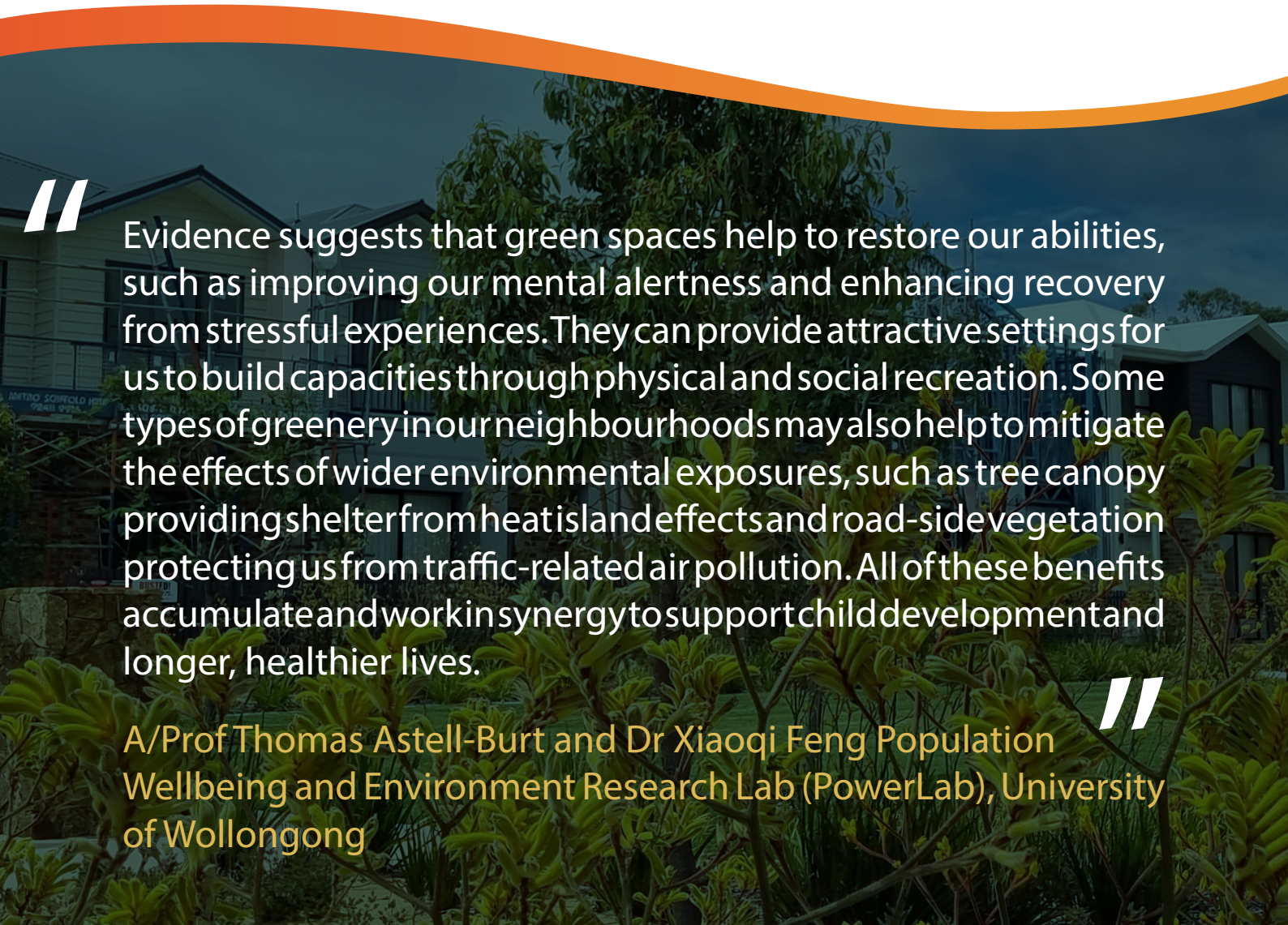
Plate 1: Strategic and Statutory Documents Providing Support for Urban Forest in the City of Kalamunda

Benefits of an Urban Forest

A cohesive and connected urban forest benefits the community across three broad categories (as shown in Plate 2 and Plate 3):

1. Environmental benefits (e.g. carbon sequestration, improved air and soil quality, habitat);
2. Health and wellbeing benefits (e.g. mitigation of "urban heat island effect" [refer Appendix 1] through shading and cooling effects, physical and mental health benefits, recreation opportunities); and,
3. Economic benefits (e.g., reduced utility use and associated costs, increased property values where verge trees are present, reduced health care costs).

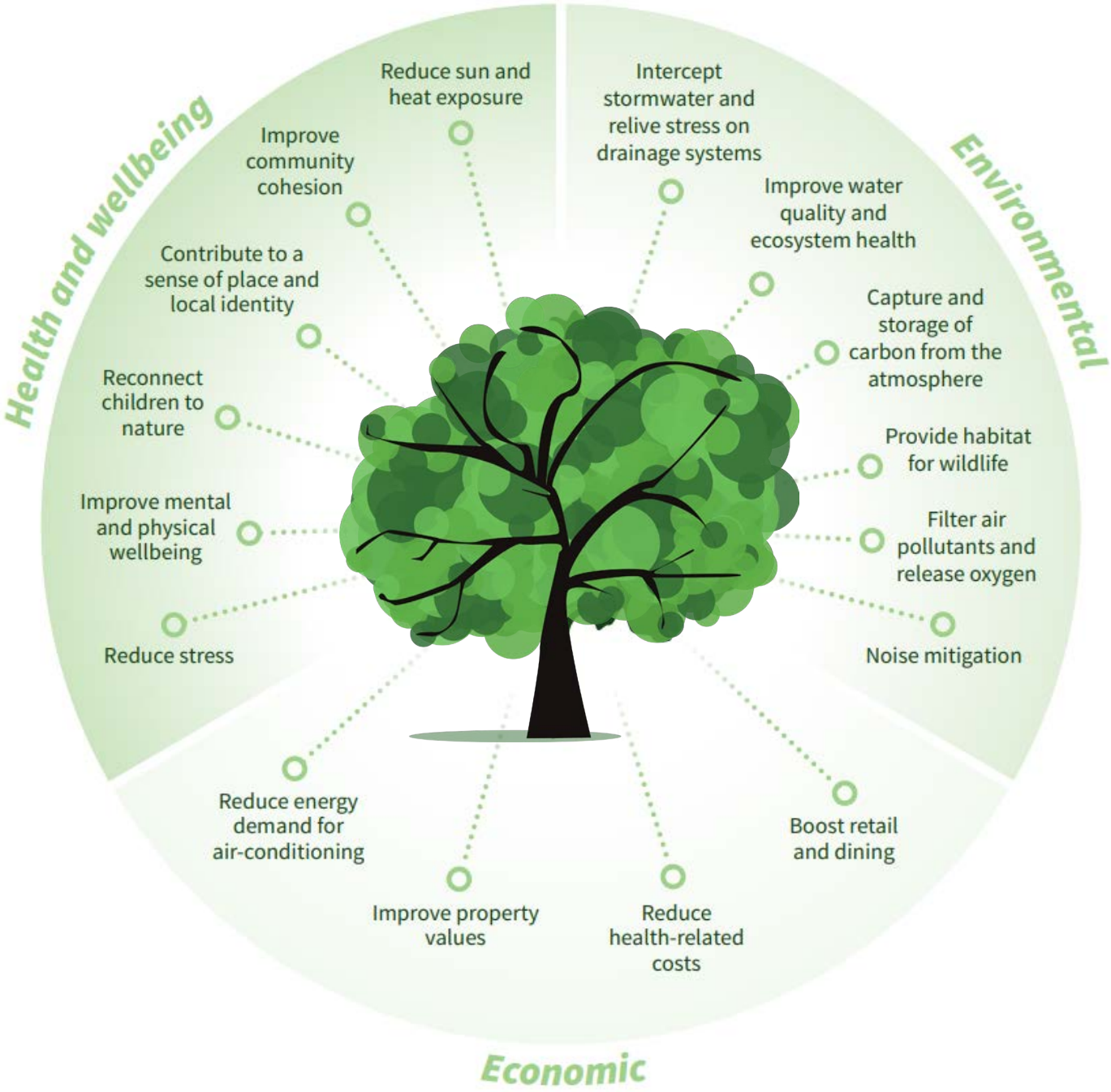
For more information on the benefits of an urban forest, please see Appendix 1.



"Evidence suggests that green spaces help to restore our abilities, such as improving our mental alertness and enhancing recovery from stressful experiences. They can provide attractive settings for us to build capacities through physical and social recreation. Some types of greenery in our neighbourhoods may also help to mitigate the effects of wider environmental exposures, such as tree canopy providing shelter from heat island effects and road-side vegetation protecting us from traffic-related air pollution. All of these benefits accumulate and work in synergy to support child development and longer, healthier lives."

A/Prof Thomas Astell-Burt and Dr Xiaoqi Feng Population Wellbeing and Environment Research Lab (PowerLab), University of Wollongong

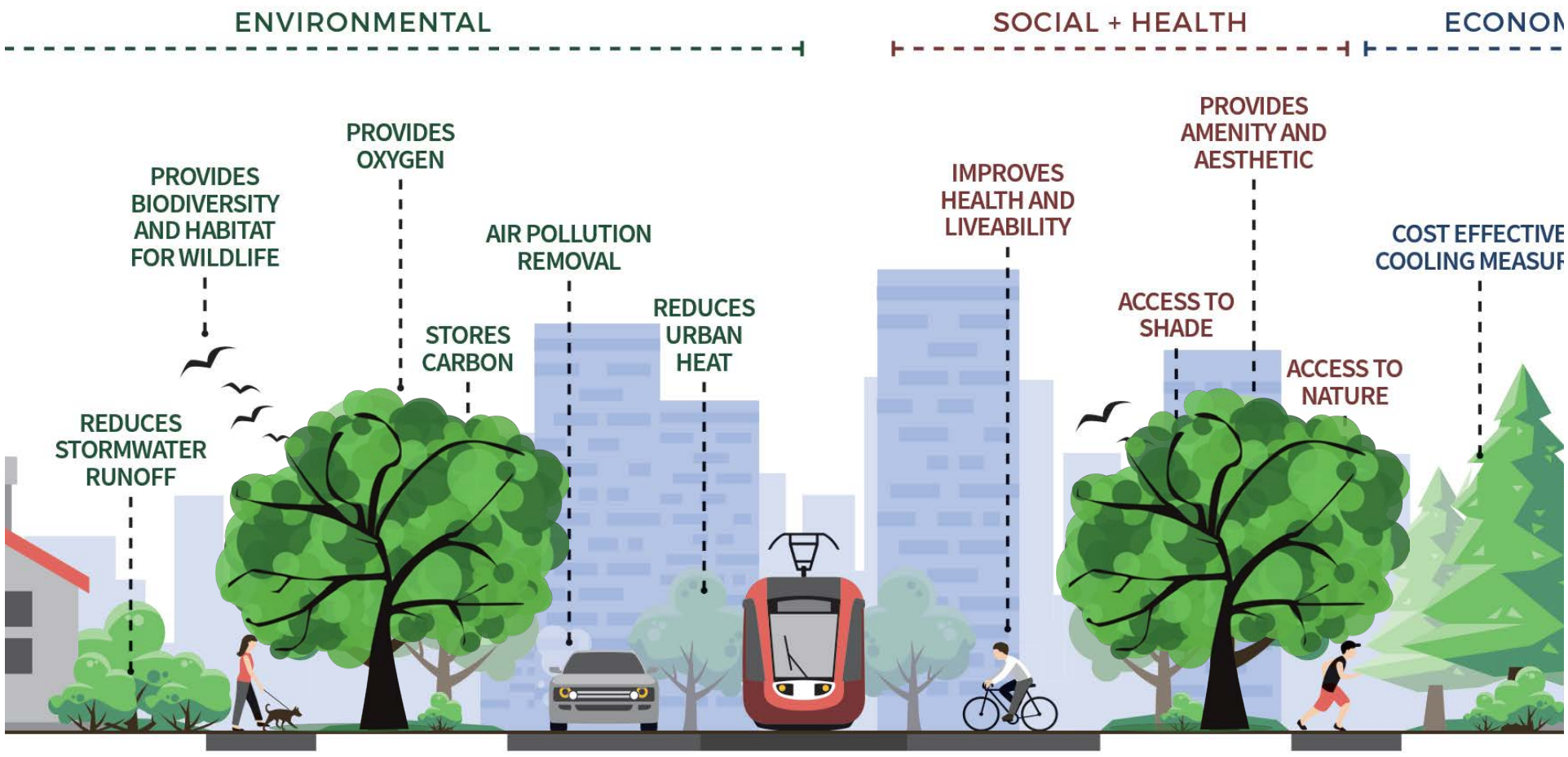
Plate 2: Urban Forest Benefits (City of Bendigo 2021)



The Hales

Tree retention and planting at the Hales in Forrestfield is anticipated to achieve a 7% increase in canopy cover at maturity.

Plate 3: Benefits of Healthy Urban Trees



Measuring the Urban Forest

On behalf of the Western Australian Planning Commission, the Commonwealth Scientific and Industrial Research Organisation (CSIRO) sources urban tree canopy cover data for the Urban Monitor Program. Local governments use this data to track and plan their tree canopies over time. The Light Detection and Ranging (LiDAR) data is captured by CSIRO every two years and is subsequently analysed by the Department of Planning, Lands and Heritage (DPLH). Canopy data is presented as total canopy coverage of trees above three metres in height.

For this UFS, Year 2020 is the most recent data capture year to use as a baseline to assess future urban canopy cover (>3m) against to determine changes in urban canopy cover.

For the purpose of the UFS, the DPLH dataset was enhanced using the City of Kalamunda LPS No. 3 and the Perth Metropolitan Region Scheme (MRS) land use zones. Areas within the City which did not meet the "urban" part of the definition, such as state forest, national parks, regional park and Perth Airport were excluded from the dataset.

The remaining zones and reserves were then grouped into the following broad land use categories:

1. Urban (private clubs and institutions, public purposes, residential, urban development, residential bushland);
2. Parks (local open space, parks and recreation (excluding the state forest, national parks, regional park));
3. Commercial (commercial, district centre, mixed use, service station);
4. Industry (light industry, general industry, industrial development);
5. Roads;
6. Other Infrastructure (e.g., rail and waterways); and,
7. Rural (rural composite, special rural).

The seven land use categories from the City's urban canopy dataset cover approximately 10,812ha of the City's total 32,375 ha or around 33% of the City's total area. The remaining areas of the City have been excluded from the urban forest definition, as explained in Section 1.2.

The Hales

Tree retention and planting at the Hales in Forrestfield is anticipated to achieve a 7% increase in canopy cover at maturity.

The City's Urban Forest

The City's average urban forest canopy >3m high for Year 2020 is 27%, or 2,950 ha of the available 10,812 ha covered by the seven land use categories described in Section 4.

Table 2 provides the percentage canopy cover for each of the seven land use categories for the year 2020. Land use categories are listed in descending order of percentage canopy cover. The land use categories with the highest canopy cover are Parks and Rural, with the poorest performing categories being Commercial, Other Infrastructure and Industrial.

Table 2: Total Canopy Cover >3m (Year 2020) by Land Use Category

Land use category	Canopy cover (%)
Parks	37
Rural	32
Urban	24
Roads	19
Commercial	8
Other Infrastructure	4
Industrial	4

The urban forest canopy data is further described in the following subsections, for each of the three distinct landform areas below:

1. The Swan Coastal Plain;
2. The Escarpment; and,
3. The Darling Plateau.

The percentage of urban forest canopy cover follows a similar trend to population density with lowest canopy levels on the Swan Coastal Plain (which supports approximately 63% of the City's total population [ABS, 2022]) increasing to the highest canopy levels on the Escarpment and within the Darling Plateau (Figure 1).

Table 3 and Figure 2 display the percentage canopy cover for each suburb for the year 2020. All suburbs located on the Swan Coastal Plain have less than 30% canopy cover, while all suburbs within the Escarpment and Darling Plateau areas, except for Pickering Brook and Hacketts Gully, achieved a minimum canopy cover of 30%.

Table 3 shows the priority for each suburb with 2020 canopy cover less than 30% is to grow the urban forest. These areas will be prioritised for planting during the implementation of the "Action Plan" (Section 7).

The priority for suburbs with canopy cover above 30% is e to protect the existing urban forest.,

Planting may still occur in these areas through planning and development controls (e.g. LPP33) and planting programs.

A further breakdown of canopy cover by region and suburb is provided in Appendix 2 and canopy cover by suburb and land use category is provided in Appendix 3.

Table 3: Total Percentage Canopy Cover >3m by Suburb (Year 2020)

Region	Suburb	Canopy Cover by Suburb (%)	Priority
Swan Coastal Plain	Maida Vale	23	Grow
	Wattle Grove	20	Grow
	Forrestfield	13	Grow
	High Wycombe	12	Grow
	Kewdale	3	Grow
Escarpment	Kalamunda	35	Protect
	Gooseberry Hill	35	Protect
	Walliston	33	Protect
	Lesmurdie	30	Protect
Darling Plateau	Paulls Valley	36	Protect
	Piesse Brook	39	Protect
	Carmel	39	Protect
	Bickley	44	Protect
	Pickering Brook	27	Grow
	Canning Mills	47	Protect
	Hacketts Gully	21	Grow
	Reservoir	35	Protect

Figure 1: City of Kalamunda Percentage Canopy Cover >3m for Year 2020 (Data Source: Urban Monitor, 2022)

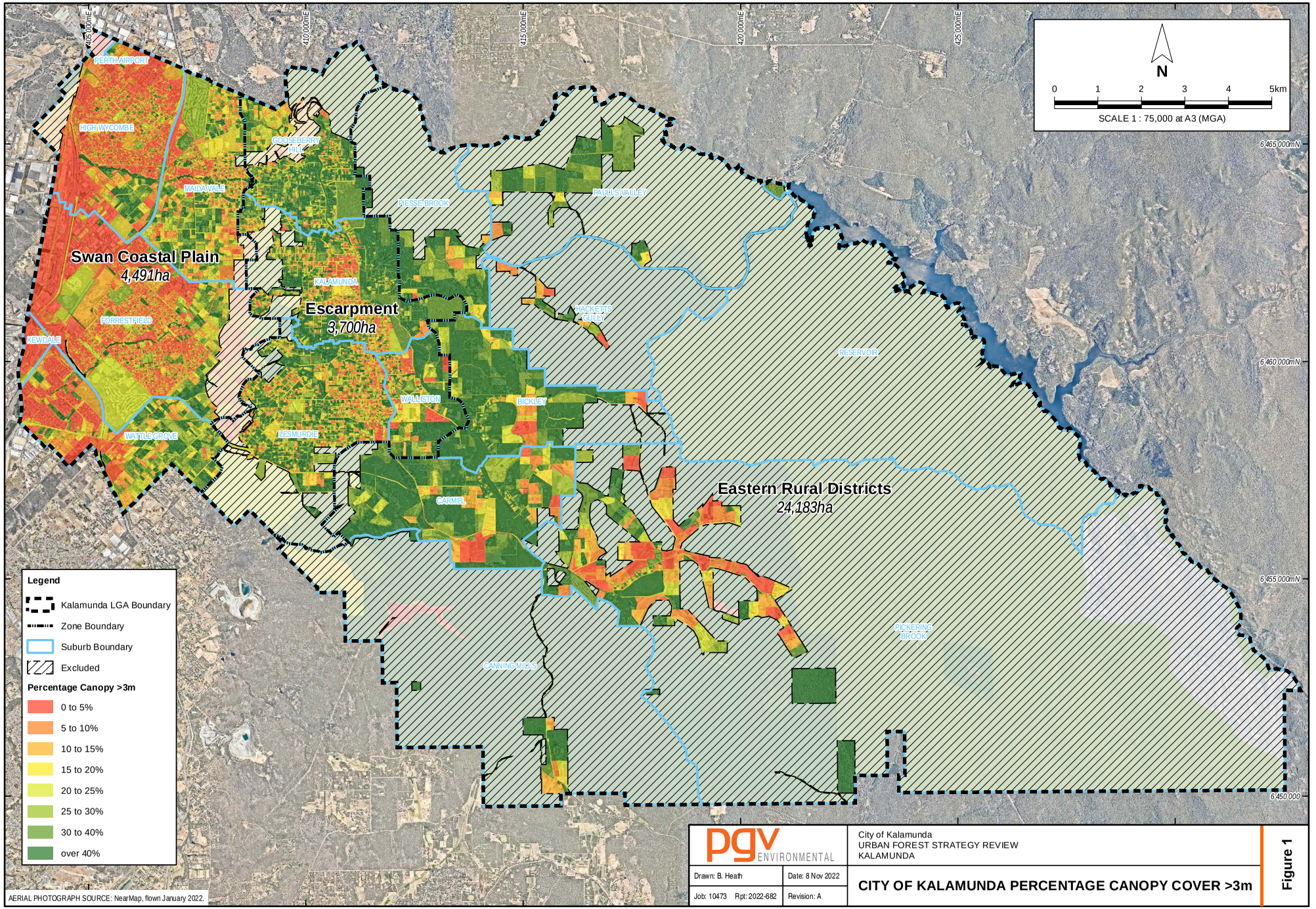
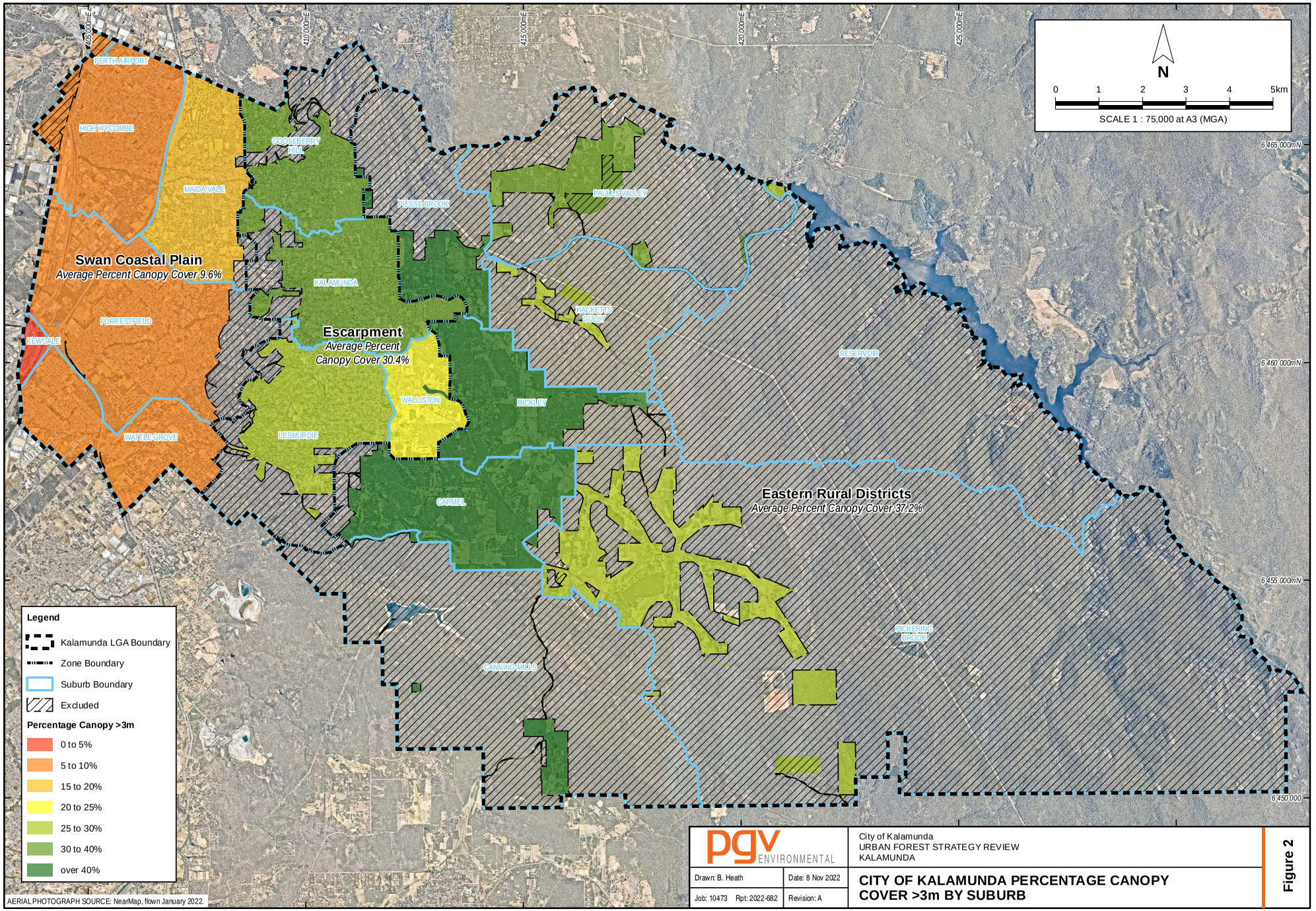


Figure 2: City of Kalamunda Percentage Canopy Cover >3m by suburb for Year 2020 (Data Source: Urban Monitor, 2022)



4.1 Swan Coastal Plain

The Swan Coastal Plain extends westward from the lower edge of the Darling Scarp, and generally features sandy soils over a relatively flat terrain. Suburbs on the Swan Coastal Plain include High Wycombe, Maida Vale, Forrestfield, Wattle Grove and a small section of Kewdale.

Over the last 10 to 20 years the suburbs of the Swan Coastal Plain area have developed, leading to increased residential densities, residential infill and industrial development. These changes have impacted existing vegetation, with the decrease in urban canopy. 84% of the population growth experienced in the City since 2001 has occurred in the five suburbs on the Swan Coastal Plain.

The Swan Coastal Plain suburbs will continue to undergo infill development to accommodate the expanding population and to meet the requirements of the State Planning Policy Perth and Peel 3.5 million which outlines strategic urban infill goals to limit urban sprawl.

4.1.1 Year 2020 Canopy Cover

The Swan Coastal Plain has the lowest urban forest canopy cover of the three landform areas (Figure 3a) with 16% cover. This can be linked to historic clearing for rural purposes as well as the level of development on the Swan Coastal Plain (Plates 5 and 6).

The Swan Coastal Plain percentage urban canopy cover >3m high by suburb is shown in Table 3. In order of descending canopy cover, the Swan Coastal Plain suburbs are; Maida Vale (23%), Wattle Grove (20%), Forrestfield (13%), High Wycombe (12%) and Kewdale (3%).

The percentage canopy cover by area across the land use categories on the Swan Coastal Plain is shown in Chart 1. Figure 3b and Figure 3c spatially depict the percentage canopy cover for each of the land use categories across the Swan Coastal Plain.

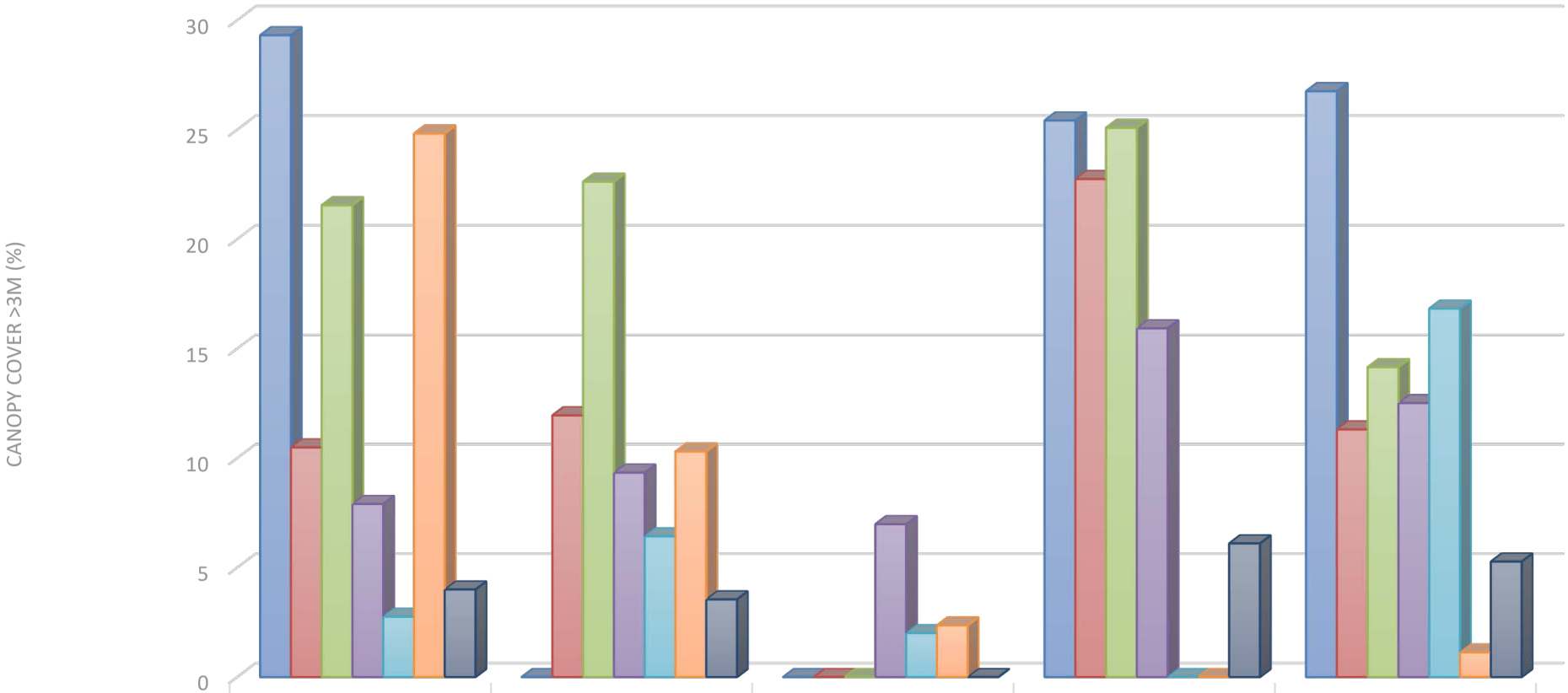
There has been relatively high retention of urban forest canopy in City-managed parks across the Swan Coastal Plain, from 25% in Maida Vale down to 14% in Wattle Grove. Maida Vale is largely residential, however, zonings such as residential bushland which feature low density R-codes has allowed for more trees to be retained within the urban forest (25%).

The mapping indicates the City has been more successful in retaining/creating tree canopy within the Rural (>20%) and Roads categories (with the exception of roads in Forrestfield). Canopy cover in parks across the Swan Coastal Plain is between 22 and 25% except for parks in Wattle Grove which has 14% canopy cover.

Canopy cover in the Urban category is below 15% for all Swan Coastal Plain suburbs except Maida Vale, which has 23% cover. Maida Vale is largely residential, however, zonings such as residential bushland which feature low density R-codes has allowed for more trees to be retained in the urban forest.

Canopy cover in the Industrial and Commercial categories is below 10% for all Swan Coastal Plain suburbs except for Wattle Grove (17%).

Chart 1: Percentage Canopy Cover by Land Use for Suburbs on the Swan Coastal Plain



	FORRESTFIELD	HIGH WYCOMBE	KEWDALE	MAIDA VALE	WATTLE GROVE
Rural	29	0	0	25	27
Urban	10	12	0	23	11
Parks	22	23	0	25	14
Roads	8	9	7	16	13
Industrial	3	6	2	0	17
Other Infrastructure	25	10	2	0	1
Commercial	4	4	0	6	5

Plate 5: Forrestfield Area 1953 (Landgate, 2022)

Plate 5: Forrestfield Year 2020 (Landgate, 2022)

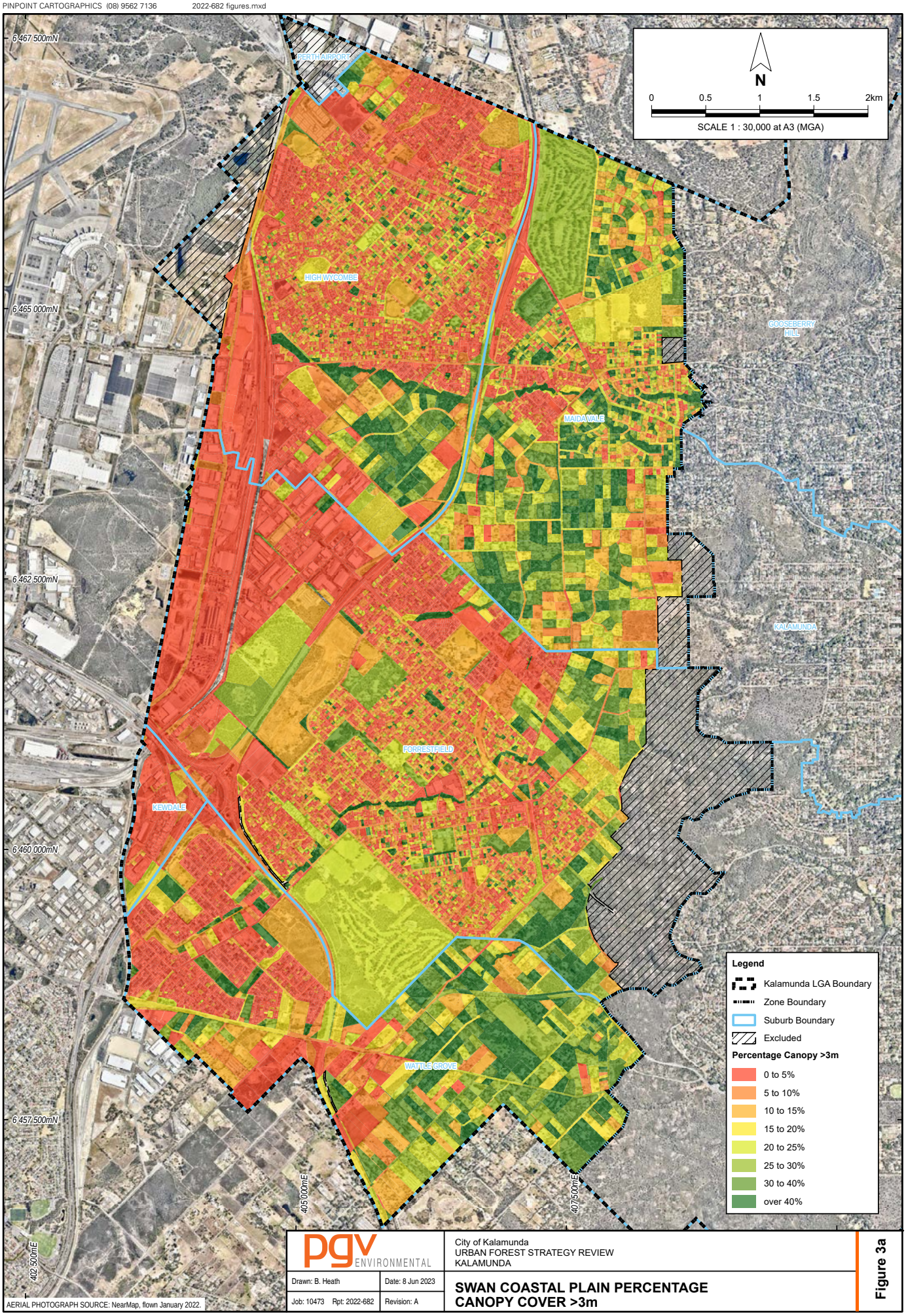


Figure 3a: Swan Coastal Plain Percentage Canopy Cover >3m Year 2020

Figure 3b Swan Coastal Plain Canopy Cover Percentage by Land Use Category Year 2020

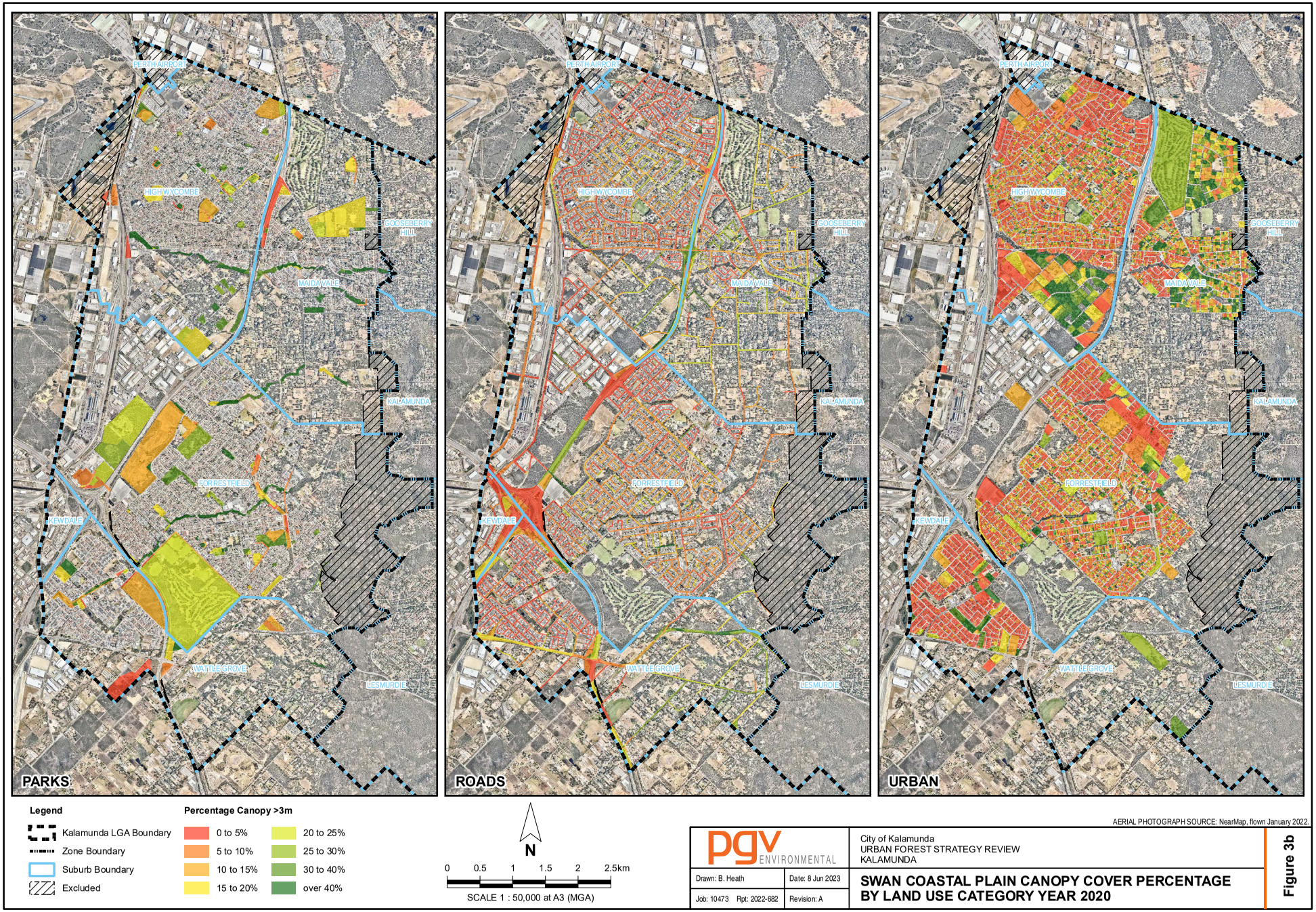


Figure 3c Swan Coastal Plain Canopy Cover Percentage by Land Use Category Year 2020

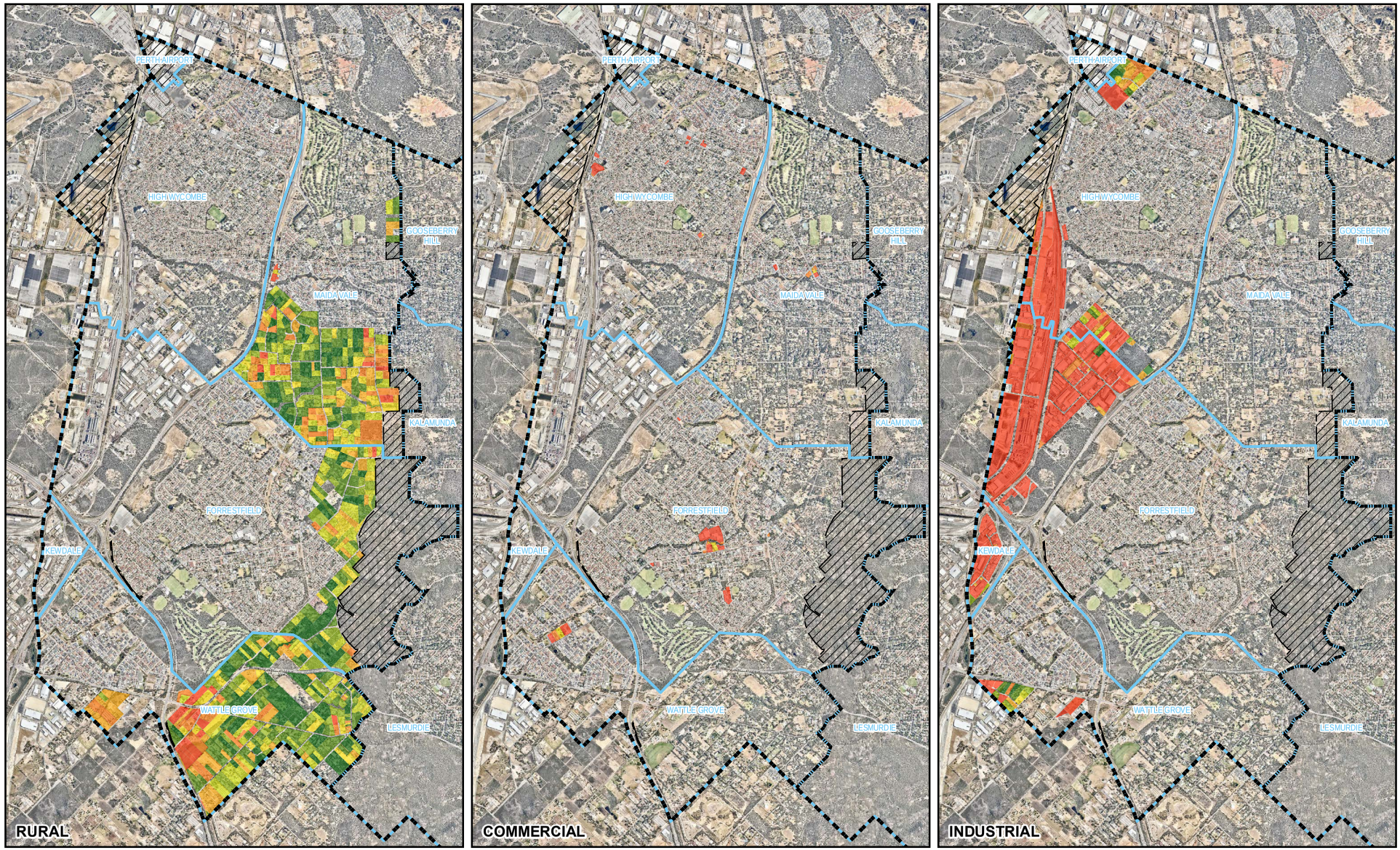
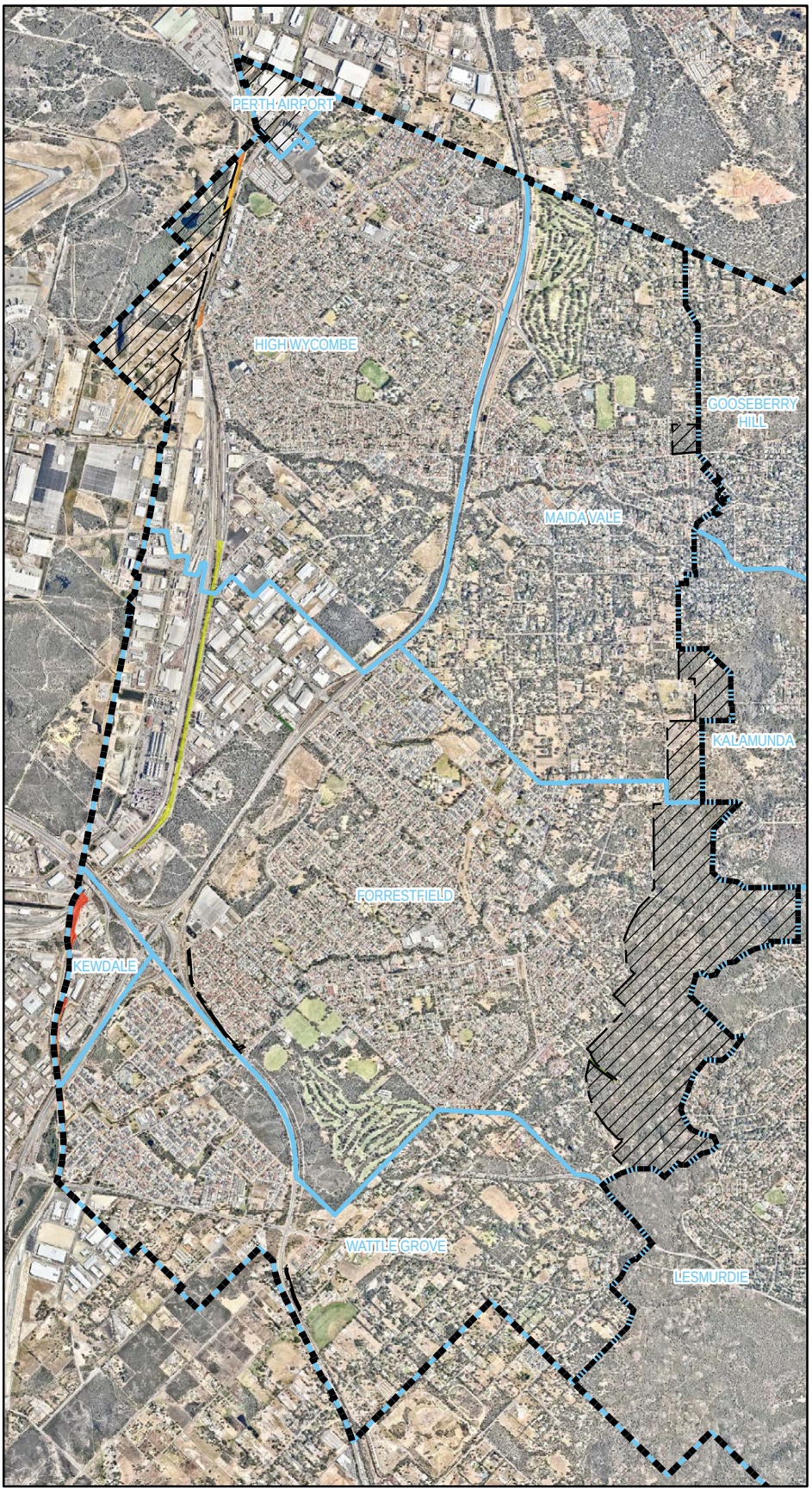


Figure 3d Swan Coastal Plain Canopy Cover Percentage by Other Infrastructure Category Year 2020



N

0 0.5 1 1.5 2km

SCALE 1 : 50,000 at A4 (MGA)

Legend

- Kalamunda LGA Boundary
- Zone Boundary
- Suburb Boundary
- Excluded

Percentage Canopy >3m

- 0 to 5%
- 5 to 10%
- 10 to 15%
- 15 to 20%
- 20 to 25%
- 25 to 30%
- 30 to 40%
- over 40%

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SWAN COASTAL PLAIN CANOPY COVER PERCENTAGE >3M BY OTHER INFRASTRUCTURE CATEGORY

Figure 3d

4.2 The Escarpment

The City's Escarpment area extends eastward from the eastern edge of the Swan Coastal Plain to the Darling Plateau and is mainly a moderately steep to very steep sloping escarpment. Vegetation on the Escarpment is often dominated by open woodland and shrubland. Kalamunda's wildflower season is a drawcard for city-dwellers, and its natural marri, jarrah and wandoo eucalypt stands are cherished by generations of residents and visitors.

Suburbs on the Escarpment include Lesmurdie, Kalamunda, Gooseberry Hill and Walliston. These suburbs make up approximately 3,710ha of the City's total area of 32,375ha or 11% of the City.

The Escarpment features large areas of regional and national parks together with well-established residential suburbs with generally low-density residential codes (mostly R5 and R10). Lower residential densities are a result of historically more rural land uses, natural constraints such as landform and geological constraints which limit building capability and limited provision of services. This is reflected in the low increases in residential housing density over time.

The main pressures on the urban forest across the Escarpment are infill development around the Kalamunda City Centre, bushfires, disease, potential impacts from climate change and the ability of the landform to support larger trees due to limitations of rocky and shallow soils.

4.2.1 Year 2020 Urban Canopy Cover

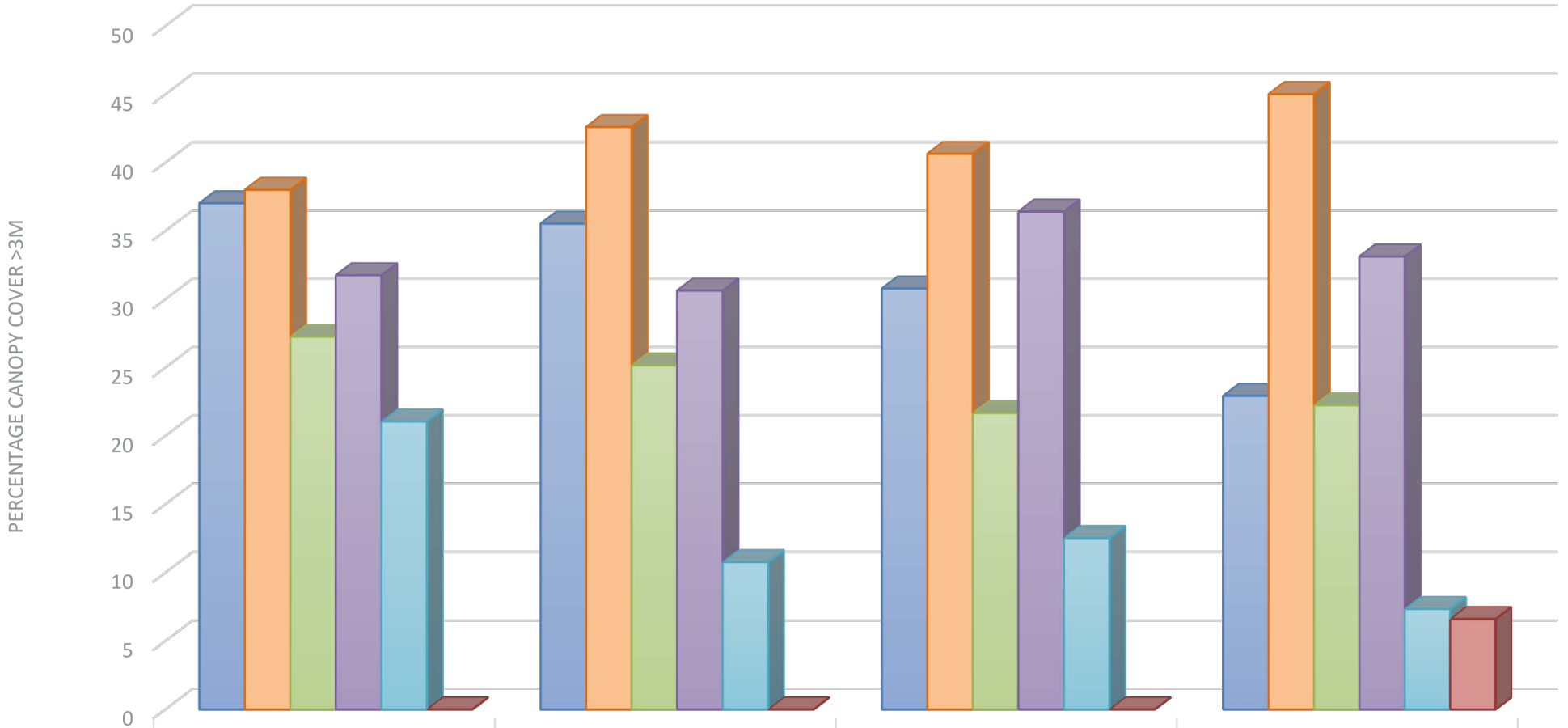
The urban canopy cover >3m on the Escarpment for Year 2020 was estimated to be 32%. The percentage urban canopy cover for the Escarpment suburbs and land use categories is depicted in Figures 4a-c.

Urban canopy cover (>3m) for all Escarpment suburbs is above 30%, as shown in Table 3. In order of descending canopy cover, the Escarpment suburbs are; Kalamunda and Gooseberry Hill (35%), Walliston (33%) and Lesmurdie (30%).

Chart 2 shows the percentage canopy cover per hectare by area for each of the land use categories across the Escarpment suburbs. Urban forest canopy cover is generally high (>30%) across the Escarpment for all land use categories, except for Roads which have between 20% and 30% cover, Industrial and Commercial uses which have between 7% and 21% canopy cover (e.g. Kalamunda Town Centre and the Walliston Industrial Area) and Urban areas in Walliston (23%).

The most significant areas of canopy cover occur in urban areas, rural areas and parks. This reflects the predominant urban land use of the Escarpment and low-density zoning which allows for greater tree retention and planting.

Chart 2: Percentage Canopy Cover by Land Use for Suburbs on the Escarpment



	GOOSEBERRY HILL	KALAMUNDA	LESMURDIE	WALLISTON
Urban	37	36	31	23
Parks	38	43	41	45
Rural	27	25	22	22
Roads	32	31	36	33
Commercial	21	11	13	7
Industrial	0	0	0	7

Figure 4a: Escarpment Percentage Canopy Cover >3m Year 2020

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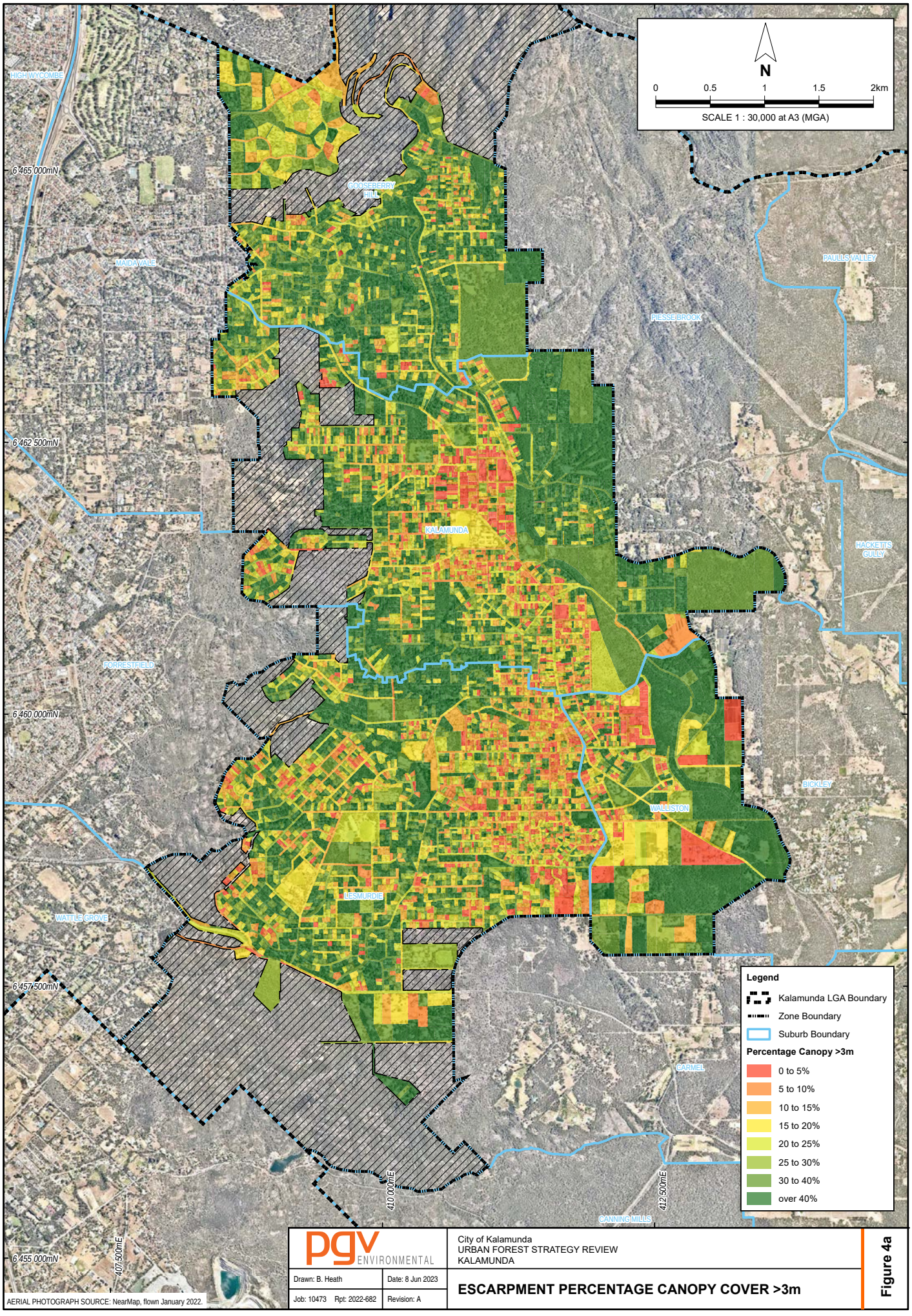

AERIAL PHOTOGRAPH SOURCE: NearMap, flown January 2022.

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ESCARPMENT PERCENTAGE CANOPY COVER >3m

Figure 4a

Figure 4b: Escarpment Canopy Cover Percentage >3m by Land Use Category

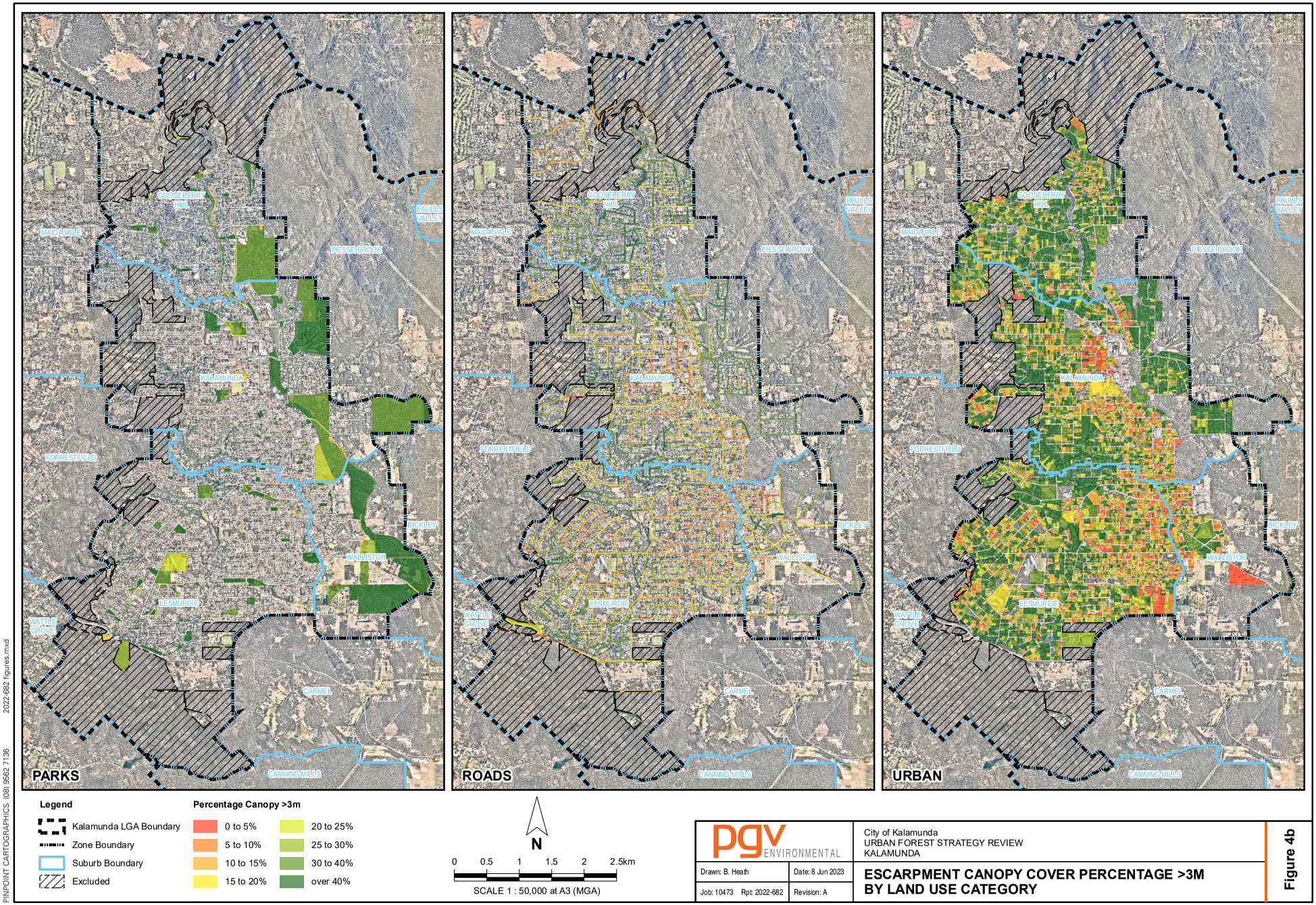


Figure 4c: Escarpment Canopy Cover Percentage >3m by Land Use Category

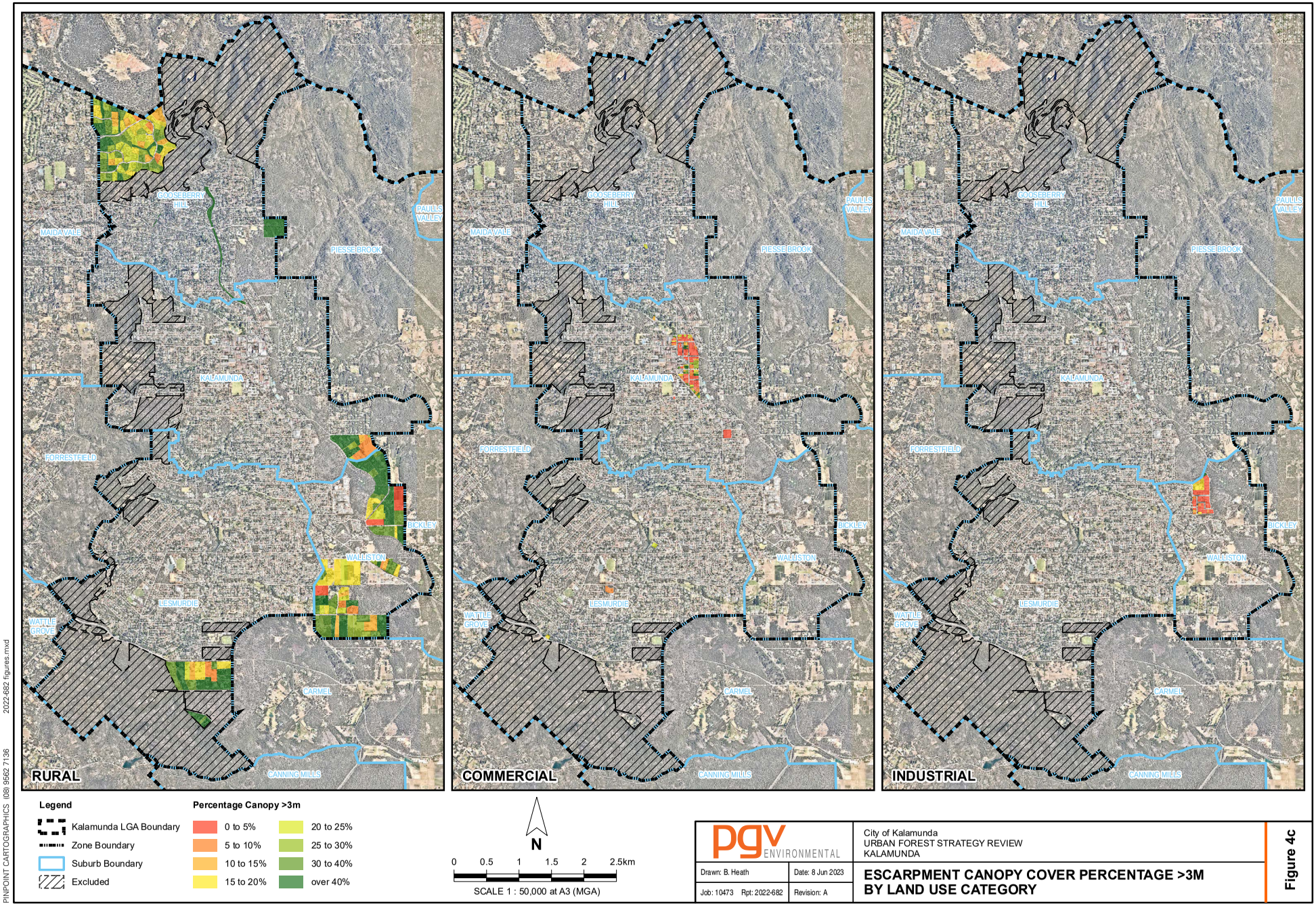
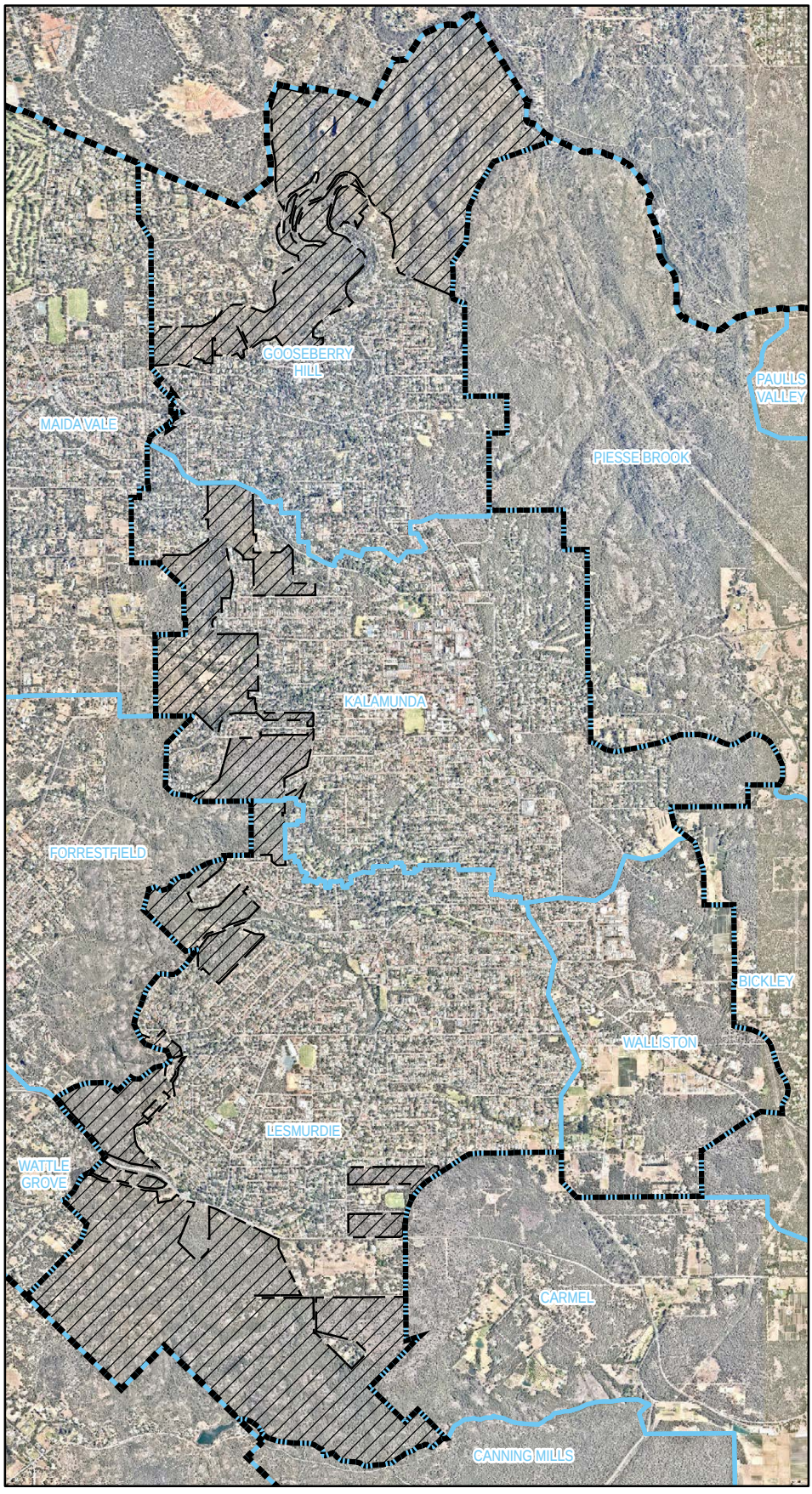


Figure 4d - Escarpment Canopy Cover Percentage >3m by Other Infrastructure Category



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ESCARPMENT CANOPY COVER PERCENTAGE >3M BY OTHER INFRASTRUCTURE CATEGORY

Figure 4d

4.3 The Darling Plateau

The Darling Plateau forms the eastern upland section of the City. Gently undulating slopes are dominated by native Jarrah and Marri forest zoned for conservation and agricultural land uses.

The Darling Plateau features large areas of state forest (noting that vast areas of state forest and national parks are excluded from the urban forest dataset) together with predominantly rural agricultural uses (e.g. fruit orchards) and rural conservation uses, such as bushland on private property. Lower residential densities are a result of historically more rural land uses, natural constraints, such as landform and geological constraints which limit building capability and limited provision of services. This is reflected in the low increases in residential housing density over time.

4.4 Year 2020 Urban Canopy Cover

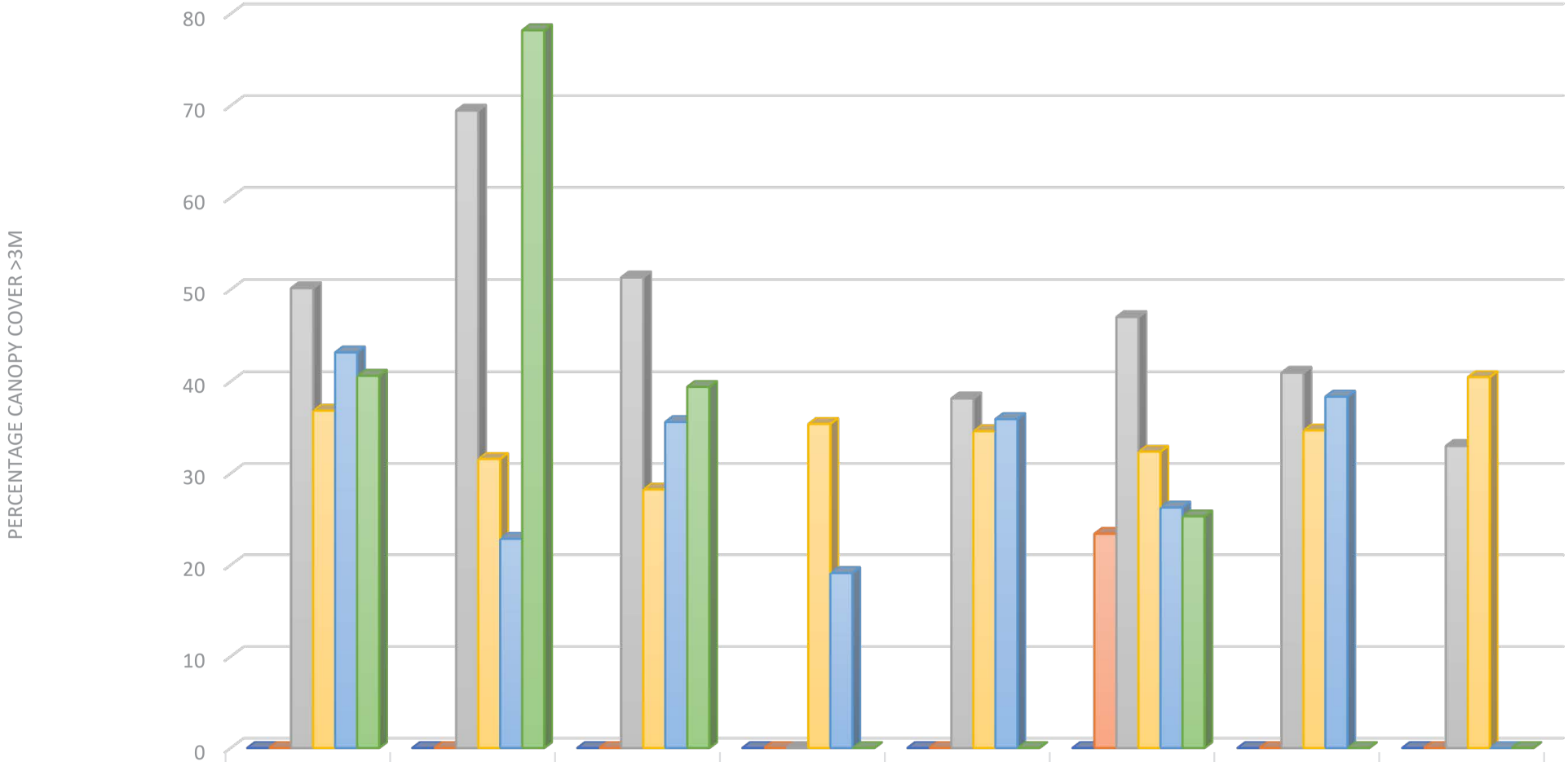
Overall, the Darling Plateau land use categories has an average urban canopy cover of 35% (Figure 5a). All suburbs in the region, with the exception of Hacketts Gully and Pickering Brook, have retained urban canopy cover above 30% due to the low-density nature of the Darling Plateau (Table 3).

In order of descending canopy cover, the Darling Plateau suburbs are; Canning Mills (47%), Bickley (44%),), Piesse Brook and Carmel (39%), Paulls Valley (36%), Reservoir (35%), Pickering Brook (27%) and Hacketts Gully (21%).

Chart 3 and Figures 5b-e show the percentage canopy cover >3m of each land use category for suburbs within the Darling Plateau areas. The land use categories Commercial, Industrial and Other Infrastructure are not represented on the Darling Plateau. Canopy cover is predominantly greater than 30% across the represented categories with a few exceptions. Suburbs and land uses with canopy cover below 30% include:

1. Roads in Carmel;
2. Rural areas in Hacketts Gully and Pickering Brook;
3. Urban areas in Pickering Brook; and,
4. Commercial areas in Pickering Brook.

Chart 3: Percentage Canopy Cover by Land Use for Suburbs on the Darling Plateau



	BICKLEY	CANNING MILLS	CARMEL	HACKETTS GULLY	PAULLS VALLEY	PICKERING BROOK	PIESSE BROOK	RESERVOIR
Other Infrastructure	0	0	0	0	0	0	0	0
Commercial	0	0	0	0	0	23	0	0
Parks	50	69	51	0	38	47	41	33
Roads	37	32	28	35	35	32	35	40
Rural	43	23	36	19	36	26	38	0
Urban	41	78	39	0	0	25	0	0

Figure 5a: Darling Plateau Percentage Canopy Cover >3m

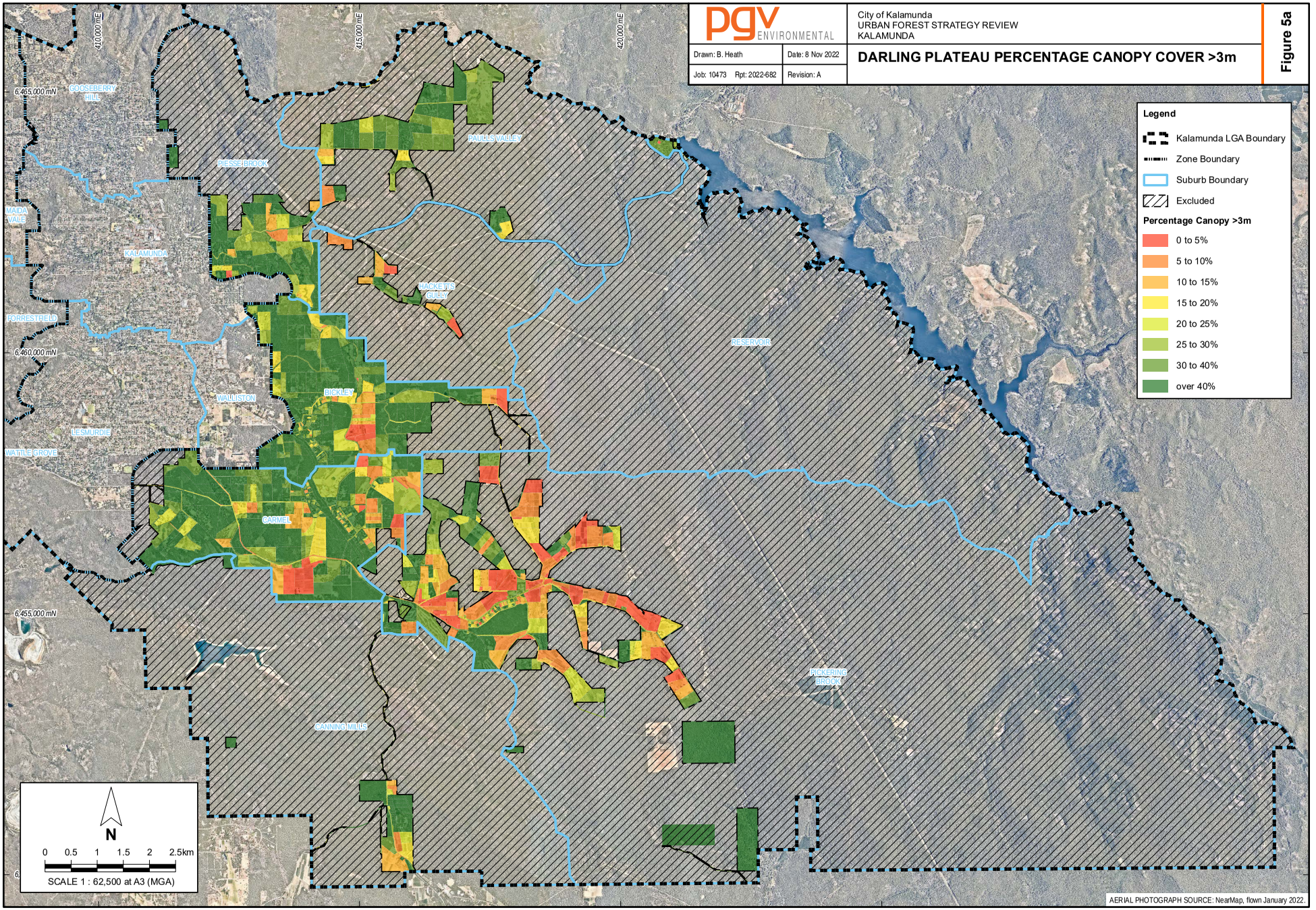


Figure 5b: Darling Plateau percentage canopy cover- Parks Category

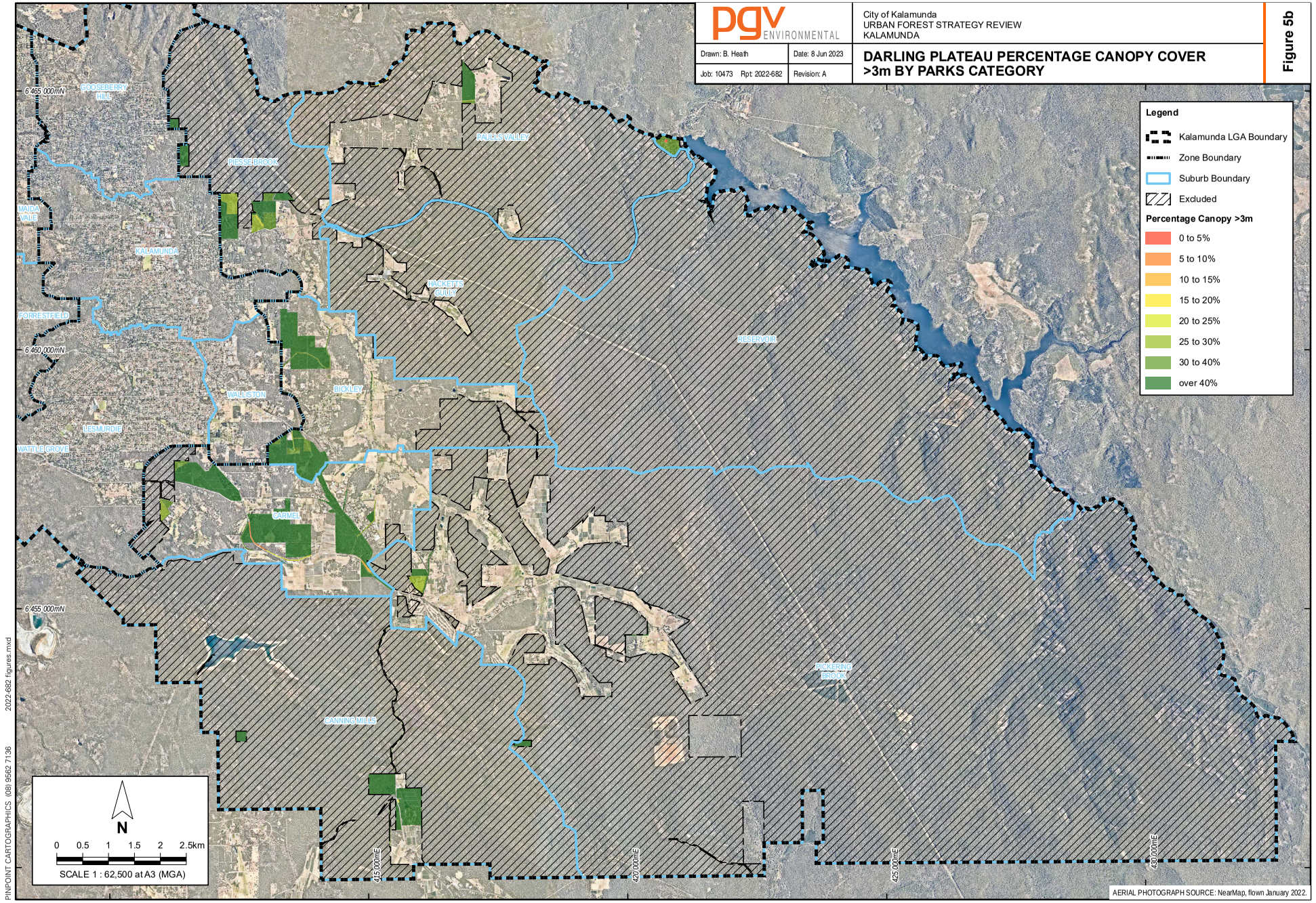


Figure 5c: Darling Plateau Percentage Canopy Cover >3m- Roads Category

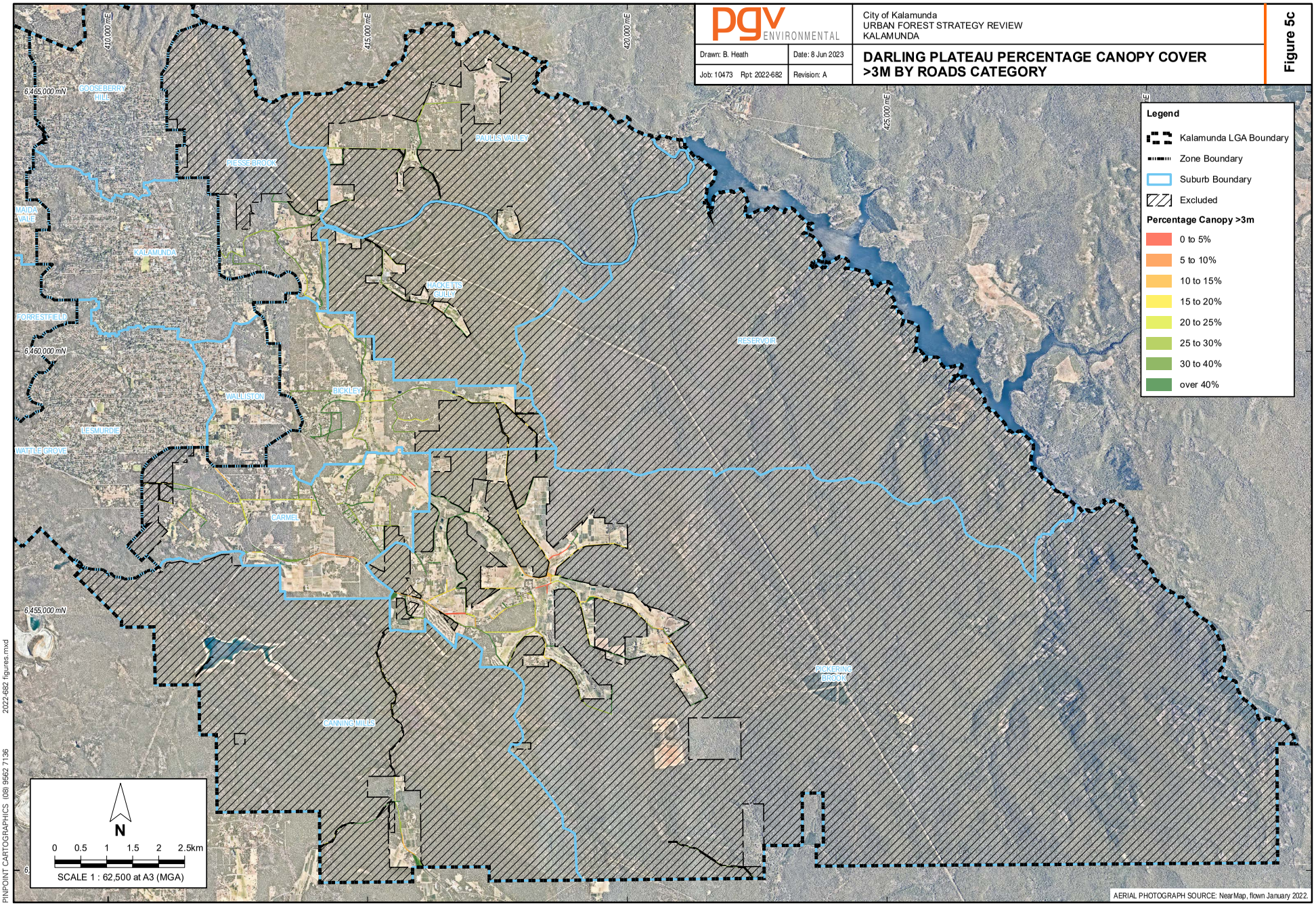


Figure 5d: Darling Plateau Percentage Canopy Cover >3m- Urban Category

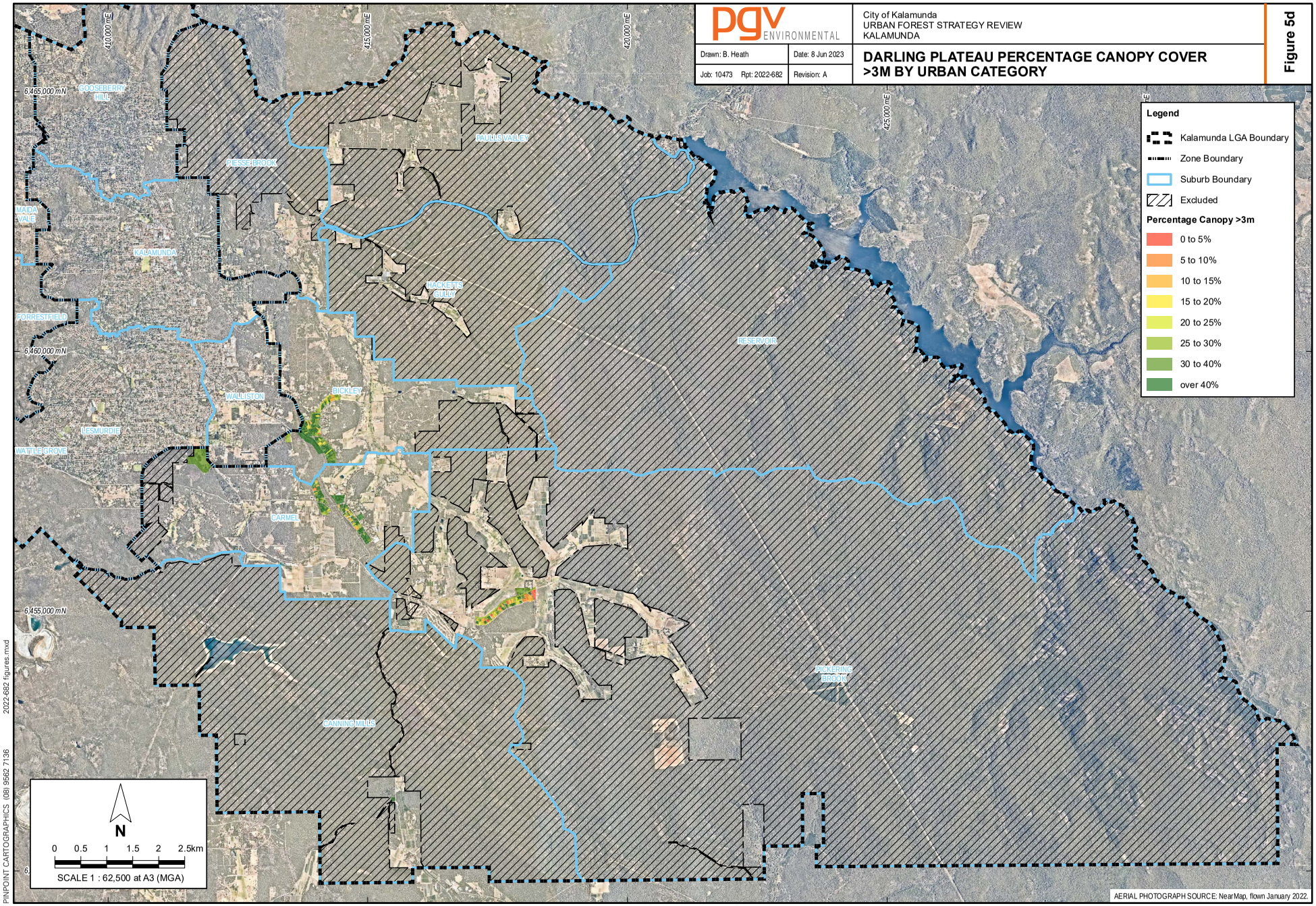
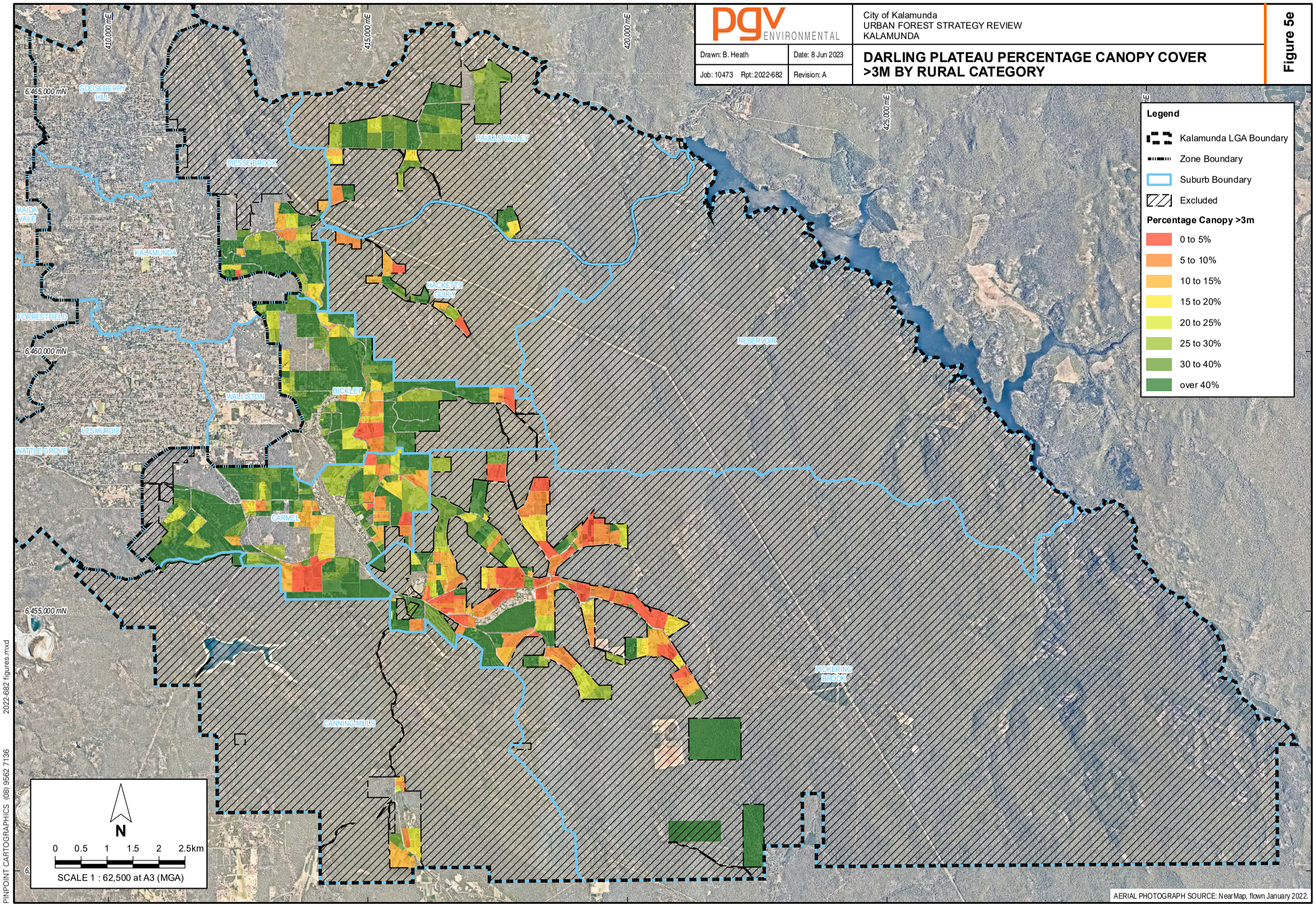


Figure 5e: Darling Plateau Percentage Canopy Cover >3m- Rural Category



5 Urban Forest Challenges and Opportunities

The UFS has identified areas and land uses across the City which have considerable urban forest canopy cover (above 30%), where protecting the urban forest is a priority over planting new trees. For example, this includes parks and rural areas on the Escarpment and Darling Plateau.

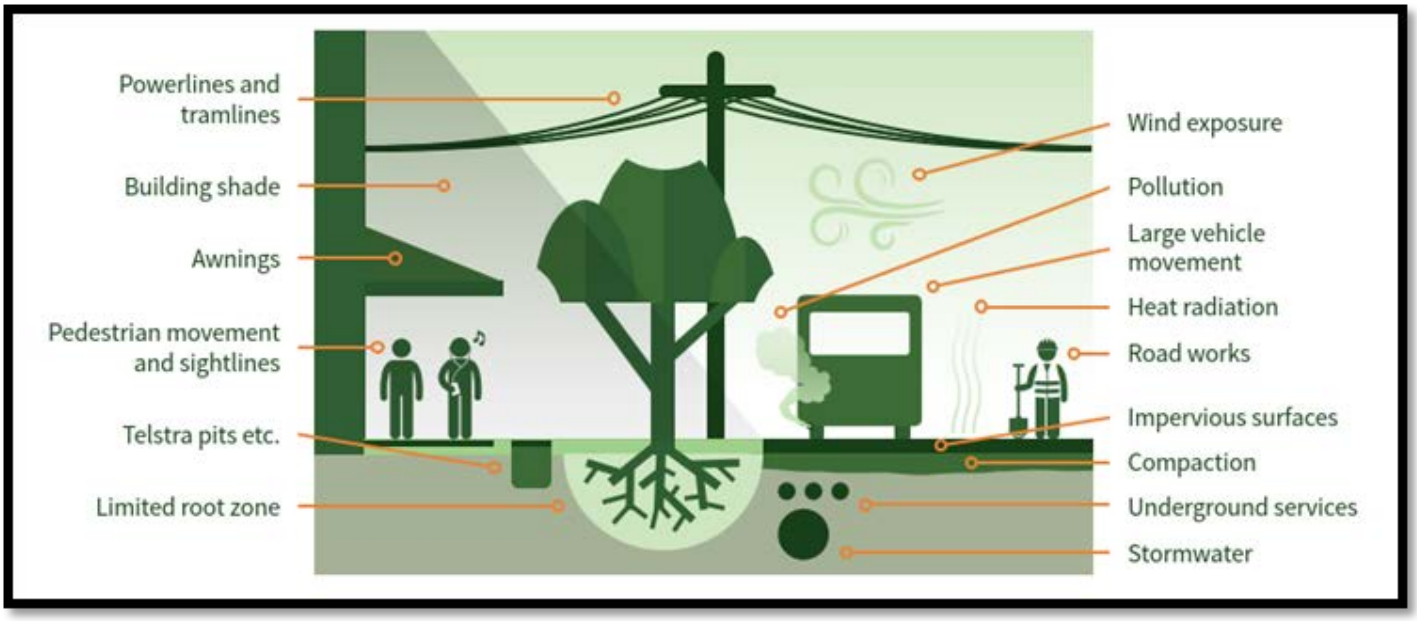
Conversely, the UFS identified areas and land uses across the City which currently have low canopy cover due to historic and current challenges, particularly areas on the Swan Coastal Plain. The priority for these areas, in addition to protecting existing trees, is to grow the urban forest and where possible, overcome growth challenges. The Action Plan (Section 6) includes an action to prioritise planting of trees in road verges and parks in areas with the lowest canopy cover, where constraints permit (such as the location of services and presence of powerlines).

Tree health is influenced by factors such as climate, soil conditions, pests and diseases and soil moisture availability . Climate change places additional stress on trees but also raises the importance of the cooling and other benefits they provide. Given the lifespan of trees, maintaining and regenerating the urban forest must consider the longer-term changes in the local climate.

Aside from water and temperature stresses, the tree stock can also be impacted by diseases such as Phytophthora cinnamomi (Dieback) and Quambalaria coyrecup (Marri Canker). Maintaining a resilient urban forest means having a tree stock able to withstand and bounce back from a range of impacts. This requires diversity at the tree species, genus and family levels for long term resilience to threats such as pests, diseases and a warmer, drying climate. Further information regarding maintaining a resilient urban forest is provide in Appendix 4.

Above-ground, trees in the built environment must contend with electrical lines, clearance requirements for transport (e.g. site lines) and urban structures such as verandas and signage (Plate 7). These constraints should be addressed to accommodate larger trees which provide many benefits, as outlined in Section 5.8.

Plate 7: Constraints on the Urban Forest (Source ACT Government, 2020)



Community opinions of trees can be challenging for local governments as trees may be perceived as messy, causing nuisance, increasing fire risk or not in line with individuals' aesthetic preferences. Residents may have differing opinions on trees and in some cases, trees are illegally vandalised or cleared. Both education and compliance are important factors in managing community perception and behaviour around the urban forest.

The City's influence on private land, particularly land with existing development, will require engagement with the various stakeholders, including schools, commerce and industry, meeting places, and sporting clubs, to raise the level of understanding of urban canopy cover and the considerable benefits to the community and environment. Opportunities for increasing or enhancing the canopy cover may be realised through the stakeholder engagement process.

The City also has an opportunity to lead by example on some of our own landholdings. Funding opportunities with industry and commercial enterprise can be explored as part of the consultation process.

The City also has an advocacy role to play in improving urban forest outcomes through the state planning process and maintains representation on working groups such as WALGA's Urban Forest Working Group.

The following sub-sections explore the challenges and opportunities for the City's urban forest and informs the Action Plan (Section 6) which aims to protect, grow, and enhance urban canopy across the City.

5.1 Urban Development

5.1.1 Challenges

The State Government's Perth and Peel @ 3.5 million frameworks outline strategic urban infill goals to increase residential densities for local governments and contain urban sprawl through consolidation measures. To accommodate population growth, the City needs to plan for diverse and sustainable development while protecting, managing, and enhancing the natural environment.

Development can lead to the loss of established trees on vegetated land due to reduced lot sizes and increased infrastructure. This increases the extent of hard surfaces and reduces the amount of land available to support trees, their required planting areas, and soil volumes. As urban development and density increases, greater importance and pressure is placed on the public realm to provide healthy trees and green spaces for people.

Many cities are facing the challenge of urban developments which limits the area to retain or plant trees and maintain the urban forest. The large lots that were once part of the urban fabric are now being subdivided. Often where a house and garden once existed, a lot now have multiple dwellings with little room for gardens.

The City is experiencing urban development predominantly in the suburbs on the Swan Coastal Plain and this trend is forecast to continue (e.g. High Wycombe South Structure Plan area, previously referred to as Forrestfield North).

Urban development is somewhat constrained on the Escarpment and within the Darling Plateau due to the limited provision of services (i.e. sewer resulting in larger lots) and the natural geological and landform characteristics presenting challenges to higher density development. This creates opportunities for tree retention.

5.1.2 Opportunities

While individual lots may reduce in size and canopy cover may be reduced as a result of higher density development, in some cases the overall development can increase urban canopy. Plates 8-10 show the transition from Rural to Urban land use in High Wycombe, noting the time lag for planted vegetation to mature and provide canopy cover in Jacaranda Springs Park and on residential lots.

Additionally, Plates 11-12 show an increase in canopy cover post-development of public open space at The Hales development in Forrestfield. Over time, the newly planted trees will provide a significant increase in canopy cover as they reach maturity. In some cases, the historically cleared rural land may have an increase in canopy cover post-development once landscaping has matured, as shown in the example in High Wycombe and Forrestfield (on pages 52 and 53).

New urban development will be guided by relevant state and local policies, which incorporate tree preservation and planting principles and requirements. LPP33 is a key local government policy which will assist in achieving tree retention, protection, and planting objectives.

Council adopted LPP33 in December 2022. This policy exceeds current state tree planting requirements for new residential developments by introducing a tree planting ratio and deep soil planting area based on land area, meaning. larger lots require more trees to be planted. The current state requirements only require one tree per dwelling and a $2m^2$ planting area, regardless of lot size. LPP33 also requires replacement planting or offsetting of trees removed (at a 2:1 ratio) that are not exempt under the policy.

Through the implementation of LPP33 and public and private realm design guidelines, new development provides an opportunity to retain existing trees, or replace trees which are removed to facilitate development.

New developments provide opportunity for tree retention and planting in newly created public road verges. New residential development is required to provide 10% of the development area as Public Open Space (POS), providing opportunity for tree retention and planting.

Plate 8-10: Infill Development In High Wycombe (Landgate, 2022)

Year 2001

Year 2005

Year 2022

Plate 11-12: Infill Development In Forrestfield (The Hales; Nearmaps 2022)

Year 2013 (Pre-development)

Year 2022 (Post-development)

5.2 Rural Land Uses

5.2.1 Challenges

Rural land uses can necessitate widescale clearing of vegetation for livestock grazing or food production (e.g. orchards).

Additionally, rural areas often have increased bushfire management requirements such as the requirement to clear vegetation for firebreaks.

5.2.2 Opportunities

Larger lot sizes in rural areas provide sufficient space for tree retention and tree planting. Canopy cover in the rural land use category is high, with 32% cover across the City in 2020.The priority for the urban forest in the rural land use category is to ensure and maximise the protection of the existing urban forest.

Through the implementation of LPP33 the City will carefully consider the need for tree removal and identify suitable replacement trees for unavoidable removal. Additionally, through the development and implementation of a new LPS, the City has the opportunity to increase protection of vegetation and trees and natural areas within rural areas.

Further, where rural landholdings comprise vegetation and habitat trees for Threatened fauna, such as black cockatoos, there is opportunity for environmental offsets to be applied and funded by third parties to ensure the protection and enhancement of the urban forest. This is reflected in action 4.4 of the Action Plan (Section 6).

5.3 Industrial Development

5.3.1 Challenges

Historically, industrial developments have resulted in canopy loss at a much greater scale than other land uses, due to competing objectives and spatial requirements between industrial operations and trees. Industrial developments often retain very few trees and have limited landscaping, resulting in large areas of impervious space with limited or no green space. The average urban canopy cover for existing industrial areas across the Perth Metropolitan Region is around 0-5%.

The low canopy cover in industrial areas is also due to there being no requirement for POS. This differs from urban developments which must contribute 10% of the development area to POS.

5.3.2 Opportunities

Canopy cover in the Industrial category is the lowest across the City at 4% (Table 2). This is consistent with industrial areas across the Perth Metropolitan Region which predominantly have between zero and 4% canopy cover. Industrial areas have low canopy cover due to the nature of the land use which generally requires large areas devoid of vegetation to accommodate warehouses and hardstands that facilitate heavy vehicles.

Increasing urban canopy cover in this land use category is generally limited to landscaping, drainage and carparking areas on private land, ands streetscaping road verges. There are also challenges with green retrofitting in existing industrial areas due to the constraints on planting trees shown in Plate 7.

New developments however can be planned to include plantings in carparks, around the lot perimeter, in landscaping and drainage areas and in street and verge plantings. Industrial Design Guidelines can be used as the mechanism to deliver on urban canopy cover. The City has design guidelines in place for industrial areas undergoing development, for example LPP19 – MKSEA Design Guidelines which specify minimum landscaping and tree planting requirements. These include a minimum landscaping area of 5% (total site area), tree planting every 10m in the road reserves, and every four car parking bays on private land. As a case study for the UFS, the City will monitor the change in canopy cover over time for the area of MKSEA located within the City of Kalamunda (refer Appendix 5).

Additionally, the Forrestfield/High Wycombe Industrial Area Design Guidelines (Local Planning Policy 27) support streetscaping, tree planting in car parks at a rate of one tree per four parking bays and water sensitive urban design.

The City has also introduced a target of 10% canopy cover for new industrial developments through the development of LPP33 and includes a requirement of one tree for every four parking bays. LPP33 also provides opportunities for replacement tree plantings or financial offsets where trees cannot be retained in the development. Financial offsets may be collected by the City and used for planting of trees in public areas in the locality, such as by roads or parks.

Additionally, the City is proposing to develop Industrial Local Planning Policies/Design Guidelines, consistent with the targets and tree planting requirements of LPP33. The future policy could include provisions around minimum tree plantings, the number of shade trees in car parks, street scaping and minimum landscaping requirements.

The above targets/ outcomes have been reflected in the objectives and actions outlined in Section 7 of the UFS.

5.4 Commercial Development

5.4.1 Challenges

Shopping centres and commercial areas have been planned in the past with little or no vegetation to provide shade and amenity to customers. This has resulted in vast expanses of hard surfaces which radiate heat.

Commercial developments provide facilities associated with shopping, business, professional, civic, cultural and entertainment facilities. These developments must also provide safe and efficient traffic and pedestrian circulation. These factors often compete with space for tree retention and planting, including adequate soil volume.

The Commercial land use category has low canopy cover across the City with only 8% cover (Table 2).

5.4.2 Opportunities

Planning for future commercial areas like shopping centres and trade precincts should include a significant number of trees to assist with reducing the heat island impacts that currently characterise these areas. Below is an example of a new shopping precinct in Melbourne that includes several green areas and tree plantings (Plate 13).

Plate 13: Concept Burwood Brickworks Shopping Centre, Melbourne (Source: Frasers Property)

There are opportunities to improve urban canopy cover in new commercial developments where urban canopy cover can be strategically planned and implemented through the application of LPP33. LPP33 specifies a minimum tree canopy target of 20% for Commercial development, including a requirement for one medium or large tree for every four car parking bays. To address space limitations in car parking areas, LPP33 allows for below surface structural soil cells to be implemented to ensure healthy trees with a full and healthy canopy at maturity.

5.5 Parks

5.5.1 Challenges

While the percentage canopy cover in Parks is 38% across the City (Table 2), it is currently less than 25% for each of the Swan Coastal Plain suburbs (Chart 1).

Constraints on Parks are influenced by the designated use of the park, active/passive recreation, safety and bushfire risk, water availability, drainage, and conservation. The Parks category includes public and private playing fields, as well as "kick-about" spaces in local parks. Such areas are generally not suited to tree planting and there are limitations to increasing canopy cover in these areas.

5.5.2 Opportunities

The Parks category provides further opportunity for the City to increase canopy cover levels in both new urban developments, which are required to create public open space, and increasing the number of shade trees in existing parks. Retrofitting green plantings in existing parks to increase shaded areas in urban environments with low canopy cover will be given a high priority.

New development (local government, residential and industry) can be guided through planning controls to include suitable plantings that at maturity will be >3m in new parks. As demonstrated in Plates 8-12, development of previously cleared rural land in High Wycombe and Forrestfield has increased canopy cover through providing public open space once the trees reach maturity.

5.6 Roads

5.6.1 Challenges

Steet trees have many challenges and often competing management constraints as presented in Plate 7. Below-ground space for tree roots is compromised by extensive road and path networks and underground utilities including gas, water, sewer and telecommunications. Soils are often compacted, contaminated and covered by impermeable surfaces making it harder for trees to access water, air and nutrients required for growth.

Some street trees pose an element of danger to the public as the species can cause vehicle sight-line issues or drop tree limbs onto footpaths and roads in certain weather conditions. This has resulted in some local government areas (LGAs) removing mature street trees as a risk mitigation measure. Many LGAs are also faced with aging street trees coming to a natural end of life, in danger of dropping limbs, or with roots are destroying footpaths and roads.

5.6.2 Opportunities

There is potential to increase canopy cover in the Roads category, with Roads having 19% canopy cover in 2020 (Table 2). The Swan Coastal Plain suburbs have the lowest canopy cover and will be prioritised for tree planting through the City's annual street tree planting program. The City has a high degree of control over, and influence within, road reserves, meaning a higher likelihood of success and a measurable reward for effort.

New development such as subdivisions can increase the public road network, providing opportunities to grow the urban forest through street tree planting in road verges. To accommodate larger trees in road verges and reserves, planning at a strategic level for new development (residential, industry and commercial) will be required to avoid some of the constraints that impact street trees. New and infill development can be guided through planning controls to retain and accommodate new trees in road reserves and include suitable plantings that at maturity will grow to >3m in height.

5.7 Other Infrastructure

5.7.1 Challenges

The Other Infrastructure category relates to land uses such as rail and waterways. This category currently has 5% urban canopy cover (Table 2). This category has limitations on increasing canopy cover due to the nature of the land use, associated infrastructure requirements and conflicts with tree retention and planting.

5.7.2 Opportunities

As a result of the limitations with increasing the canopy cover of this land use category, as well as consideration of the small area of the City that this land use category occupies in comparison to other land use categories, there is limited opportunity to increase canopy cover.

5.8 People and Trees

5.8.1 Challenges

Many of the benefits provided by trees relate to their growth and canopy cover, meaning their benefits increase as trees mature and remain healthy. However, in urban environments, there can be competition for space between trees and built infrastructure and facilities, often creating conflicts which need to be resolved to ensure human safety and uninterrupted utility services. For example, inappropriate tree selection and/or soil and site preparation, can lead to tree root systems or branches causing structural damage to public and private assets.

Additionally, a tree may be too large for a given site and as a result may not be capable of reaching full maturity if, for example, it is located beneath powerlines or too close to a building.

Leaf fall and accumulation can also create maintenance and bushfire concerns for residents when large amounts of leaves accumulate on the ground and in gutters. The City faces conflicting management priorities regarding urban forest canopy and managing the risk of bushfires and protecting property and life under the Bushfires Act 1954 and State Planning Policy 3.7 Planning in Bushfire Prone Areas (SPP 3.7). A balance between these two management priorities is required. In the context of urban canopy cover which is measured at >3m high there is room to keep the fuel levels down in the under strata.

Additionally, stormwater infrastructure can be impacted by leaves blocking drains or pipes and providing detrimental nutrients into natural wetlands and constructed lakes.

5.8.2 Opportunities

With appropriate tree selection, soil and site selection and preparation, and ongoing management, many of the management problems and concerns of residents and the City can be addressed. Information regarding these measures can be provided through reviewing, updating and developing internal technical guidelines for tree planting and maintenance (refer Table 4, Action 1.4).

The City has the least influence on private land that is already developed, however community engagement through education and incentives on the importance of the urban forest will influence some landowners to assist in improving canopy cover in their street.

5.9 Bushfire

5.9.1 Challenges

Bushfire can impact the City's urban forest both directly through uncontrolled bushfire events and prescribed burns, as well as indirectly through bushfire risk mitigation (e.g., clearing for firebreaks and emergency access).

As highlighted in the in the report Where Will all the Trees Be published by Greener Spaces Better Places in 2020, the City experienced a loss of 4% green cover. The report acknowledges that the City was significantly affected by bushfire during the period of the study (2016-2020). A review of State government spatial information showing records of fire events, including prescribed burns and bushfire, which were captured on departmental-managed land, and where available non-department managed land in Western Australia, shows that over 5,000 ha of vegetation was burnt over the period of the study. While many of these burnt areas were state forest, regional parks and national parks which are excluded from the UFS, it is acknowledged that natural regeneration of the lost green cover is likely to occur over time.

Separately, bushfire risk management required to protect life and property assets in bushfire prone areas can also impact the urban forest. These impacts occur through clearing for measures such as firebreaks and asset protection zones as required under the Bushfires Act 1954 and SPP 3.7. The UFS will not conflict with bushfire management requirements under the Bushfires Act 1954 or SPP 3.7 however will seek ways to ensure best-practice management to balance tree retention with bushfire risk mitigation.

5.9.2 Opportunities

There are opportunities to ensure impacts to the City's urban forest associated with bushfire risk management are minimised. This can be achieved through the following measures:

1. Engage and educate residents on suitable tree retention, tree planting (e.g. fire-wise species) and management (pruning of lower limbs and removal of leaf litter) for bushfire protection on private property.

2. Advocate for state government to undertaken research on the impact of tree retention on fire behaviour and potentially improve state policy/ guidance relating to tree retention outcomes.

3. Encourage state government and local bushfire officers to undertake training in ecologically sustainable bushfire management and implement best practice to protect the ongoing health and viability of the urban forest in parks (e.g. mosaic burning for prescribed burns).

6 Action Plan

Protecting and enhancing the City's urban forest is a shared responsibility between government agencies, local government, and the community. Local government has varying degrees of influence over how different land uses and tenures impact upon urban forest coverage. For example:

1. Greening in streets and parks in new developments can be managed through urban planning controls, in discussion with developers and other regulators;

2. Existing streets and parks can be 'retrofitted' with additional greening;

3. Greening on private land can be managed by ensuring existing high-value vegetation is protected; and

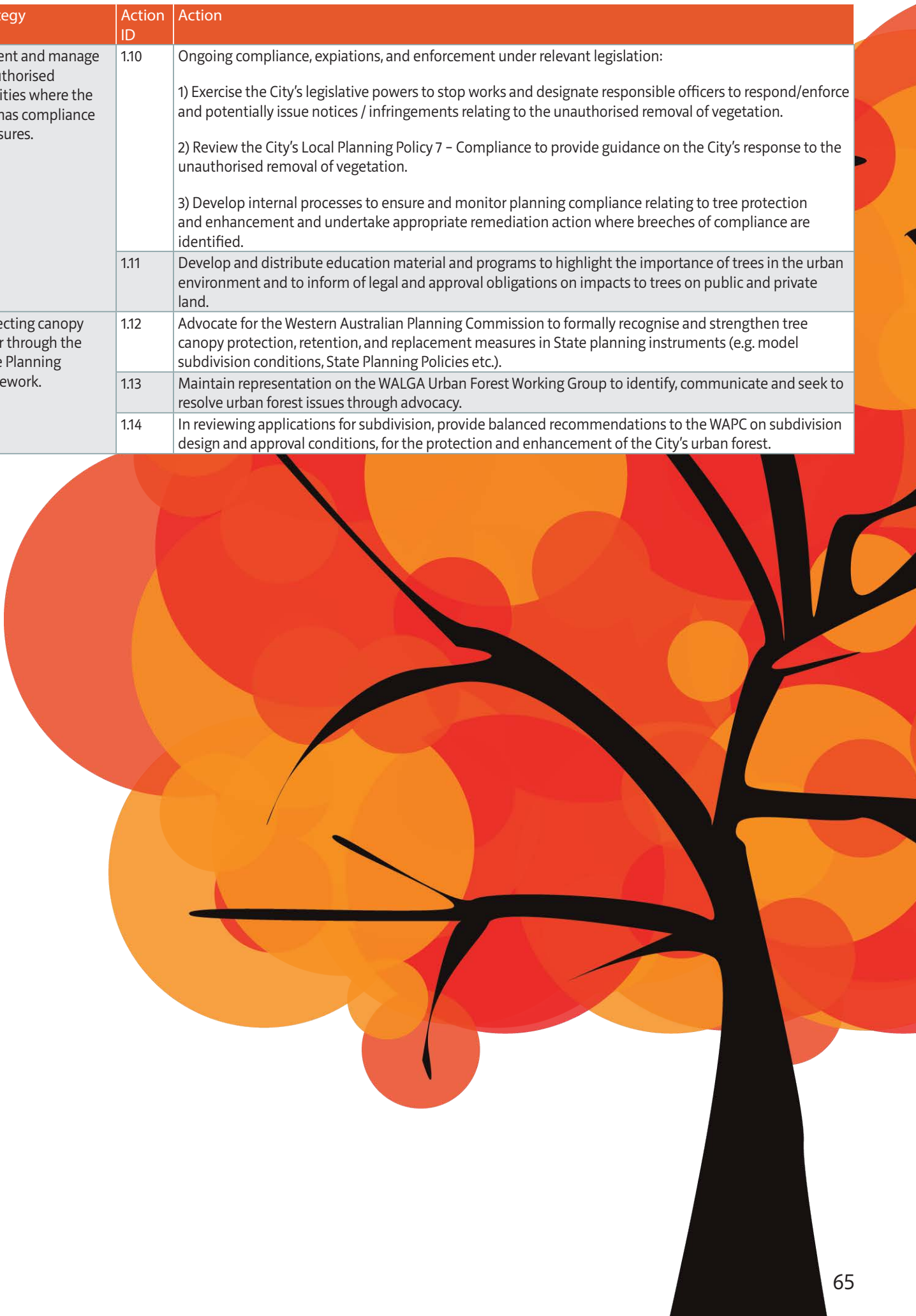
4. Encouraging further planting and educating residents in the social, environmental, and economic benefits of an urban forest.

To achieve the city-wide target of 30% canopy cover by 2043, as well as the goals and objectives of the UFS (outlined in Section 1.3), a number of strategies and actions are proposed to be undertaken by the City as outlined in Table 4.

Table 4: Urban Forest Goals, Objectives and Actions

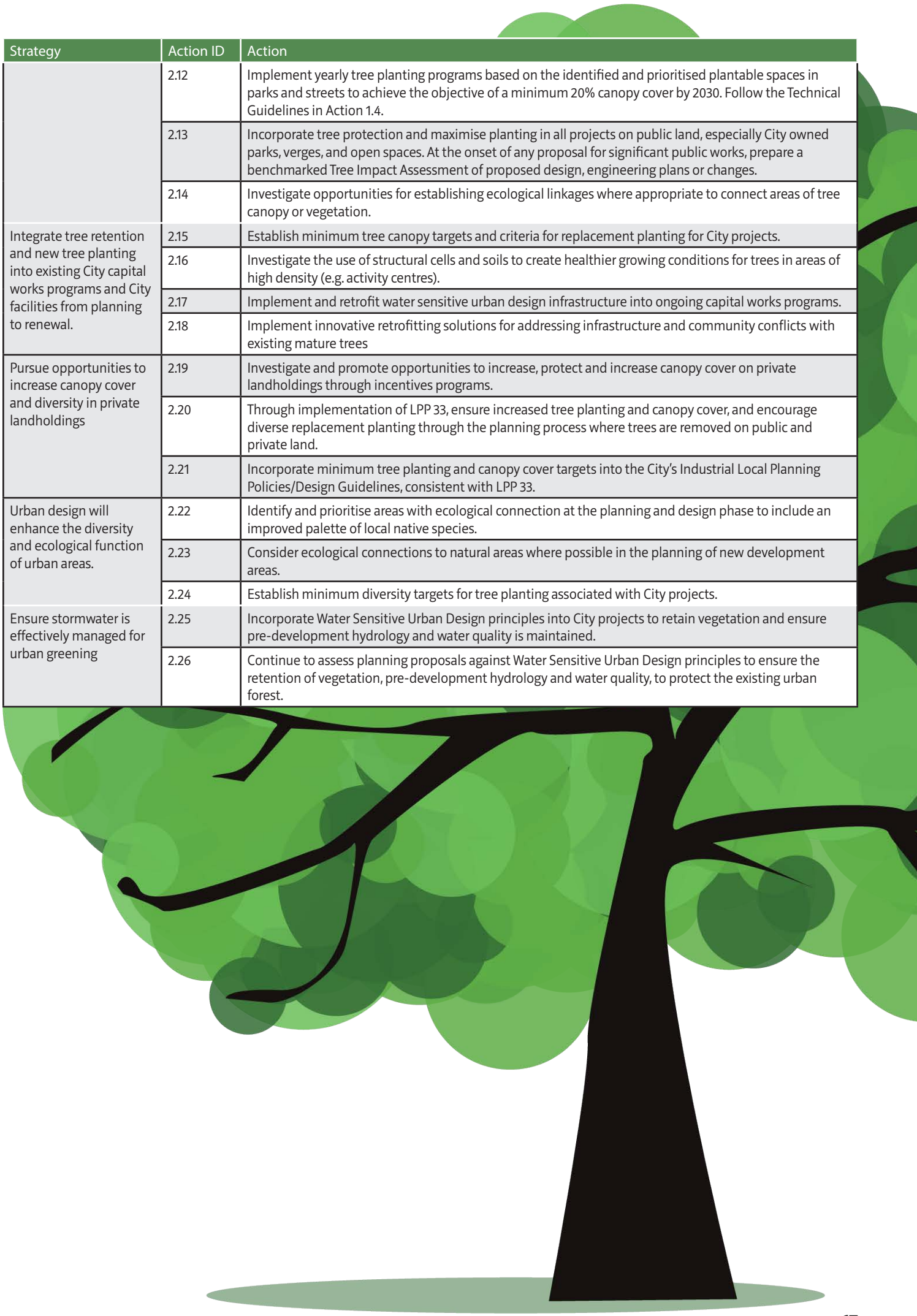
Goal	Protect the City's existing urban forest on public and private land	
Objectives	• No net loss of canopy cover on public and private land. • All reported compliance matters relating to tree removal actioned within 10 business days.	
Strategy	Action ID	Action
Build knowledge and capacity of City staff to protect the City's urban forest.	1.1	Increase internal awareness on urban forest through information sessions for staff regarding their role in protecting the City's urban forest.
	1.2	Ensure staff have dedicated responsibilities to incorporate the urban forest into City Policy, processes, and procedures.
	1.3	Encourage State government and require local bushfire officers to undertake training in ecologically sustainable bushfire management and implement best practice to protect the ongoing health and viability of the urban forest in parks (e.g. mosaic burning for prescribed burns).
	1.4	Ensure that staff involved in planning and management of the City's urban forest have appropriate training and/ or qualifications.
Establish clear policies and guidelines for protecting, managing, and maintaining urban trees on public and private land.	1.5	Review and identify any gaps in City practices and procedures, policies, design and development guidelines to align with the objectives of the UFS.
	1.6	Develop technical guidelines to inform tree selection, species, procurement, planting (e.g. rootable soil volume), replacement, maintenance (watering, pruning, staking, weed control), removal, risk management (e.g. dieback management), habitat and best practice management across the public and private land for the City, developers and residents.
	1.7	Develop and implement new or amended policies to protect existing street and parkland trees from damage caused by development works and other infrastructure works in the City.
	1.8	Undertake compliance monitoring and enforcement relating to the City's urban forest (e.g. unlawful tree removal or fulfillment of tree planting approval conditions).
Improve the content and implementation of the local planning framework to strengthen the requirements for tree canopy protection and provision.	1.9	1)Review local planning policies that stipulate minimum landscaping requirements to ensure alignment with UFS targets. 2) Implement LPP 33 which provides for the protection of trees on public and private land. 3) Update engineering policies and guidelines for crossovers, verge treatments and street trees to protect and enhance the urban forest on public land. 4) Review and update the City's model conditions to ensure protection and enhancement conditions are consistently applied to all relevant development approvals. 5) Investigate incentives for retention of trees for new development. 6) Review all Bushfire Management Plans and the City's Fire Hazard Reduction Notices to ensure environmental objectives are balanced where possible.

Strategy	Action ID	Action
Prevent and manage unauthorised activities where the City has compliance measures.	1.10	Ongoing compliance, expiations, and enforcement under relevant legislation: 1) Exercise the City's legislative powers to stop works and designate responsible officers to respond/enforce and potentially issue notices / infringements relating to the unauthorised removal of vegetation. 2) Review the City's Local Planning Policy 7 – Compliance to provide guidance on the City's response to the unauthorised removal of vegetation. 3) Develop internal processes to ensure and monitor planning compliance relating to tree protection and enhancement and undertake appropriate remediation action where breeches of compliance are identified.
	1.11	Develop and distribute education material and programs to highlight the importance of trees in the urban environment and to inform of legal and approval obligations on impacts to trees on public and private land.
Protecting canopy cover through the State Planning framework.	1.12	Advocate for the Western Australian Planning Commission to formally recognise and strengthen tree canopy protection, retention, and replacement measures in State planning instruments (e.g. model subdivision conditions, State Planning Policies etc.).
	1.13	Maintain representation on the WALGA Urban Forest Working Group to identify, communicate and seek to resolve urban forest issues through advocacy.
	1.14	In reviewing applications for subdivision, provide balanced recommendations to the WAPC on subdivision design and approval conditions, for the protection and enhancement of the City's urban forest.



Goal	Grow the urban forest on public and private land through new tree plantings to maximise the social, economic and environmental benefits of trees and urban greening.	
Objectives	•Plant enough trees by 2030 to achieve a minimum of 20% canopy cover (at maturity) in roads across the City. •Encourage landowners/ managers to increase tree planting and diversity on private land. •All new industrial developments to achieve 10% canopy cover (at maturity). •All new Urban, Centre, District Centre, Commercial, Mixed Use zoned developments to achieve 20% canopy cover (at maturity). •Ensure diversity of trees for City projects and tree planting, including no more than 10% of the same species or 30% of the same genus.	
Strategy	Action ID	Action
Informed and collaborative approach to planning and implementing UFS.	2.1	Establish a multi-disciplinary team to regularly meet to: 1. Discuss urban forest management issues and opportunities; 2. Coordinate short to medium term actions as they relate to the urban forest; 3. Communicate relevant information (such as roles and responsibilities) to internal departments.
	2.2	Participate with the Department of Planning Lands and Heritage's Urban Monitor Partners to keep up to date with the latest changes to the urban forest canopy program and assimilate any changes through reviews of this Strategy.
Promote and use GIS tools to inform City staff and Council on urban forest values, prioritisation of where the values can be improved and spatial planning and reporting on urban forest values across the City.	2.3	Develop a technical GIS layer for urban canopy cover to allow City staff to analyse spatial information relevant to City programs and projects and use high quality data that informs decision making.
	2.4	Develop and continue to update a publicly accessible GIS layer to share spatial information on the City's urban forest with the community.
	2.5	Continue to develop and update the baseline audit of all trees currently growing on public land and streets including species, age, size, canopy spread, and health/condition within the Swan Coastal Plain suburbs as a priority, followed by the Escarpment suburbs.
	2.6	Use data from the baseline audit of all trees on public land to identify any areas where significant gaps in canopy cover may emerge due to a large proportion of street and parkland trees reaching the end of their useful life expectancy.
	2.7	Use data from the baseline audit of all trees on public land to determine the causes of tree health decline and mortalities, and risks to tree health/viability. Further, identify mitigation measures to incorporate into City policies and procedures (e.g. Technical Guidelines proposed by Action 1.4) to prevent decline of the City's urban forest.
	2.8	Establish centralised data collection and record keeping for tree assessment, planting, maintenance and removal.
	2.9	Undertake four-yearly urban forest canopy audits to review and report the changes in the urban forest across the City.
Invest in a targeted tree planting program to maximise benefits of urban greening.	2.10	Identify and prioritise (based on lowest canopy cover) the plantable places on roads and parks where urban canopy can be increased across the City, to assist with achieving the following: 1. Aspirational target of 30% City-wide canopy cover. 2. Objective to plant enough trees in roads by 2030 to achieve a minimum of 20% canopy cover (at maturity).
	2.11	Prepare an Urban Forest Planting Masterplan based on the prioritised roads and parks identified in Action 2.10 and following the Guidelines in Action 1.4. The Urban Forest Planting Masterplan should incorporate the Street Tree Masterplan which is to be developed under the City's ELUPs. The Urban Forest Planting Masterplan should use tree species which will reach a minimum height of 3m at maturity.

Strategy	Action ID	Action
	2.12	Implement yearly tree planting programs based on the identified and prioritised plantable spaces in parks and streets to achieve the objective of a minimum 20% canopy cover by 2030. Follow the Technical Guidelines in Action 1.4.
	2.13	Incorporate tree protection and maximise planting in all projects on public land, especially City owned parks, verges, and open spaces. At the onset of any proposal for significant public works, prepare a benchmarked Tree Impact Assessment of proposed design, engineering plans or changes.
	2.14	Investigate opportunities for establishing ecological linkages where appropriate to connect areas of tree canopy or vegetation.
Integrate tree retention and new tree planting into existing City capital works programs and City facilities from planning to renewal.	2.15	Establish minimum tree canopy targets and criteria for replacement planting for City projects.
	2.16	Investigate the use of structural cells and soils to create healthier growing conditions for trees in areas of high density (e.g. activity centres).
	2.17	Implement and retrofit water sensitive urban design infrastructure into ongoing capital works programs.
	2.18	Implement innovative retrofitting solutions for addressing infrastructure and community conflicts with existing mature trees
Pursue opportunities to increase canopy cover and diversity in private landholdings	2.19	Investigate and promote opportunities to increase, protect and increase canopy cover on private landholdings through incentives programs.
	2.20	Through implementation of LPP 33, ensure increased tree planting and canopy cover, and encourage diverse replacement planting through the planning process where trees are removed on public and private land.
	2.21	Incorporate minimum tree planting and canopy cover targets into the City's Industrial Local Planning Policies/Design Guidelines, consistent with LPP 33.
Urban design will enhance the diversity and ecological function of urban areas.	2.22	Identify and prioritise areas with ecological connection at the planning and design phase to include an improved palette of local native species.
	2.23	Consider ecological connections to natural areas where possible in the planning of new development areas.
	2.24	Establish minimum diversity targets for tree planting associated with City projects.
Ensure stormwater is effectively managed for urban greening	2.25	Incorporate Water Sensitive Urban Design principles into City projects to retain vegetation and ensure pre-development hydrology and water quality is maintained.
	2.26	Continue to assess planning proposals against Water Sensitive Urban Design principles to ensure the retention of vegetation, pre-development hydrology and water quality, to protect the existing urban forest.



Goal	Engage the community, research institutions, schools, government, and private sector to care for the urban forest and broaden the understanding of the benefits it provides.	
Objectives	•Maintain or increase the physical and fiscal support provided for volunteer groups within the City for urban forest initiatives. •Increase participation in tree planting initiatives that educate and inspire the community. •Increase engagement of private landholders and developers in supporting urban forest initiatives.	
Strategy	Action ID	Action
Increase awareness about the value and importance of the urban forest	3.1	Review and develop environmental programs and engagement opportunities, including an urban forest landing page on the City's website, to educate the community on the value and importance of the urban forest, the goals and objectives of the UFS and to promote the benefits of urban greening.
Provide opportunities to participate in protecting and enhancing the City's urban forest.	3.2	Support, resource and enhance existing hands-on community programs and enable community greening initiatives, such as the annual commemorative tree planting day, National Tree Day, Plants for Residents and Friends Group programs. These programs should be reviewed and enhanced to align with the goals and objectives of the UFS, for example ensure these programs incorporate tree species that produce sufficient canopy cover.
	3.3	Investigate incentives and mechanisms to facilitate urban tree planting outcomes on private land including planting of appropriate canopy trees, riparian corridors, habitat enhancement and retention, and weed management.
Engage the whole community in designing and protecting urban forest landscapes	3.4	Develop and maintain partnerships with schools, external agencies, and private sector to identify opportunities to grow and enhance the urban canopy and increase knowledge regarding the importance of the urban forest.
	3.5	Directly engage local residents through friends groups and other stakeholders in design and planning processes for urban forest landscapes.
	3.6	Work with Whadjuk Noongar traditional owners and Aboriginal people to develop community programs that increase knowledge about the cultural significance of landscapes, flora, and fauna in the City.
	3.7	Update policies and procedures to outline the expectations for community consultation and notification on programs and projects affecting public trees.
Resource and knowledge sharing	3.8	Engage with experienced land management groups such as landcare/friends groups and infrastructure managers (DBCA/DWER) to promote knowledge exchange.
	3.9	Through WALGA, advocate for the WAPC to continue fund the Urban Monitor Program to assist local government with monitoring urban forest canopy cover.
	3.10	Identify and look to participate in tertiary institution, Cooperative Research Centres (CRCs), WALGA and government lead projects/partnerships to leverage funding for urban canopy projects.
	3.11	Identify and support broader Natural Resources Management group initiatives for landscape scale restoration.
	3.12	Encourage community participation in tree planting days run by third parties through active engagement.
	3.13	Engage and educate residents on suitable tree retention, tree planting (e.g. fire-wise species) and management (pruning of lower limbs and removal of leaf litter) for bushfire protection on private property.

Goal	Investigate new resourcing and research opportunities to enable further investment in on ground actions using best practice science to manage and grow the urban forest.	
Objectives	•Increase available funding to facilitate protection and enhancement of the City's urban forest. •Identify and secure opportunities for offset tree planting under State and Commonwealth legislative approvals for private and government projects. •Continually improve urban forest practices and outcomes.	
Strategy	Action ID	Action
Investigate and secure funding opportunities for urban forest protection and growth in the private and public sector.	4.1	Develop a business case to advocate for increased government funding for tree planting programs.
	4.2	Adopt and implement a tree valuation methodology to ensure appropriate value of compensation is received when public trees are removed.
	4.3	Ensure that compensation received from successful prosecutions relating to unlawful tree removal is used for replacement tree planting.
	4.4	Develop and promote an offset register of land that will be managed for conservation purposes and provide opportunity for replacement tree planting, in line with State and Commonwealth legislative offset requirements for State and private development proposals.
Investigate and improve urban forest practices and outcomes.	4.5	Undertake monitoring of urban forest outcomes across case study areas (refer Appendix 5) within the City to determine if pre-development urban forest predictions are achieved.
	4.6	Identify opportunities to improve urban forest practices and implement measures to achieve improved urban forest outcomes based on the results of monitoring undertaken (action 4.5).

7 Monitoring, Reporting and Adaptive Management

7.1 Annual Urban Forest Action Plan

This UFS will inform an annual action plan which will provide details about the actions to be implemented for the following year. The action plan will be developed by a working group formed within the City with expertise in arboriculture, environmental management, planning and operations.

The action plan will include quantifiable, time-based, and prioritised actions. The action plan will include details regarding the resources required to implement the actions for the given year. The list of priority actions will be published on the City's website for each implementation year, along with the proposed measures of success determined by the Monitoring and Evaluation Program (MEP) outlined below.

The working group will seek feedback from the Kalamunda Sustainability and Advisory Committee on the annual action plan and MEP, and will provide progress reports through Corporate Business Plan updates.

7.2 Monitoring and Reporting

A MEP will be established by the working group to track the progress and relative success of the UFS actions and assess whether the City is meeting the goals and objectives. The objectives of the UFS are specific, measurable, actionable, realistic and time-bound to ensure progress toward targets can be effectively measured and reported and adapted if needed.

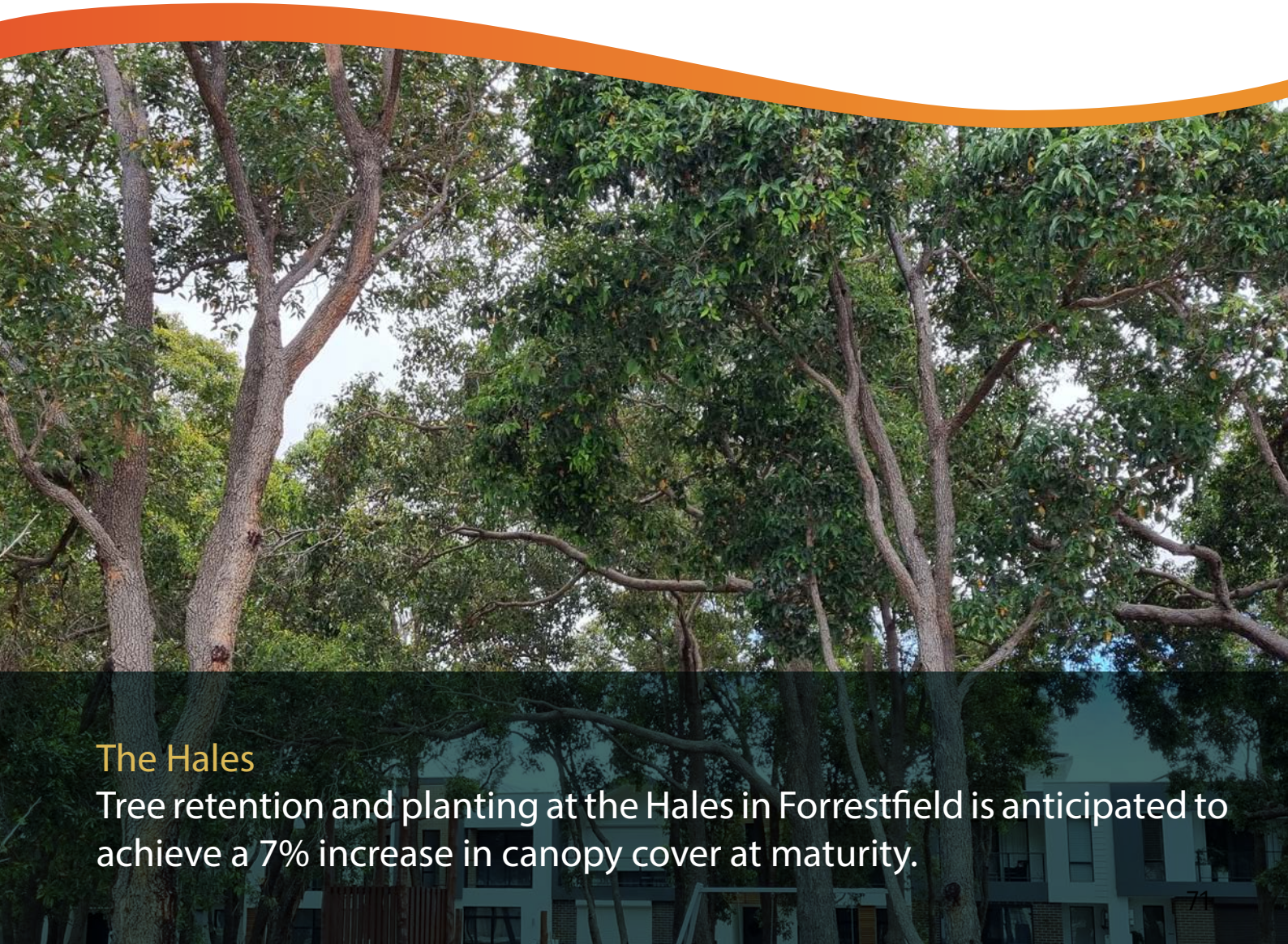
Each year the City will monitor and report against:

1. Progress toward the aspirational target of 30% city-wide canopy cover (refer Section 1.3)
2. Progress toward the broad goals (Protect, Grow, Engage, Investigate- refer Section 1.3)
3. Progress toward the shorter-term objectives (refer Action Plan Table 4)
4. Achievement of the actions and their determined, measurable targets under the Annual Urban Forest Action Plan for the given year.

Reporting on the progress and measures of success of the UFS actions will be undertaken annually through the City's Corporate Business Plan, and provided with the following years' annual action plan. Additionally, key updates on the UFS will be reported via an Urban Forest landing page on the City's website.

The UFS will be reviewed every four years to analyse changes in the urban canopy and to determine if the UFS needs to be adjusted to address any new issues or actions that have not been effective.

Urban canopy data collected from the DPLH Urban Monitor program for Year 2020 is proposed to be the baseline year of data for this UFS. This data is anticipated to be updated by DPLH every two years and can be analysed to see the change in canopy cover for trees >3m in height.



The Hales

Tree retention and planting at the Hales in Forrestfield is anticipated to achieve a 7% increase in canopy cover at maturity.

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City of Kalamunda

APPENDIX 1

BENEFITS OF AN URBAN FOREST

Environmental Benefits and Ecosystem Services

An urban forest provides the following environmental benefits and ecosystem services:

1. Carbon sequestration.
   Trees capture and store carbon, removing it from the atmosphere and helping to mitigate the impact of global warming.
2. Improved air quality.
   Trees and vegetation absorb and intercept polluting gases and particulate matter through their leaves including ozone, carbon, and nitrous oxide (McPherson, 2010; Nowak, 2006). Trees absorb carbon dioxide, reducing greenhouse gases (Independent Expert Panel, 2019). Scott *et. al*, (1999), concluded that shading from trees in car parks reduces emissions from cars, through reducing fuel evaporation from fuel tanks of cars in hot weather.
3. Shading and cooling of streets and public places.
   Trees provide shade and cool the surrounding air through the process of evapotranspiration, helping to reduce urban temperatures and improve levels of pedestrian thermal comfort.
4. Reduction of storm water run off.
   Tree canopies and permeable urban green space intercept and store rainfall, reducing stormwater flows and reducing the impact on stormwater infrastructure (Berland, *et al*., 2017; Xiao, 1998). Urban vegetation improves stormwater infiltration into urban soils increasing groundwater recharge (Xiao, 2002). Vegetation and associated soil volumes remove nutrients and heavy metals from stormwater runoff (Read, 2008). Urban forest can slow and divert stormwater, which reduces erosion and removes sediments and pollutants from water (Berland, *et al*., 2017). Healthy urban trees intercept rainfall and temporarily store part of the water on leaves and branches, which slows the rate that the water reaches the ground, and consequently reduces the peak flow of surface flow (Dias Baptista *et al*. 2018). This can reduce the amount of dirt, litter and pollutants washed into stormwater drains and reduce the amount of soil erosion during rainfall events.
5. Provision of food and shelter for fauna.
   A healthy and diverse urban forest provides suitable habitat for flora and fauna species. Importantly, it provides an ecological link for species to move between forest and natural areas. This is important for the more mobile fauna such as small mammals (bats) and avian species. The urban forest provides habitat for a wide range of small reptiles, insects and spiders (Majer, 1996).
6. Improved soil quality
   Trees and other vegetation are also crucial in returning nutrients to the soil, thereby maintaining and improving soil fertility.

Social and Community Health Benefits

Trees in an urban forest combine to produce the following benefits for the local community and the local environment:

1. Reduces sun and heat related illness;
    a. Shade trees can reduce daytime temperatures between 5 and 20 degrees Celsius (Akbari *et al.,* 1997; Livesley, 2010).
2. Improve community health outcomes by:

    a. Encouraging exercise and social interaction;
    b. Positively increasing productivity and learning outcomes; and
    c. Increasing health outcomes buy positively impacting obesity, diabetes, heart attack, stroke, depression and anxiety (Astell-Burt, Feng, & Kolt, 2014).
    d. Viewing vegetation has a positive impact on human health, with research showing that surgery patients recover faster in hospital rooms that have a view of greenery (Franklin, 2012).

3. Positively support recreational opportunities through providing a diversity of green spaces (Giles-Corti, *et al*., 2005). For example, the City has a variety of spaces that support various recreational activities, such as:

    a. Active public open space that support sports and social gathering;
    b. Natural reserves that are actively managed by community members;
    c. Parks that include walking and running tracks with shaded areas; and
    d. Community gardens.

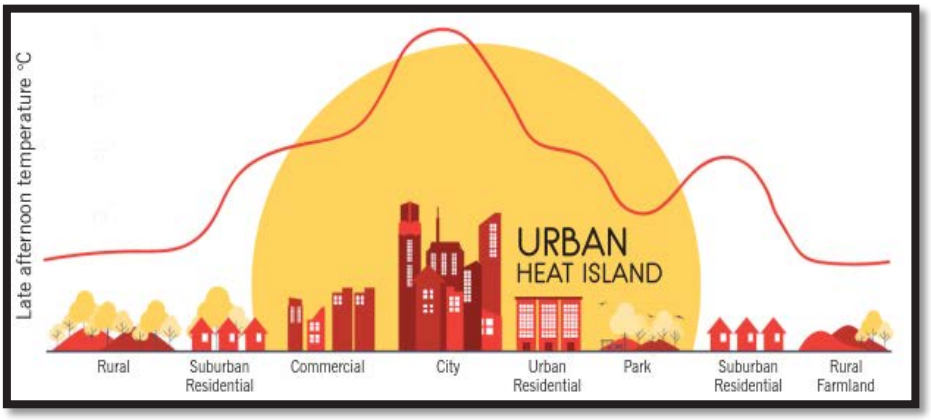
4. Trees naturally filter air, and so planting vegetative barriers along transport corridors can be beneficial for removing diesel particulate matter and decrease residents' exposure (Pugh *et al*., 2012). A New York study found that its urban forest removed 1,821 metric tonnes of air pollution at an estimated value to society of $9.5 million annually.
5. Urban forest can provide natural shade and shelter for people. Trees attenuate road traffic noise, with research showing that even a few rows of trees can have a significant positive effect on noise pollution (Peng, Bullen, & Kean, 2014). Urban trees have been shown to reduce the air temperature in built up areas when compared to built up areas without trees. This is a result of shading and evapotranspiration cooling the air providing more comfort to residents.
6. Urban trees can assist in reducing noise from traffic, humans and wind through attenuation and provide sounds associated with birds moving through the urban landscape (Laverne and Kellogg, 2019).

Mitigation of Urban Heat Island Effect

Higher temperatures occur in built up areas where there are less trees and shade and a higher proportion of hard, dark surfaces which retain and radiate heat (Plate 1). There is significant evidence that the urban heat island is a major issue facing all Australian cities and is likely to worsen with more extreme weather events if no action is taken (Climate Council, 2016).

There is one quite simple rule of thumb; areas with high levels of canopy cover will have a lower temperature than those with low levels due to the natural cooling effects of shading and evapotranspiration. Put simply, more urban forest canopy means less heat.

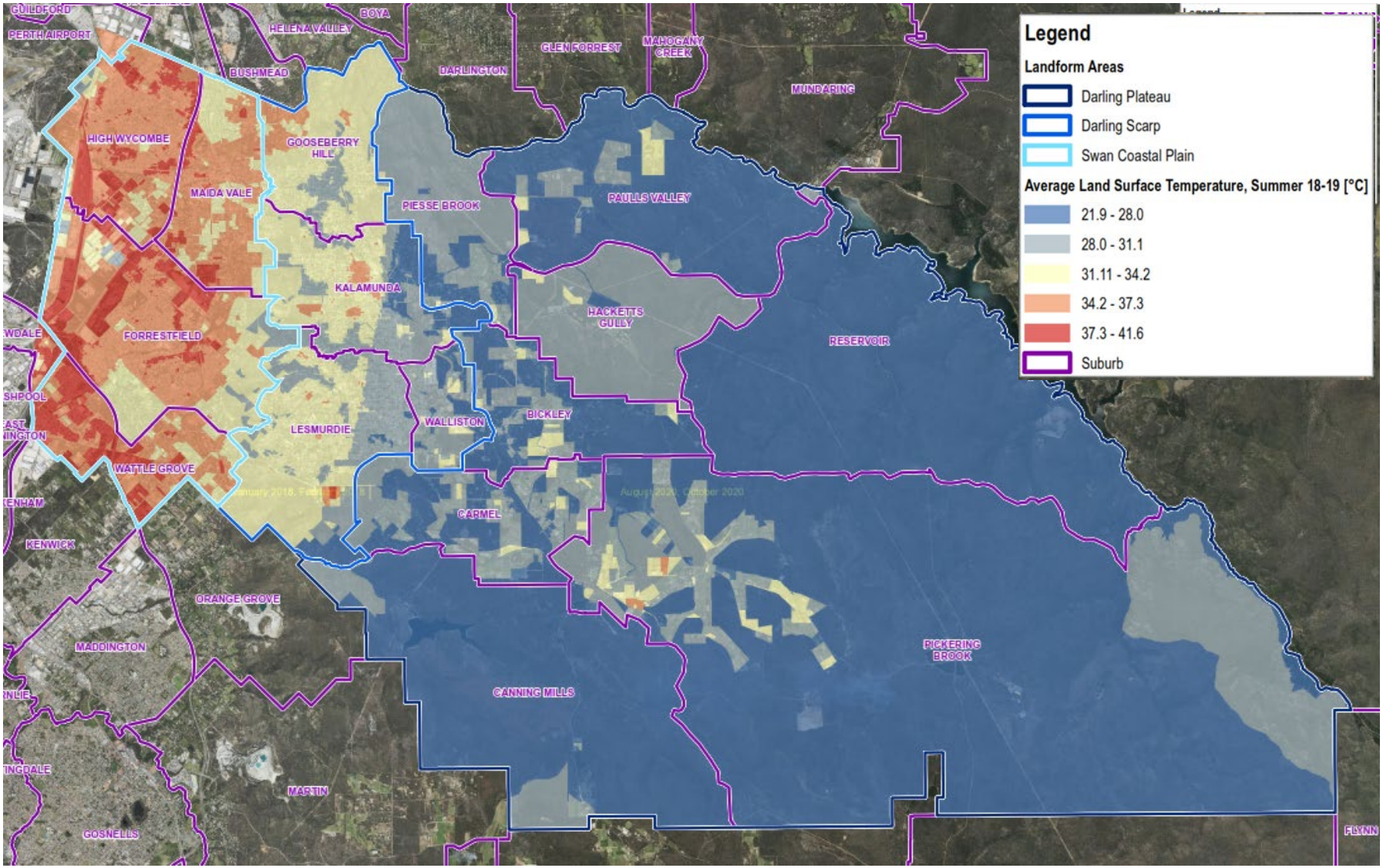
Plate 1: Urban Heat Island Effect (Source: Climate Council, 2016)



The urban forest is a proven performer when it comes to cooling cities through a combination of shade and transpiration from leaves. Plate 2 shows estimated land surface temperatures for Summer 2018/2019 (Devereux and Caccetta 2019) and displays a strong correlation between high land surface temperatures and low percentage canopy cover across the City. Continuing to support the maintenance and growth of the City's urban forest will help manage heat island impacts into the future

Shading and evapotranspiration are different but related functions, with the shade of tree canopies, together with the transpiration of water by canopies, significantly reducing temperatures in urban areas (Gillner *et al*. 2015, Coutts *et al*. 2016), resulting in a range of benefits including increased comfort for residents, and extension of life of public infrastructure such as roads.

Plate 2: Land Surface Temperature Summer (ºC) 2018-2019 (Devereux and Caccetta 2019)



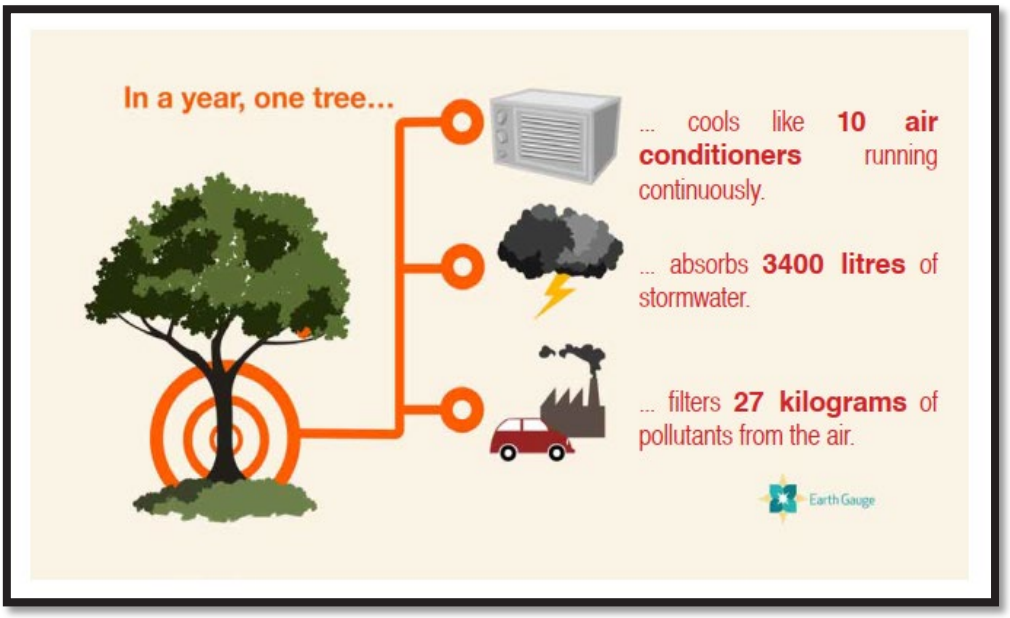
Economic benefits

A US study estimated that for every $1 spent on tree planting and maintenance there is a return of $8.36 ($US5.82) in benefits (McPherson et. al., 2015). These benefits are often called ecosystem services.

Increasing street tree canopy and private garden canopy can provide;

1. Shading to houses and materially decrease the amount of air conditioning that is required, thereby reducing electricity bills (CoM, DELWP, 2017; Simpson and Macpherson, 1996).
2. Increases the desirability of neighbourhoods by creating character, enhancing sense of place and consequently supporting property values. Research suggests a positive economic benefit of $16,889 for a house where a broad leaf street tree is present on the verge (Pandit, *et.al*, 2013).
3. Promotes higher spending in retail areas
4. Improves the life span of key assets
5. Reduces health care costs.

Plate 3: Economic Benefits of One Tree (NEEF, 2022)



APPENDIX 2

CANOPY COVER BY REGION AND SUBURB

Region	Suburb	Category Area (ha)	Canopy Cover >3m (ha)	% Canopy Cover >3m of Category Area
Swan Coastal Plain	FORRESTFIELD	1518.0	202.1	13
	HIGH WYCOMBE	918.7	107.0	12
	MAIDA VALE	795.9	183.7	23
	WATTLE GROVE	797.9	155.8	20
	KEWDALE	187.5	5.8	3
Escarpment	KALAMUNDA	910.7	316.8	35
	GOOSEBERRY HILL	561.7	193.7	34
	WALLISTON	376.1	123.9	33
	LESMURDIE	862.1	259.0	30
Eastern Rural Districts	PICKERING BROOK	1112.4	301.2	27
	CARMEL	1063.2	410.2	39
	BICKLEY	793.2	349.1	44
	PAULLS VALLEY	372.8	133.8	36
	PIESSE BROOK	309.1	119.5	39
	CANNING MILLS	134.9	63.0	47
	HACKETTS GULLY	63.7	13.5	21
	RESERVOIR	33.9	12.0	35
Total (Rounded)		10811.8	2949.8	27%

APPENDIX 3

CANOPY COVER BY SUBURB AND LAND USE CATEGORY

	Area (ha) Canopy Cover by Land Use Category						
SUBURB	**Commercial**	**Industrial**	**Other Infrastructure**	**Parks**	**Roads**	**Rural**	**Urban**
BICKLEY				70.65	12.13	250.13	16.17
CANNING MILLS			0.04	45.86	4.54	12.13	0.38
CARMEL				108.61	11.47	274.88	15.24
FORRESTFIELD	0.46	7.26	2.31	71.78	19.61	50.22	50.48
GOOSEBERRY HILL	0.07			28.79	24.14	38.44	102.21
HACKETTS GULLY					2.74	10.71	
HIGH WYCOMBE	0.17	7.51	0.29	19.30	18.00		61.70
KALAMUNDA	2.18			80.63	34.70	5.85	193.41
KEWDALE		0.62	2.96		2.20		
LESMURDIE	0.26			25.19	34.93	16.41	182.25
MAIDA VALE	0.11			18.37	16.55	79.80	68.91
PAULLS VALLEY				8.43	14.56	110.80	
PICKERING BROOK	0.07			8.64	28.08	258.82	5.58
PIESSE BROOK				28.79	7.94	82.78	
RESERVOIR				7.63	4.34		
WALLISTON	0.01	0.80		50.49	8.24	49.02	15.29
WATTLE GROVE	0.26	3.83	0.02	10.46	16.68	105.63	18.88
TOTAL	**3.59**	**20.02**	**5.62**	**583.62**	**260.82**	**1345.60**	**730.49**

	Percentage (%) Canopy Cover by Land Use Category						
SUBURB	**Commercial**	**Industrial**	**Other Infrastructure**	**Parks**	**Roads**	**Rural**	**Urban**
BICKLEY	0	0	0	50	37	43	41
CANNING MILLS	0	0	4	69	32	23	78
CARMEL	0	0	0	51	28	36	39
FORRESTFIELD	4	3	25	22	8	29	10
GOOSEBERRY HILL	21	0	0	38	27	32	37
HACKETTS GULLY	0	0	0	0	35	19	0
HIGH WYCOMBE	4	6	10	23	9	0	12
KALAMUNDA	11	0	0	43	25	31	36
KEWDALE	0	2	2	0	7	0	0
LESMURDIE	13	0	0	41	22	36	31
MAIDA VALE	6	0	0	25	16	25	23
PAULLS VALLEY	0	0	0	38	35	36	0
PICKERING BROOK	23	0	0	47	32	26	25
PIESSE BROOK	0	0	0	41	35	38	0
RESERVOIR	0	0	0	33	40	0	0
WALLISTON	7	7	0	45	22	33	23
WATTLE GROVE	5	17	1	14	13	27	11

APPENDIX 4

MAINTAINING A RESILIENT URBAN FOREST

Tree health is influenced by factors such as climate, soil conditions, pests and diseases and the availability of soil moisture.

The climate of Western Australia is projected to continue to change over the coming decades with hotter temperatures and an increase in the number of very hot days (e.g., > 40 °C) resulting in longer bushfire seasons and more very high fire danger days. Extreme rain events in Western Australia are projected to become more intense, however as a whole, Western Australia is likely to become drier. Periods of water stress as a result of drought and drier seasons in general are expected to increase with climate change which may result in tree losses through lack of water availability.

Climate change places additional stress on trees but also raises the importance of the cooling and other benefits they provide. Given the lifespan of trees, the maintenance and regeneration of the urban forest needs to consider the longer-term changes in the local climate.

Aside from water and temperature stresses, the tree stock can also be impacted by diseases such as *Phytophthora cinnamomi* (Dieback) and *Quambalaria coyrecup* (Marri Canker).

Maintaining a resilient urban forest means having a tree stock that can withstand and bounce back from a range of impacts. This requires diversity at the tree species, genus, and family levels for long term resilience to threats such as pests, diseases and a warmer, drying climate.

In determining the appropriate diversity for the City, consideration should be given to the size of the area, the well-established nature of the trees, the limited opportunity to achieve very high diversity targets, and the drier climatic conditions meaning that there is lower species availability than may be the case in some wetter parts of Australia. Encouraging diversity in tree selection should also include the use of native and non-native trees. Native trees may be well suited to the local environment and provide biodiversity benefits.

Working with the community to ensure that new street plantings or replanting continue to meet amenity objectives while also being more diverse will be important.

As trees grow and mature, they increase the range of benefits that they provide to the community and environment. However, as they age, they require maintenance and then eventually removal and replacement. In a natural system this happens gradually and with little impact on people. In an urban environment, an ageing or hazardous tree cannot usually be left until it completely falls apart, which is often seen through limb fall or dieback of branches and loss of leaves.

Managing the aesthetic impact of ageing trees is also a challenge because in many instances entire streets will have been planted within a short period of time meaning that when trees are removed and replaced there can be periods with limited tree canopy. Removal of an

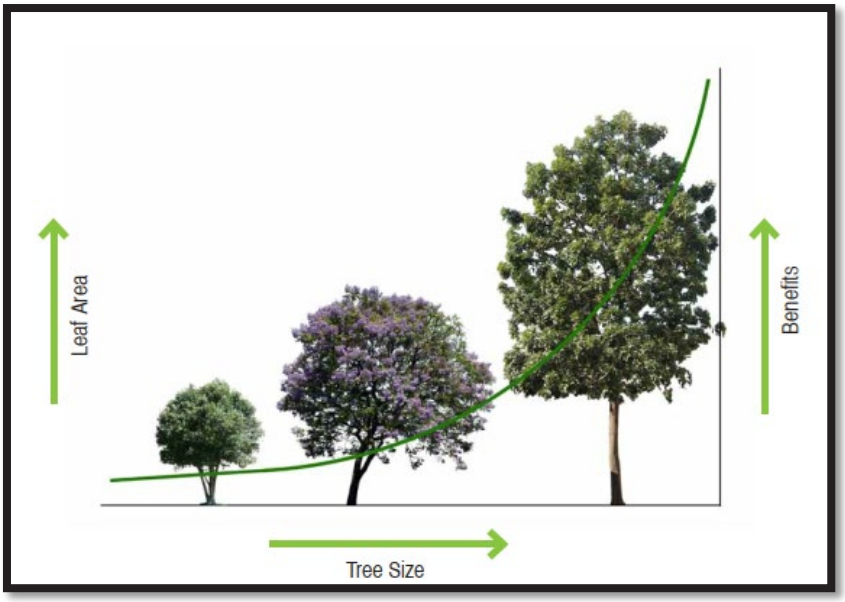
avenue of trees can be difficult for the City, from a social perspective where residents place high value on the trees. Communication with the residents could include the importance of trees and their long-term management. Removal of trees towards the end of their life could be staged to reduce the psychological impacts on residents and the overall visual impact on the streetscape. Replacement of street trees on a staged program will continue to provide habitat for avian and mammal (bats) that move through the treetops.

Compared to a small-stature tree, a strategically located large-stature tree has a bigger impact on conserving energy, mitigating an urban heat island, reduction in stormwater flow, removes more air pollution and cools a parking lot. Even at maturity, small-stature trees do not come close to providing the same magnitude of benefits. Larger trees provide exponentially greater ecosystem services to their community (Plate 14). Research has shown that benefits of large-statured trees far out-weigh the costs of caring for them, sometimes as much as eight to one (Nowak, et al., 2010; Rogers et al.,2015, Bornsworth, 2015; Beecham & Lucke, 2015).

The Urban Tree Alliance Organisation (2022) states that:

"large trees provide exponentially greater services to their community. They remove air pollutants, lessen home heating and cooling costs, reduce the urban heat-island effect, absorb noise, capture stormwater, sequester carbon, increase property values, and provide cultural and aesthetic value".

Plate 14: Tree Size Matters (adapted from Urban Tree Alliance, www.urbantreealliance.org)

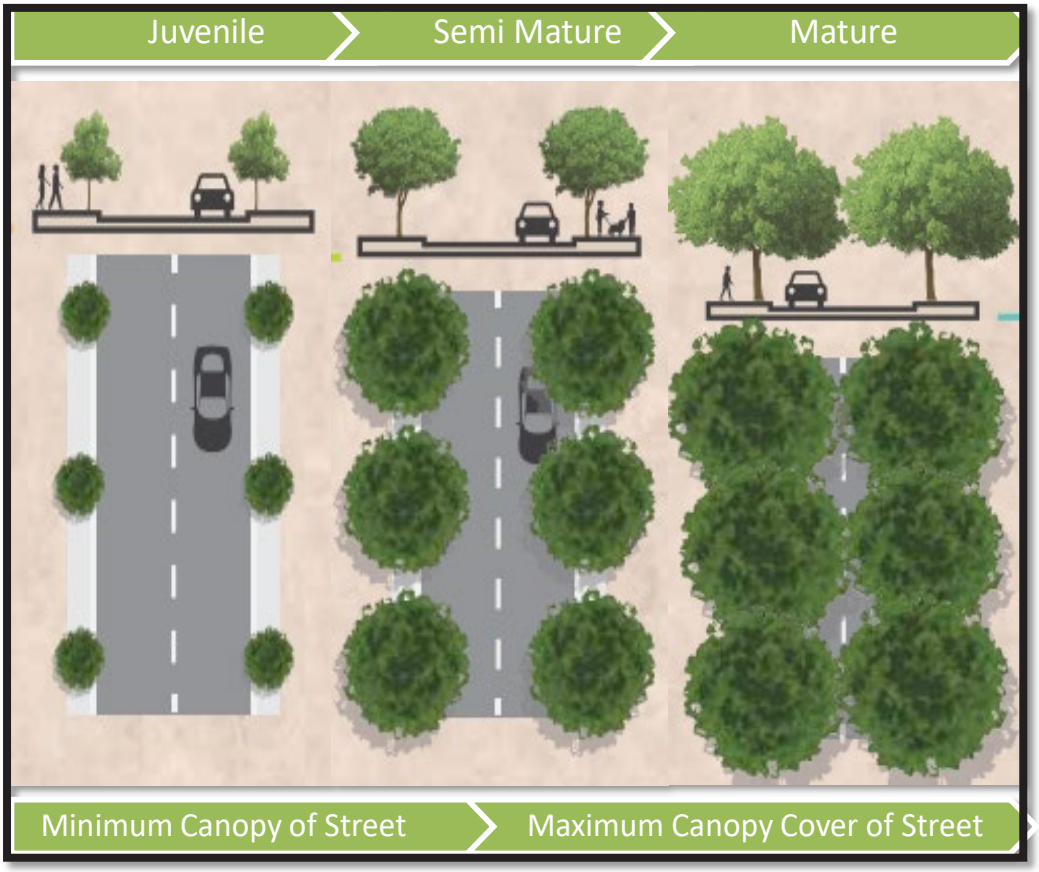


Different tree species have different canopy structure, partly due to the various spatial patterns they adopt for intercepting light. These canopies provide varying levels of density and depth in canopy layers, creating different types and quality of canopy cover.

While the selection of tree species should prioritise endemic species where appropriate, native species tend to have leaves that point downwards particularly in warmer locations to minimise heat impacts in comparison to some exotic species that have leaves aligned horizontally to capture as much light as possible. Consideration should be given to selecting a tree species with a canopy structure that is appropriate to the context of its specific planting site. For example, in outdoor eating areas a deciduous tree may be preferred over a native eucalypt as it will provide good shade cover in summer and allow sunlight through in winter when it is dormant.

Trees should be planted to encourage the development of an appropriate level of continuous and connected canopy cover over city streets and public spaces at maturity (see Plate 15). Planting trees at suitable spacing to develop a vigorous and healthy canopy, along with issues such as maintaining solar access and adequate levels of space and access for all city users, should be considered in the urban forest planning process.

Plate 15: Tree Spacing (Coutts and Tapper, 2017)



In Western Australia, sensitive urban water design principles are followed in all new and infill development. The City invests in water sensitive urban design features that help to better manage stormwater and provide water for vegetation. Increasing the use of urban water

design principles will need to be adopted to ensure that the urban trees have enough water in the current drying climate.

Further research into providing water to street and verge trees through water harvesting techniques and use of pervious surfaces rather than impervious would increase water availability for trees. Additional effort will be required in finding innovative methods to divert stormwater into street verges and parks. Pervious paving should be considered in all environments so rainfall can be absorbed rather than diverted off into soak wells.

APPENDIX 5

CASE STUDIES

Urban Forest Case Studies

In accordance with actions 4.5 and 4.6 of the Action Plan (refer Section 6 of the UFS), the City will undertake monitoring of urban forest outcomes across five case study development areas within the City to determine if post-development urban forest predictions are achieved. Post-development predictions are high-level and based on a number of assumptions.

The case study areas include:

1. Kalamunda Town Centre
2. Maddington Kenwick Strategic Employment Area
3. The Hales, Forrestfield
4. High Wycombe South (future urban development area)
5. Wattle Grove South (potential future urban development area).

Based on the monitoring outcomes, the City will identify opportunities to improve urban forest practices and implement measures to achieve improved urban forest outcomes. This may include (but is not limited to):

- Infill planting in road reserves and parks;
- Review of species selection for improved growth rates and canopy cover;
- Improvements to planning policies/ design guidelines;
- Improvements to internal operational policies and processes;
- Opportunities for advocating State government for improved urban forest outcomes; and,
- Identification of incentives/ education for tree planting on private land.

Case Study 1: Kalamunda Town Centre

Summary

The City, in consultation with the community and stakeholders, prepared the Kalamunda Activity Centre Plan (KACP) in 2020, which established a long term vision for the development of the town centre and a planning framework to guide subdivision, development and public realm improvements.

The Kalamunda town centre contains a mix of commercial, civic and urban land uses, vibrant, energised spaces and streetscapes, while other areas in the town centre lack a sense of identity and commercial investment, resulting in a fragmented pattern of development and character. The Kalamunda Landscape Masterplan (KLM) was developed in conjunction with the KACP to facilitate planning for public realm improvements, including opportunities to enhance tree canopy.

The streetscape upgrades in Central Mall were a priority recommendation within the KLM. The works, which included significant landscaping and pedestrian amenity, were completed in 2022. This case study will consider the change in tree canopy resulting from the streetscape improvements.

Development within the Kalamunda town centre will be required to be considered by the City's Design Review Panel, which will, amongst other things, make recommendations based on the principles included in the LPP 30, taking into consideration the character of the surrounding landscape and buildings.

The City also adopted Local Planning Policy 33- Tree Retention (LPP 33) which establishes minimum tree planting requirements and tree canopy cover targets of 20%, for activity centres.

Plate 1: Kalamunda Town Centre Landscape Masterplan Area (August 2020)

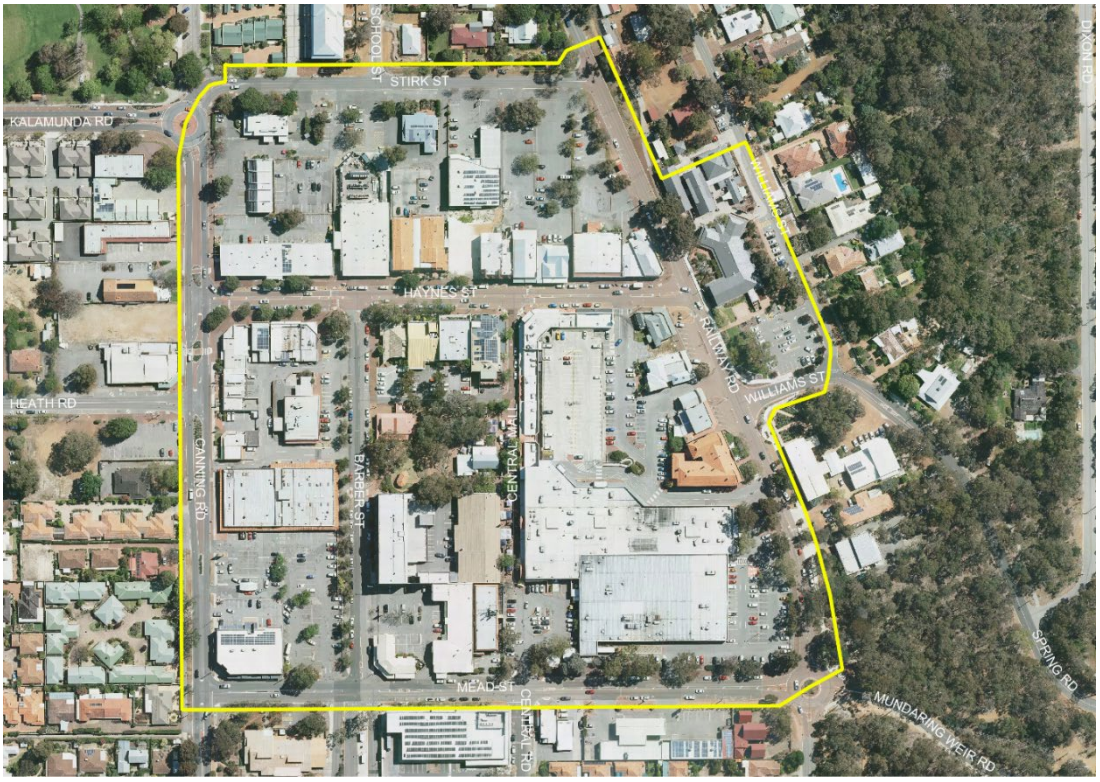


Plate 2: Kalamunda Town Centre Landscape Masterplan

LEGEND

1. Town Square
2. Public art focal point
3. Shared street
4. Main street
5. Corner park activation and way finding
6. Barber St Piazza
7. Green park upgrades
8. Central lane activation
9. Town centre entry paving nodes
10. 'Green' streets
11. Heritage/Civic precinct
12. Main street entry treatment

Land Area (within City of Kalamunda)	12.2 ha
Pre-Development canopy	9 % (Data source: DPLH 2020 Urban Forest Parcels[1]). 13% (Data source: Landgate 2021)

[1] Note: DPLH Urban Forest Parcel data aligns to cadastral boundaries and may include some areas external to the project area, or may exclude some areas within the project area as a result of lot boundaries overlapping the project area boundary. As such, marginal canopy cover inaccuracies may occur.

<table>
<tr>
<td>Strategic Canopy Targets</td>
<td>

Urban Forest Strategy target:- All new Urban, Centre, District Centre, Commercial, Mixed Use developments to achieve 20% canopy cover (at maturity).
LPP 33:

20% canopy cover target for Urban, Centre, District Centre, Commercial, Mixed Use developments.
One tree per four car parking bays.
Tree planting requirements apply to residential development (coded R25 and lower) and non-residential development.

Local Planning Policy 30 (LPP 30): Refers to tree planting as per Section 3.3 of the State planning policy 7.3 Residential Design Codes Volume 2 Apartments, which is based on lot size. These requirements apply to residential and mixed-use development.

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<tr>
<td>Proposed tree planting</td>
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The Kalamunda Landscape Masterplan (Plate 2) depicts the vision for enhancing the urban forest across the project area.
The KLM focusses on tree planting in road verges to create “green streets” and in landholdings owned/ managed by the City, such as Town Square and the Heritage/ Civic Precinct.

Noting that the KLM is a concept plan, the table below outlines the estimated tree planting and canopy cover projections. These are estimations based on a number of assumptions and are subject to change through the detailed design process and in response to site specific constraints and opportunities.

<table>
<tr><th>KLM area</th><th>Tree planting/ retention assumptions</th><th>Trees required</th><th>Existing Trees</th><th>Residual trees to be planted</th><th>Total estimated increase in canopy cover</th></tr>
<tr><td>Railway Road</td><td rowspan="2">6 medium trees per 50 m, planting in verge on both sides of road.</td><td>86 trees</td><td>40</td><td>46 trees</td><td>2 300 m^2</td></tr>
<tr><td>Barber Street</td><td>48 trees</td><td>34 trees</td><td>6 trees</td><td>300 m^2</td></tr>
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		Medium trees estimated to have 50m^2 canopy cover at maturity.				
	Canning Road	6 medium trees per 50 m, planting in verge on both sides of the road and central median. Medium trees estimated to have 50m^2 canopy cover at maturity.	108	6	102 trees	5 100 m^2
	Stirk Street		72 trees	27 trees	45 trees	2 250 m^2
	Mead Street		115 trees	35 trees	80 trees	4 000 m^2
	Haynes Street	4 medium trees per 50 m, planting in verge on both sides of road. Medium trees estimated to have 50m^2 canopy cover at maturity.	40 trees	19 trees	21 trees	1 050 m^2
	Town Square/ Heritage Precinct	One medium tree planted for every four bays in car parking area on Williams Street. Six new medium trees planted along Williams Street in road verge.	22 trees	N/A	22 trees	1 100 m^2
	Corner Park Activation	Existing trees, no significant change. Some small scale planting of medium trees is assumed.	12 trees	6 trees	6 trees	300 m^2
	Barber Street Piazza	One medium tree planted for every four bays in car parking area.	16 trees	-	16 trees	800 m^2
	Green Park Upgrades	Existing trees, no change anticipated.	-	-	-	-
	Central Lane activation ("Central Mall")	Works complete. Included planting of 24 new trees, comprising				1 050 m^2

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<tr><td></td><td>predominantly Eucalyptus species, resulting in a net gain of 21 trees.</td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="4">TOTAL</td><td>344</td><td>18 250 m^2 (15% increase)</td></tr>
</table>

Opportunities for enhancing tree canopy on private land will be limited to new development proposals, which will need to address the requirements of LPP 30 and LPP 33. It is anticipated that additional tree canopy may be achieved on private land, particularly in car parking areas.
</td></tr>
<tr><td>Predicted post-development canopy at maturity</td><td>28 % (13% existing plus 15% anticipated, post-implementation of the KLM).

The KLM will be implemented on a staged basis. Following completion of works, trees will likely reach maturity after approximately 10 to 40 years, depending on the species. As such, 27% is a long-term estimation of canopy cover.</td></tr>
</table>

Case Study 2: Maddington Kenwick Strategic Employment Area

The Maddington Kenwick Strategic Employment Area (MKSEA) is an Industrial Development Precinct in Wattle Grove that commenced development in 2017. Approximately 13% of MKSEA identified land is within City of Kalamunda's boundaries with the remaining areas of MKSEA located within the City of Gosnells. The MKSEA area in the City of Kalamunda is bounded by Welshpool Road East and City of Gosnells boundary and is located immediately adjacent to significant freight and transport corridors.

Prior to the commencement of industrial development, the area was characterised as a rural residential area with established tree canopy, comprising a mix of native and introduced species.

As part of the industrial development planning process, design guidelines were prepared to facilitate tree planting criteria and to maximise the amenity and ecological outcomes after development has occurred.

The City has also adopted Local Planning Policy 33- Tree Retention which establishes minimum tree planting requirements and canopy cover targets for industrial development.

Plate 3: Maddington Kenwick Strategic Employment Area (Pre-development February 2016)

Land Area (within City of Kalamunda)	19.3 ha
Pre-Development canopy	30 % (Data source: DPLH 2020 Urban Forest Parcels[2])

Strategic Canopy Targets	• Urban Forest Strategy target:- All new Industrial developments to achieve 10% canopy cover (at maturity).
	• Local Planning Policy 33:
	  • 10% canopy cover target for Industrial developments.
	  • One tree per four car parking bays.
	• Local Planning Policy 19 MKSEA Design Guidelines:
	  • One tree per four car parking bays on private land
	  • One tree every 10m in road reserves

Proposed tree planting	Based on the strategic planting requirements listed above, as well as the details of approved landscaping plans for approximately 85% of the case study area, it is anticipated that the following tree planting will occur: • One medium size tree per 10 m in road verges = 177 medium trees or 8 850 m^2 canopy cover. Note this result is based on a simplified calculation of 1 tree per 10 m of road verge and doesn't take into consideration crossovers etc. This result also assumes all trees are a medium size, reaching 50m^2 at maturity. • Medium size trees on private lots (car park areas, landscaping/ drainage areas) = 316 trees or 15 800 m2 canopy cover. Note this result is based on specific tree planting required

[2] Note: DPLH Urban Forest Parcel data aligns to cadastral boundaries and may include some areas external to the project area, or may exclude some areas within the project area as a result of lot boundaries overlapping the project area boundary. As such, marginal canopy cover inaccuracies may occur.

	under approved landscaping plans, however, assumes all trees are a medium size, reaching 50m^2 at maturity. Potential additional tree planting in landscaping areas which occupy a minimum of 5% of each individual private lot.
Predicted post-development canopy at maturity	14 % Following completion of works, trees will likely reach maturity after approximately 10 to 40 years, depending on the species. As such, 27% is a long-term estimation of canopy cover.

Case Study 3: The Hales, Forrestfield

Summary

The Hales Structure Plan area is an urban development area comprising R30 and R60 residential lots, seven areas of local open space, a public road network, shared use paths and a powerline easement. The Hales development commenced in 2016.

Prior to the commencement of The Hales development, clearing of vegetation and trees occurred between 1953 and 1965, to facilitate historic rural land uses, resulting in a considerable reduction of the pre-European canopy cover extent. The Hales residential development has provided opportunities to reintroduce vegetation and tree canopy cover in public road verges, local open space (including within the foreshore area of Crumpet Creek) and within private lots. For dwellings approved post-2021, the State R-Codes require that one tree per dwelling is planted on private lots.

The City also adopted Local Planning Policy 33- Tree Retention in December 2022, which establishes minimum tree planting requirements and canopy cover targets for residential development. Any dwellings approved after this time need to include tree planting on private lots, in accordance with the policy requirements, which modify the State R-Code requirements.

Plate 4: The Hales- Hawtin Road, Forrestfield Structure Plan Area

(Pre-development February 2016)

Land Area (within City of Kalamunda)	29 ha
Pre-Development canopy	11 % (Data source: DPLH 2016 Urban Forest Parcels[3])
Strategic Canopy Targets/ Requirements	• Urban Forest Strategy target: Planning approvals predate adoption of UFS. • Local Planning Policy 33: Structure Plan and subdivision approvals predate adoption of LPP 33. Lots are coded above R25 and thus the modified R-Codes do not apply. • State Planning Policy 7.3 - Residential Design Codes Volume 1: For new dwellings on lots coded R40 or lower, approved after July 2021, landowners are required to plant 1 tree per dwelling. • State Planning Policy 7.3 - Residential Design Codes Volume 2: For apartments and mixed use development on lots coded R40 or higher, approved after May 2019, landowners are required to plant trees based on lot size. It is noted that lots coded R60 are occupied by two storey single residences and thus this policy does not apply.
Proposed tree planting	Private land • 1 tree per dwelling in a 2m by 2m planting area for lots coded R30or lower, where approved prior to the current version (July 2021) of SPP 7.3 Volume 1 being adopted. Public land • Street tree planting assuming one medium tree per lot. • Landscaping in public parks, outlined below.

[3] Note: DPLH Urban Forest Parcel data aligns to cadastral boundaries and may include some areas external to the project area, or may exclude some areas within the project area as a result of lot boundaries overlapping the project area boundary. As such, marginal canopy cover inaccuracies may occur.

<table>
<tr><td></td><td>Crumpet Creek Revegetation Management Plan (CCRMP) outlines the revegetation works required within the foreshore area of Crumpet Creek. Due to the necessity of bushfire risk management, the number of trees to be planted within the foreshore area is limited. The CCRMP includes a criteria for the developer to plant a minimum of 10 new trees (in addition to understorey, native vegetation).</td></tr>
<tr><td>Predicted post-development canopy at maturity</td><td>All tree clearing associated with The Hales urban development is now complete. Between 2016 and 2021, tree canopy >3m in height reduced from 11% to 3%. A number of mature trees were retained in Public Open Space.

While there has been some loss of mature tree canopy to facilitate development, canopy cover is expected to increase over time as a result of tree planting on private property, in road verges and parks, as estimated below.

Planting in Public Open Space
<table>
<tr><th colspan="2">Land tenure</th><th>Tree planting predictions</th><th>Predicted increase in tree canopy cover >3m (ha)</th><th>Predicted increase in tree canopy cover >3m (%)</th></tr>
<tr><td>Private lots</td><td>Post July 2021 and Pre December 2022</td><td>177 lots x 1 small tree (assumed canopy of 20m^2 at maturity)

This assumes that half of the lots coded R30 across the case study area were approved prior to the current version (July 2021) of SPP 7.3 Volume 1 being adopted.</td><td>3 540m^2</td><td>1%</td></tr>
</table>
</td></tr>
</table>

	Public road verges		1 tree per lot = 418 medium trees (assumed canopy of 50m^2 at maturity) Street tree planting has been assumed at a rate of one medium tree per lot,	20 900 m^2	7%
	Public parks	Crimson Boulevade Dog Park	280 medium trees (canopy of 50m2 at maturity)	14 000m^2	5%
		Autumn Approach Reserve	Majority of mature trees retained. Approximately 6 trees removed and 14 trees planted. Net gain of 8 medium sized trees (canopy of 50m2 at maturity).	400m^2	<1%
		Koda Mews Reserve	Approximately 8 trees removed and 35 trees planted. Net gain of 27 medium sized trees (canopy of 50m2 at maturity).	1 350m^2	<1%
		Crumpet Creek	10 medium trees (canopy of 50m^2 at maturity) =	500m^2	<1%
		Spinosa Boulevde Park	27 medium trees (canopy of 50m^2 at maturity)	1 000m^2	<1%
		Gala Way Reserve	37 medium trees (canopy of 50m^2 at maturity)	1 850m^2	<1%

	Total change in canopy cover (at maturity) from 2021 Landgate data (post-clearing)	43 540m^2	15%
	Total predicted canopy cover, at maturity (2021 existing cover plus planted trees).	52 240m^2	18%
	Trees will likely reach maturity after approximately 10 to 40 years, depending on the species. As such, 18% is canopy cover is anticipated to be achieve between 2032 and 2062.		

Case Study 5: High Wycombe South Residential Precinct

Summary

In line with the WAPC's North-East Sub-regional Planning Framework, the High Wycombe Train Station is a key focus to connect people with places of work, housing and recreation in the new High Wycombe South TOD Precinct Activity Centre and adjoining High Wycombe South Residential Precinct which will deliver medium and high-density residential housing.

The Residential Precinct includes multiple environmental conservation and local open space areas. The Residential Precinct Local Structure Plan and supporting Environmental Assessment and Management Strategy includes measures to retain and enhance significant areas of native vegetation (including Threatened Ecological Communities) and trees (including Carnaby Cockatoo Habitat) where practical.

The City of Kalamunda *Local Planning Policy 33 – Tree Retention* establishes criteria for tree retention, minimum tree planting and canopy cover targets for residential and commercial development. Design Guidelines for the Residential Precinct are being drafted and will further address protection of significant vegetation, particularly within the public realm.

Plate 4: High Wycombe South Structure Plan Area (August 2020)

Land Area (within City of Kalamunda)	123. 05 ha
Pre-Development canopy	26.7 % (Data source: DPLH 2020 Urban Forest Parcels[4]) 38% (Data source: Landgate 2021)

[4] Note: DPLH Urban Forest Parcel data aligns to cadastral boundaries and may include some areas external to the project area, or may exclude some areas within the project area as a result of lot boundaries overlapping the project area boundary. As such, marginal canopy cover inaccuracies may occur.

Strategic Canopy Targets/ Requirements	• Urban Forest Strategy target:- All new Urban development to achieve 20% canopy cover (at maturity).
	• State Planning Policy 7.3 - Residential Design Codes Volume 1: For new dwellings on lots coded R40 or lower, approved after July 2021, landowners are required to plant 1 tree per dwelling.
	• State Planning Policy 7.3 - Residential Design Codes Volume 2: For apartments and mixed use development on lots coded R40 or higher, landowners are required to plant trees based on lot size.
	• Local Planning Policy 33:
	  • 20% for urban
	  • New dwellings on lots coded R25 or lower to achieve tree planting requirements of Table 1.1 of LPP33, which modify the requirements of the State Residential Design Codes Volume 1.
	• Design Guidelines- in preparation.

Proposed tree planting/ retention	Tree planting will occur on private land, as per the requirements of the State R-Codes and LPP 33. It is anticipated that tree retention and planting will occur in road reserves at a rate of one tree per lot, through conditions imposed on subdivision approvals. It is assumed that all trees will be retained in local open space and environmental conservation areas for the purpose of post-development canopy cover predications. Where canopy over can be enhanced in local open space, tree planting will be required through landscape management plans.

	Cell density plans will be required to demonstrate how the 20% tree canopy cover target will be achieved.
Predicted post-development canopy at maturity	26% (assumes 20 % cover for urban development areas, excluding local open space and environmental conservation areas, plus existing canopy cover in local open space and environmental conservation areas to be retained) Following completion of works, trees will likely reach maturity after approximately 10 to 40 years, depending on the species. As such, 26% is a long-term estimation of canopy cover.

Case Study 5: Wattle Grove South

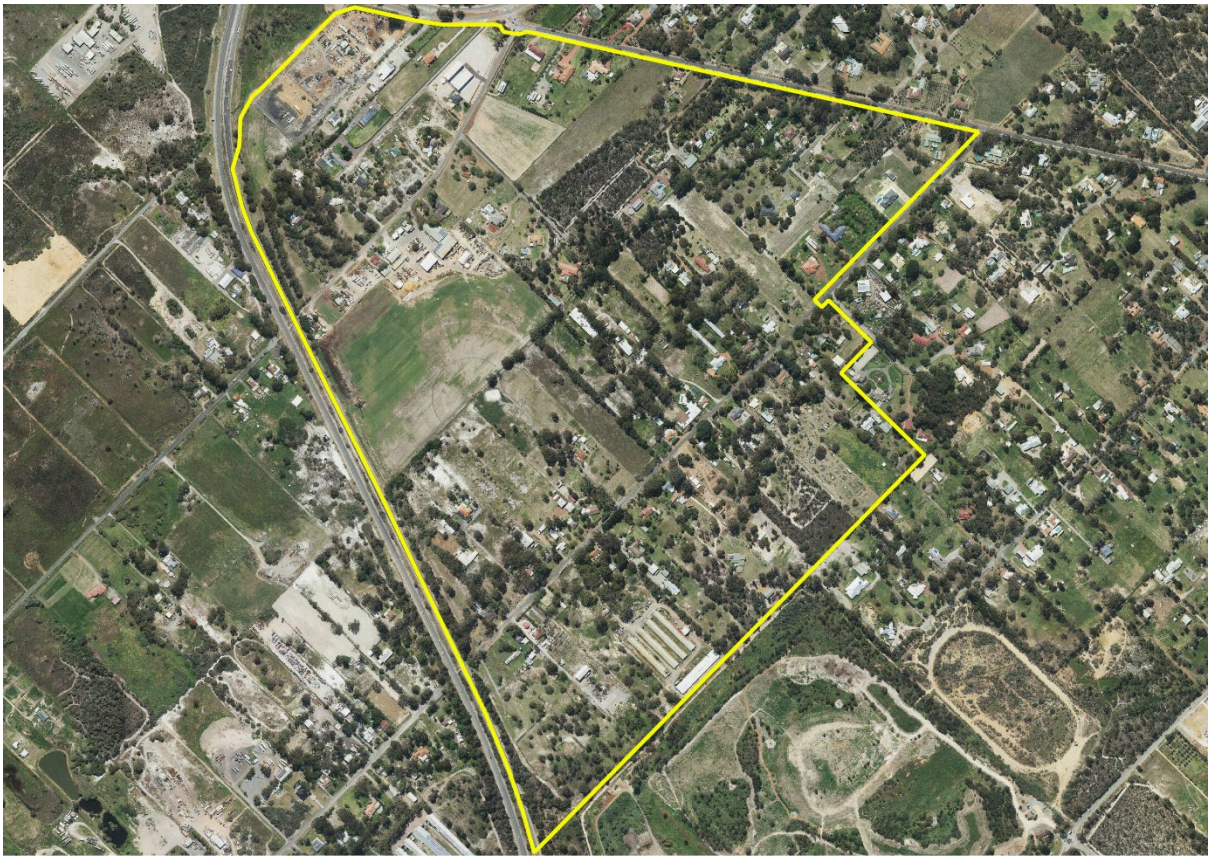
Summary

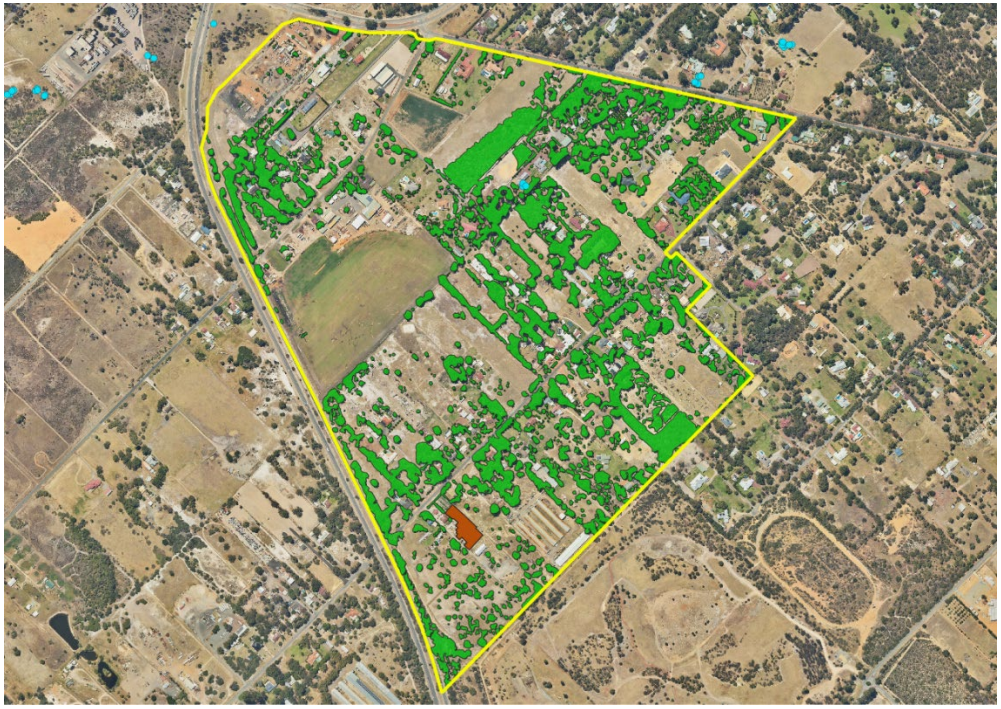
Wattle Grove South is a proposed future urban development area, subject to a local scheme amendment (currently under assessment). The local scheme amendment seeks to rezone the land from 'Rural Composite' and 'Special Rural' to 'Urban Development' zone under the City of Kalamunda Local Planning Scheme No. 3 (LPS 3) and creates a Special Control Area over Wattle Grove South known as Development Area 3 (DA3) with corresponding provisions under Schedule 11 of LPS 3.

The Schedule 11 – Development Areas: Part 4 Wattle Grove South, DA3 provisions will guide subsequent structure planning, subdivision and development and ensure the protection of environmental values within and surrounding the land the subject of this scheme amendment.

The City has adopted Local Planning Policy 33- Tree Retention which establishes minimum tree planting requirements and canopy cover targets for urban development.

Plate 5: Wattle Grove South Scheme Amendment Area (August 2020)



Land Area (within City of Kalamunda)	129 ha
Pre-Development canopy	19% (Data source: DPLH 2020 Urban Forest Parcels[5]) 26% (Data source: Landgate 2021) 

[5] Note: DPLH Urban Forest Parcel data aligns to cadastral boundaries and may include some areas external to the project area, or may exclude some areas within the project area as a result of lot boundaries overlapping the project area boundary. As such, marginal canopy cover inaccuracies may occur.

Strategic Canopy Targets/ Requirements	• Urban Forest Strategy target:- All new Urban development to achieve 20% canopy cover (at maturity).
	• State Planning Policy 7.3 - Residential Design Codes Volume 1: For new dwellings on lots coded R40 or lower, approved after July 2021, landowners are required to plant 1 tree per dwelling.
	• State Planning Policy 7.3 - Residential Design Codes Volume 2: For apartments and mixed use development on lots coded R40 or higher, landowners are required to plant trees based on lot size.
	• Local Planning Policy 33:
	  • 20% for urban
	  • New dwellings on lots coded R25 or lower to achieve tree planting requirements of Table 1.1 of LPP33, which modify the requirements of the State Residential Design Codes Volume 1.

Proposed tree planting/ retention	Tree planting will occur on private land, as per the requirements of the State R-Codes and LPP 33. It is anticipated that tree retention and planting will occur in road reserves at a rate of one tree per lot, through conditions imposed on subdivision approvals. It is assumed that all trees will be retained in local open space and environmental conservation areas for the purpose of post-development canopy cover predications. Where canopy over can be enhanced in local open space, tree planting will be required through landscape management plans. Future Structure Plans and subdivision plans will be required to demonstrate how the 20% tree canopy cover target will be achieved.
Predicted post-development canopy at maturity	20 % canopy cover, excluding future environmental conservation areas which are to be identified as part of the structure planning process. Following completion of works, trees will likely reach maturity after approximately 10 to 40 years, depending on the species. As such, 20% is a long-term estimation of canopy cover.