



YOUR VISION.
YOUR FUTURE.

Urban Forest Strategy

An aerial photograph of a suburban neighborhood in Hornsby, Australia. The image shows a grid of streets with houses, trees, and green spaces. A large, teal-colored map of the Hornsby Shire is overlaid on the center of the image. The map has a jagged, organic shape, representing the council's boundaries. The text "LET'S SHAPE THE HORNSBY OF TOMORROW." is written in white, uppercase letters across the center of the map.

LET'S SHAPE
THE HORNSBY
OF TOMORROW.

Prepared For:

Hornsby Shire Council

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1. Executive summary

Hornsby Shire Council's urban forest is one of the core components of the Shire's green infrastructure network. The urban forest, which are the trees within Hornsby's urban areas and on rural lands, contributes significantly to the liveability, environment and prosperity of the Shire. These trees provide a myriad of benefits from shading, carbon storage, air pollution reduction, stormwater interception, habitat and food for wildlife as well contributing to the landscape character that the community value so highly.

The urban forest is facing a number of challenges including urban densification, a changing climate, urban heat and canopy loss. It is estimated that each year Hornsby is losing between 2 – 3 percent or approximately 12 – 15,000 trees of its tree canopy cover primarily on private land (Smith et al, 2017). This places increased pressure on the smaller area of public land to protect, grow and enhance the urban forest.

A changing climate also poses a number of threats for the urban forest making it vulnerable. Such challenges require a new approach in how the forest is managed, how it interconnects with Sydney's Green Grid aspirations and Hornsby's biodiversity framework so that future vulnerability can be minimised, and benefits maximised.

The proposed framework for Hornsby's future urban forest is:

Vision

Hornsby Shire Council will have a healthy, thriving, diverse and valued urban forest that provides shade, cooling and adds colour and life to the Shire.

Objectives

In order to build a thriving, healthy and diverse urban forest the key objectives are to:

- Maintain and improve Hornsby Shire's unique character
- Increase community knowledge and connection with the urban forest
- Mitigate and adapt to climate change
- Protect, secure and create habitat
- Showcase integrated and sustainable design
- Provide strong leadership and good asset management
- Targets
- The targets proposed to achieve these objectives are:
 - Maintain canopy cover on private land at 33 percent
 - Increase canopy cover over streets from 39 percent to 50 percent
 - Increase canopy cover over commercial zones from 11 percent to 15 percent
 - Increase biodiversity corridors in streetscapes
 - Improve species diversity
 - Improve useful life expectancies of street trees.

Meeting these targets will provide many benefits. Most importantly they will ensure that we will adapt our urban forest for predicted climate change, manage the health of our trees and provide the community with the benefits of public health and wellbeing for the environment.



2. Introduction

Hornsby's trees make one of the most important contributions to the landscape character and attractiveness of the region highlighting why Hornsby Shire, the Bushland Shire, is seen as a sanctuary away from inner city Sydney. But these trees do much more for the liveability, health and wellbeing of our community than many realise. They provide many environmental, economic and social benefits. For these reasons, Hornsby Shire Council has set a clear mandate to not only protect but increase its tree canopy cover. This mandate will help Council better plan and manage trees throughout its urban and rural environments.

Hornsby Shire Council is currently developing a range of policies, plans and strategies to inform the future of the Shire. This Urban Forest Strategy, which is the first of its kind for Council, provides guidance on the future care and management of Hornsby's urban forest. The outcomes of this Strategy are designed to integrate with other local and regional management priorities such as biodiversity, water, climate change, active living, public domain planning and community health.

Through their canopies, trees cover almost 59 percent of the entire local government area, which is one of the highest canopy cover percentages within Greater Sydney. Canopy cover over Hornsby's urban area, excluding National Parks and rural lands, is 39 percent. Benchmarked against the average local government canopy cover across Sydney of 26 percent (Amati, et al, 2016), Hornsby's canopy cover is high and only just short of Greater Sydney Commission's target of 40 percent. Hornsby Shire Council's urban forest is one of the biggest contributors of tree canopy to the Greater Sydney Region, making it a valuable asset for all of Sydney.

In 40 years' time the character of the Hornsby Shire will be significantly different and reflect a landscape typical of an inner-city local government area.

However, despite this important contribution, it is estimated that the urban area of Hornsby Shire is losing between 2-3 percent of its tree canopy cover, or 12-15,000 trees, every year (Smith et al, 2017). If this trajectory continues and the urban forest is not properly managed, in 40 years' time the character of the Hornsby Shire will be significantly different and reflect a landscape typical of an inner-city local government area. Residential zoned land contributes almost half of all urban tree canopy cover and it is this zoned land that is experiencing the bulk of tree loss. Protecting trees and regulating their renewal on private land is not a simple task nor is it one that Hornsby Shire faces alone. Canopy loss in the private realm is being experienced across many parts of Sydney and other major global cities. While development related canopy loss continues, there are no single or clear solutions on how to stop the loss. For this reason, this strategy recommends multiple approaches.

Beyond the private realm, the public trees across Hornsby Shire's streets and parks will also require a stronger best practice management approach. A history of reactive works and battles against the impacts of development, infrastructure, utilities and community perceptions means there is significant opportunity for an improved, robust and evidence based public tree management program.

Despite these issues, there is significant opportunity for Hornsby Shire to take a clear leadership role in the management of its urban forest and empower all landholders to consider their influence on one of Hornsby's greatest assets. The Greening Our Shire program is a step in the right direction and this Urban Forest Strategy will provide the much-needed legacy for transitioning this program into an ongoing best practice urban forest program for the Shire.

Councils Community Strategic Plan supports this by aiming to ensure that the natural environment is well cared for and protected. As a result, Council has committed to valuing green and open spaces.



Figure 1: Hornsby shire has a high canopy cover across the Municipality



Image 2: Hornsby Community Strategic Plan aims to ensure that the natural environment is well cared for

3 What is Hornsby's Urban Forest

Definition

Tree

A tree is defined as a long lived woody perennial plant with one or relatively few main stems with the potential to grow to a height greater than 3 metres (Hornsby Development Control Plan 2019).

Urban Forest

Hornsby's urban forest is the sum of all vegetation, the soil and water that support it across the Shire, excluding National Parks and bushland reserves. It is one of the core components of Hornsby's green infrastructure network.

It is made up of trees and other vegetation in urban streets, parks, in resident's back and front yards, on commercial and industrial land, within the rural villages dotted throughout the rural living zone, on rural land, along rural roads and river communities. It is estimated that there are 30,000 street trees across Hornsby (excluding rural roads) and about 50-60,000 park trees. The number of trees in bushland reserves and on privately owned land is unknown. It is further estimated that there are 30,000 vacant street tree sites across urban Hornsby Shire which could be planted with street trees.

While the urban forest is the sum of all vegetation it is the trees that are the most dominant element. They are the most iconic and provide the greatest community, environmental and economic benefits. As such, this

Rural Lands

While the definition of Urban Forest focuses on the urban area, Hornsby's unique landscape includes valuable rural areas. Trees on private rural land are important connectors between National Parks and urban areas. As such, this Strategy includes all trees on rural lands as well.

National Parks and Bushland Reserves

Whilst the National Parks and bushland reserves are not considered to be part of the urban forest, our urban trees are important connectors, buffers and protectors of the vegetation within these important areas as demonstrated in Council's Biodiversity Conservation Management Plan, 2019. The Bushland Shire title, as Hornsby Shire is commonly known, stems from the relationship that Hornsby's urban forest has with its National Parks, bushland reserves and waterways.

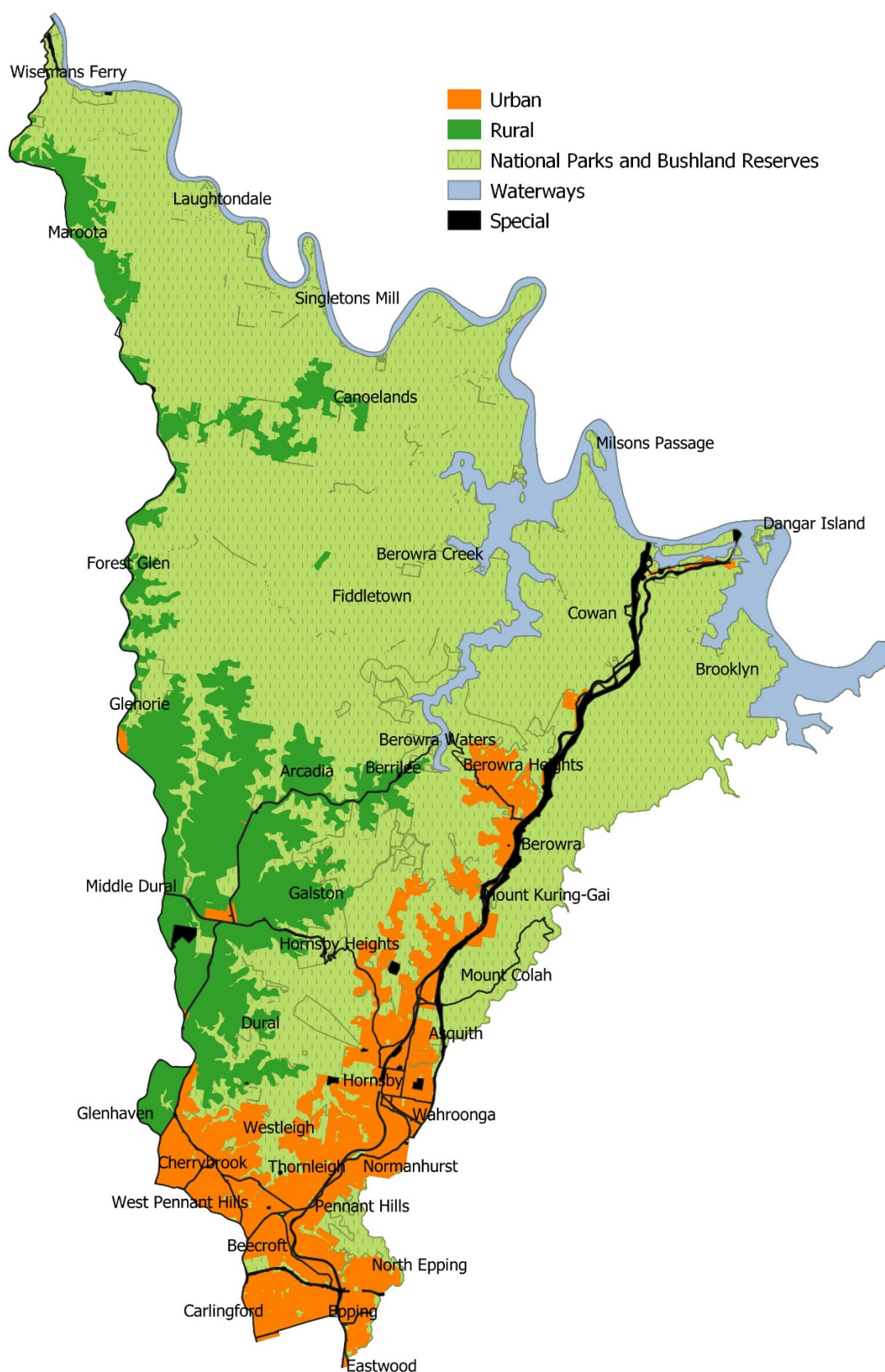


Figure 3: Boundaries between urban, rural and national park/bushland reserve for Hornsby Shire

Benefits of Urban Forests

Hornsby Shire's urban forest is a vitally important part of the urban and rural landscape for a range of reasons that benefit the community, the environment and also the economy.

Community Benefits

- Urban trees can make you feel 7 years younger and \$10,000 richer (Karden, et al 2015)
- Access to urban trees for play, improves childhood development and resilience (Gull et al, 2018)
- Reduces UV exposure through shading (Heisler, 2000)
- Leafy streets encourage people to walk and cycle more, improving physical health (Giles Corti, 2005)
- Green landscapes improve mental wellbeing, reduce stress and can aid in the recovery from depression (Mullaney et al, 2015)
- The urban forest allows people to connect more with nature and build social cohesion (Godfrey-Faucett, 2016)
- Reduction in a variety of health issues, such as respiratory diseases (including asthma) and skin cancer (Lovasi, et al 2008)
- Reduced crime rates, fewer acts of domestic violence and aggression (Kuo, et al 2001)
- Reduced air temperatures, lower surface temperatures (Norton et al, 2013)
- Better air quality (Nowak et al, 2008)
- Less motor vehicle accidents due to reduced speeds along avenues and boulevards (Harthoorn, 2018) (Naderi et al, 2008).

Environmental Benefits

- Trees reduce air pollution – one large tree can absorb up to 60-70 times more air pollution than a smaller tree (Nowak et al, 2008)
- Habitat provision for local wildlife (Mullaney et al, 2015)
- Connectivity and buffer of areas of biodiverse value (Mata et al, 2015)

- Improves soil health (Mullaney et al, 2015)
- Urban trees are one of the most efficient and cost-effective mechanisms for adapting to climate change and mitigating urban heat (Norton et al, 2013)
- Filter stormwater pollution and mitigate storm water runoff (Gill et al, 2007)
- Perceived reduction in noise – particularly from traffic (Mullaney et al, 2015)
- Storing and sequestering carbon (Nowak et al, 2008).
- **Economic Benefits**
 - Well treed and landscaped retail areas can generate up to 20 percent more productivity – people spend more time, and more money (Wolf, 2005)
 - Street trees can add up to 15 percent to residential property values (Plant, 2016) (Pandit, 2013)
 - Enhance sense of place, landscape character and city branding (Wolf, 2005)
 - Marketing and bolstering city image and profile (Konijnendijk, 2005)
 - Shading can reduce need for mechanical cooling in summer (Nowak et al, 2008)
 - Increase the number of green jobs for those managing the urban forest
 - Tree Shade can prolong the life of hard infrastructure from UV exposure damage (Mullaney et al, 2015).

Strategic Context

The management of the urban forest is nested within Council's existing programs and priorities. Figures 4 and 5, show how and where the urban forest is identified within both State and Council planning documents.

This Urban Forest Strategy aims to provide a clear line of sight between Council's urban forest vision objectives and the State planning framework.

STATE

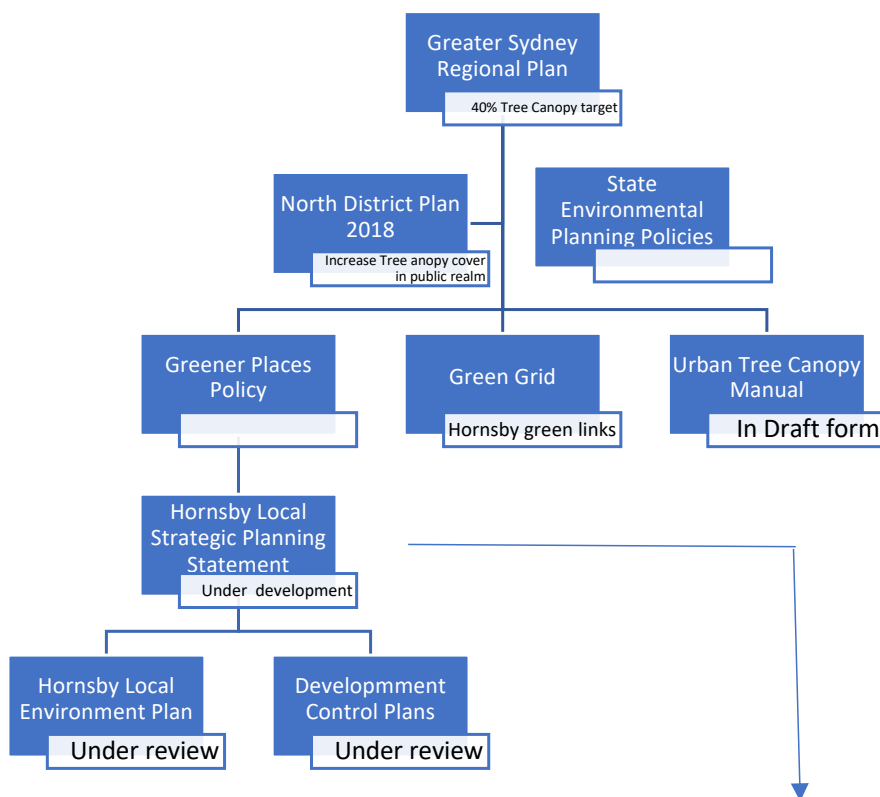


Figure 4: Strategic planning hierarchy in NSW and the connection to the protection and management of urban trees

LOCAL

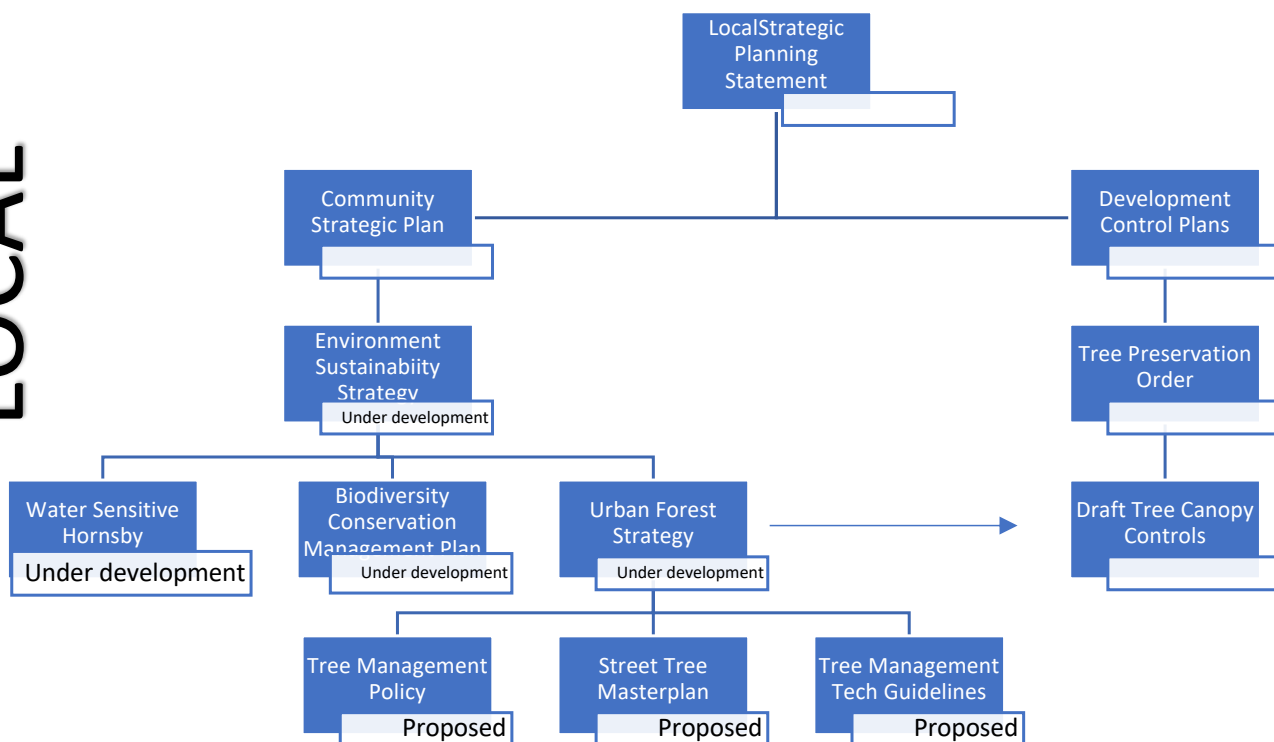


Figure 5: The integration of plans, policies and controls to protect and manage Hornsby Council's urban forest



The Hornsby Shire was originally occupied by the Aboriginal people of the Darug, Gu-ring-gai and Darkinjung language groups.



History of Hornsby's Forests

Landscape

Hornsby's natural backdrop is an ancient landscape with great variety in landforms and vegetation. The Shire consists of gorges, floodplains, estuaries, stepped hill slopes, cliffs and steep hills with narrow ridgetops and broader plateau tops that are interspersed with urban development. These variations in landforms give rise to an incredibly diverse range of vegetation species, including trees.

Much of Hornsby's sandstone landscape still retains its native vegetation due to its unsuitability for large scale development as it is more rugged and infertile as compared to shale. This includes smooth-barked apple *Angophora costata*, red bloodwood *Eucalyptus gummifera*, thin-leaved stringybark *E. eugenioides* and scribbly gum *E. haemastoma*.

In contrast, the more fertile shale soils were extensively cleared by early settlers for animal grazing and food production. These areas provided flatter topography suitable for development which now forms the present-day Hornsby. Interspersed amongst residential housing within our suburbs, patches of remnant vegetation house one of Hornsby's greatest assets, Blue Gum High Forest and Sydney Turpentine Ironbark Forest, with species such as turpentine *Syncarpia glomulifera*. The sheer size of these trees is simply breathtaking, and they remain some of the last reminders of Hornsby's original landscapes.

People

The Hornsby Shire was originally occupied by the Aboriginal people of the Darug, Gu-ring-gai and Darkinjung language groups. Many significant artefacts of their culture remain today including engravings on sandstone ridges, cave paintings and scarred trees. Some of these relics date back at least 22,000 years.

In 1788, the first European explorers voyaged up the Hawkesbury River. Many of the initial settlers were farmers and orchardists, followed by timber-getters from 1816. The timber-getters removed the valuable timber which allowed the farmers to cultivate the land (<https://www.hornsby.nsw.gov.au/council/about-council/history>). The timber-getters, who were mostly convicts, penetrated much of the upper reaches of Hornsby's creeks and rivers in their quest for Sydney Blue Gums and Blackbutts. Local builders also used the resources of the area to supply cut stone and Sheoak shingles to Sydney builders. Hornsby's substantial timber resources undoubtedly helped generate part of the riches used to expand Sydney.

As early as the 1880's, residents were attracted to the bushland setting of suburbs across Hornsby to benefit from the 'healthy climate'. Early residents aspired to the bush lifestyle of big homes amongst the trees with an easy rail commute to the city. They also benefited from the public open spaces that were set aside for recreational use. This lifestyle has continued well into current times.

As Sydney and the Hornsby Shire grew, hardwood timbers continued to be sought, cut and milled generating significant economic benefits for the local community. However, the depletion of these resources has rendered both the Blue Gum High Forest and the Sydney Turpentine Ironbark Forest critically endangered.

There is approximately 37 hectares of Blue Gum Forest remaining in Hornsby Shire in areas such as Hornsby, Epping, Pennant Hills, Thornleigh and Beecroft. Whilst these forests have been modified, they still provide natural heritage significance as they are remnants of past vegetation.

Around 195 hectares of The Sydney Turpentine Ironbark Forests including Sydney Turpentine, Grey Ironbark and Sydney Redgum remain, mostly within urban, rural and roadside areas. These forests provide habitat for native fauna and importantly, contain genetic material indigenous to the area. They also form nature corridors and urban habitat links and contribute to the landscape character of Hornsby.

These two forest types are now key influencers towards Hornsby's urban character and neighbourhood sense of place. They are interspersed with a diversity of tree species, indigenous, native and exotic which all contribute to the status of the urban forest today and will continue to do so into the future.

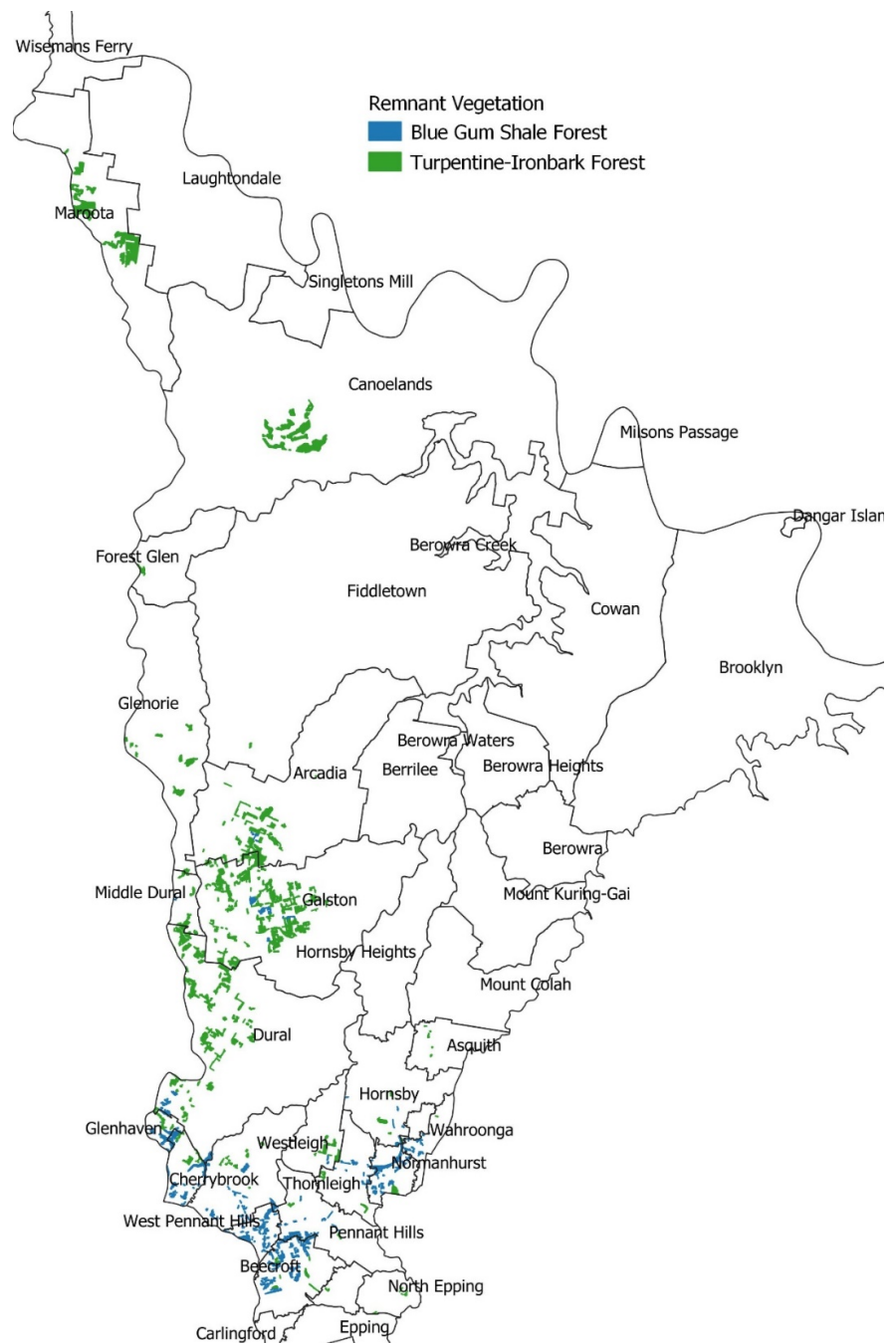


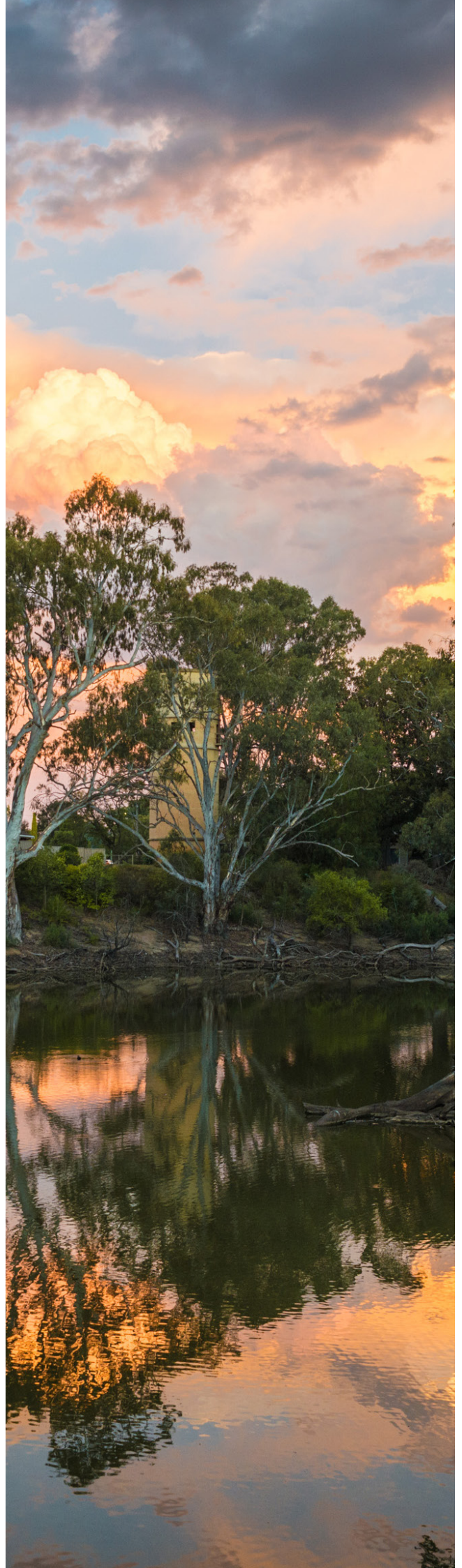
Figure 6: Distribution of Hornsby's remnant forest types, Blue Gum and Turpentine Ironbark

Hornsby's Urban Forest Today

The urban forest can be studied in a number of ways. In order to best manage existing vegetation, and to guide the development of the forest of the future, extensive mapping of various elements of the urban forest has been done. This includes tree canopy cover, ecological connectivity, large and significant trees, diversity and species composition and useful life expectancy of Council owned trees. The mapping provides key indicators to enable benchmarking of the forest, setting future targets and monitoring and evaluation over time.

1. Tree Canopy Cover

Hornsby Shire Council has an enviable level of tree canopy cover that many other local governments can only aspire to. Canopy cover for the whole local government area (LGA) is 59 percent and is distributed unevenly across the LGA (Figure 3). The total canopy cover far exceeds the 40 percent tree canopy target as set by the Sydney Commission and is the third highest canopy cover across Metropolitan Sydney. The Office of Environment and Heritage has invested in high resolution vegetation mapping across Metro Sydney, which allows land managers to measure their tree canopy cover as at 2016 and compare areas across their LGA as well as compare to other LGAs.



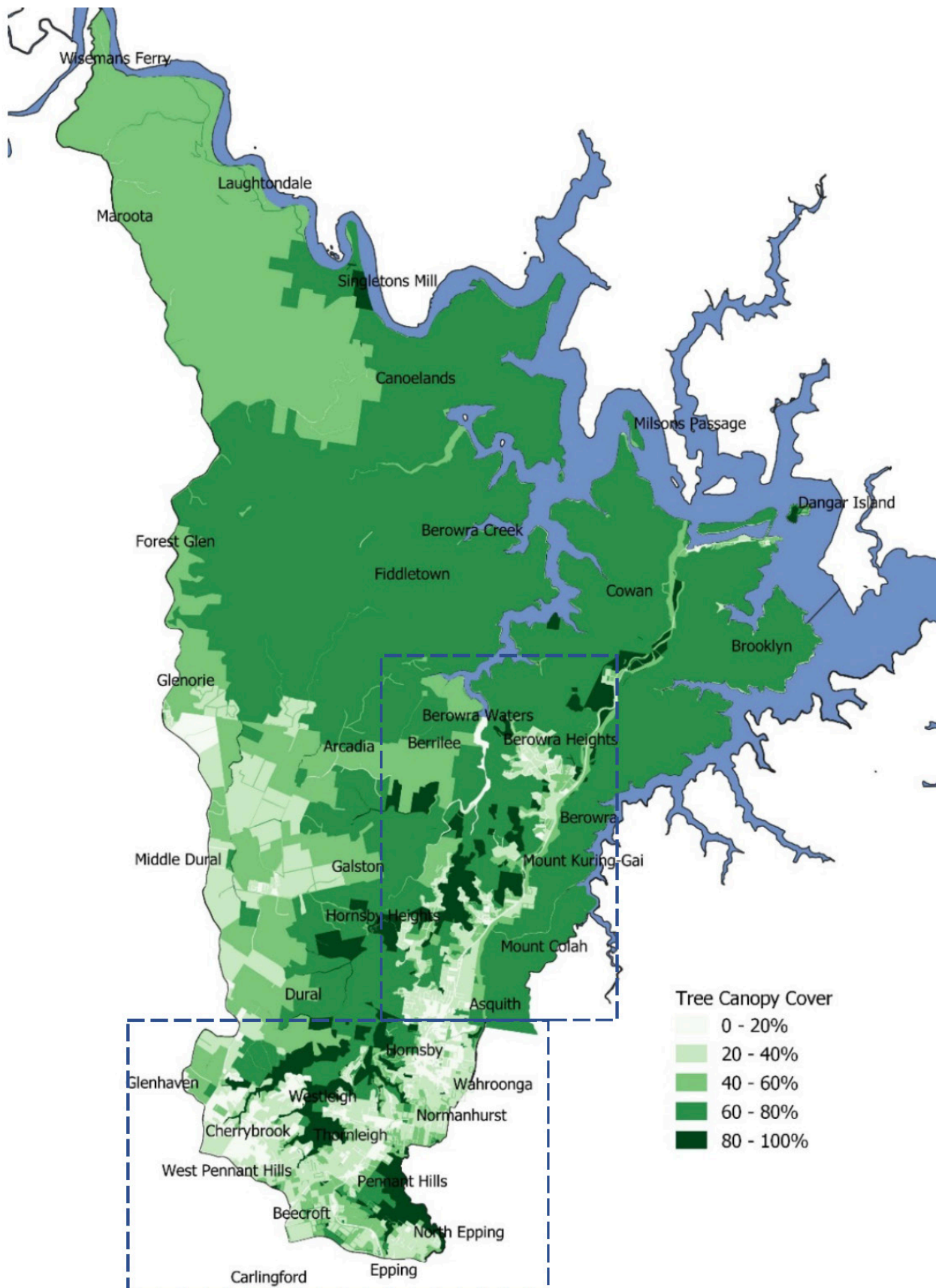


Figure 7: Tree Canopy distribution across the whole shire. Source: OEH, 2019.

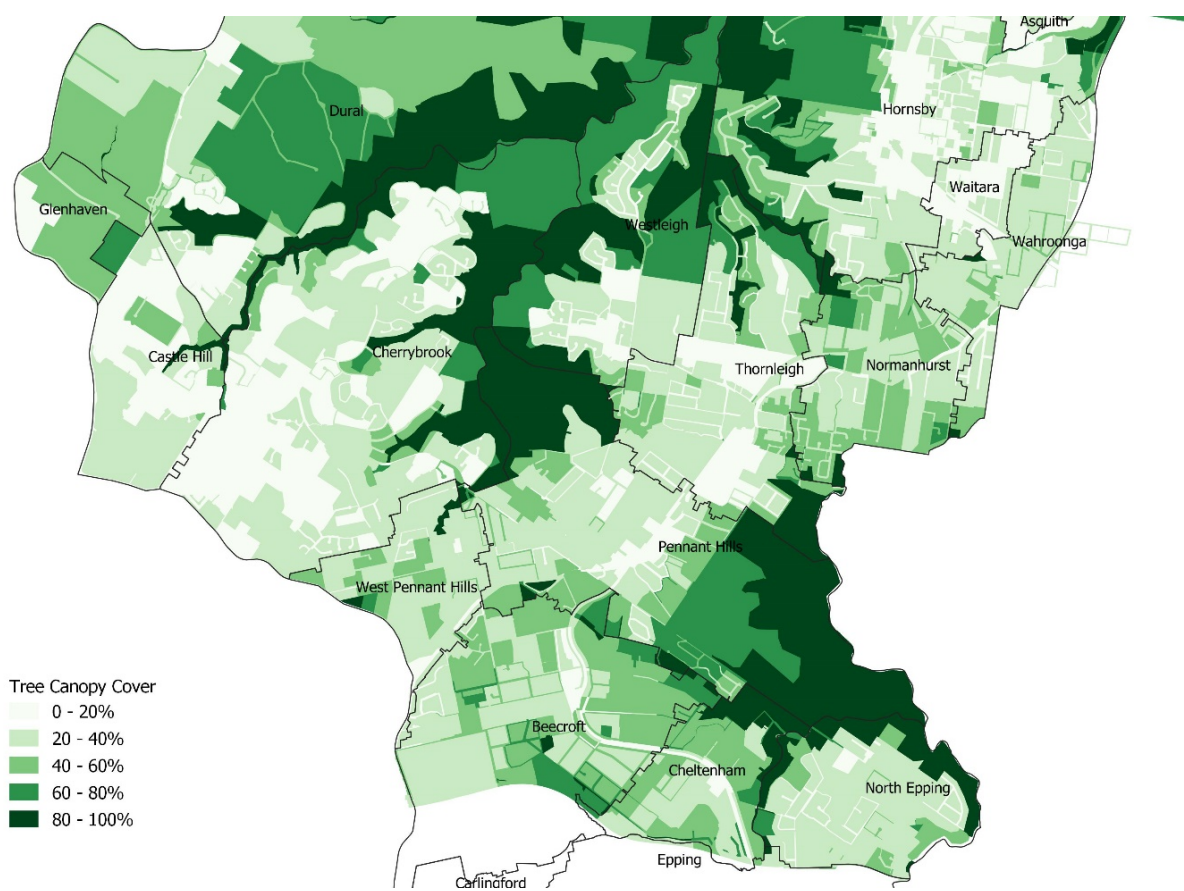


Figure 8: Tree canopy cover for southern section of Hornsby Shire. Source: OEH, 2019

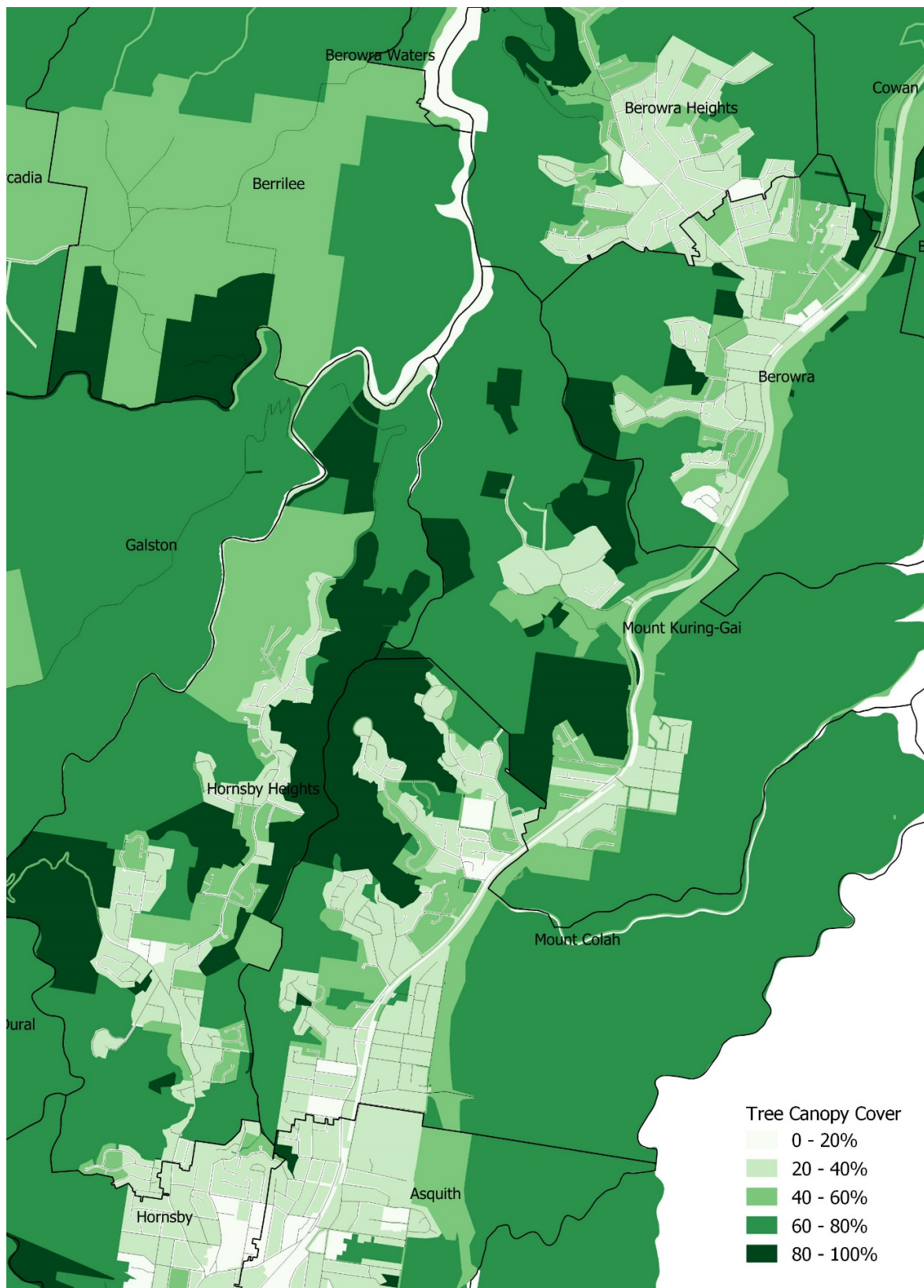


Figure 9: Tree canopy cover for southern section of Hornsby Shire. Source: OEH, 2019

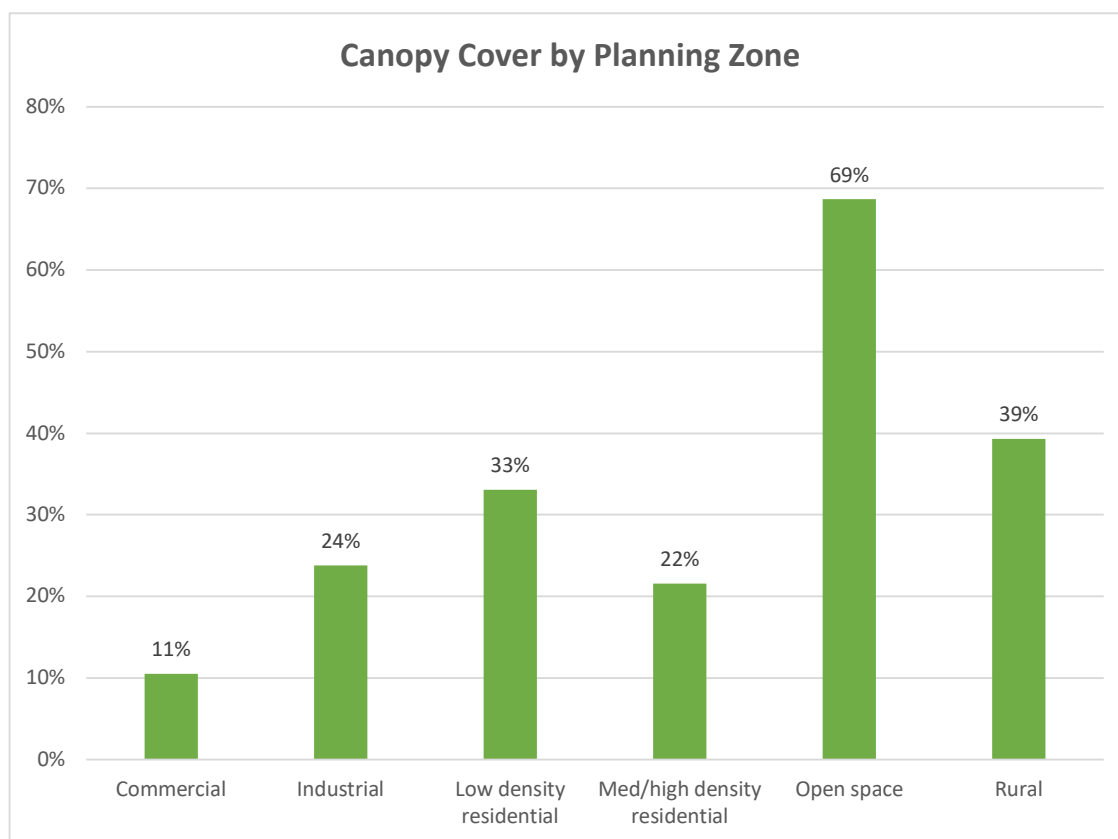


Figure 10: Tree Canopy Cover by Land Use. Source: OEH, 2019

Whilst 59 percent is high, canopy cover varies depending on the type of land in which it sits (Figure 4). Open space which includes National Parks, has 69 percent tree canopy cover. Commercial and industrial zoned land on the other hand, have the lowest with 11 percent and 24 percent respectively. Different residential zones have marked differences within their canopy cover. Rural and low-density residential lands have similar canopy cover (39 percent and 33 percent) while medium-high residential is much lower at only 22 percent. This is to be expected as both medium and high density residential tend to include underground carparks and additional utility services, reducing available planting space for trees.

Tree canopy cover over urban roads sits at 39 percent (Figure 5), again with similar disparities between suburbs as the overall canopy per suburb graph. Waitara, Castle Hill and Cherrybrook have the least amount of tree canopy over their road reserves, highlighting the opportunity for a street tree planting program in these suburbs. Rural roads in comparison maintain almost twice as much canopy cover with an average of 62 percent.

County Drive in Cherrybrook and James Street in Hornsby are examples of road reserves with very low tree canopy.



Image 11: Example of medium and high -density residential areas where tree canopy cover is low.
Ref: Parramatta Urban Design Guidelines, 2015

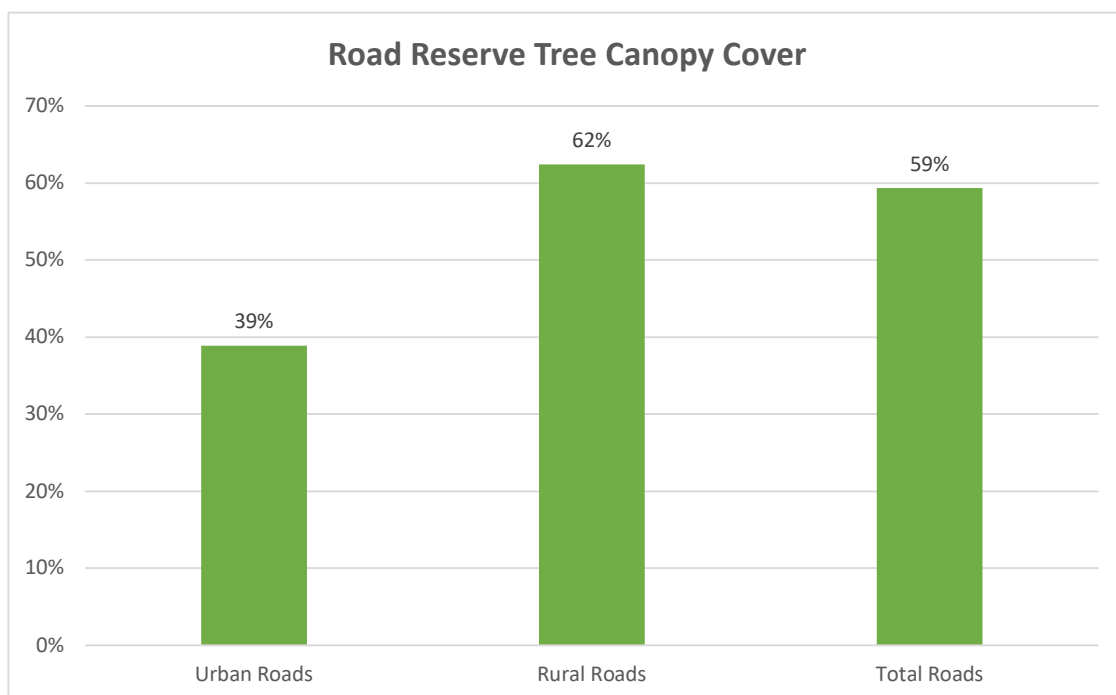


Figure 12: Road Reserve Tree Canopy Cover. Source: OEH, 2019

Image 13: County Drive in Cherrybrook shows very low levels of canopy, this section only 5.9 percent tree canopy cover





Image 14: James Street in Hornsby has only 3.8 percent tree canopy cover over its road reserve

Malton Road Beecroft and Treetops Road in Cherrybrook are examples of good road tree canopy cover

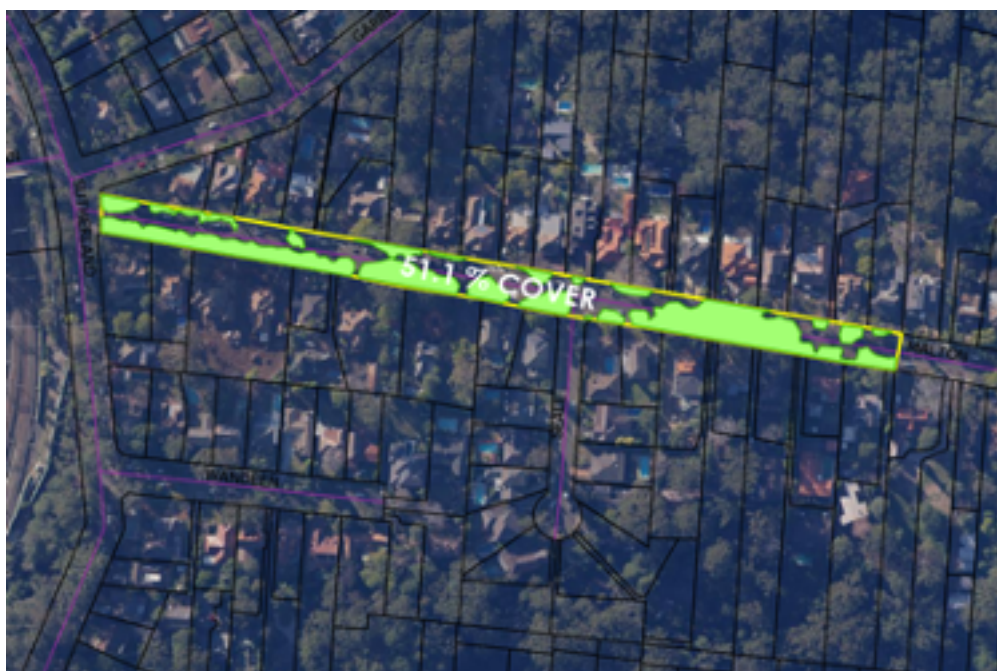
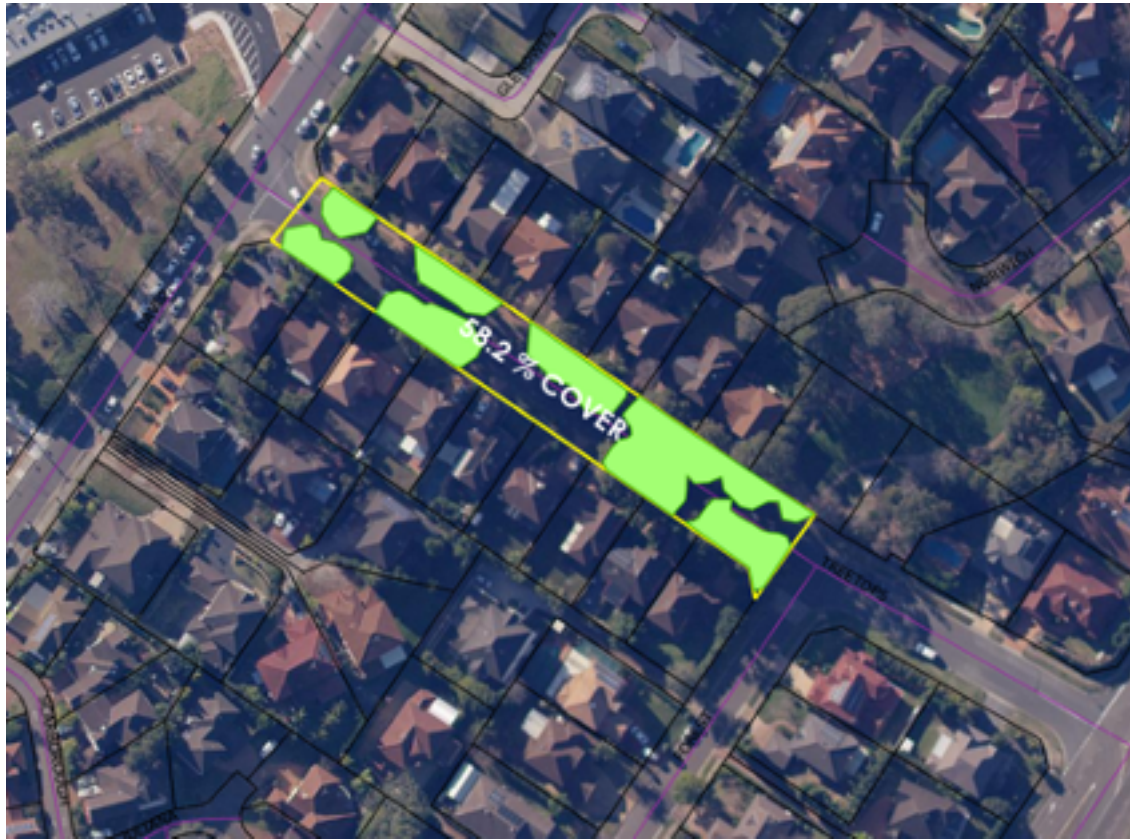


Image 15: Malton Road in Beecroft has optimum tree canopy cover at 51.1 percent

Image 16: Treetops in Cherrybrook has optimum tree canopy cover at 58.2 percent



Urban Tree Canopy

It is noted that two thirds of the Shire are designated National Park and rural land. This means that the 59 percent figure doesn't represent true canopy cover over the urban area, where people live and work and where tree canopy cover is critical for the benefit of people. When looking at canopy levels by suburb (Figures 6 and 7), there are clear differences that may reflect past or present development patterns and pressures, the character of these areas or values of the residents.

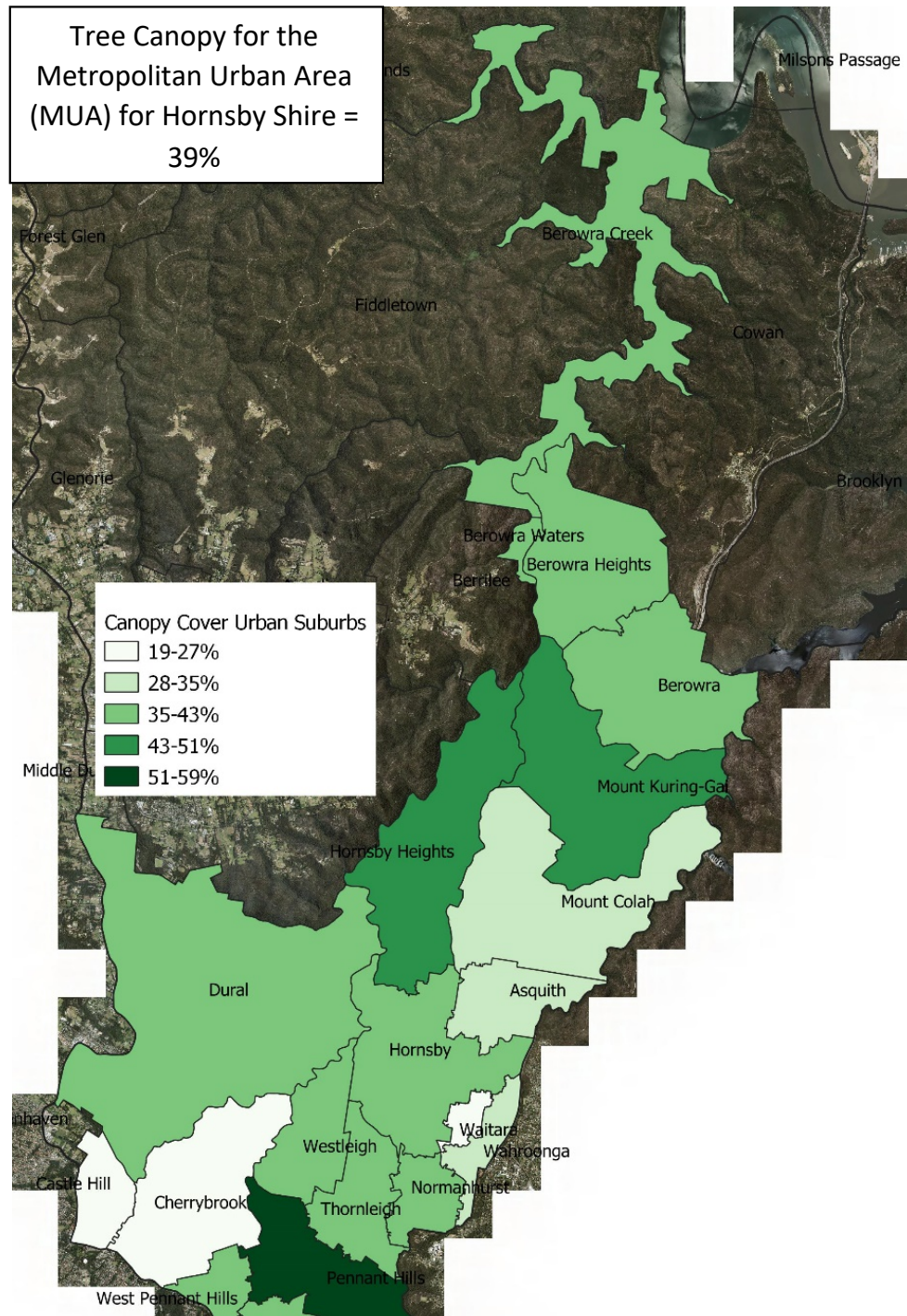


Figure 17: Tree Canopy distribution across the urban area of the Shire. Source: OEH, 2019.

Canopy cover of the designated urban area (defined by The Greater Sydney Commission) is 39 percent . This figure is still quite high when considering canopy levels across other Municipalities where the New South Wales urban average is 26 percent (Amati et al, 2016), highlighted in red in Figure 18 below.

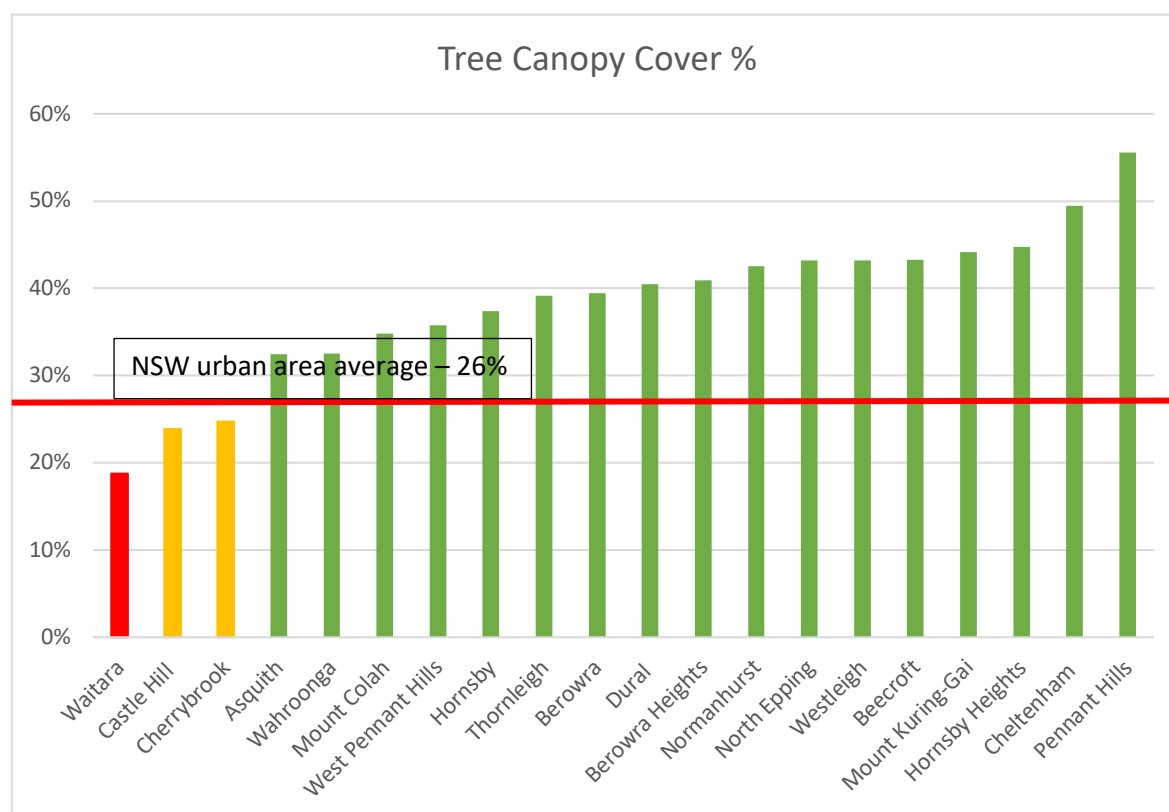


Figure 18: Urban Tree Canopy distribution by suburb. Source: OEH, 2019.

The lowest canopy cover is recorded in Waitara (19 percent), Castle Hill (24 percent) and Cherrybrook (25 percent) which all record canopy cover lower than 30 percent .

At the other end of the scale, Normanhurst, Beecroft, Cheltenham and Pennant Hills still have very high tree canopy cover with Pennant Hills recording the highest at 56 percent .

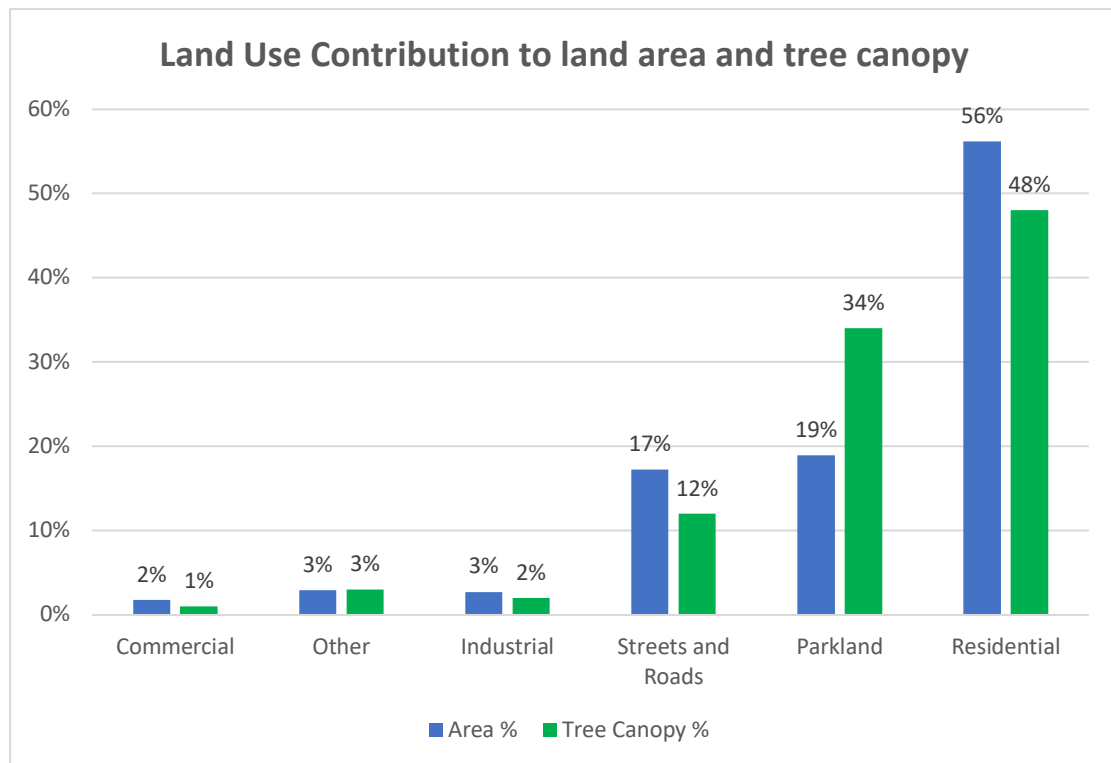


Figure 19: Urban Tree Canopy by land use contribution. Source: OEH, 2019.

Figure 19 demonstrates that almost half (48 percent) of Hornsby's urban tree canopy cover sits on residential zoned land, making it the biggest contributor to Hornsby's urban forest. This is not surprising given that 56 percent of Hornsby Shire is zoned residential land. Parkland contributes 34.5 percent of total canopy cover, despite only representing 19 percent of land area. Streets and roads contribute 11.9 percent of total tree canopy and make up 17 percent of Hornsby's land area. This highlights three important factors.

1. In terms of impact, the Shire relies heavily on private residential land to provide the overall benefits from the urban forest.
2. Parkland already takes more responsibility for providing tree canopy cover than its land area allows for
3. Given that tree canopy cover over both urban/rural roads and parkland is already high, it would be impossible to compensate for the loss of canopy from residential areas within public areas alone.

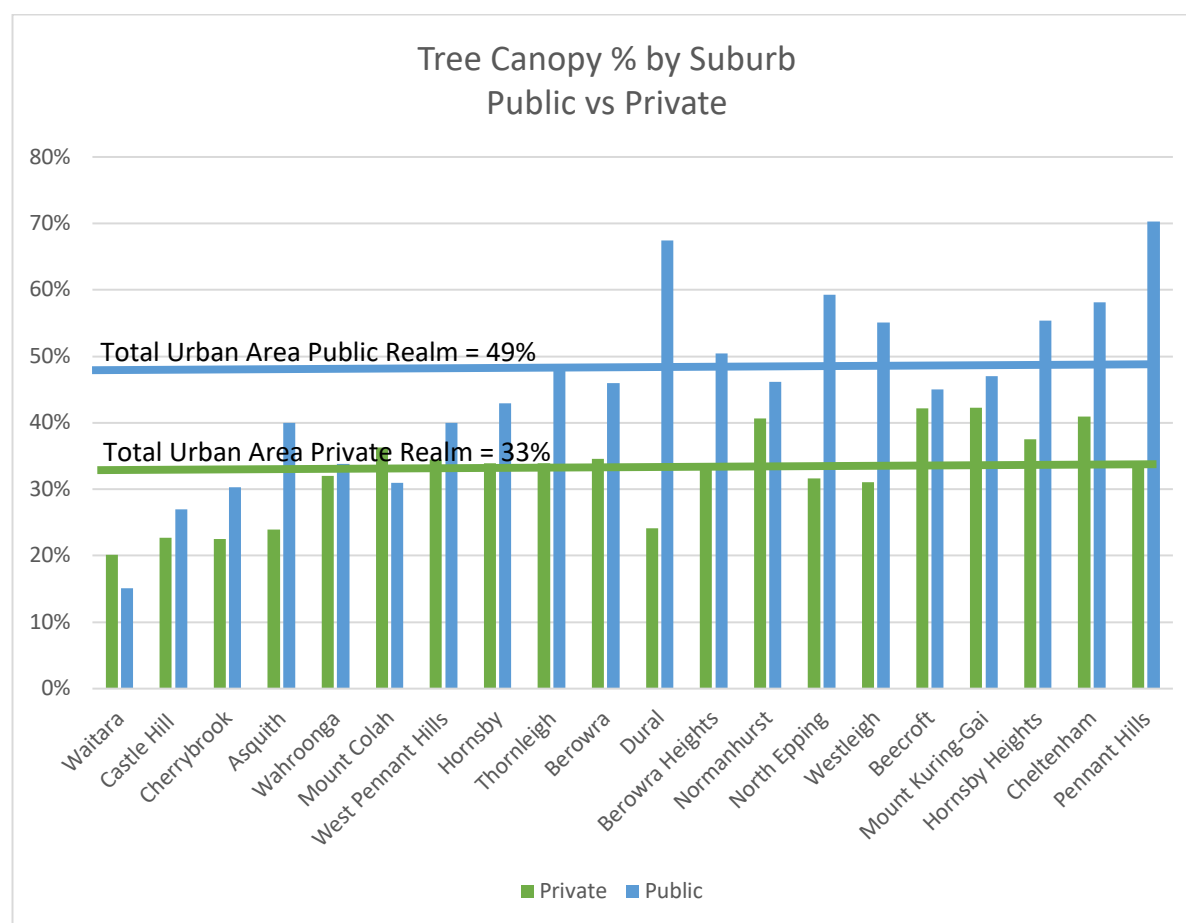


Figure 20: Public vs Private Tree Canopy by Suburb. Source: OEH, 2019

Despite half of Hornsby's urban forest being located on residential land, it would appear that the public realm more often than not, has higher percent ages of canopy cover than the private realm within the same suburb (Figure 20). As shown in Figure 9, apart from Waitara and Mt Colah, the public realm, predominantly parks and streets, have higher percent ages of canopy cover than the private realm does. In essence, this places more responsibility on a smaller area of land to provide the much-needed benefits of the urban forest.

Rural Tree Canopy

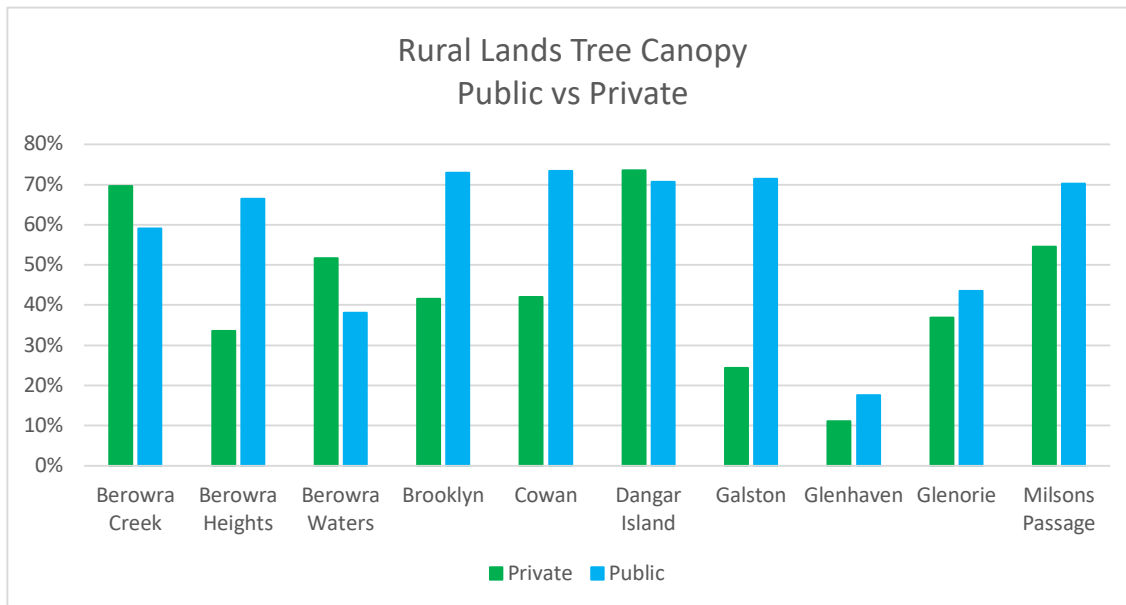
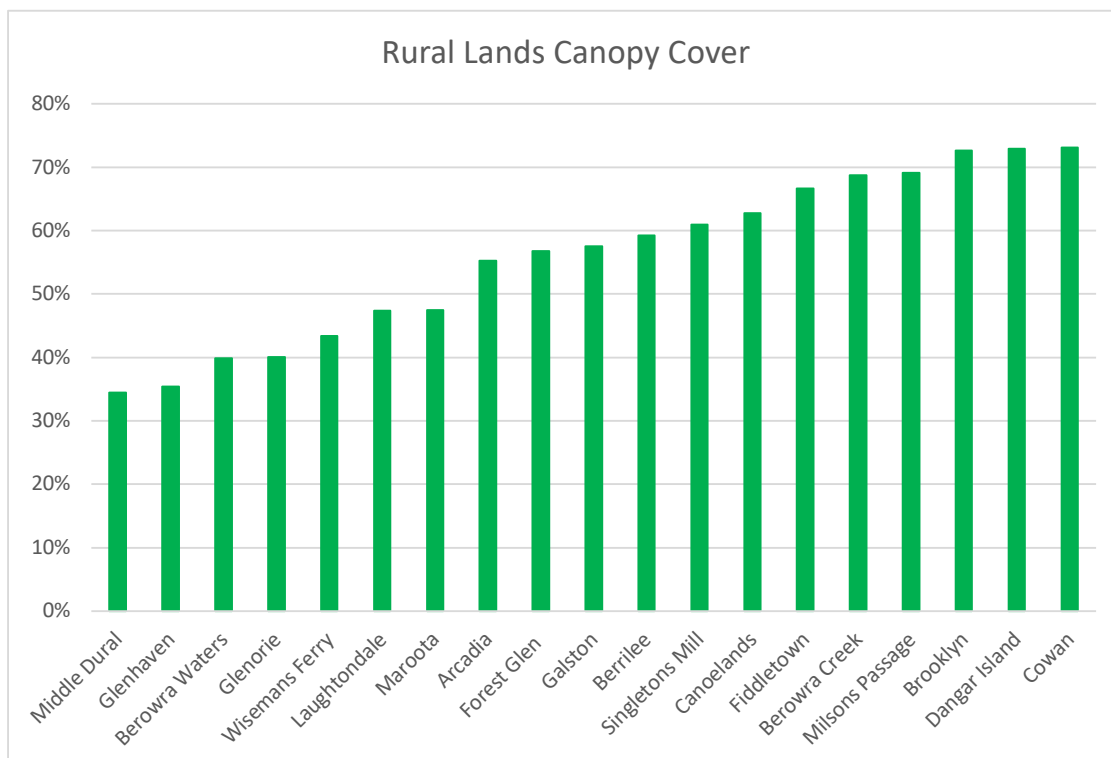


Figure 21: Public vs Private Tree Canopy by Rural area



Overall, tree canopy cover is much higher in rural lands than on urban lands as would be expected due to its undeveloped nature. Apart from Berowra Creek, Berowra Waters and Dangar Island, the public owned land has higher tree canopy than its private counterpart.

2. Ecological Connection

The urban forest plays a critical role in connecting areas of ecological value and habitat. Figure 22 below shows the distribution of remnant trees i.e. those with significant local ecological value, across the urban area. These trees should be protected within urban forest policy and looked to be supported and enhanced by streetscape, open space and private tree plantings.



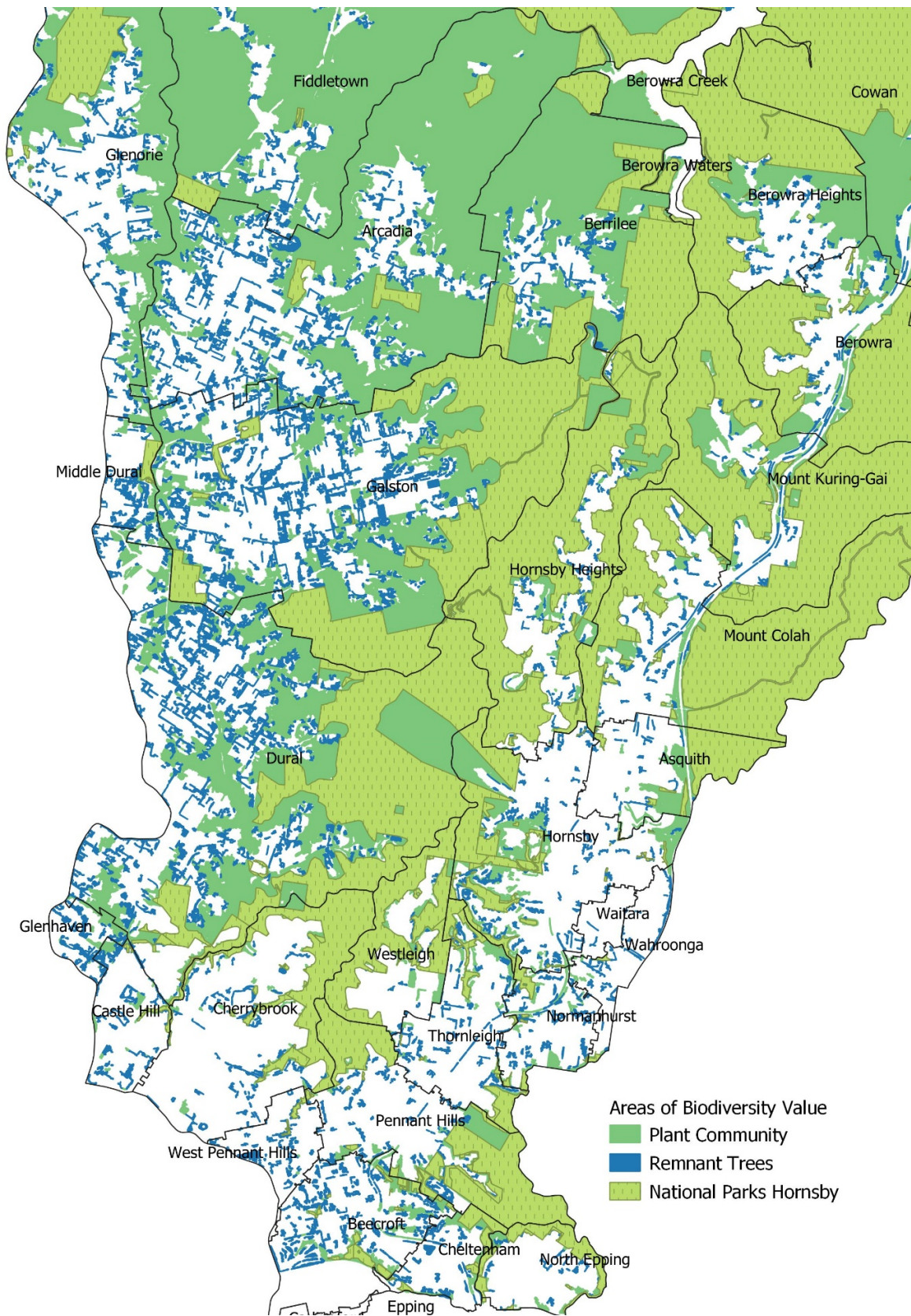


Figure 22: Distribution of remnant trees with high conservation and biodiversity value across the urban and rural landscapes of the shire. (Hornsby Shire Council GIS, 2019)

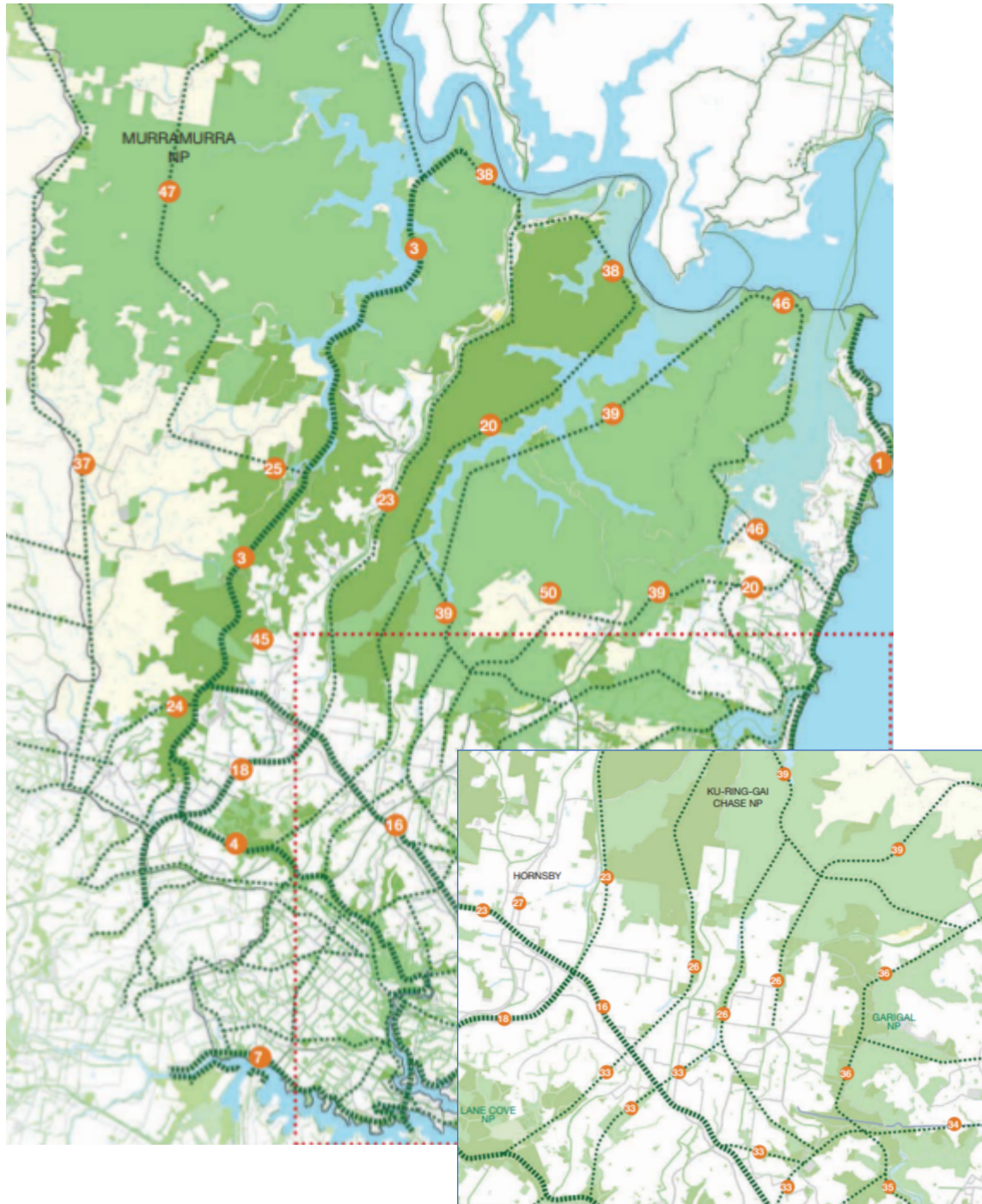


Green Infrastructure Framework

- 20m buffers
- 30m buffers
- 50m buffers
- 75m buffers

Council's Biodiversity Conservation Management Plan 2020 (BCMP) identifies the prospective role that a green infrastructure approach can take towards improving ecological outcomes. This approach also aligns with State Government planning around the green grid approach for Greater Sydney. A street tree masterplan will need to acknowledge these linkages and seek to plant street and park trees that support the corridor functions.

The BCMP used ecological modelling of agricultural lands, significant hydrological features and remnant vegetation to define a modelled Green Infrastructure network with 100m corridors for Hornsby Shire (Figure 23).



The North District Green Grid Plan was overlaid onto the Hornsby Green Infrastructure Framework, including opportunities for Hornsby Open Space and Green Links (no 27 in figure 24) and the Northern Rail line Linear Open Spaces (no 23 in Figure 12). From there, local knowledge was sought to adjust the design detail of corridors so as to reconnect fragmented landscapes.

Figure 24: Green Grid Project Opportunities, specifically project opportunities 23 and 27.

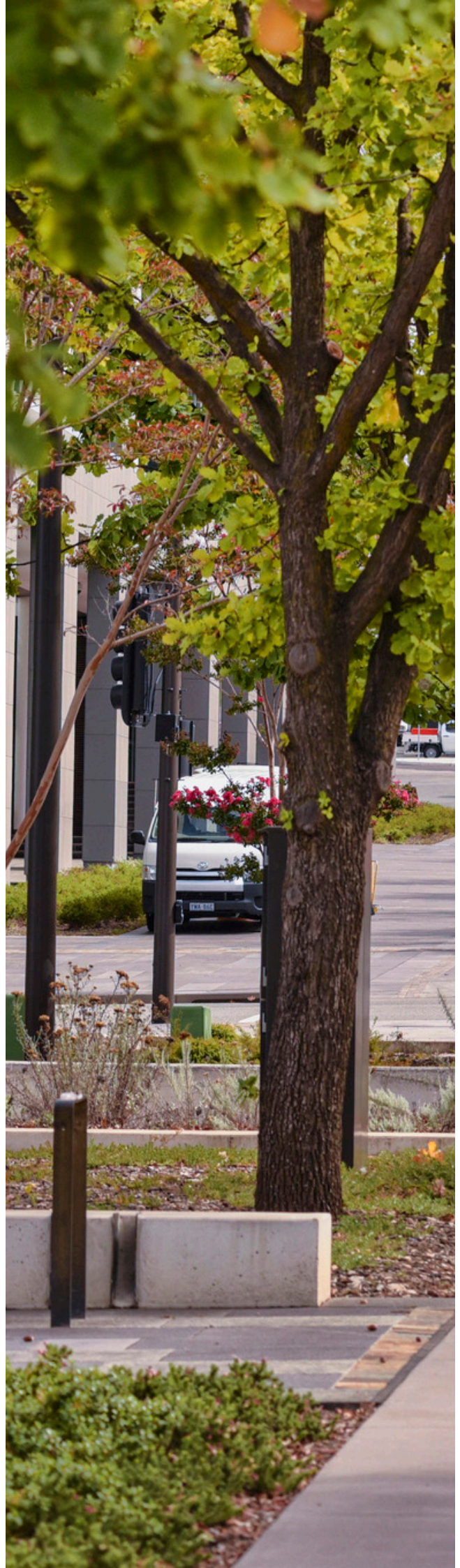
Source: North District Green Grid Plan, 2017

3. Tall and Significant Trees

State government vegetation mapping allows for the extraction of vegetation heights. Figure 13 identifies land parcels where there are concentrations of large trees in the urban areas. These trees are highly influential for setting Hornsby's landscape character and provide vital biodiversity links. Further detailed analysis of the data is needed to understand the predominant species within these areas including their contribution to endangered ecological communities and as food or habitat for native species. Based on their location as representative of pre-European remnant forest communities, they are likely to consist of Sydney Turpentine Ironbark and Blue Gum Forest trees. Given the length of time of development that has occurred across Hornsby, many of these trees are also likely to be exotic species.

Figure 25 reveals parts of the LGA where taller trees (over 15m in height) are concentrated within the major suburbs including Pennant Hills, Castle Hill, Beecroft, Cherrybrook, Westleigh and Thornleigh. Notably, the locations of many of these concentrations of tall trees often corresponds with the locations of council bushland sites. These tall trees are critical for supporting Hornsby's biodiversity and ecological systems and should, where possible, be managed for risk minimisation and ongoing protection from removal. Council will need to continue efforts to preserve space for these large trees, especially in larger public parks and reserves. Tall, ecologically valuable trees on private land are also very important, however are more susceptible to risk management. Sound decision making is required to preserve and manage these trees going forward but also to account for any risks to land-owners. There are various mechanisms that could be explored by Council to incentivise landowners to protect and care for these large trees on their properties and minimise the need for removal.

Further height stratified vegetation mapping data is required to differentiate the locations of these tall trees between council and private land. There is also a need to identify any topographic or habitat preferences for tall trees e.g. gullies, steep land or on certain slopes and soil types so that these areas can be prioritised for housing Hornsby's tall trees.



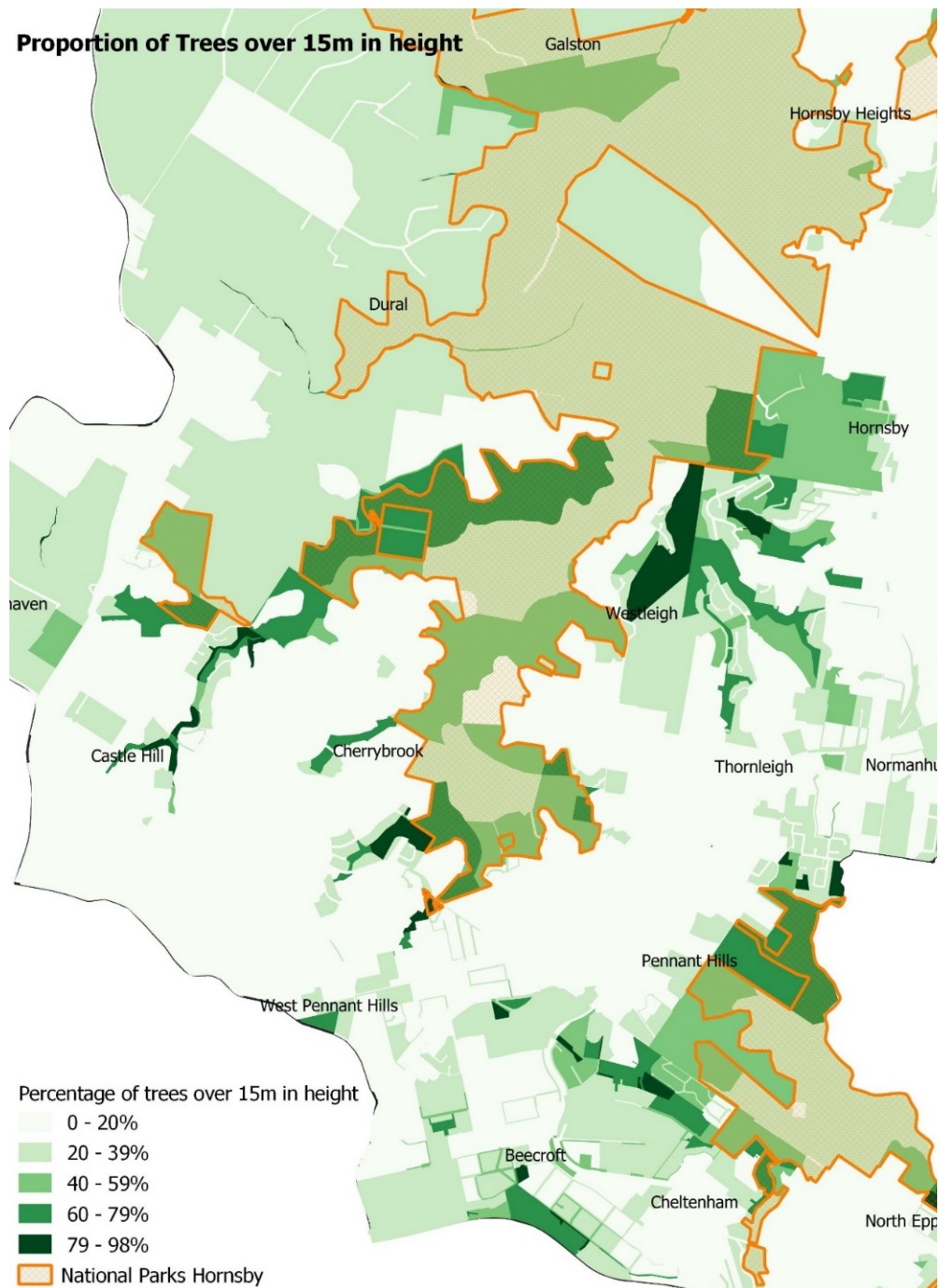


Figure 25: Areas where taller trees (over 15m) are concentrated. Source: OEH, 2019

4. Public Tree Diversity

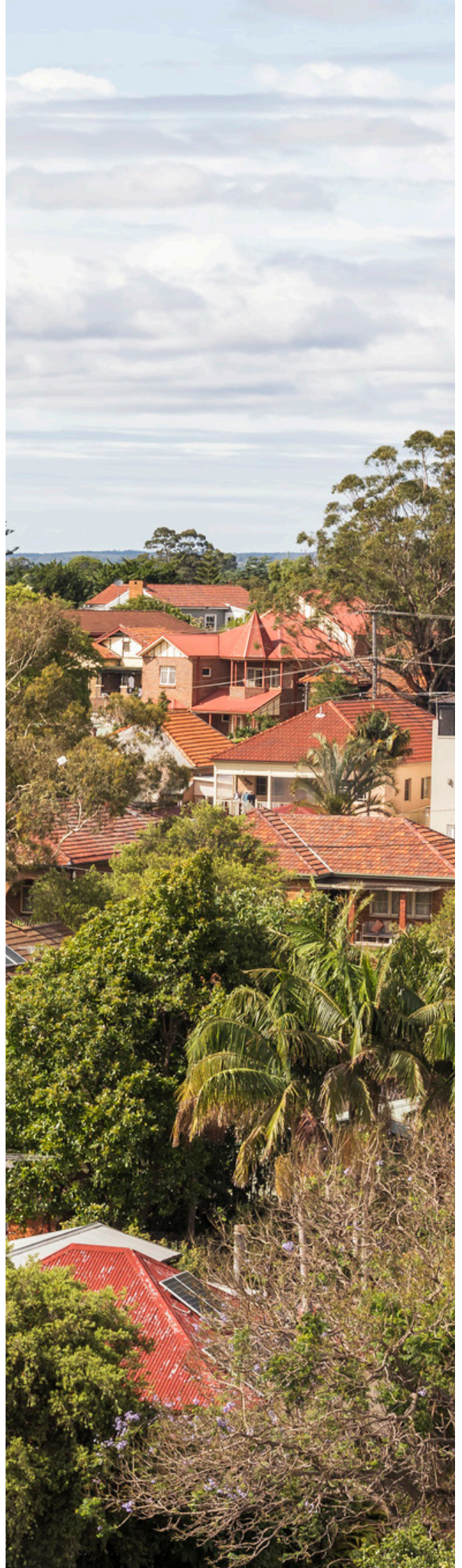
A sample tree survey was conducted on Hornsby's street trees in 2013 (Figure 14). The extensive survey measured a range of attributes for 21,550 street trees.

Whilst this survey is now 6 years old and some of these trees may have been removed and new ones planted, the data still holds valuable overall themes for the urban forest.

Key points of the 2013 tree survey data:

- The survey recorded an extremely high number of species. Over 480 different street tree species alone were recorded in this survey which suggest that Hornsby's urban forest is extremely diverse
- However, there continue to be only a few species that dominate the landscape. The most common species recorded in the survey were *Callistemon viminalis* - Bottlebrush (10 percent of the survey population), *Jacaranda mimosifolia* - Jacaranda (8 percent) and *Lophostemon confertus* – Queensland Brushbox (3 percent). At 10 percent for one species, this would suggest an over-representation of *Callistemon viminalis* within Hornsby's streetscapes.
- Cumulatively, 14 percent of the surveyed trees were from the Genus *Callistemon*, which is considered high.
- Climate vulnerability of species is currently being researched by Macquarie University. *Callistemons* are deemed to be highly vulnerable to climatic changes
- Over 70 percent of the assessed trees had a useful life expectancy (ULE) less than 15 years. 10 percent had an ULE less than 5 years. This is an extremely high figure and requires further analysis to validate if in fact so many trees are reaching the end of their useful lives.
- 57 percent of the trees surveyed had a low visual and functional amenity which is comparatively high
- 91 percent of the assessed trees were in acceptable health.
- 6 percent were in declining health.

Given these findings, more up to date information is required for Hornsby's street trees, particularly in relation to useful life expectancy. If the majority of Hornsby's street trees do in fact have low useful lives, then many of these trees may need to be considered for removal and replacement so as to properly manage the landscape amenity. This renewal is critical to support a healthy, resilient, dynamic and long-lived urban forest.



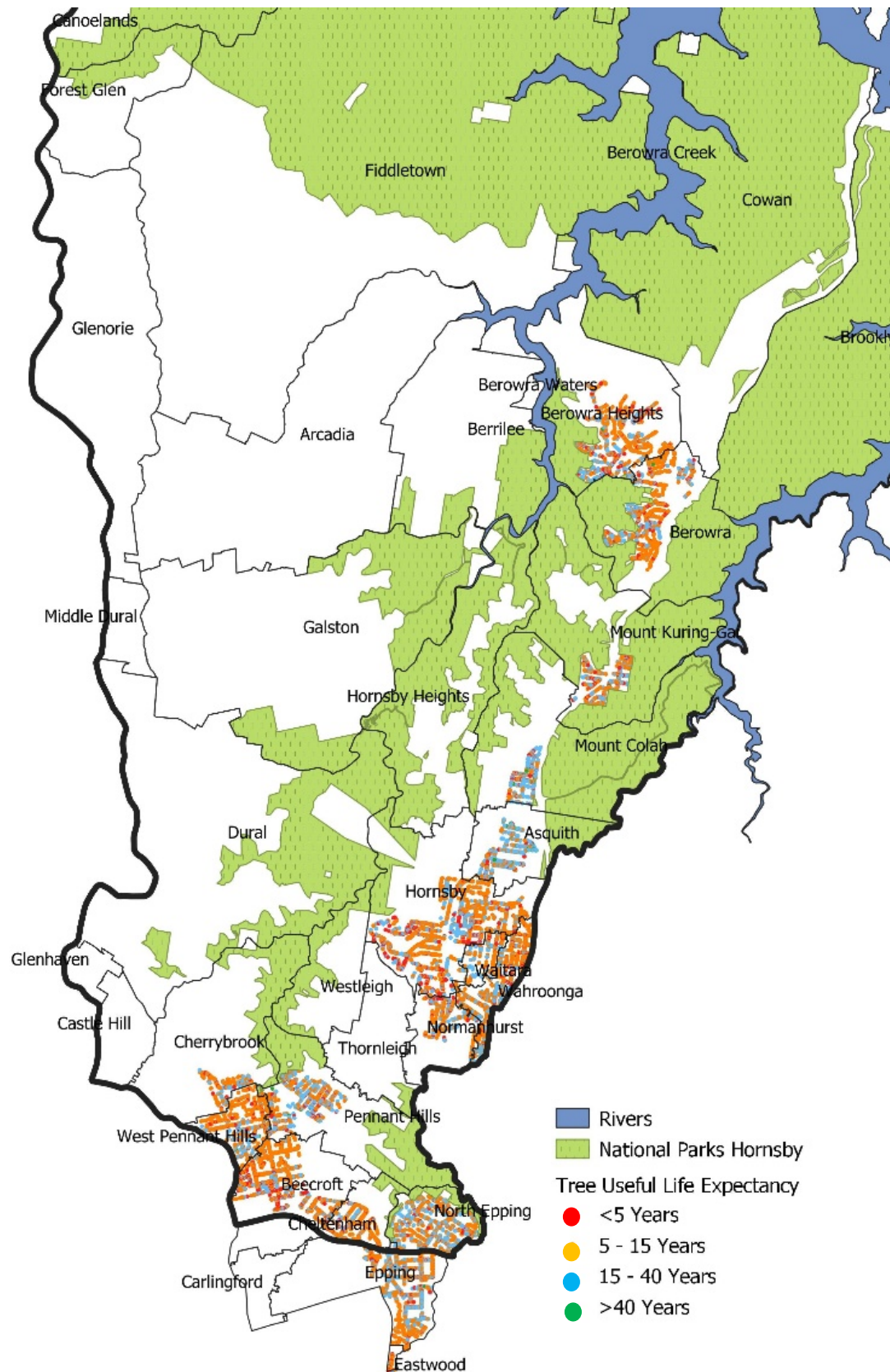


Figure 26: Distribution of the 21,550 trees survey, colour coded based on useful life expectancy. Red is less than 5 years, orange is 5-15, light blue is 15-40 years and green = over 40 years. (Hornsby Shire Council GIS, 2019)

5. Soils and Water

Soil and water are extremely important components of the urban forest that need to be considered for supporting long term health and viability of tree canopy cover.

The southern, or more urban areas of the LGA typically compose of sandstone and clay soils. The clay soil types are dominated by Glenorie Soil Landscape which is described (DECC, 2008) as having an underlying geology of Wianamatta shale. Having vegetation that has experienced extensive clearing of tall open forests. Dominant tree species on Glenorie soil landscapes include Sydney Blue Gum *Eucalyptus saligna* and Blackbutt *E. pilularis*.

Transitional soil types typically have a geology of shale and Hawkesbury Sandstone. Within the LGA the most predominant transitional soil landscape is Lucas Heights which typically occurs on ridge and plateau areas around Berowra and within Berowra Valley. Transitional soil vegetation is dominated by turpentine *Syncarpia glomulifera*, smooth-barked apple *Angophora costata*, red bloodwood *Eucalyptus gummifera*, thin-leaved stringybark *E. eugenioides* and scribbly gum *E. haemastoma*.

Urban Hornsby has a range of native and imported soils. Urban soils are generally altered, of poorer quality and in locations where development or past land filling has occurred, yet, are able to support development and urban greening. Any future tree planting should consider the existing soil type as well as the appropriate soil volume in selecting the right tree.

Water, also a fundamental input into the urban forest, is being considered in more detail for Hornsby as part of the Water Sensitive Hornsby Strategy. The strong links between water and urban vegetation will be identified, strengthening the concept of the need for integration between all physical aspects of the public and private domain and the urban forest.

The draft vision for a Water Sensitive Hornsby is that: Hornsby Shire is a beautiful, green, and thriving shire whose management of water supports pristine waterways, sustainable resource use, and a lifestyle that is connected to nature. With the emerging themes relevant to the urban forest being:

- Hornsby and its villages are full of beautiful blue and green spaces that connect people to their surrounding environment and local community
- Sustainable resource use is supported by integrated, multi-functional infrastructure

A Water Sensitive Hornsby will seek to develop and promote a network of green and blue corridors, open space and streetscapes that enables all residents to recognise and acknowledge the benefits vegetation and water provides to local liveability. This will translate into smarter and more effective growing conditions for urban trees e.g. stormwater collection and harvesting to passively water street trees.



Figure 28: Vision Theme - Hornsby and its villages are full of beautiful blue and green spaces that connect people to their surrounding environment and local community (Draft Water Sensitive Hornsby Strategy 2020)

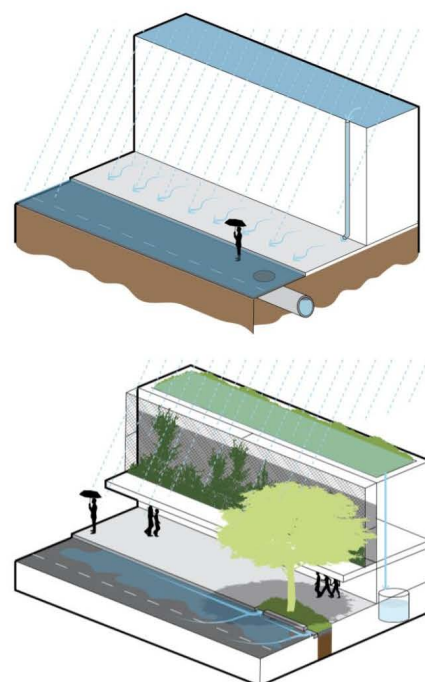


Figure 29: Collecting stormwater can have added benefits to street trees and therefore people. Source: CRC for Water Sensitive Cities

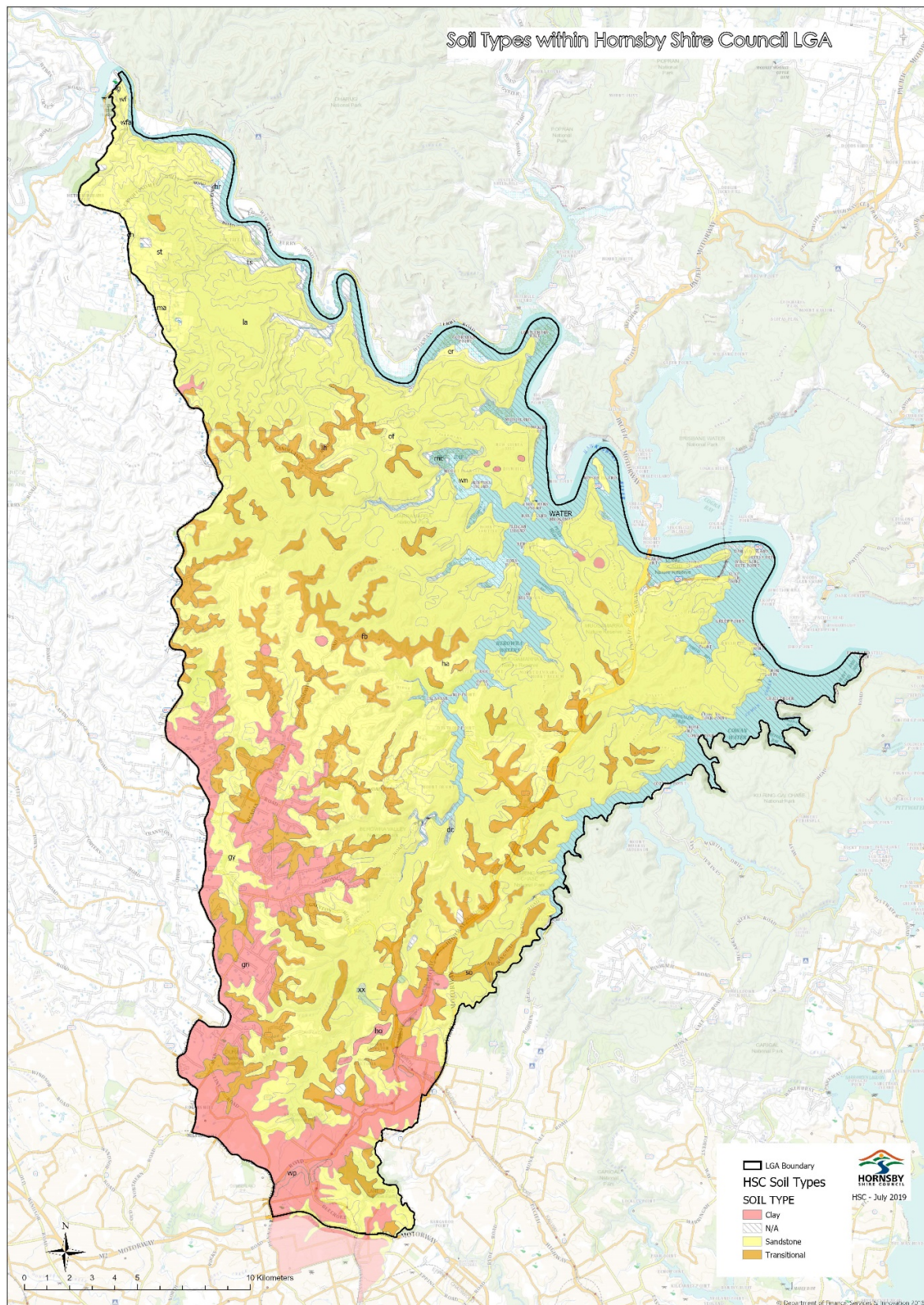


Figure 27: Hornsby's soil types (Hornsby Shire GIS, 2019)

6. Community Perceptions of the Urban Forest

Conversations with the Hornsby Shire community during the development of the Community Strategic Plan in 2017, identified the very high values placed on the natural landscape by the community. Results from the 2019 community engagement for the Environmental Sustainability Strategy revealed the following:

- Over 90 percent of respondents thought that tree canopy cover was very or somewhat important environmental aspects for Hornsby Shire
- 70 percent of respondents felt very or somewhat satisfied with current tree canopy cover
- One of the biggest concerns for respondents on the environment was over development (the biggest concern was traffic congestion)
- The engagement shows that trees (and concern for loss of tree canopy) represent one of the most important current and future environmental priorities for the Hornsby LGA.
- There were recognised concerns about climate change, water and biodiversity however they were not seen as a top priority for the community
- Active transport was rated as one of the lowest concerns for the community
- While tree loss and over development were key concerns, detail around this issue was mixed. Some consider that regulation of tree protection is excessive while others feel that there is not enough tree protection on private land.
- Particular mention was made to conserve both the Blue Gum and Turpentine Ironbark forests.
- Specific action for Council to consider include:
- Increasing the number of trees planted
- Adequate building setback requirements to allow for tree planting
- Seeking out opportunities to align tree planting with active transport networks
- Preserve native/indigenous species
- Reduce amount of tree loss due to apartment developments.

From these results, a targeted tree survey was conducted within the community to understand in more detail, how trees fit in to this inherent value of Hornsby's landscapes. The results are extremely important in

providing the evidence needed to develop appropriate policies and regulation for both public and private trees.

The survey revealed the following:

- Certain benefits of trees are more widely recognised by the community than others e.g. contribution to local neighbourhood character, provision of biodiversity/habitat and providing colour and shade to the urban environment were well recognised benefits of trees. Less recognised were the value that trees contribute to residential property prices, their ability to shade and cool houses and their contribution to health and wellbeing.
- There is a strong feeling of responsibility in providing a greener legacy for future generations and that both Council and the community should together be addressing the issue of canopy decline
- The majority of respondents want the same or a greater number of trees across the Shire than there are now
- There was strong recognition and support for PUBLIC tree management, including protection and renewal especially through the payment of fines or bonds if damage to public trees occurs during development
- However, there was much less support for regulation or penalties for non-approved removals of PRIVATE trees
- Despite support for a greener legacy, half of the respondents thought they should be able to do whatever they liked on their own property regarding trees
- Respondents supported the idea of offsets for removed private trees being planted nearby but did not support property owners paying Council to replant trees on public land
- Over half of the respondents felt that Council should focus more on tree planting in the public domain, not the private
- Common ideas for retaining and planting trees on private property included education and awareness campaigns, financial assistance or subsidy from Council to help support maintenance of private trees, free or subsidised arboricultural advice for landowners, recommended tree planting guides for species of trees less likely to cause future issues, free tree giveaways, ensuring that new trees are planted as part of new developments, reducing the

amount of development overall and including other greening options for high rise development e.g. green roofs

- The main reasons people remove trees from their properties are due to old age, poor health, storm damage and concern about limbs dropping.
- Of those who removed trees, only half replanted a tree/s
- Trees were not replaced because there was not enough space, other types of vegetation were planted instead or there were simply enough trees on the property already.

These findings are important for two reasons:

1. They validate the need for a robust, adequately funded, best practice public tree management program
2. Any mechanism to stem the loss of tree canopy on private land will need careful consideration and likely require a suite of tools. Regulation, while broadly unpalatable to the general public, will still be required but will need to be supported by other mechanisms such as education, incentives and access to good arboricultural advice.

4. How is Hornsby's Urban Forest Managed?

1. Urban Street and Park Trees

Public urban trees and those within the rural villages are managed by the Tree Management Team of Hornsby Shire Council. Within this program, Council must adhere to various pieces of legislation, such as the Electricity Supply Act 1995, Electricity Supply (Safety and Network Management) Regulations, 2008, and various environmental and planning laws as well as Australian Standards for the management of urban trees.

Currently, Council removes around 300-400 street and park trees per year (excluding post storm events) and guarantee that they replant more trees each year than they remove.

It is estimated that there are potentially 50-60,000 public urban trees including an estimated 30,000 street trees in Hornsby Shire. There is a further estimated 30,000 vacant street tree sites across the Shire. Given there is only data for a third of the estimated street tree population, it is difficult to identify broader themes and

issues. The paucity of data also means it is difficult to plan and strategically manage the street and park tree assets.

The Tree Management Team are responsible for:

- Actioning customer requests
- Tree removal and tree planting
- Maintenance works
- Reviewing development applications that impact on private and public trees
- Enforcing the Tree Preservation Order for private trees.

Due to the bulk of the team's work stemming from customer requests and development applications, there has been no opportunity or pathway to deliver a strategic tree management program. While tree works are carried out to best practice standards, the lack of robust asset planning and future works, means that there are gaps in best practice asset management and alignment with other streetscape planning and works.

2. Rural Roads

Council's Parks, Trees and Recreation and Natural Resources Branch's jointly respond to management issues regarding trees on rural roads. Given the lower density of residents in these areas, customer requests for trees on rural roads are much lower than for those in the urban area.

Some rural roads house protected ecological vegetation communities and as such are managed by the Natural Resources Team. There is, however, no overarching set of principles that dictate the management of these areas, no detailed data showing the quality and quantity of trees and no formal policy for their ongoing management.

3. Bushland Trees

Council's Natural Resources teams respond to management issues regarding trees in Bushland Reserves. Many of the customer requests for trees in these areas relate to properties on the interface of residential areas and bushland.

As much of the vegetation on the interface represent remnant vegetation communities, and are therefore often of high ecological values, e.g., Endangered Ecological Communities (EECs), the management response to trees in these areas prioritises ecological arboriculture practises.

4. Other public land trees

State Government Agencies are also responsible for managing trees on their own land. This includes larger landholders such as the Department of Primary Industry and Environment, including Crown lands, Departments of Education, Family and Community Services as well as agencies such as Sydney Water Corporation, Transport for NSW, Sydney Trains, Roads and Maritime amongst others. Each of these have their own guidelines regarding tree management, particularly regarding the risk trees place on their own assets.

Greening Our Shire program

The public tree management program has been boosted significantly with one-off funding for the delivery of the Hornsby 30,000 by 2021 trees program. This program will see 10,000 more street trees planted over the 2019-2021 period, which is a huge boost to the street tree population. An ongoing urban forest management program will need to pick up the legacy left by this 30,000 Trees program by continuing to manage all the trees planted under this program, fill remaining vacant street tree sites across the Shire and continuing to engage and involve the local community.

5. Private Trees

Trees in front and back yards, on rural properties and on commercial and industrial owned land are managed by their respective landowners and are accountable under the existing Hornsby Local Environment Plan and Development Control Plan.

The NSW planning code, which is essentially controlled and directed by the NSW government through Local Environment Plans (LEP) sets the boundaries for how development can occur within a region. At a local level, Council has the ability, through its Development Control Plan (DCP) to seek protection of certain trees. Complying and exempt development also require a permit or development consent for removal or pruning of trees.

6. Other influencing agencies

The ongoing management and renewal of infrastructure and services also influences and impacts on urban trees. Ausgrid is required to keep electricity lines safe by clearing any vegetation within a certain area of the line. This is a legislative requirement that must be maintained, but which regularly impacts on both the extent and quality of the tree canopy across, not only Hornsby, but across Greater Sydney. Also, the NSW Rural Fire Service, which administers the 10/50 vegetation clearing scheme

provides a mechanism for private property tree and vegetation removal without requiring approval or reporting.

7. Traditional Owners

There is very little known about the current cultural values of Hornsby's trees and their meaning for traditional owners. It is likely that some trees remain which form part of indigenous history, yet more research and collaboration is needed to identify these and link them into cultural story telling. Traditional owner values have an equal place in the ongoing management of the urban forest yet are largely a silent voice, except for specific project-based consultation, e.g., Environmental Sustainability Strategy, undertaken with the Hornsby Aboriginal and Torres Strait Islander Consultation Committee (HATSICC).

5. Key Challenges

1. Canopy loss

2020 Vision in collaboration with The Royal Melbourne Institute of Technology (RMIT) undertook some baseline tree canopy mapping comparing the years between 2009 and 2016. This analysis suggested that tree canopy cover across Hornsby Shire Council reduced by 5 percent during that seven-year period (Amati et al, 2016).

More detailed analysis with Hornsby Shire was conducted to try to understand these causes and locations of loss. The report by Smith et al, (2017) found that the Hornsby Shire is more likely losing canopy in urban areas at approximately 3 percent each year. This is equivalent to 12,000 to 15,000 trees each year across the public and private realm.

There are multiple reasons that have and continue to contribute to the canopy loss across Hornsby. On private land, Smith et al. (2017), reported three reasons:

1. general removal of trees and non-replacement
2. clearing directly associated with urban development and renewal
3. the impact of clearing within bushfire prone areas.

Trees are being removed either with or without approval under the Council's requirements set in the Hornsby Development Control Plan. The research by Smith et al (2017) further suggests that once trees are removed, they are not replaced. RMIT's tree canopy cover change mapping suggests the same.

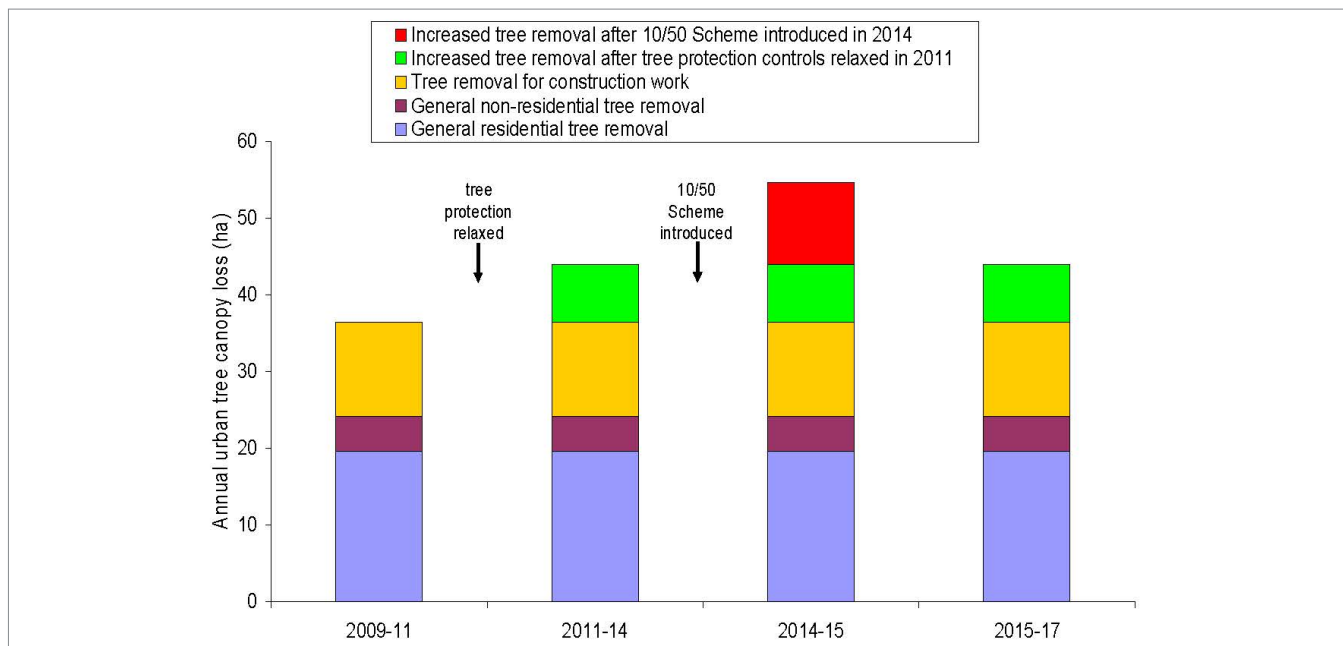


Figure 30: Proportional canopy loss each year by tree removal “activity” across the Hornsby local government between 2009-2017 (Smith et al 2017).

If this trajectory of loss continues, Hornsby’s urban forest could be significantly diminished within a 40 year period.

The issues of both clearing for bushfire and urban development are discussed in their own sections below (sections 4 and 5 respectively).

It is yet unknown if tree canopy cover is increasing or decreasing on public land. It is likely there are considerable losses attributed to road, drainage and utility (including electricity and telecommunication) works as well as extreme weather events such as

storms and heatwaves. However, it is possible that these losses may be compensated for by the annual growth in remaining tree canopy across the public realm. Further detailed canopy change analysis is required to understand the change in canopy cover across the public realm to understand if it is reducing, remaining stable or increasing.

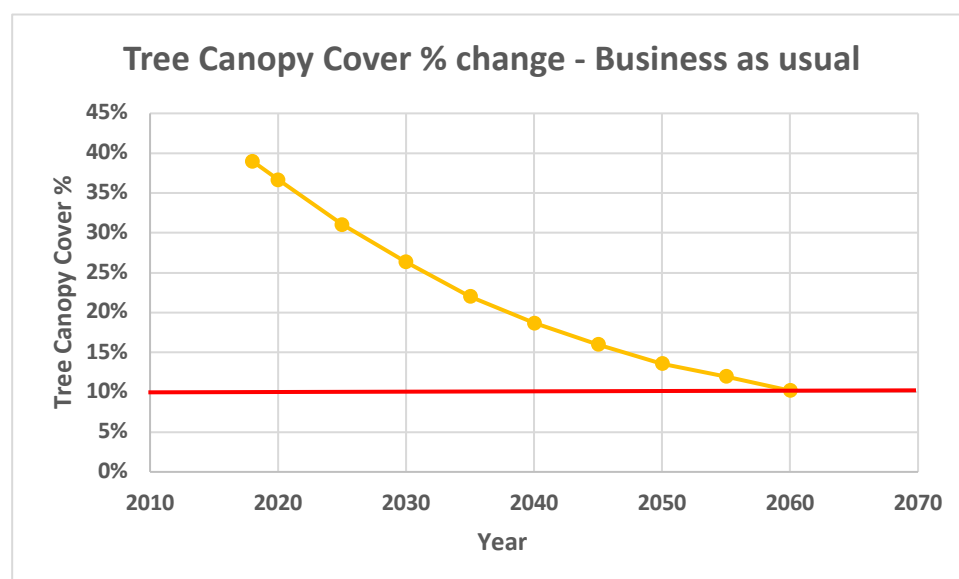


Figure 31: Trajectory of canopy cover change if Hornsby continues to lose 3 percent of its total canopy each year

2. Data, Evidence and Knowledge

Robust data, evidence and science is now the necessary foundation required for any new government policy. Understanding the extent, quality and change of the urban forest asset is required in order to make good decisions.

Added to this, consistent and accurate data is paramount. The Office of Environment and Heritage, following suit of other State Governments across Australia, recently invested in high resolution spatial vegetation mapping. This data provided the basis for the detailed baseline canopy mapping for this Strategy. From here though, regular snapshots of this data will be paramount for measuring the change in canopy at scales which can inform land use planning i.e. where exactly are trees being lost and why. Without this data, there is still a major gap in understanding Sydney wide what the changes are.

Further to this, the collection of detailed tree inventory data for Council's managed trees is expensive and time consuming. Maintaining the data integrity of this data base poses challenges for staff and data management systems. A more efficient method of updating this tree data coupled with a streamlined tree assessment program should be explored to overcome this issue.

The emergence of new and cheaper technologies for gathering remote spatial data means that this regular data capture will be possible. When combined with an improved tree data management system, the ability to track change, monitor success and loss is tremendous. This data could also help Council to monitor illegal tree removals, helping compliance and enforcement of regulation.

3. Trees on Private Property

In Hornsby, the evidence strongly points to canopy loss predominantly occurring on private land which therefore raises high expectations of land use planning. The NSW planning code, which is essentially controlled and directed by the NSW government through Local Environment Plans (LEP) sets the boundaries for how development can occur within a region. At a local level, Council has the ability, through its Development Control Plan (DCP) to seek protection of certain trees through its Tree Preservation Order.

This is largely a merit-based assessment process that applies to any tree as defined by the Council. Notable, however, is that Council has changed its definition of a tree three times within the period 2000 to 2018. Tree loss between 2011-2018 can be attributed to a very narrow definition made up entirely of only trees that are indigenous to the Hornsby Shire. This narrow definition in effect permitted the removal without approval of all other trees. Amendments in 2018 have addressed this shortcoming.

What is less certain is the extent to which residents are aware of and follow the new provisions that requires an application, fee and determination by Council. While Council has broadened its definition of a tree in the DCP, 60-70 percent of applications for tree removal or pruning are approved.

Results from the Community Tree Survey in June 2019 overwhelmingly show that while people want to leave a greener legacy and support Council to better manage trees in the public realm, they feel they should be able to determine what happens on their own land. However, as the canopy statistics show, relying on public realm tree canopy is simply not enough for Hornsby. What happens on private land is important, meaning that regulation is still likely to be a useful tool as part of an integrated suite of solutions.

Table 1 Hornsby Shire Council's changing Definition of a Tree

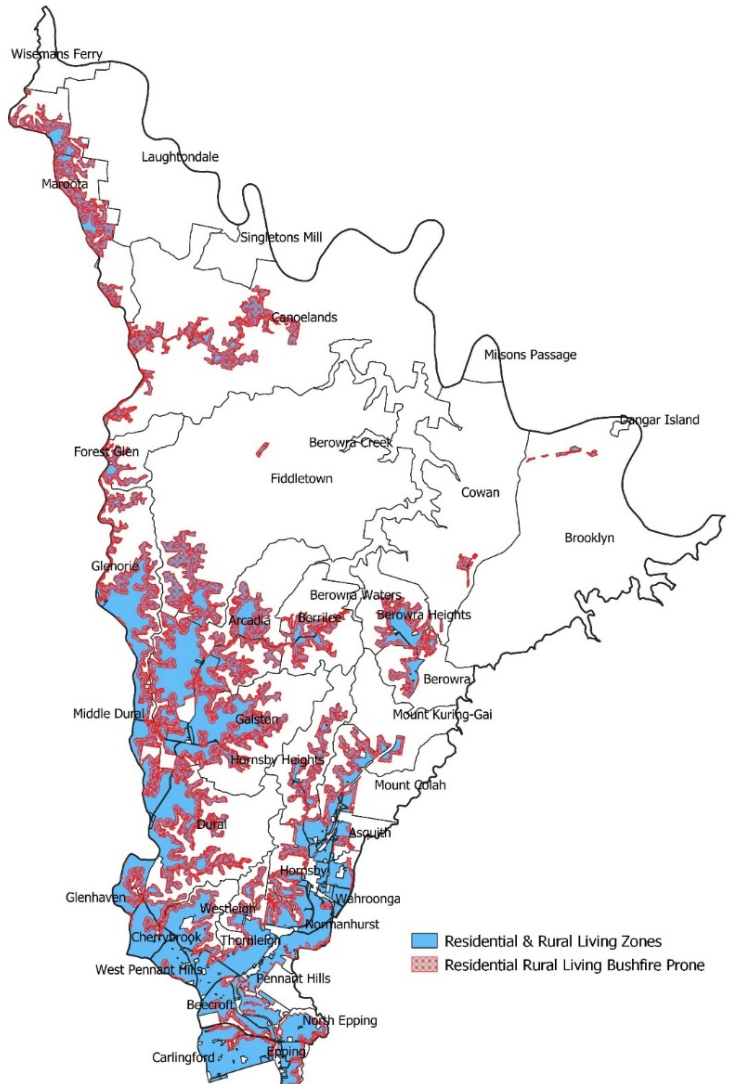
| Tree Preservation Order | 2000 | 2011 | 2018 (DCP definition) |
|--|--|--|--|
| General definition of a tree (noting that within the TPO there are specific exemptions and provisions) | 'tree' shall mean a single or multi-trunked wood perennial plant having a height of not less than 3 metres and which develops many branches, usually from a distance of not less than 1 metre from the ground, but excluding any plant which, in its particular location, is a noxious plant declared as such pursuant to the Noxious Weeds Act 1993. This definition of 'tree' includes any and all types of Palm trees | Trees that are indigenous to Hornsby Shire and greater than 3 metres | A tree is defined as a long lived woody perennial plant with one or relatively few main stems with the potential to grow to a height greater than 3 metres |

4. Bushfire

Approximately half of the populated areas (i.e. designated residential or rural living zones) across Hornsby are prone to bushfire (Figure 31). These zones are also regulated by the 10/50 vegetation clearance entitlements.

Tree removal for the purpose of managing bushfire risk, known as the 10/50 Vegetation Clearing Scheme, is another driver for loss. In 2014 an amendment to the Rural Fires Act 1997 and introduction of the 10/50 Scheme resulted in a spike in tree removal in the period 2014-2015. As Hornsby Shire is Sydney's most vulnerable Council to bushfire risk (Hannam, 2016) this loss is not surprising. What is notable as part of the analysis of canopy loss between 2009 and 2017 is that properties within the Bushfire Prone Lands area, and therefore subject to the 10/50 Vegetation Clearing, have reported no additional clearing of canopy since 2015. This suggests residents living in these areas took advantage of the entitlement early on (2014-2015) as an opportunity to clear land. As demographic and land use density changes continue and the likelihood of bushfires increase it is likely that further canopy loss within bushfire prone lands will continue due to clearing.

Figure 31: Bushfire planning map of the Hornsby Shire



The urban forest has two key considerations in the issue of bushfire. The first is the perceived or real risk of urban trees contributing to bushfire. The second is the evidence and data that suggests that urban trees can play a key role in buffering urban areas from bushfire, using exotic species less prone to burning and the increased use of irrigation and water sensitive urban design in the landscape. (Driscoll, 2013). Smooth barked trees have proven to be effective in reducing the impact and distance of embers and therefore severity of bushfire. (CFA, 2011). Further to this, recent research suggests that land clearing actually contributes to increased bushfire by altering the climate, reducing soil moisture and losing windbreaks (Maron et al, 2019).

Research suggests that majority of bushfires are started by people, not weather, so good urban planning and tight regulations and prosecution of those lighting fires should be given greater priority than removal of urban trees. Fire safety is about urban planning, managing vegetation right next to houses, implementing bushfire survival plans, e.g., leaving early, prevention and rapid suppression, house construction standards and insurance (Driscoll, 2013).

Further to this, there is much work to be done in educating the community about bushfire, the actual risks, how best to prevent it around the property and responses for managing property in a bushfire situation. The aim of an educational component would be to understand the very real fear that the community has about bushfire and discuss best practice ways of managing its risks, including the role that the urban forest plays.



5. Growth, Development and the Shrinking Backyard

While the benefits of urban forests are widely recognised, they continue to remain a low investment priority when compared with both urban development and infrastructure. Over the past three decades the Hornsby local government area has increased the area of developed land through the opening of new subdivisions and increased urban density. In the recent decade this has been directly attributed to meeting state government housing targets. These targets however did not include any corresponding canopy or vegetation retention targets or expectations, unlike the current North District Plan. Cumulatively, past development decisions have contributed to a de-valuation of trees and therefore existing trees have been lost and new ones not planted. Development has also resulted in a corresponding need for enabling infrastructure, such as new roads, telecommunications, water, gas and electricity that collectively have led to the clearing of many canopy trees. The actual attribution to canopy loss as a result of the various forms of infrastructure is complex. Similarly, it is also simplistic to suggest that slowing the rate or type of development and having more effective policy and enforcement will alone successfully stop the decline.

Increasing residential development across the Hornsby Local Government Area has been enabled through State-wide, metropolitan, district, local housing and development targets. Changes in zoning, increasing urban densities, and the impacts of complying development and other state planning policies collectively contribute to lesser soft landscape areas and consequently the area required to support canopy trees. In essence, Australia is facing the issue of the shrinking backyard which has been well documented across Australia (Hall, T. 2010)

The need for more housing and therefore services to accommodate a growing population will be a constant factor in Hornsby's future decision making. Hornsby's population is predicted to grow at 1 percent per annum to 2036 (<https://profile.id.com.au/hornsby>, 2019). This population growth will essentially be driven by the existence of new dwellings. Dwelling numbers are likely to increase in the areas of Asquith, Waitara and Hornsby where medium and high-density residential development are focussed whereby associated infrastructure for services will also be required. Relying solely on street trees to provide the requisite canopy cover for these areas will be inadequate. These developments in medium-high density areas will need to contribute properly their share of tree canopy cover. This means that tree protection, onsite tree planting and deep soil requirements will need to be applied within these development zones.

As a result, the way in which this new housing is built must instead include better landscaping, trees and broadly urban greening outcomes (such as green roofs and undergrounding of overhead power lines) if the character of the Shire and the objective of liveability and climate change adaptation are to be met. An important first step will be to place appropriate values on both existing and future trees. Hornsby will then need to better integrate infrastructure and building design with urban greening outcomes, including adequate space for street trees.

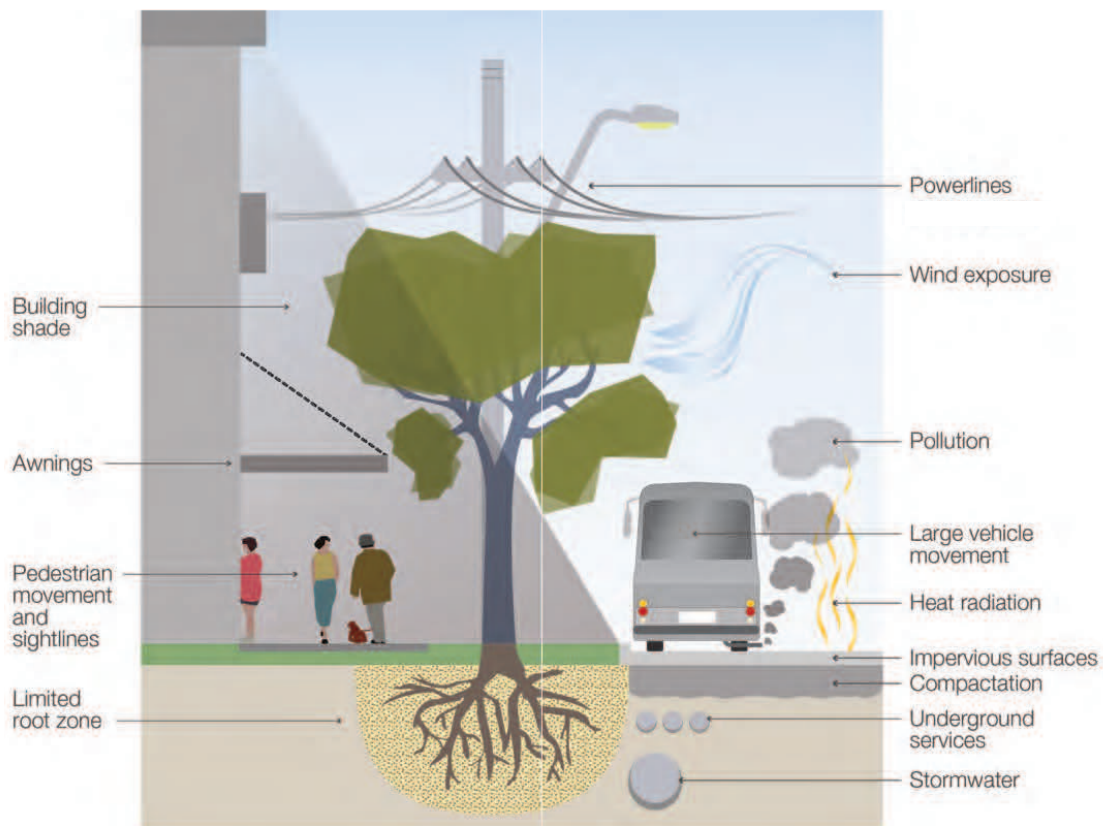


Figure 32: Urban trees face an array of challenges including competition for space
 Source: City of Melbourne Tree Diversity Guidelines, Aspect Studios, 2011

6. Trees on Public Land

Trees on public land face a constant range of hardships and conflicts that require ongoing assessment and management. Competition for space with services and utilities, traffic, footpaths means that trees in public spaces are often compromised. Severe pruning of canopies to abide by electrical line clearance guidelines or air space for overhead trainlines, roots being cut to make way for new underground services as well as compaction from cars and heavy traffic make for fairly tough growing conditions. There are many practices that tree managers can now follow to improve these impacts on trees of which Council follow many already. Given the population growth, increased densification and urbanisation set to occur in Hornsby Shire, these practices will need to be embedded as business as usual so as to improve the outlook for many of the public urban trees.

7. Large and Significant Trees

Hornsby is home to large and significant trees, on both private and public land. They contribute enormously to the distinct character of Hornsby Shire and its local biodiversity. However, Hornsby faces a clear tension between these trees and the residents who live underneath them. The perceived and real risks of large trees in urban environments influence personal decisions often leading to tree removal for reasons such as safety, development, bushfire or simply that the tree has or is perceived to be at end of its life.

While there is clear recognition that large trees are very important in urban environments, appropriate recognition must be given to the real and perceived issues of living underneath one. Council will need to carefully negotiate between these two ideals e.g. establish robust protocols to retain or remove trees based on sound principles of risk management whilst taking into account the broader regional benefits of the tree.

8. Climate Change

The climate is changing and while in Hornsby this may not be readily felt by the community as it is in Western Sydney, this will mean some significant challenges for Hornsby Shire, its community and environment.

Warmer temperatures, increased occurrence of storm events and potentially lower average rainfall will have deep impacts on the urban forest. Research suggests that many endemic or indigenous tree species across Australia will simply not cope with increases in temperature or lower rainfall. The latest research from Macquarie University shows that the two dominant species of street trees in Hornsby, Callistemons and Jacaranda's are not likely to thrive under Sydney's modelled climate scenarios (Burley et al, 2019). Increased storm events will see greater damage being caused by high winds and heavy rain. This means that any species of tree planted in Hornsby need to be considered for their resilience in the face of climate change and a preferred species list constantly reviewed and updated based on the latest research.

While the urban forest is one of the most efficient and cost-effective mechanisms for adapting to climate change, there is a caveat. Hornsby's Urban Forest must be resilient, healthy, diverse and well managed. And this requires robust planning and annual investment in a strong tree management program.



6. Hornsby's Future Urban Forest

Hornsby's future urban forest will continue to be a valuable asset and integral to maintaining Hornsby's character, but only if the appropriate processes and programs are put in place now. Strategies will be required for all land: public and private. Vacant street and park tree sites will be filled with resilient, healthy and diverse trees. Existing trees will be managed for their useful lives and renewed when needed. Some locations across the Shire will have more vacant sites than others, while other locations will continue to maintain very high levels of tree canopy cover. Appropriate species will be selected for their ability to thrive and be supported in their individual locations. Species will also be resilient and diverse.

It will not be possible to compensate for the existing loss of canopy only within public areas. As a result, Council will also need to implement the most appropriate and robust planning tools with support mechanisms to deal head on with the loss of tree canopy in the private realm.

And this will all be driven by the recognition that it is everyone's responsibility to be stewards for the future urban forest, led by Council and supported by landholders and agencies across the Shire.

Hornsby's Future Urban Forest will be built around three strong opportunities:

1. Leadership

Hornsby Shire Council, in developing its first Urban Forest Strategy, is able to set a strong policy framework to guide the future character and liveability of the Shire and to define its role as a regional leader.

Leading by example with the community is critical for raising awareness, knowledge, connectedness, and stewardship amongst those living, working and visiting in the Shire. Leading policy and strategy implementation through innovation, science-based evidence and community empowerment is critical for a thriving future urban forest that will provide guidance and an inspiration for other local governments.

Leadership is multifaceted and incorporates small scale changes. This can range from better decision making around trees to larger scale transformation in amended DCP controls and advocacy with the state government around consistent regional data and delivery of multi-government urban forest outcomes for the Sydney

region.

By ensuring that its policy, programs and projects reflect best practice urban tree management, Hornsby Shire has the opportunity to be a leading exemplar for urban forest management for bushland and peri-urban municipalities.

2. Developing a clear, integrated urban narrative with the community

Council has developed a Local Strategic Planning Statement. This includes the development of a narrative and principles to guide the future of Hornsby. It is imperative that the urban forest vision and objectives as set in this Strategy are embedded in this. A strong shared vision will enable better decision making, more meaningful outcomes and a thriving future.

In setting this narrative, the needs of current and future communities as well as the highly valued environment need to be considered alongside economic development, housing and population growth. This means engaging, educating and advocating more with the community to understand what their desires and aspirations are.

There is also a clear opportunity to integrate all elements of planning, policy and implementation across Council to enable good urban design, outcomes with multiple benefits, and the realisation of a connected, healthy and thriving future urban forest.

3. Empowerment

All landholders in the Shire have responsibility for the future of Hornsby's urban forest. By providing leadership and developing a strong narrative for Hornsby, Council can enable, empower and inspire all landholders, including residents, state government, businesses and developers to contribute to the growth of a thriving future Hornsby Shire and its urban forest.

Vision

Hornsby Shire Council will have a healthy, thriving, diverse and valued urban forest that provides shade, cooling and adds colour and life to the Shire. Six emerging themes are as follows

- Maintain and improve Hornsby's unique character
- Retain and value the strong green and leafy character in our suburbs
- Protect and value existing trees, renew the ageing trees and increase tree numbers on public and private land
- Increase community knowledge and connection with the urban forest and the surrounding bushland
- Engage and educate the community by encouraging participation and stewardship
- Embed the Shire's goals and objectives into a better community understanding of the importance of the urban forest and its evolution
- Mitigate and adapt to climate change
- Build a resilient urban forest, reduce urban heat island, design for health and wellbeing, improve water sensitivity
- Protect, secure and connect urban habitats and surrounding bushland
- Improve the functionality of the urban forest to deliver higher conservation, habitat and connectivity values through a thriving urban ecology
- Showcase integrated and sustainable design
- Ensure sustainable green development in public and private realm through integrated place making, urban design and housing development
- Strong leadership and good asset management
- Provide leadership in urban forestry and adopt and adhere to professional standards and best practice asset management
- Acknowledge the importance of the urban forest as a critical asset class .

Targets

By 2040:

1. Tree Canopy Cover over private residential areas will be maintained at 33 percent to ensure no net loss
2. Tree Canopy cover over Hornsby's urban road network will increase from 39 percent to 50 percent .
3. Tree canopy cover over commercial zones will increase from 11 percent to 15 percent
4. Increase the number of streetscapes incorporating biodiversity corridors
5. Improve the species diversity and useful life expectancy distribution of Hornsby's street trees

The Draft Urban Tree Canopy Guide (NSW Government Architect, 2019) has been used to set these proposed targets: "The percent age of canopy cover in areas identified as priority links within the Sydney Green Grid aligns with the urban tree canopy targets: > 15 percent in CBD, > 25 percent in medium to high-density areas, and > 40 percent in suburban areas." The guide has been developed to accompany the Greater Sydney Commission's District Plans.

7. Action Plan

In achieving the vision and targets, Council will need to focus on managing trees on public land, regulating and influencing tree canopy on private land and empowering the community.

All are equally important in ensuring that Hornsby retains its aspirational canopy cover so as to continue to provide the wealth of benefits it provides. In framing the implementation plan, the following hierarchy of priorities are proposed. These reflect the ecological and landscape values of the existing large canopy trees. Given the rate of canopy loss across the Shire it is also critical to undertake additional tree planting, noting that the canopy

and operational plan

- Implement policy, controls, actions and enforcement. This will have a dual focus on the management of canopy across public and private land and how the policy and actions are framed, simply as regulatory or voluntary
- Monitor and evaluate policy/actions and enforcement. This turns on internal and external data, systems and reporting processes.

Coordination and governance

Urban forest management is broader than just street and park tree management. Implementation of this Strategy will require resources to work over and above the current tree management program, but in close collaboration

Urban Forest Priorities

Protect and conserve large, healthy canopy trees – this should extend to all trees, whether indigenous, native or exotic, as defined by Council's DCP, to provide ecological habitats and support a contribution to the urban greening character of the area.

Replace canopy trees lost on public and private land through required planting, education and incentives targeted at property landowners and developers. Some trees will need to be removed for various reasons including to manage risk and to balance individual and institutional concerns of trees in poor health or within inappropriate locations. However, it is important that this canopy is reinstated to maintain vigour and dynamism of the urban forest.

Create new canopy opportunities - for new development areas and street scapes with little canopy there are opportunities to create new areas of urban tree cover. This can integrate with the outcomes of other council and district plans and policies to support urban greening and to make more liveable and sustainable suburbs.

benefits of this part of the strategy will take many years to achieve the desired canopy levels.

The implementation of the Urban Forest Strategy is framed within a conventional management response. There are four types of recommended actions:

- Develop and refine policy and associated actions. This process must involve internal and external consultation and is the focus of this document and is central to the development of Hornsby Shire's Local Strategic Planning Statement.
- Design budgetary, program, regulation and enforcement processes. This step needs to have an emphasis on the internal capacity and political priority to ensure policy outcomes remain a priority. This should link to the Council's community strategic planning process and the annual budget

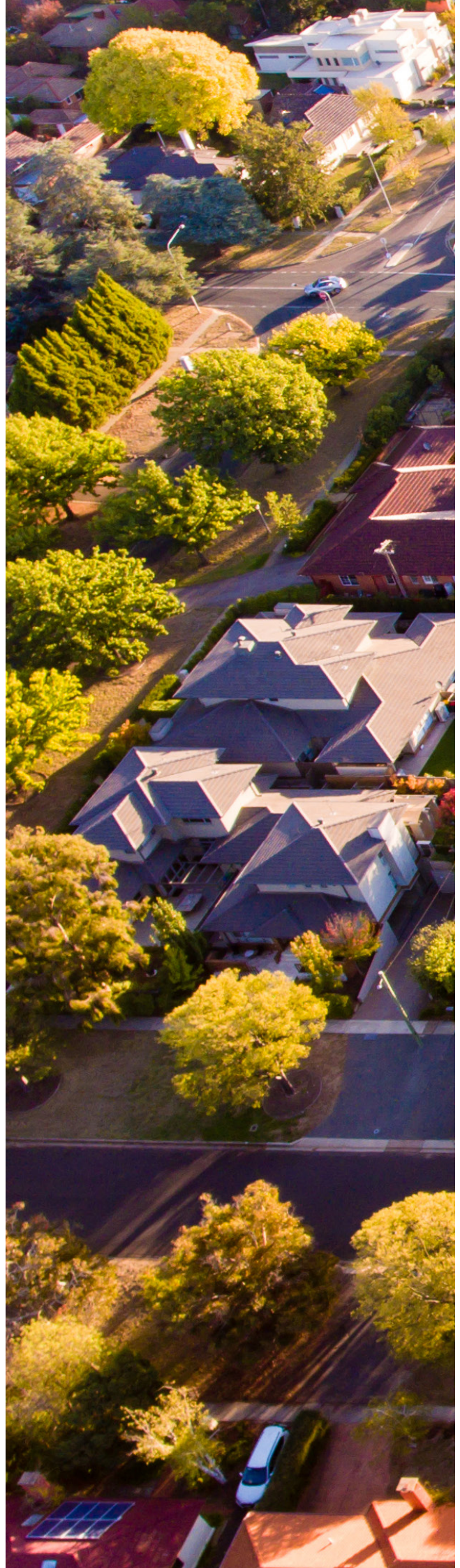
and partnership with them. Urban forest management will require ongoing internal planning and collaboration with planners, natural resource management, biodiversity, community engagement, engineering and risk teams to fulfil the actions listed below. It will also require strategic liaison and education with external agencies and the community so as to integrate the canopy concerns across public and private realm, regardless of landholder. This will mean the procurement or restructuring of role/s to build the requisite knowledge and skills for coordination and governance.

Priority Action:**1. Investigate resources required to progress actions**

A dedicated resource/s will be needed to implement this Strategy. The resource will need to work closely with all relevant Council Branches as well as external agencies. They will need to regularly ensure that the urban forest is part of the planning and implementation of all projects and programs across the Council area.

The dedicated resources will also need to reconcile and adopt the huge amount of work already undertaken for the Greening Our Shire project and transition it into an annual tree planting and management program, including ongoing community engagement.

Implementation of actions will be dependent upon the availability of Council resources (staff and financial). Where possible, Council will realise opportunities through alternate funding pathways by working in collaborative partnerships and applying for grants.



| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|---------------------------|------|---|--------|---|---|----------|
| | | | | | | |
| 1. Public Tree Management | 1.01 | Prepare a street tree database and inventory | 1.01.1 | Collect current qualitative and quantitative data regarding Hornsby's public urban tree assets, including street trees and trees within community land classified as Parkland or Sports field (Refer to Appendix 1 for details) | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.02 | Manage street trees through Council's asset management system | 1.02.1 | Incorporate data from tree inventory into Council's asset management system | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.02 | Manage street trees through Council's asset management system | 1.02.2 | Implement tree management in line with best practice asset management | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, EP&A Act HSC DCP | H |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|---------------------------|------|--|--------|---|---|----------|
| 1. Public Tree Management | 1.03 | Prepare a Street Tree Masterplan | 1.03.1 | Collect and assess knowledge and data from existing and proposed programs to inform the masterplan preparation | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP | H |
| 1. Public Tree Management | 1.03 | Prepare a Street Tree Masterplan | 1.03.2 | Prepare a Street Tree Master Plan to inform the strategic and operational management of these assets. (Refer to Appendix 1 for details) | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.03 | Prepare a Street Tree Masterplan | 1.03.3 | Engage all relevant sections of Council to ensure the Street Tree Master Plan is supported through other works programs. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.04 | Establish an annual tree planting budget | 1.04.1 | Capital and operational expenditure need to be informed by the Masterplan and integrated within Council's community strategic planning process. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP | H |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|---------------------------|------|---|--------|---|---|----------|
| 1. Public Tree Management | 1.05 | Develop a public urban tree management policy | 1.05.1 | Develop a urban tree management policy that standardises decision making processes against a clear Council objectives all elements of street and park tree management | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP HLEP | H |
| 1. Public Tree Management | 1.07 | Prepare a Rural Roads/ Roadside Remnant Vegetation Monitoring and Management policy | 1.07.1 | Prepare a policy that aligns with the Biodiversity Conservation Management Plan 2020 to manage the protection of trees and provide guidance for other practices along rural roads. | North District Plan, BC Act | H |
| 1. Public Tree Management | 1.08 | Develop a schedule of tree maintenance works | 1.08.1 | Prepare a yearly schedule of maintenance and management works, based on the results from the street tree data collection, to improve the overall health and amenity of street trees. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.09 | Prepare technical tree management guidelines | 1.09.1 | Prepare guidelines that incorporate the working processes, supporting standards, guidelines and preferred species selection list for staff to make daily decisions regarding tree management. | North District Plan, Green Infrastructure Policy, Community Strategic Plan, | H |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|---------------------------|------|---|--------|--|---|----------|
| 1. Public Tree Management | 1.09 | Prepare technical tree management guidelines | 1.09.2 | Update the guidelines regularly to reflect best practice tree management, new evidence and research, Australian standards and other asset guidelines such as water sensitive urban design protocols. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | L |
| 1. Public Tree Management | 1.1 | Review tree management procedures and workflows | 1.10.1 | Audit all tree management decision making and procedures to identify areas to improve efficiencies and remove duplication and inconsistencies. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 1. Public Tree Management | 1.1 | Review tree management procedures and workflows | 1.10.2 | Implement changes and solutions to streamline procedures e.g. customer requests, procurement and data management. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 1. Public Tree Management | 1.1 | Review tree management procedures and workflows | 1.10.3 | Support staff to implement changes and solutions through education and building capacity | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

| Strategy | Action | Task | Strategic/ Legislative Driver | Priority |
|---------------------------|--|--|---|----------|
| 1. Public Tree Management | 1.11 Identify and adopt a tree valuation method | 1.11.1 Develop a tree valuation methodology, using data captured from the tree inventory, for Hornsby's public trees, including environmental, social and economic benefits of trees. | North District Plan, Green Infrastructure Policy, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.11 Identify and adopt a tree valuation method | 1.11.2 Investigate using valuations to implement bonds | North District Plan, Green Infrastructure Policy, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.11 Identify and adopt a tree valuation method | 1.11.3 Use valuations to improve education and awareness within Council and the community about the benefits of trees in urban and bushland settings. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.12 Investigate the functionality of public tree protection bonds for use by Council | 1.12.1 Investigate an appropriate process, using the valuation method, to implement and enforce public tree protection bonds as condition of consent for private development that may impact on public trees. | North District Plan, Green Infrastructure Policy, Community Strategic Plan, | H |
| 1. Public Tree Management | 1.13 Develop procedures for ongoing street tree data collection | 1.13.1 Develop a clear and efficient system for real time data updates to the tree database when any staff or contractor complete work on a public street tree. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|---------------------------|------|---|--------|--|---|----------|
| 1. Public Tree Management | 1.14 | Review Plans of Management | 1.14.1 | Incorporate relevant urban forest objectives and refer to the Urban Forest Strategy when Plans of Management are reviewed and updated. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, EP&A Act | M |
| 1. Public Tree Management | 1.15 | Liaise and work collaboratively with utility and external service providers | 1.15.1 | Continue to work closely with Ausgrid, Sydney Trains and Sydney Water regarding better outcomes for the urban forest in the planning and management of their assets. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 1. Public Tree Management | 1.15 | Liaise and work collaboratively with utility and external service providers | 1.15.2 | Align with NSW Roads and Maritime Services Landscape Design Guidelines 2019: Design guideline to improve the quality, safety and cost effectiveness of green infrastructure in road corridors. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 1. Public Tree Management | 1.15 | Liaise and work collaboratively with utility and external service providers | 1.15.3 | Advocate for aerial cable bundling or undergrounding of powerlines where possible and feasible. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M, L |
| 1. Public Tree Management | 1.16 | Monitor and evaluate canopy cover at regular time intervals into the future | 1.16.1 | Measure canopy cover every five tree years and evaluate against baseline and intended targets for canopy and diversity | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |

| Strategy | Action | Task | Strategic/ Legislative Driver | Priority |
|----------------------------|--------|--------|---|----------|
| 1. Public Tree Management | 1.18 | 1.18.1 | Prioritise Council's Community Nursery as the primary source of public tree stock | |
| | | | Review Council's Community Nursery tree production program to ensure it is informed by future street tree masterplans and preferred street and park tree planting lists. | |
| 2. Private Tree Management | 2.01 | 2.01.1 | Assess lot scale canopy cover change through digital mapping | |
| | | | Measure and identify the change in tree canopy at lot scale across Hornsby's residential zones. Identify where on lots canopy trees are being removed (front, side, rear) and the relationship to other canopy trees in the public and private realm. | H |
| 2. Private Tree Management | 2.01 | 2.01.2 | Assess lot scale canopy cover change through digital mapping | |
| | | | Measure every 5 years given the rate of development and tree loss across the Shire. | H |
| 2. Private Tree Management | 2.01 | 2.01.3 | Assess lot scale canopy cover change through digital mapping | |
| | | | Investigate and measure the effectiveness of DCP controls using updated data | H |
| | | | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, Green Infrastructure Policy, Community Strategic Plan, North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP HELP | |

| Strategy | Action | | Task | Strategic/ Legislative Driver | Priority |
|----------------------------|--|------|---|---|----------|
| 2. Private Tree Management | Engage with the State Government to secure local government area and suburb vegetation mapping | 2.02 | Lobby with other local governments to the State Government to commit to collecting high resolution vegetation mapping for Greater Sydney on a regular basis e.g. every two or five years to provide temporal data set | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | Engage and advocate with developers regarding the benefits of tree retention and planting | 2.03 | Engage with local developers to educate them on the importance and benefits of the urban forest, particularly in residential and mixed-use development | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan | M |
| 2. Private Tree Management | Engage and advocate with developers regarding the benefits of tree retention and planting | 2.03 | Investigate trials or pilot projects, including possible incentives, for those developers interested in seeking better urban greening outcomes. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan | M |
| 2. Private Tree Management | Develop assessment protocols for vegetation management for exempt/complying development | 2.05 | Review LEP controls, with a particular focus on setbacks to enable canopy retention and planting, for exempt and complying development. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP HLEP | H |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|----------------------------|------|---|--------|---|---|----------|
| 2. Private Tree Management | 2.05 | Develop assessment protocols for vegetation management for exempt/complying development | 2.05.2 | Prepare guidelines for developers for exempt and complying development to support Council's local strategic planning strategy and character statements across the LGA. Controls must be consistent with LEP outcomes and DCP controls. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP HLEP | H |
| 2. Private Tree Management | 2.05 | Investigate the establishment of a canopy target for rural lands similar to those for urban areas | 2.05.2 | Using mapping data review existing canopy cover and explore opportunities to establish a target for rural lands that takes into account rural land use and biodiversity needs. This should include incentive programs for increasing canopy | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP HLEP | H |
| 2. Private Tree Management | 2.06 | Develop Local Environment Plan standards | 2.06.1 | Develop relevant LEP standards (Part 4 of the standard LEP template) to support the protection and management of existing canopy trees and future canopy planting within relevant land use zones and consistent with local character statements (Refer to Appendix 1 for details) | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP HLEP | M |

| Strategy | Action | Task | Strategic/ Legislative Driver | Priority |
|----------------------------|---|---|---|----------|
| 2. Private Tree Management | 2.07 Revise Development Control Plan provisions | 2.07.1 Revise and develop DCP provisions to reinforce the hierarchy of protecting, restoring and creating canopy across the local government area consistent with local character statements, tree canopy targets and district planning directions. (Refer to Appendix 1 for details) | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP HLEP | H,M |
| 2. Private Tree Management | 2.08 Liaise and lobby the relevant state government agencies | 2.08.1 Identify state policies and planning instruments that provide significant hurdles to delivering better urban forest outcomes on the ground. These include, but are not limited to: - State Environmental Planning Policy - 10/50 Bushfire Clearance Entitlements - Housing targets - Electrical Line Clearance Regulation | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | 2.08 Liaise and lobby the relevant state government agencies | 2.08.2 Engage with relevant state government agencies to lobby for policy and planning instrument change because of inconsistencies with greener city objectives as stated in the District Plans and Council strategies. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | 2.09 Review and update Green Offset Policy | 2.09.1 Review the future scope of the Green Offset Policy to determine whether it looks to deliver both biodiversity and tree canopy outcomes (Refer to Appendix 1 for details) | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|----------------------------|------|--|--------|--|--|----------|
| 2. Private Tree Management | 2.09 | Review and update Green Offset Policy | 2.09.2 | Develop a tree canopy policy to support the LEP and DCP if its determined that the focus of that Green Offset Policy remains primarily biodiversity | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP HLEP | M |
| 2. Private Tree Management | 2.10 | Review compliance procedures relating to unauthorised tree removal | 2.10.1 | Review compliance procedures in a wholistic manner across the Organisation, to support statutory planners and compliance officers in their ability to audit, enforce conditions of consent and seek prosecution for breaches | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, EP&A Act HSC DCP HLEP HSC Enforcement Policy and Guideline (to be developed) | M |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|----------------------------|------|---|--------|---|---|----------|
| 2. Private Tree Management | 2.11 | Develop species planting guidelines | 2.11.1 | Identify species for private landscaping with consideration for public/private habitat and amenity linkages, locational characteristics, tree growth and canopy spread and maintenance. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 2. Private Tree Management | 2.11 | Develop species planting guidelines | 2.11.2 | Prepare planting and establishment technical advice for landowners replacing trees, for developers/homeowners planting new trees and people moving into new developments. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 2. Private Tree Management | 2.12 | Develop green roof and wall guidelines | 2.12.1 | Develop a set of guidelines and Community Nursery-located examples for high rise residential and/or commercial development to encourage take up and implementation of alternative elements of greening. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 2. Private Tree Management | 2.13 | Investigate an education and incentives program to encourage tree retention on private land | 2.13.1 | Develop education and awareness campaigns about how individual trees are equally important for the whole forest | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|----------------------------|------|---|--------|--|---|----------|
| 2. Private Tree Management | 2.13 | Investigate an education and incentives program to encourage tree retention on private land | 2.13.3 | Develop recommended tree planting guides and continue free tree giveaways for species of trees less likely to cause future issues | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | 2.13 | Investigate an education and incentives program to encourage tree retention on private land | 2.13.4 | Investigate options to encourage new trees to be planted as part of new developments and explore other greening options for high rise development e.g. green roofs | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | 2.14 | Prepare Housing Development Guidelines that incorporate urban greening | 2.14.1 | Develop development guidelines that include lot scale green infrastructure outcomes. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | 2.14 | Prepare Housing Development Guidelines that incorporate urban greening | 2.14.2 | Lobby with local government groups to develop industry wide housing development guidelines that include lot scale green infrastructure outcomes. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|----------------------------|------|--|--------|---|---|----------|
| 2. Private Tree Management | 2.15 | Support tree giveaways program | 2.15.1 | Actively promote and implement Council's free tree giveaway program | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | H |
| 2. Private Tree Management | 2.16 | Develop a Urban Forest Community Education Program | 2.16.1 | Develop ongoing media and communications pieces talking to the issue of tree canopy loss on private property and what community member can do about it. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | 2.16 | Develop a Urban Forest Community Education Program | 2.16.2 | Develop case studies and education collateral | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | 2.16 | Develop a Urban Forest Community Education Program | 2.16.3 | Implement interactive community workshops and forums on trees for wildlife, bushfire and trees, Hornsby's Tall trees, Hornsby's remnant vegetation and green corridors. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|------------------------------|-----|---|-------|--|---|----------|
| | | strategies, plans and programs | | | | |
| 3. Governance and Engagement | 3.1 | Align urban forest strategy vision and objectives with related Council strategies, plans and programs | 3.1.2 | Incorporate the Urban forest Strategy targets into Council's operational and delivery plan programs and projects. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.2 | Support the development of strategic urban biodiversity framework | 3.2.1 | Identify the role that urban trees play within the development of a strategic urban biodiversity framework which includes core, transition, and corridor areas and prioritise these areas for planning | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.3 | Prepare a Water Sensitive Urban Design (WSUD) Policy that incorporates urban forest outcomes | 3.3.1 | Prepare WSUD policy incorporating guidelines for all stormwater treatment and consistent with urban forest outcomes | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.3 | Prepare a Water Sensitive Urban Design (WSUD) Policy that incorporates | 3.3.2 | Align with Water Sensitive Hornsby project. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|------------------------------|-----|---|-------|---|---|----------|
| | | urban forest outcomes | | | | |
| 3. Governance and Engagement | 3.4 | Develop Green wall and roof policy | 3.4.1 | Prepare green wall and green roof policy for new developments and retrofits | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, HSC DCP | M |
| 3. Governance and Engagement | 3.5 | Establish an Urban Forest/Urban Landscapes internal working group | 3.5.1 | Engage across the organisation. The group should be multi-disciplinary, have executive support and meet on regular basis to share knowledge and build internal capacity with a focus on integrated design and resilient landscapes. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.5 | Establish an Urban Forest/Urban Landscapes internal working group | 3.5.2 | Develop objectives for the group, including supporting the statutory planners and practitioners with tools and evidence to inform their decision making. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.7 | Implement Community Tree Planting Days | 3.7.1 | Continue to implement tree planting days on Council managed land. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|------------------------------|-----|--|-------|--|--|----------|
| 3. Governance and Engagement | 3.7 | Implement Community Tree Planting Days | 3.7.2 | Deliver planting days specific to demographic groups, including culturally sensitive days to encourage greater participation and stewardship from local migrant groups, and youth-specific specific planting days. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.8 | Engage with local Indigenous Groups | 3.8.1 | Engage and partner with the Guringai and Darug people to raise knowledge and awareness surrounding the cultural value of Hornsby's trees. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.8 | Engage with local Indigenous Groups | 3.8.2 | Explore partnerships to develop an indigenous history of Hornsby's trees identify culturally significant trees. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.9 | Prepare annual urban forest communication campaign | 3.9.1 | Develop a suite of engagement tools articles, community workshops, stories, competitions annually to reach out to the broader Hornsby community. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

| Strategy | | Action | | Task | Strategic/ Legislative Driver | Priority |
|------------------------------|-----|--|-------|--|--|----------|
| 3. Governance and Engagement | 3.9 | Prepare annual urban forest communication campaign | 3.9.2 | Identify and target particular audiences, including migrant groups, youth, schools, tertiary students | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 3. Governance and Engagement | 3.9 | Prepare annual urban forest communication campaign | 3.9.3 | Notify and engage with residents regarding annual tree planting program including renewals. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |
| 2. Private Tree Management | 3.9 | Prepare annual urban forest communication campaign | 3.9.4 | Explore the use of developing infographic style communications with landowners to demonstrate the importance of their street tree to the whole urban forest. | North District Plan, Green Infrastructure Policy, Biodiversity Management Plan, Community Strategic Plan, | M |

8. Glossary

Biodiversity: the variety of all living things including different plants, animals and micro-organisms, the genetic information they contain and the ecosystems they form

Climate change adaptation: actions undertaken to reduce the adverse consequences of climate change, as well as to harness any beneficial opportunities

Ecological arboricultural practices: urban tree management techniques that favour biodiversity or ecological outcomes above others e.g. retaining stag trees, planting indigenous species, cutting hollows in tree trunks etc.

Micro-climate: Microclimate is the complex of environmental variables, including temperature, radiation, humidity and wind, to which the plant is exposed.

National Parks: Natural areas of land and/or sea, designated to

(a) protect the ecological integrity of one or more ecosystems for present and future generations,

(b) exclude exploitation or occupation inimical to the purposes of designation of the area and

(c) provide a foundation for spiritual, scientific, educational, recreational and visitor opportunities, all of which must be environmentally compatible. (World Conservation Union (IUCN) 1994 definition

Remnant Trees: Those trees that remain in the landscape following widespread clearance of native vegetation.

Resilience: Urban resilience is typically understood as the capacity of cities to bounce back or even bounce forward from a disturbance or crisis event.

Tree: A tree is defined as a long lived woody perennial plant with one or relatively few main stems with the potential to grow to a height greater than 3 metres

Tree canopy cover: The extent of tree canopy over 3 metres in height over a land area expressed as a percent age of the land area.

Urban heat island effect: Where a city or urban area experiences hotter temperatures than nearby rural areas. It is caused by the heat stored by hard surfaces such as asphalt which is then radiated out. Anthropogenic heat which is created by machines such as cars and air-conditioners, contributes to the urban heat island effect too

Urban forest: Hornsby's urban forest is the sum of all vegetation, the soil and water that support it across the Shire, excluding National Parks and bushland reserves. It is one of the core components of Hornsby's green infrastructure network.

Water Sensitive Urban Design: is an approach to planning and designing urban areas to make use of stormwater and reduce the harm it causes to surrounding waterways

References

- Abhijith, KV., Kumar P., Gallagher, J., McNabola, A., Bauldorf, R., Pilla, F., Broderick, B., Di Sabatino, S., Pulvirenti, B. (2017). "Air Pollution abatement performances of green infrastructure in open road and built-up street canyon environments – A review." *Atmospheric Environment* 162, 71-86
- Amati, M. Boruff, B. Caccetta, P. Devereux, D. Kaspar, J. Phelan K. and Saunders, A. (2017). Where should all the trees go? Investigating the impact of tree canopy cover on socio-economic status and wellbeing in LGAs prepared for Hort Innovation by the Centre for Urban Research, RMIT University
- Burley H, Beaumont L, Ossola A, Baumgartner J, Gallagher R, Laffan S, Esperon-Rodriguez M, Manea A, Leishman M. 2019. "Substantial declines in urban tree habitat predicted under climate change." *Science of The Total Environment*, Volume 685, Pages 451-462, ISSN 0048-9697
- City of Melbourne, 2011. Tree Diversity Guidelines, prepared with Aspect Studios <https://www.melbourne.vic.gov.au/SiteCollectionDocuments/urban-forest-diversity-guidelines.pdf>
- City of Sydney, 2013. Urban Forest Strategy. https://www.cityofsydney.nsw.gov.au/__data/assets/pdf_file/0003/132249/Urban-Forest-Strategy-Adopted-Feb-2013.pdf
- Clark J.R., N.P. Matheny, G. Cross and V. Wake, 1997. A model of urban forest sustainability. *Journal of Arboriculture*. 23(1):17-30.
- CFA, 2011. Landscaping for Bushfire: Garden Design and Plant Selection. https://www.cfa.vic.gov.au/documents/20143/72271/landscaping_for_bushfire.pdf/1c6084e1-159e-a820-b0b3-6dc077e661c0
- DECC, 2018. Soil and Land Resources of the Hawkesbury-Nepean Catchment. Parramatta, N.S.W.: NSW Dept. of Environment and Climate Change.
- Driscoll, D. 2013. Is Melbourne's urban sprawl creating more bushfire risk? Deakin University <https://this.deakin.edu.au/society/is-melbournes-urban-sprawl-creating-more-bushfire-risk>
- Dunn, J. (2016) Improved neighbourhoods generate higher property prices. *Australian Financial Review*, 5 Feb. <http://www.afr.com/news/special-reports/202020-vision/generating-higher-property-prices-through-improved-neighbourhoods-20160204-gmlsxf>
- (http://friendsberowravalle.org.au/html/story_of_the_park.html).
- Giles-Corti, B., et al. 2005. Articles: Increasing walking. How important is distance to, attractiveness, and size of public open space? *American Journal of Preventive Medicine*. 28(Supplement 2): p. 169-176.
- Gill, S., Handley, J., Ennos, R., & Pauleit, S. (2007). Adapting cities for climate change: the role of the green infrastructure. *Built Environment* 33(1): 115–133.

Godfrey-Faussett, K., 2016. A counselling psychology approach to reconnecting with urban nature for personal and societal wellbeing. City, University of London

Greater Sydney Commission, 2018. Greater Sydney Region Plan, A metropolis of three cities – connecting people, Objective 30, Urban Tree Canopy Cover is increased. <https://www.greater.sydney/metropolis-of-three-cities/sustainability/city-its-landscape/urban-tree-canopy-cover-increased>

Gull, C., Levenson Goldstein S., Rosengarten, T. 2017. Benefits and risks of tree climbing on child development and resiliency. International Journal of Early Childhood Environmental Education Copyright © North American Association for Environmental Education ISSN: 2331-0464 (online)

Hall, T. 2010. The life and death of the Australian backyard, CSIRO Publishing, ISBN: 9780643098169.

Hannam, P. 2016. The 10 Sydney Regions most exposed to bushfire. Sydney Morning Herald, 8 Nov. <https://www.smh.com.au/environment/the-10-sydney-regions-most-exposed-to-bushfire-risk-20161107-gsk08y.html>

Harthoorn, M. 2017 "Influence of Street Trees on Roadway User Safety". Community and Regional Planning Program: Student Projects and Theses. 46. http://digitalcommons.unl.edu/arch_crp_theses/46

Heisler, Gordon M.; Grant, Richard H. 2000. Ultraviolet radiation, human health, and the urban forest. Gen. Tech. Rep. NE-268. Newtown Square, PA: U. S. Department of Agriculture, Forest Service, Northeastern Research Station. 35 p.

Hornsby Shire Population Projections Report 2016-2036, .id the population experts, April 2019

<https://www.hornsby.nsw.gov.au/environment/flora-and-fauna/bushland-management/threatened-forests-and-fauna>

Jacobs, B., Mikhailovich, N., and Delaney, C. (2014) Benchmarking Australia's Urban Tree Canopy: An i-Tree Assessment, prepared for Horticulture Australia Limited by the Institute for Sustainable Futures, University of Technology Sydney.

Kardan, O. et al. Neighborhood greenspace and health in a large urban center. Sci. Rep. 5, 11610; doi: 10.1038/srep11610 (2015).

Kenney, W.A. & Wassenaer, Phillip & Satel, A.L. (2011). Criteria and indicators for strategic urban forest planning and management. Arboriculture and Urban Forestry. 37. 108-117.

Klein, Ryan & Koeser, Andrew & Hauer, Richard & Hansen, Gail & Escobedo, Francisco. (2018). A Review of Tree Risk Assessment and Risk Perception Literature Relating to Arboriculture and Urban Forestry. 10.13140/RG.2.2.29977.06240.

Konijnendijk, C.C., 2005. Urban Forestry Branding & The Celje, Slovenia Experience. City Trees, Journal of the Society of Municipal Arborists. Nov/Dec pp 22-25

Kuo, F. E., and W. C. Sullivan. (2001) "Aggression and Violence in the inner City: Effects of Environment Via Mental Fatigue." Environment and Behaviour 33.4, 543 – 571.

Lovasi, G. S., J.W. Quinn, K. M. Neckerman, M. S. Perzanowski, and A. Rundle. "Children Living in Areas with More Street Trees Have Lower Prevalence of Asthma." Journal of Epidemiol Community Health 62 (2008): 647 – 49.

Maron M, Griffin A, Reside A, Laurance B, Driscoll D, Ritchie E, Turton S, 2019. To reduce fire risk and meet climate targets, over 300 scientists call for stronger land clearing laws. The Conversation, March 11. <https://theconversation.com/to-reduce-fire-risk-and-meet-climate-targets-over-300-scientists-call-for-stronger-land-clearing-laws-113172>

Mata, L., Ives, C. D., Morán-Ordóñez, A., Garrard, G. E., Gordon, A., Cranney, K., Smith, T. R., Backstrom, A., Bickel, D. J., Hahs, A. K., Malipatil, M., Moir, M. I., Plein, M., Porch, N., Semeraro, L., Walker, K., Vesk, P. A., Parris, K. and Bekessy, S. A. 2015. The Little Things That Run the City – How Do Melbourne's Green Spaces Support Insect Biodiversity and Ecosystem Health? RMIT University. Melbourne

McManus, R., Nicholson, L., Hammer, K., and Khoshdooz, N., (2019). Water Sensitive Cities Benchmarking and Assessment: Hornsby Shire Council, New South Wales. Melbourne, Australia: Cooperative Research Centre for Water Sensitive Cities,

Miller, R. W., Hauer, R. J., & Werner, L. P. (2015). Urban forestry. Planning and managing urban greenspaces. Third edition. Waveland Press, Inc.

Moore, G. 2014. Defending and expanding the urban forest: opposing unnecessary tree removal requests. The 15th National Street Tree Symposium. 70-76.

Mullaney J, Lucke T, Trueman SJ (2015) A review of benefits and challenges in growing street trees in paved urban environments. Landscape and Urban Planning 134 157-166

Naderi JR, Kweon BS, Maghelal P. 2008. The Street Tree Effect and Driver Safety. The Journal on the Web, <https://www.naturewithin.info/Roadside/Tree&Driver ITE.pdf>

Norris, M. (2007). Tree Risk Assessments – What Works – What Does Not – Can We Tell? In: International Society of Arboriculture Australian Chapter Conference 2007. Perth: International Society of Arboriculture Australian Chapter.

Norton B, Coutts A, Livesley S, Williams N, (2013). Decision Principles for the selection and placement of green infrastructure to mitigate urban hotspots and heatwaves, Victorian Centre for Climate Change Adaptation Research

Norton, B., Bosomworth K, Coutts A, Williams N, Livesley S, Trundle A, Harris R, McEvoy D (2013). Planning for a Cooler Future: Green Infrastructure to Reduce Urban Heat, Victorian Centre for Climate Change Adaptation Research

Nowak, D.J., and D.E. Crane, Stevens, J.C., Hoehn, R.E., Walton, J.T., and Bond, J., 2008. A Ground-Based Method of Assessing Urban Forest Structure and Ecosystem Services. *Arboriculture & Urban Forestry* 34(6): November 2008. International Society of Arboriculture.

Office of the NSW Government Architect, 2017. North District Sydney Green Grid Spatial Framework and Project Opportunities, <https://www.governmentarchitect.nsw.gov.au/resources/ga/media/files/ga/plans/sydney-green-grid-plan-6-north-district-2017.pdf>

Pandit, R, Polyakov, M., Tapsuwan, S., Moran, T. (2013) The effect of street trees on property value in Perth, Western Australia. *Landscape and Urban Planning*. Volume 110, February 2013, Pages 134–142

Plant, L. (2016) The economic value of greenspace. *Real Green – The Brisbane Experience Case Studies*

Richards, N.A., (1993). Reasonable guidelines for street tree diversity. *Journal of Arboriculture* 19(6). 344-350.

Rosenzweig, C., Solecki, W.D., Parshall, L., Lynn, B., Cox, J., Goldberg, R. Hodges, S., Gaffin, S., Slosberg, R.B., Savio, P., Dunstan, F. and Watson, M. (2009). Mitigating New York City's heat island. *Bulletin of the American Meteorological Society* 90: 1297-1312

Simpson, J. R. and E. G. McPherson (1996). "Potential of tree shade for reducing residential energy use in California." *Journal of Arboriculture* 22 (1): 10-1

Santamour, Frank S., Jr. (1990). Trees for Urban Planting: Diversity, Uniformity, and Common Sense. Conference Proceedings 7th. Metropolitan Tree Improvement Alliance (METRIA) 7:57-65.

van Wassenae, P. J. E., Satel, A. L., Kenney, W. A., & Ursic, M. (2011). A framework for strategic urban forest management planning and monitoring. Trees, people and the built environment. Proceedings of the Urban Trees Research Conference 13–14 April 2011

Which Plant Where: <https://www.whichplantwhere.com.au/>

Wolf, K. L. (2005). "Business district streetscapes, trees and consumer response." *Journal of Forestry* 103 (8): 396-400.

Appendix 1 - Action Plan Details

| Task ID | Task | Details |
|---------|---|--|
| 1.3.1 | Collect and assess knowledge and data from existing and proposed programs to inform the masterplan preparation | <p>Knowledge and data should include (but not limited to):</p> <ul style="list-style-type: none"> - results from the Environmental Sustainability Strategy engagement, specially requests for trees in particular locations - future community surveys - the identification and planting of vacant street tree sites as part of the Greening Our Shire program - tree inventory data, specifically ULE, amenity and species distribution - actions and identification of biodiversity areas from the Biodiversity Conservation Management Plan 2020 |
| 1.3.2 | Prepare a Street Tree Master Plan to inform the strategic and operational management of these assets. | <p>The plan should identify (but not be limited to):</p> <ul style="list-style-type: none"> - the preferred character statements for each street/precinct/suburb including a species list - opportunities for tree planting - schedules for renewal - integrate within future development and infrastructure planning. |
| 2.6.1 | Develop relevant LEP standards (Part 4 of the standard LEP template) to support the protection and management of existing canopy trees and future canopy planting within relevant land use zones and consistent with local character statements | <p>Controls should relate to (but not be limited to):</p> <ul style="list-style-type: none"> - Floor space ratio to enable deep soil planting areas; - Setbacks to support integrated canopy outcomes between neighbouring properties and the street verge; and - Building height to ensure canopy plantings are appropriate to the scale of the proposed zoning. |
| 2.7.1 | Revise and develop DCP provisions to reinforce the hierarchy of protecting, restoring and creating canopy across the local government area consistent with local character statements, tree canopy targets and district planning directions. | <p>Controls must account for various landscape character types (town centre, bushfire prone, high density, medium density, low density and environmental protection) that:</p> <ul style="list-style-type: none"> - Encourages retention of existing canopy - Mandates deep soil plantings - Mandates replacement canopy cover |



Appendix 2 – DCP and Green Offset Policy

Recommended DCP detail for planning review:

Revise and develop DCP provisions to reinforce the hierarchy of protecting, restoring and creating canopy across the local government area. Controls must account for various landscape character types (town centre, bushfire prone, high density, medium density, low density and environmental protection) that:

- Encourages retention of existing canopy
- Mandates deep soil plantings
- Mandates replacement canopy cover

Recommended controls, that would form the basis of conditional consents, must accord with the Newbury test (Newbury District Council v Secretary of State for the Environment [1981] AC 578 at 607) in that the control/condition:

- must have a planning purpose (thus ensuring that it is consistent with the planning Act and vertically to the LEP and District Plan including a contribution to LGA canopy targets);
- must relate to the permitted development to which it is annexed (that is the site so limiting the application of the borrowed canopy idea);
- and be reasonable and implementable (for example must relate to the capacity of the site to accommodate the conditioned landscaping)

Establish prescriptive standards as the basis of the controls (as below) but allow for developers to adopt a performance-based approach that can respond to specific characteristic of a site or land use.

Prescriptive Standards:

1. Enable front set-backs, relative to lot size, dimensions and zoning, to support a minimum of one canopy tree forward of the main building on the site for land zones as R2, a minimum of 2 canopy trees for land zoned as R3 and a minimum of 3 canopy trees for land zoned as R4.

The location of the front landscape area, and related to the setback, should complement current and future street tree planning and be of sufficient dimension to support a canopy tree relevant to the lot and local character statement. Performance based controls may be used to vary the minimum canopy requirements where other parts of the site can be used to support current and future canopy outcomes.

2. Deep soil planting zones are required to protect existing mature trees and enable the planting of future canopy trees. Deep soil areas also improve infiltration of water on the site providing stormwater benefits.

The dimensions of the deep soil area at a minimum must support the size of current or future canopy tree for the lot. Ideally these should amount to an area one-third the size of the future canopy area and be at least one metre in depth. To support a small tree (3-8 metres) the minimum area should be 9m², medium trees (8- 10 metres) 16m² and for larger trees (greater than 10 m) 25m².

3. Promote planting in rear setbacks and in common areas for larger projects and in carparks for commercial and residential.

4. Integrate canopy planting outcomes with water sensitive urban design policies, in particular the maximising of deep soil landscaping and bio-retention controls

5. Location and integration of overhead and underground services to minimise future impacts on trees and canopy

6. Location and limit in number of crossovers/driveways per property

7. Consideration of Solar PV access

Green Offsets Policy Review:

Principles:

The Biodiversity Offsets policy is based on the Council's Biodiversity Strategy 2006. The principles that underpin the policy are avoid, minimise and mitigate, and achievement of net gain for ecological condition. These principles are common to biodiversity strategies and are well-accepted.

The Urban Forest Strategy has a broader scope compared to the Biodiversity Strategy; however, the two approaches will overlap because the DCP controls (proposed) will likely use a similar hierarchy of avoid, minimise, mitigate (replace). There may be a broader range of trees to be protected (e.g. exotic species) and like-with-like species replacement needs to be explored in these cases.

Operation:

The Green Offsets policy requires the applicant or property owner to submit their minimise/mitigate response to proposed vegetation removal. First preference is replacement of vegetation on the site, however if this is not possible, public lands are acceptable offset locations. Council will review and accept/modify the response with agreed outcomes becoming a condition of a planning consent.

A proposal is initially assessed on its merits, with offsetting as the final step in the assess, minimise and mitigate approach. The policy provides clear multipliers reflective of vegetation categorisation for public and private land.

Like-for-like replacement of vegetation strata is preferred but may be varied to achieve a positive biodiversity outcome. Should a proposal involve an impact resulting in a net loss of biodiversity or inadequate consideration of the principles of the DCP, Council can refuse the development application under its merit assessment process.

The policy contains a guide to fees and charges for offsetting on public land, which may be implemented if an appropriate offset cannot be achieved on the site. The applicant / property owner must enter into a Voluntary Planning Agreement to offset on public land, involving the payment of the calculated offset fee plus a management fee.

‘Offsetting on public land’ payments under a voluntary planning agreement:

Under ‘Calculating the offset value’ in the policy, there are standard fees to be applied for the offset area per hectare and canopy area. This makes the Green Offsets policy robust and transparent.

Conclusion

To conserve the urban forest it’s important that strategies for trees, urban canopy and biodiversity conservation are aligned. To compliment these strategies an Offsets Policy is implemented to support these strategy objectives. The offset policy has been designed based on the key principal of net gain, to seek like for like tree replacement (with associated multipliers) as the priority and where site constraints will allow. If like for like tree replacement cannot be achieved, then a net gain improvement in biodiversity is achieved on site. Where there are significant site constraints the Policy then allows for off-site offsetting, which is only considered where a net gain in canopy and biodiversity is not achievable. It is recommended for ease and efficiency of documentation and usability by the community to have one Offsets policy that seeks to achieve both onsite biodiversity and urban forest outcomes.

Appendix 3 – Photomontages of trees added

Appendix 3 – Photomontages of trees added











Appendix 4 – Photomontages of trees removed



