

**Urban Tree
Management Policy**

Volume 3

**Street Tree
Master Plan**



**WILLOUGHBY
CITY COUNCIL**

City of Diversity

Prepared by

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Willoughby Street Tree Master Plan

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Executive Summary

A. Introduction

Willoughby's street trees are a highly valued asset providing a range of visual, aesthetic, environmental, health, social and economic benefits for the community. The Willoughby Street Tree Master Plan forms the third volume of a suite of four tree policy documents prepared by Willoughby City Council:

- Willoughby Urban Tree Management Policy;
- WLEP 2012 Tree and Bushland Preservation;
- **Willoughby Street Tree Master Plan**; and
- Willoughby Natural Heritage Register

The Willoughby Street Tree Master Plan establishes the strategic framework to guide the provision, selection and planting of street trees throughout the City. This Plan aims to enhance the quality and connectivity of urban streetscapes including major arterial roads, commercial centres and suburban residential areas ensuring appropriate selection of tree species – *the right tree for the right place*.

B. Guiding Principles

Together the *Willoughby City Council Sustainability Action Plan 2011-2015* and *Sustainability Charter 2008* establish a strategic framework for a green, connected and sustainable environment. This approach involves ecological, social and economic choices for a greener more sustainable living environment.

The Street Tree Master Plan builds on Council's commitment to this process ensuring broader social and ecological connectivity within the City's streetscapes, suburban parkland and bushland reserves. Accordingly, the key objectives for this Street Tree Master Plan are:

- Selection based on "the right tree for the right location";
- Clear guidelines to ensure consistent approach;
- Establish precinct plans that reinforce and enhance special character (incl. identification of Heritage Conservation Areas);

- Establish a species palette suited to environmental conditions;
- Increase the canopy coverage in Willoughby's streets;
- Enhance green corridors/ connectivity and faunal linkages;
- Guide maintenance and management of existing and new trees.

C. Study Approach

A review was conducted of Willoughby's tree policy, environmental and land-use planning, street tree inventory, heritage data base (including WDCP 2012 and Willoughby Natural Heritage Register) and Council's maps. The project was developed in close liaison with Council staff. Following initial broad-scale mapping of Willoughby's natural and cultural landscapes, twelve street tree precincts were developed to capture the diversity and thematic character of each of these areas. Furthermore, the performance of existing street trees was reviewed and evaluated on a street-by-street basis providing valuable data for final recommendations. Tree species were selected for specific functional traits and their ability to meet established criteria.

D. Street Tree Precincts

Street trees broadly define Willoughby's streetscape character not only within individual streets but also across recognisable localities or precincts. These precincts are shaped by distinctive physical, environmental, social and economic factors. Willoughby's streetscape character, visual integrity and sense of place are determined by the following criteria:

- A. Geology and soils (soil landscapes);
- B. Topography, slope and aspect;
- C. Environmental, visual and aesthetic character, including:
 - a) Areas conserving a strong 'natural' landscape character
 - b) Areas with a predominantly cultural landscape character
- D. Historic street tree selection and performance;
- E. Land use character and scale (see WLEP 2012 zoning);
- F. Heritage Conservation Areas and significant cultural plantations.

This Street Tree Master Plan establishes twelve (12) street tree precincts (refer to FIGURE 1: Willoughby Street Tree Precincts Map on [page 26](#)):

- 1) Chatswood CBD – commercial core
- 2) North-western slopes and valleys (incl. Blue Gum High Forest)
- 3) West-central – medium to high density residential
- 4) South-western mixed use and industrial area
- 5) West-central – low density residential (incl. Conservation Area)

- 6) Southern mixed residential and commercial
- 7) South-central mixed residential and commercial
- 8) North-central mixed residential (incl. Conservation Area)
- 9) Northern mixed residential (incl. Conservation Area)
- 10) North-central light industrial and residential (incl. Conservation Areas)
- 11) Upper Middle Harbour bushland and residential (incl. Conservation Areas)
- 12) Northbridge residential and steep bushland slopes

E. Streetscape character and heritage significance

The Chatswood West/ Lane Cove River Valley and Middle Harbour areas conserve significant remnant native vegetation (i.e. Precincts 2, 11 and 12). These areas have the steepest topography and largest bushland reserves protecting a broad range of vegetation communities. Notably, the Artarmon area (Precinct 5) also conserves significant remnant native vegetation and communities. Moreover, Willoughby City is largely defined by its urban and cultural landscapes including many Inter-war period (1919-1939) and early Post-war period (1940s-1960s) avenues. Naremburn (Precinct 6) retains some of the earliest designed landscapes with a plantation of Canary Island Date Palms possibly dating from the late Federation or early Inter-war period. Many of these avenues are notable for their high representative and integrity values. Some are protected and conserved within Heritage Conservation Areas. These avenues are dominated by a single species – Brush Box, one of Sydney's most popular and enduring street trees. Other notable single species avenues of local rarity value include Jacaranda, Plum Pine and Yellow Outeniqua.

In the latter part of the twentieth century many generic native species and cultivars were planted as replacements and infill planting. These trees have now matured creating a new urban cultural landscape. This past approach however has created streetscapes which at times are compromised by many different uncoordinated elements. In recent years Willoughby City Council, in consultation with the local community, has implemented replacement programs which address many of these issues. Finding the right tree for the right place is complicated by a range of widely varying factors. Street trees by definition are inextricably linked with urban infrastructure and the associated impacts on health and sustainability. These and other issues are examined in this Plan and recommendations are provided for broader consistency in street tree palettes within and across each of the precincts.

F. Key objectives – precincts

Key objectives are provided for each precinct (refer to Part B: Landscape Context & Selection Criteria). In summary these include the following:

Highly urbanised and core commercial streetscapes

- Maintain and promote formal character and consistency in plantations using select deciduous and evergreen broadleaf species and cultivars;
- Select species for high tolerance to urban spaces (i.e. hard paved surfaces, microclimatic extremes, pollutants, etc.)
- Protect and maintain the integrity and intactness of mature single species avenues of high visual and environmental integrity;
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.);
- Phase-out species with aggressive root-systems, fruit-fall/ life-history or allergenic issues or poor performance under prevailing conditions;
- Enhance microclimatic conditions and seasonal variation (e.g. maximise shade in summer, sun in winter) and provide seasonal colour and texture consistent with highly urbanised precinct.

Cultural streetscapes (including Heritage Conservation Areas)

- Protect the historic character, scale and integrity of Victorian, Federation and Inter-war period streetscapes within Heritage Conservation Areas;
- Protect and maintain the integrity and intactness of mature single species avenues (e.g. Inter-war period heritage streetscapes) and provide consistency in replacement programs in accordance with heritage palettes;
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;
- Provide appropriate scale and massing in selection of street tree planting consistent with the scale and type of development (e.g. low or medium density residential or light industrial or neighbourhood centre);
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.) and variety of tree species in many streets;
- Consolidate thematic planting approach in local and neighbourhood centres including use of select cultivars of deciduous species to enhance microclimatic conditions and to provide seasonal colour and texture;
- Prioritise key connector roads (incl. Willoughby Road, Penshurst Street, Eastern Valley Way, Pacific Highway and Sailors Bay Road) implementing

a planting strategy using single or two (mixed) species within the streetscape (i.e. one species under overhead powerlines/ shop awnings and alternative species with no service restrictions);

- Promote strategies to supplement and enhance ecological connectivity between streetscapes, parkland and major bushland reserves using provenance-sourced material, where possible, consistent with ecological communities.

Streetscapes conserving a strong natural landscape character

- Protect and maintain high visual, aesthetic and environmental values including (as applicable) strong physical and historical connections with Heritage Conservation Areas;
- Protect and maintain the significant biodiversity and geodiversity values of these precincts, particularly the diversity of ecological communities and native tree species within the street verges (as scheduled in WNHR);
- Investigate opportunities for extending current bush regeneration and restoration strategies in consultation with local Bushcare groups;
- Promote opportunities for natural recruitment of canopy trees and community-based restoration strategies in streetscapes linking to adjoining bushland reserves;
- Selection of native species to be in accordance with mapped geology, soils and ecological communities, noting the highly variable local conditions (e.g. sandstone outcrops or shallow, porous coarse-grained sandy soils);
- Promote strategies to supplement and enhance native tree canopy using provenance-sourced material;
- Avoid the use of generic native species in these precincts (i.e. species native to other geographic areas or of unknown provenance) and phase-out unsuitable and/ or poorly performing street trees;
- Protect scenic vistas, particularly along elevated ridges and scarps. Promote the use of native broadleaf species (under overhead powerlines) and open-canopied local native species (no powerlines) in these locations.

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Part A: Introduction

Overview

Willoughby's tree-lined streets are widely recognised for their leafy green character and charm linking the City's urban centres to suburban parks and bay-side bushland. Willoughby City has approximately 40,000 street trees. Willoughby City Council is committed to maintaining and enhancing this outstanding community asset with over 1,200 street trees planted during the last three years. Street trees provide a range of environmental, health, social and economic benefits for the community.

The Willoughby Street Tree Master Plan forms the third volume of a suite of four tree policy documents prepared by Willoughby City Council:

- Willoughby Tree Management Policy;
- Regulatory controls (WLEP 2012 Tree and Bushland Preservation)
- **Willoughby Street Tree Master Plan**; and
- Willoughby Natural Heritage Register

The Willoughby Tree Management Policy is the key policy document for tree management in Willoughby City. It promotes the primary aims of enhancing liveability, connectivity and sustainability. The second document, Council's *WLEP 2012 Tree and Bushland Preservation* provides specific requirements to ensure the conservation and management of trees and bushland in the local area.

This Willoughby Street Tree Master Plan, the third tree policy document in the series, aims to enhance the quality and connectivity of urban streetscapes including major arterial roads, commercial centres and suburban residential areas ensuring appropriate selection of tree species – *the right tree for the right place*.

Willoughby Natural Heritage Register, the fourth and final document, identifies and lists items of natural heritage, including many streetscapes. Willoughby's natural heritage is under increasing threat from urban pressures and this document aims to improve protection and management of these items.

How to use this Plan

The Street Tree Master Plan is divided into four sections. Parts A and B provide background information on the objectives and decision-making process. Part C identifies your particular precinct and gives a detailed description of the thematic approach and key tree species for future planting. Part D provides supplementary tables including a summary of recommended tree species linked to each precinct and tree image files.

Part A: Introduction

This section introduces the broader themes and objectives of the Street Tree Master Plan, its relationship to other tree policy documents, the way it affects existing street trees and a framework for enhancing sustainability and resilience in Willoughby's street tree population.

Part B: Landscape Context and Selection Criteria

This section reviews the natural and cultural landscape context of Willoughby City including the way trees have defined the quality and character of streetscapes. It discusses the importance of protecting the integrity and continuity of existing plantations and the role of enhancement and renewal.

This section also looks at how street trees are selected for different locations. Street tree selection criteria are based on an understanding of Willoughby's landscape context and a range of physical, environmental and cultural factors.

Part C: Street Tree Precinct Plans

The landscape context establishes a framework for developing thematic tree palettes consistent with precinct character and conditions. This Plan establishes twelve (12) street tree precincts (see [FIGURE 1: Street Tree Precincts](#)).

Refer to this section for maps showing Precinct Plans and a description of each precinct including existing cultural plantations, remnant native canopy, heritage conservation areas, key objectives and schedules of tree species to be used in future planting.

Part D: Appendices

This section provides two additional schedules including all selected tree species for all precincts and species/ precinct profiles. It also includes tree image files for identification and reference.

Planning for a sustainable and resilient future

Like all living things street trees have a life cycle from an early rapid juvenile phase to maturity, senescence and eventually they will die. The urban environment however provides many challenges for maintaining the health and integrity of these valuable assets. It's important to establish a whole-of-life-cycle approach to planning and managing street trees including options for their renewal.

The Street Tree Master Plan delivers the future strategic direction for planting, protection, management and maintenance of Willoughby's street trees and establishes a rationale for the decision making process and consistency with industry best practice. The key objectives for this Plan are:

- Selection based on "the right tree for the right location";
- Clear guidelines to ensure consistent approach;
- Establish precinct plans that reinforce and enhance special character (incl. identification of Heritage Conservation Areas);
- Establish a species palette suited to environmental conditions;
- Increase the canopy coverage in Willoughby's streets;
- Enhance green corridors/ connectivity and faunal linkages;
- Guide maintenance and management of existing and new trees.

How does the Plan affect existing street trees?

This Plan provides a simple guide to future street tree planting. It recognises the valuable contribution of all existing trees growing within Willoughby's road reserves (e.g. road verges or roadway). Existing street trees may have a cultivated origin, occurring as single specimens or planted as a row plantation or avenue. Many trees are important components of Willoughby's natural heritage and bushland areas retained in situ within the road reserve.

Willoughby City Council receives many requests for street tree planting as well as tree pruning and removals. Generally, only dead, dying or dangerous street trees are removed to avoid potential hazardous situations. For example, a healthy tree would not be removed or replaced with another tree simply to comply with the guidelines as described in this plan. Specific strategies are in place for monitoring street tree performance, condition and health and determining the appropriate response where tree pruning or removal and replacement may be necessary.

Where gaps are identified in established plantings, those species, where appropriate will be preferred when completing new plantings.

The right tree for the right place

It is important that planning responds to context and site-specific conditions. The tree species palette should reflect prevailing natural and cultural environmental conditions. Consideration needs to be given to things such as soil type and depth, slope and aspect as well as many other issues including natural or cultural setting, the width of the verge, overhead powerlines, underground services, retaining walls and so on. Climate change is a key variable affecting adaptability and resilience of individual tree species. Each tree location has its own site-specific requirements. This can be described as the “right tree for the right place”.

Green corridors, connectivity and liveability

Willoughby City is already noted for its green leafy character, particularly its bay-side bushland suburbs. This Plan aims to build on the current planting program and guide future decisions in selection of tree species. The Plan aims to increase tree canopy coverage in Willoughby’s streetscapes and act as a further catalyst for green corridors, enhanced connectivity and improved faunal habitat. This approach recognises the broader significance of street trees in terms of their environmental, economic, health and social benefits including their positive effects on wellbeing and liveability.

Protecting key heritage values

This Plan aims to protect, manage and enhance the character and integrity of the landscape setting and sense of place. It aims to protect natural heritage values (e.g. streetscapes in Blue Gum High Forest) and cultural landscape heritage values (e.g. mature avenues of planted Brush Box). Some areas display a special combination of natural and cultural streetscapes including remnant components of endangered ecological communities as well as formal avenue plantations. This Plan provides recommendations for the protection, management and enhancement of these significant streetscapes, some of which are located within Heritage Conservation Areas.

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Part B: Landscape Context & Selection Criteria

Willoughby's landscape context

Willoughby's landscape context is largely defined by physical factors such as climate, topography, geology and soils as well as patterns of historic and cultural development. Willoughby LGA can be broadly divided into areas which conserve a strong natural landscape character and areas which are distinctly cultural urban landscapes as follows:

1. Chatswood West/ Lane Cove River Valley and Middle Harbour areas (and to a lesser degree parts of Artarmon) conserve a strong natural landscape character and/ or a native remnant tree canopy with a moderate to high level of connectivity within the streetscapes or adjoining properties; and
2. Areas which are predominantly cultural landscapes with either a low component or no remnant native canopy trees present in the streetscapes or adjoining properties. The Willoughby LGA is largely defined by its urban and cultural landscapes.

Areas conserving a strong 'natural landscape' character

The Chatswood West/ Lane Cove River Valley and Middle Harbour areas conserve significant remnant native vegetation. Notably, these two areas have the steepest topography and largest bushland reserves protecting a broad range of vegetation communities. Artarmon also conserves significant remnant native vegetation and communities.

Street trees are key elements contributing to the visual, aesthetic and ecological character, integrity and connectivity within these areas. These areas can be broadly defined as follows:

Chatswood West/ Lane Cove River Valley:

- Chatswood West (western slopes and valleys conserving remnant Blue Gum High Forest and a complex mosaic of associated communities); and
- Lane Cove North (sandstone scarps and valleys conserving sandstone woodland and forest communities).

Middle Harbour:

- Castle Cove, Middle Cove, Castlecrag and Northbridge (sandstone scarps, gullies and steep foreshores conserving sandstone woodland and forest communities).

Artarmon:

- Artarmon (fragmented Blue Gum High Forest including Artarmon Reserve and environs).

Urban and cultural landscapes

Willoughby LGA is largely defined by its urban and cultural landscapes. These streetscapes have developed in response to historic patterns of subdivision and development. Naremburn retains some of the earliest designed landscapes in the public domain with a cultural plantation of Canary Island Date Palms dating from the late Federation or early Inter-war period.

Willoughby retains many Inter-war period (1919-1939) and early Post-war period (1940s-1960s) avenues. Some of these are protected and conserved within Heritage Conservation Areas. Many of these avenues are notable for their high representative and integrity values. These avenues are largely dominated by a single species – Brush Box, a popular and hardy species planted throughout the Sydney metropolitan area during this period. Other notable single species avenues of local rarity value include Jacaranda, Plum Pine and Yellow Outeniqua. Mixed species plantations were also planted (including species such as Camphor Laurel, Brush Box, Jacaranda and Canary Island Date Palms). Two species were often planted together within the same street however many of these avenues have been degraded through incremental losses and unsympathetic infill/ replacement programs over many decades.

During the 1970s-1990s many new generic native species and cultivars entered the market providing a wide range of drought-tolerant and low maintenance options for street tree planting. As exotic evergreen and deciduous species fell out of favour the new generic native species were added and inter-mixed in plantations. These trees have matured and significantly increased the green, leafy nature of Willoughby's suburbs creating a new urban cultural landscape. This approach over past decades however has created streetscapes which at times are compromised by many different uncoordinated and disjunctive elements. Notably, many of these streetscapes occur within transitional soil landscapes where there can be a high level of variability in soil depth, structure, fertility and water holding capacity.

Street trees by definition are inextricably linked with urban infrastructure (i.e. street trees are planted on public road verges or within the road carriageway) and are

often constrained by narrow verge widths, kerbs and gutters, pavements, underground services, overhead power-lines, awnings. Street trees are affected by urban run-off, surface chemicals and pollutants, poor soil environments, compaction, erosion, mechanical damage, vandalism and many other issues. These factors can further influence and impact tree health, durability and longevity. Similarly, as street trees mature they will influence their environment and in some instances impact upon surrounding infrastructure. Nevertheless, the benefits of street trees are widely recognised.

Climate is a major influence on the types of street trees growing in Willoughby

Climate

Sydney's coastal climate is typical of the subtropical east coast of Australia. The Willoughby local government area, located on the lower north shore between Middle Harbour and Lane Cove River Valley, experiences a warm wet summer-autumn and cooler drier winter-spring. Local conditions vary with distance from the sea and topography (Benson & Howell, 1990; Howell & Benson, 2000). Diurnal and seasonal ranges in temperature are mediated by maritime influences and there is little variation in average monthly relative humidity (Bannerman & Hazelton, 1990).

Mean summer maximum is 25.9°C and mean winter minimum is 8.8°C (Sydney Observatory). Mean annual precipitation is approximately 1203mm (Chatswood West) to 1257mm (Castle Cove) with the highest rainfall occurring in late summer (February ~147-176mm) and lowest rainfall in early spring (September ~ 50-69mm) (Bureau of Meteorology Climate Data Online, 2013). Differences in rainfall play a large role in establishment, growth and sustainability of street trees. The period of time between adequate falls of rain is a critical factor. Droughts place very high stresses on immature and establishing trees and can lead to elevated rates of mortality even in mature trees. Ageing and senescent trees are particularly vulnerable.

The broader “macroclimatic conditions” are further shaped by a site’s elevation, topography, slope and aspect. Urban environments can also influence the growth and suitability of street trees (e.g. wind-tunnel effects between high-rise buildings, reduction in solar access, shadowing by buildings and heat-island effects in summer caused by reflected heat from pavement and masonry surfaces. These differences in “microclimate” can lead to greater diurnal and seasonal temperature fluctuations, changes in humidity levels and increased exposure to wind-shear effects. For example trees may suffer increased stress and/ or physical damage and this may impact upon resilience to insect attack, disease and pathogens.

Tree selection also needs to consider the longer term effects of climate change with the likelihood of more extreme weather events, increases in temperature ranges, more intense rainfall events and extended dry periods.

Geology is another major influence on Willoughby's landscapes, its soils and which street trees can be grown

Topography, geology and soils

Willoughby's topography varies from gently rolling hills and slopes (northern central plateau) to steeper slopes and valleys (western, southern and eastern ridges) grading to steeper slopes (western river valley) and very steep broken scarps and valleys (along the eastern foreshores). Topography, geology and soils are key influences in shaping natural vegetation communities and the types of street trees we see growing in Willoughby today.

The surface geology of Willoughby is divided into three main areas:

1. Central plateau, rolling hills and slopes (Wianamatta shale/ clay loams);
2. Lane Cove – western plateau and slopes (Hawkesbury sandstone); and
3. Middle Harbour – eastern plateaux and slopes (Hawkesbury sandstone).

The relatively high coastal rainfall together with shale-derived clay-loams of the central plateau supported a tall Blue Gum High Forest community while the sandstone scarps and steep gullies of Lane Cove River Valley and Middle Harbour were dominated by woodlands, heaths and gully forest. These variations in geology and soils have played an important role in the development of Willoughby.

Historically, the vegetation of the relatively fertile central plateau (Wianamatta shales) was cleared for agriculture and later urban development leaving few remnants of this natural vegetation. In contrast, most of the Hawkesbury sandstone scarps and steep gullies of the eastern and western plateaus remained largely intact until the early twentieth century. At this time improved transportation links created a boom in residential development. Nevertheless, Willoughby has retained much of its scenic and natural bushland character within the steeper valleys of Middle Harbour and Lane Cove River Valley. The Willoughby landscape reflects these historic patterns of development, past agricultural uses, transportation, local industry, services, planning and conservation initiatives.

Soil landscapes and variability of streetscapes

Soil landscapes refer to the underlying geology, geomorphology, topography and soils. The *Soil Landscapes of the Sydney 1:100000 Sheet* divides Willoughby LGA into the following soil landscapes (*Chapman and Murphy, 1989*):

Wianamatta Shale:

1. Blacktown (bt)
2. Glenorie (gn)
3. West Pennant Hills (wp)

Mittagong Formation (i.e. transitional shale and sandstone):

4. Luca Heights (lh)

Hawkesbury Sandstone:

5. Hawkesbury (ha)
6. Gymea (gy)
7. Lambert (la)

Modified soil landscapes:

8. Disturbed terrain (xx)

These soil landscapes are discussed in broad terms within each of the precinct descriptions (refer to Part C: Street Tree Precinct Plans). Although soil landscapes do not provide a neat fit for the patterns and extent of original native vegetation communities this data base helps us to understand the importance of key variables such as geology, soils, topography, slope and aspect in shaping Willoughby's natural and cultural landscapes.

The mapping and data base helps to identify some of the major causes for inter- and intra-specific variability in performance of Willoughby's cultural plantations. For example, a transition from one soil landscape with moderate fertility and high water holding capacity to another with low fertility and low water holding capacity often leads to significant differences in street tree composition, structure and integrity. In effect, a threshold is crossed in terms of soil structure, soil depth, available nutrients, run-off and moisture-holding capacity and these variables can have a marked effect on the physical and visual quality of street trees. This effect is most noticeable when a boundary is crossed from moderately fertile, fine-textured, shale-derived residual soils (e.g. Blacktown) to a more variable coarse-grained, porous quartz sandstone and shale laminate soil (e.g. Gymea).

This transition in soil landscapes may occur either within a single streetscape (e.g. laterally dividing the street into an upper or lower portion or longitudinally along opposite verges). It may occur across a number of local streetscapes. The impact upon the visual and aesthetic quality of cultural plantations can be dramatic. These transitional points or gradients within the landscape are often characterised by a

broad range of generic native tree species of varying age structure (usually <40-50 years). The discordant nature of these mixed plantations may be explained to some degree by the high level of variability in species performance under these soil conditions. The soil landscapes data base therefore provides an important factor influencing precinct boundaries, streetscape character and relative species performance.

What challenges does Willoughby's urban environment place on sustainability of street trees?

Effects of urban land uses and infrastructure

The types of permissible land uses as defined by Willoughby Local Environmental Plan (WLEP 2012) play a major role in protecting and managing the environmental quality and landscape character of Willoughby's streetscapes. The WLEP 2012 Zoning Map and field investigations provided important base data in establishing the character and amenity of street tree precincts and species palettes. Land uses have a considerable impact on street tree selection and management (refer to precinct descriptions).

Land uses define the type of permissible development as well as extent and intensity of urban infrastructure and associated impacts on health, vigour and sustainability of trees. These urban impacts will vary markedly for trees located along major roads or in narrow verges on local streets. Differences in the provision of underground services, overhead power-lines, verge width, hard and impervious surfaces, solar access, etc. will all play a role in determining "the right tree for the right place".

Proliferation of mixed generic native street trees

The dominance of a mixed generic cohort of street trees (planted during the late 1970s-1990s) reflects a period of changing community values, an environmental aesthetic as well as opportunities for experimentation with newly available species and cultivars. The broad range of generic native trees offered a completely new palette geared specifically to addressing issues of less maintenance and durability in often harsh urban environments, poor soil conditions and periodic drought. This process has also been driven by community expectations, ownership, adjoining land uses and ongoing maintenance regimes. New planting strategies will need to recognise opportunities as well as the limitations imposed by environmental, social and economic variables. In recent years Willoughby City Council, in consultation with the local community, has implemented replacement programs which address many of these issues.

The role of natural heritage in street tree selection



(*Eucalyptus racemosa*)

Willoughby Natural Heritage Register

The Willoughby Natural Heritage Register (WNHR) data base identifies remnant native vegetation to individual species level on public and private land. This data base includes a description of location, tree species, height, spread, condition and an assessment of ecological resilience and connectivity within the landscape matrix.

The WNHR data sheets were analysed to provide a detailed breakdown of remnant native species occurring within areas broadly defined as predominantly natural landscapes or areas conserving significant remnant native canopy with a moderate to high level of connectivity within streetscapes or adjoining properties.

PHOTO 1: Narrow-leaved Scribbly Gum

Opportunities for provenance sourcing

The detailed information in this data base provided an opportunity to establish fine scale mapping of changes in the character of streetscapes within these areas. This approach emphasises the importance of selecting “the right tree for the right place” rather than simply using generic native species. It also provides a strategy for implementing procedures for provenance sourcing and procurement of suitable genetic stock within these areas. A number of larger nurseries now provide specialist services from seed collection, germination and seedling development through to large-container grown stock. This process would need planning and resourcing for implementation (i.e. 2-3 year time scale). It could provide a catalyst for community-based programs, improving protection of these vulnerable and threatened landscapes, maintaining genetic integrity and enhancing broader connectivity and biodiversity values.

The role of cultural heritage in street tree selection

Protecting Willoughby's cultural heritage streetscapes

Willoughby's cultural heritage landscapes are largely defined by late nineteenth and early twentieth century development, particularly the Inter-war period (1919-1939). These landscapes are conserved within Heritage Conservation Areas under the Willoughby Local Environmental Plan (WLEP 2012) and Willoughby DCP (Part



H – Heritage Items and Heritage Conservation Areas). Willoughby's Heritage Conservation Areas and significant streetscapes (including avenues and row plantations) are described in Part C: Street Tree Precinct Plans.

NSW Land and Property Information SixLITE mapping (including 1943 aerial photo overlay) was used to determine significant cultural plantations (i.e. street tree planting) within each of twelve (12) street tree precincts.

This information was correlated with current aerial photos, WCC Street Tree Inventory Data Base and detailed ground survey to establish current status and significance of these plantations.

PHOTO 2: Harwood Avenue – Brush Box
(*Lophostemon confertus*)

Some street tree plantations have matured and remain largely intact (i.e. they may retain high integrity and representative values). Some of these plantations make a significant contribution towards the fabric of Heritage Conservation Areas (e.g. Harwood Avenue and Hollywood Crescent – outstanding single-species heritage avenues of Brush Box). Others may have been degraded through significant losses and/ or mixed replanting, infill and replacement programs or lost altogether during different phases of development.

It is important that heritage landscapes are protected and managed in accordance with conservation objectives. New street tree planting should be consistent with heritage palettes, particularly within Heritage Conservation Areas. Infill and replacement planting programs within mature single or mixed species avenues should maintain, where possible, the same tree species and original design intent.

Heritage palettes and management issues

For example, Darvall Street, Naremburn (located within Naremburn Heritage Conservation Area) retains a significant Canary Island Date Palm (*Phoenix canariensis*) plantation dating from the late Federation or early Inter-war period. This may be one of the earliest formal public avenue plantations on the North Shore.



PHOTO 3: Darvall Street, Naremburn
Canary Island Date Palms

This exotic species has fallen out of favour due to its prolific seeding and ability to germinate in disturbed bushland. This species has other management issues including large spines on fronds and susceptibility to soil-borne fungal pathogens such as *Fusarium oxysporum*.

Nevertheless, this plantation exhibits significant cultural heritage values and conservation strategies (including strict plant hygiene protocols and same species replacement) should be considered as an option in this context.

These issues can be quite complex. Some very hardy and long-lived tree species used in early planting schemes have proven to be invasive in disturbed bushland (i.e. environmental weeds) or have particular growth habits or life-histories which are cause for concern. Camphor Laurels (*Cinnamomum camphora*) were often planted during the Inter-war period as single or mixed species avenues however these trees may cause considerable damage to urban infrastructure. They are also widely recognised as an environmental weed. For such species, infill programs within established plantations should consider a more suitable replacement which is consistent with heritage palettes, overall scale, aesthetic and visual character and form.

The right tree for the right place

Selection criteria

Tree species were selected for specific functional traits and their ability to meet established criteria. In summary, the selection criteria for Willoughby's street trees have included the following:

- Climatic suitability/ tolerances including macro- and micro-climatic influences relating to broader Sydney and lower North Shore context and individual precincts;
- Climate change – adaptability and resilience to likely changes (i.e. greater extremes in weather, higher maximum temperatures, more intense rainfall events and extended periods of drought);
- Physical context as a key factor in selection: local topography, aspect, geology and soils;
- Environmental and cultural context (e.g. natural bushland and cultural/ urban areas, Heritage Conservation Areas, historic, social/ cultural issues);
- Historic layering: past and present planting palettes – data sources included Willoughby DCP 2012 (HCAs), SixLITE aerial photo images (current and 1943 layer) and Council's street tree data base;
- Ecological (planting for recruitment/ habitat connectivity);
- Social/ cultural considerations (local community/ precinct values);
- Urban tolerances – hard, impervious paved surfaces, reduced oxygen exchange, urban run-off and ground pollutants, atmospheric pollution, soil compaction, extremes in temperature variation, heat-island effects, wind-tunnelling, building shadowing (reduced sunlight);
- Urban infrastructure constraints (e.g. overhead power-lines, underground services, road and verge widths, proximity to buildings, site distances, hard pavements, leaf fall blocking gutters and drains, etc.);
- Urban functional requirements – expected mature size and shape, canopy density/ shading and solar access in winter, seasonal colour display and variation, acceptable leaf and fruit fall characteristics, potential allergenic properties, propensity for tree root damage, suckering, branch inclusions, limb shear etc.;
- Composition – height, scale, form, shape, texture, evergreen or deciduous, native or exotic, character, seasonal display;
- Consistency, harmony and cohesiveness of existing plantations (including a review of disjunctive and poorly performing elements);
- Proven performance (Sydney coastal/ metropolitan and local site context as reviewed with Council staff);
- Longevity, resilience and durability;

- Nursery availability at advanced sizes and procurement practices (including NATSPEC compliance) and opportunities for provenance sourcing of trees in bushland areas;
- Ethical plant sourcing (including mature native palms) – mature transplants should not be sourced from wild populations (OEH licensing practices are under current review);
- Non-invasive species – avoidance of undesirable/ environmental weeds or potential transformer weed species;
- Planting, establishment and maintenance regimes should employ best practice methods to optimise plant survival and development;
- Resistance to pests and disease (e.g. Myrtle Rust *Uredo rangelii*, insect herbivory and psyllid attack) and tolerance to soil-borne pathogens (egg. *Fusarium oxysporum*, *Phytophthora cinnamomi*, etc.);
- Management issues (e.g. physical/ spatial constraints, tree form/ shape, bark inclusion, limb shear, coppicing, buttressing and surface roots, pruning frequency, leaf fall/ seasonal or ongoing, flowers/ fruiting, health and public safety, risk management, etc.).

The following chapter identifies street tree precincts and specific street tree palettes for each of these precincts.

...



Part C: Street Tree Precinct Plans

Overview

Precinct character

Street trees broadly define Willoughby's streetscape character not only within individual streets but also across recognisable localities or precincts. As discussed in PART A, these precincts are shaped by distinctive physical, environmental, social and economic factors. Willoughby's streetscape character, visual integrity and sense of place are determined by the following criteria:

- A. Geology and soils (soil landscapes);
- B. Topography, slope and aspect;
- C. Environmental, visual and aesthetic character, including:
 - a) Areas conserving a strong 'natural' landscape character
 - b) Areas with a predominantly cultural landscape character
- D. Historic street tree selection and performance;
- E. Land use character and scale (see WLEP 2012 zoning) including:
 - a) Infrastructure (including major road and rail corridors);
 - b) Central business district (commercial core);
 - c) Local and neighbourhood centres;
 - d) Mixed use and industrial (general and light) areas;
 - e) Residential areas (low, medium and high density);
 - f) Environmental conservation (including bushland reserves);
 - g) Parks and reserves (recreation);
- F. Heritage Conservation Areas and significant cultural plantations (i.e. heritage streetscapes).

Street tree precincts

This Street Tree Master Plan establishes twelve (12) street tree precincts (refer to FIGURE 1: Willoughby Street Tree Precincts Map:

- 1. Chatswood CBD – commercial core
- 2. North-western slopes and valleys (incl. Blue Gum High Forest)
- 3. West-central – medium to high density residential
- 4. South-western mixed use and industrial area
- 5. West-central – low density residential (incl. Conservation Area)
- 6. Southern mixed residential and commercial
- 7. South-central mixed residential and commercial

- 8. North-central mixed residential (incl. Conservation Area)
- 9. Northern mixed residential (incl. Conservation Area)
- 10. North-central light industrial and residential (incl. Conservation Areas)
- 11. Upper Middle Harbour bushland and residential (incl. Conservation Areas)
- 12. Northbridge residential and steep bushland slopes

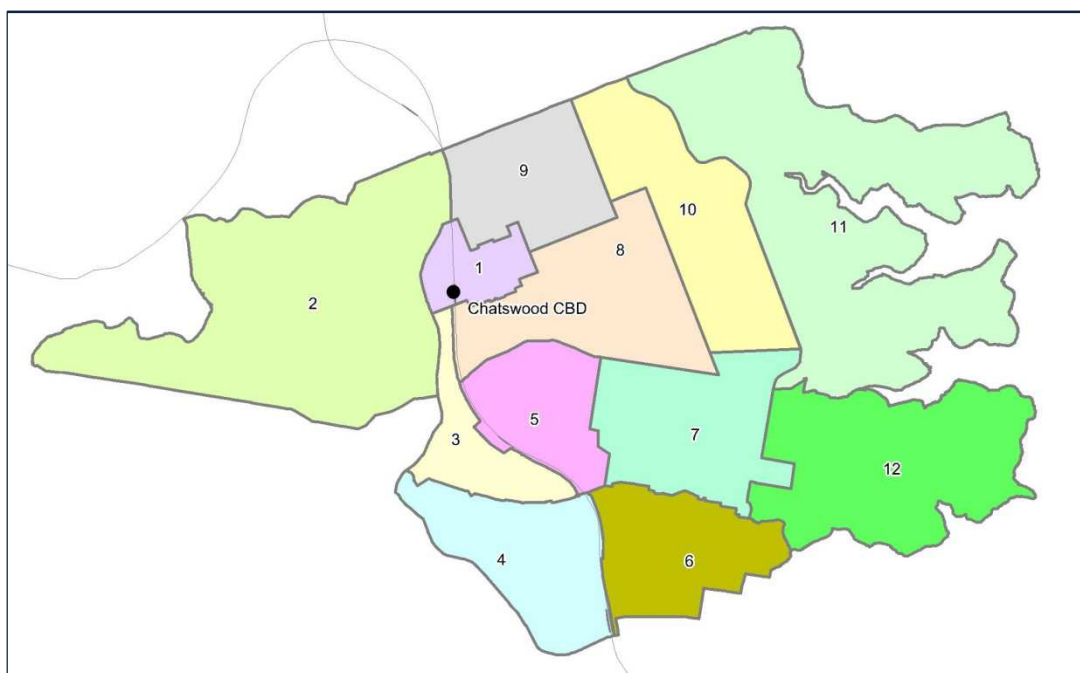
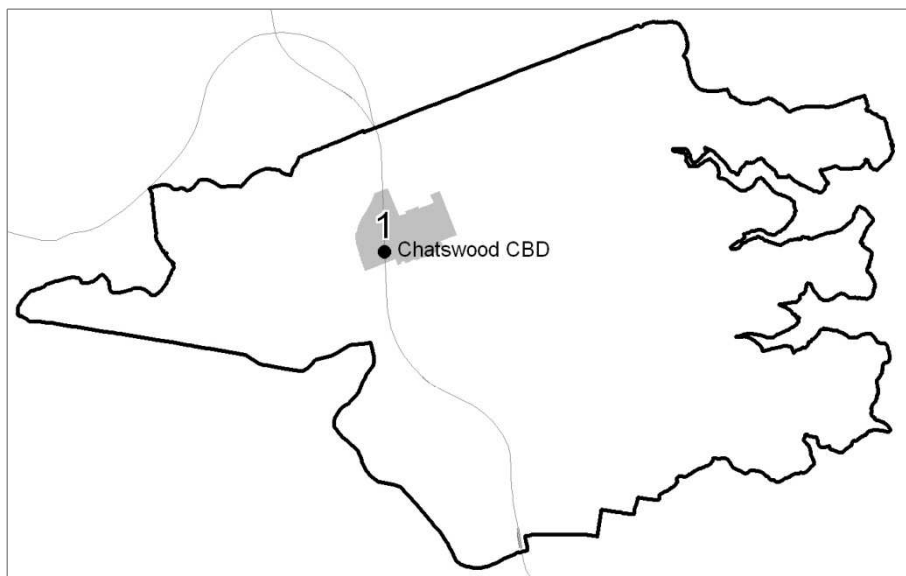


FIGURE 1:
Willoughby Street Tree Precincts Map

...

1. Chatswood CBD – commercial core



Key landscape features

Geology and soils:

Wianamatta Group shales – shallow to moderately deep loams, silty-loams and clay-loam soils of medium to low fertility.

Topography, slope and aspect:

Gently undulating to moderately inclined slopes; no rock outcrops; aspect predominantly west to north-west

Cultural landscape (commercial centre):

High rise buildings, shopping centres and mall, Chatswood railway station, Pacific Highway (portion), Archer Street, Victoria Avenue (incl. pedestrian mall), Albert Avenue and Help Street.

Presence of remnant native vegetation:

The Blue Gum High Forest (BGHF) community of this precinct was cleared during the nineteenth century. Notably, a single remnant canopy tree from this community, Smooth-barked Apple (*Angophora costata*) has been retained at the corner of Albert Avenue and Bertram Street.

Streetscape type/character:

Dominant cultural plantations/ single or mixed species deciduous (avenues); Mixed exotic/ native plantations also present.

Heritage Conservation Areas:

n/a

Significant Inter-war period plantations:

n/a (Albert Avenue and Help Street plantations removed)

Age structure of plantations:

Dominant: up to 15-20 years+ (Victoria Avenue – up to 40-50 years+)

PRECINCT 1: CHATSWOOD CBD	
Existing typical or dominant planted tree species	
Location	Tree Species (cultivated)
Victoria Avenue (incl. shopping mall)	<i>Platanus x orientalis</i> (Oriental Plane) <i>Pyrus calleryana</i> 'Chanticleer' (Ornamental Pear)
Victoria Avenue (western side of railway)	<i>Platanus x acerifolia</i> (London Plane) <i>Ulmus parvifolia</i> (Chinese Elm)
Railway Street	<i>Magnolia grandiflora</i> 'Little Gem' ('Little Gem' Southern Magnolia) <i>Podocarpus elatus</i> (Plum Pine)
McIntosh Street	<i>Ficus microcarpa</i> var. <i>hillii</i> (Hill's Weeping Fig) <i>Auranticarpa rhombifolia</i> (Hollywood/ Diamond-leaf Pittosporum) <i>Elaeocarpus eumundi</i> (Eumundi Quandong)
Victor Street/ Archer Street	<i>Ulmus</i> spp. (Elm) <i>Harpulia pendula</i> (Tulipwood)
Help Street/ Anderson Street	<i>Pyrus calleryana</i> 'Chanticleer' Ornamental Pear) <i>Tristanopsis laurina</i> (Water Gum)
Pacific Highway	<i>Eucalyptus microcorys</i> (Tallowwood) <i>Corymbia maculata</i> (Spotted Gum) <i>Cupaniopsis anacardioides</i> (Tuckeroo)

Key precinct objectives

- Maintain and promote formal character and consistency in plantations using select deciduous and evergreen broadleaf species and cultivars;
- Select species for high tolerance to urban spaces (i.e. hard paved surfaces, microclimatic extremes, pollutants, etc.)
- Protect and maintain the integrity and intactness of mature single species avenues of high visual and environmental integrity;
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.);
- Phase-out species with aggressive root-systems, fruit-fall/ life-history or allergenic issues or poor performance under prevailing conditions;

- Enhance microclimatic conditions and seasonal variation (e.g. maximise shade in summer, sun in winter) and provide seasonal colour and texture consistent with highly urbanised precinct.

PRECINCT 1: CHATSWOOD CBD Proposed street tree species						
Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Backhousia myrtifolia</i>	Grey Myrtle	E	-	cr	N	Y
<i>Elaeocarpus eumundi</i>	Eumundi Quandong	E	-	cu	M	N
<i>Eucalyptus paniculata</i> (BGHF)*	Narrow-leaved Ironbark	E	-	os	W	N
<i>Magnolia grandiflora</i> 'Exmouth'	Southern Magnolia cv.	E	-	cu	M	N
<i>Magnolia grandiflora</i> 'Little Gem'	Southern Magnolia cv.	E	-	cu	N	Y
<i>Platanus x acerifolia</i>	London Plane	-	D	os	W	N
<i>Platanus x orientalis</i>	Oriental Plane	-	D	os	W	N
<i>Pyrus calleryana</i> 'Cleveland Select'	Ornamental Pear	-	D	cr	M	N
<i>Pyrus calleryana</i> 'Capital'	Ornamental Pear	-	D	cn	N	N
<i>Tristanopsis laurina</i> spp	Water Gum '	E	-	cr	M	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

¹HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;
upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

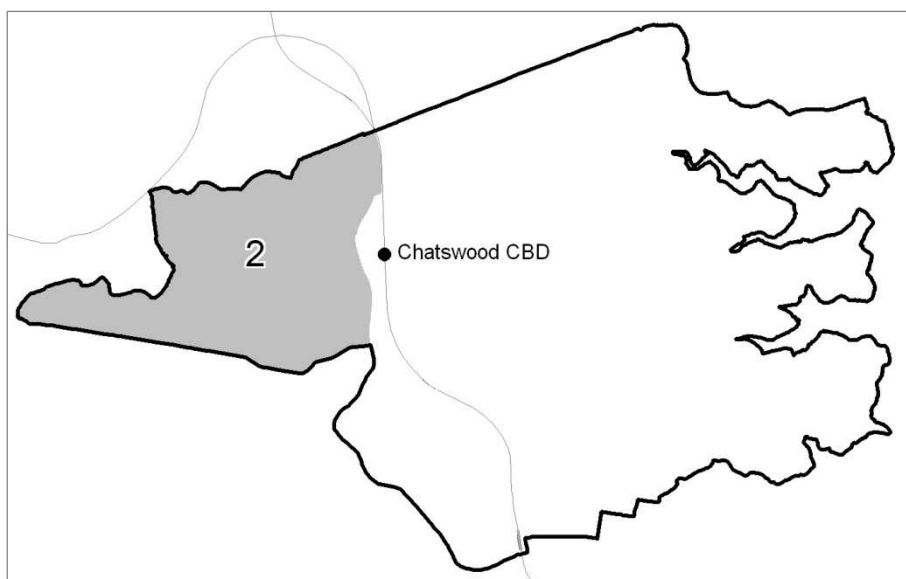
N = narrow (<2.5 metres)
M = medium (2.5-4.0 metres)
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:
N = NO; Y = YES

*BGHF LOCAL NATIVE SPECIES recommended for Pacific Highway plantations subject to adequate verge width and location of services.

2. North-western ridges, slopes and valleys (incl. Blue Gum High Forest community)



Key landscape features

Geology and soils:

Upper eastern slopes and valleys – Wianamatta Group shales with shallow to moderately deep loams, silty-loams and clay-loams grading to Hawkesbury sandstone, medium to coarse-grained quartz sandstone;

Western plateau/ ridges – Mittagong Formation with alternating bands of fine to medium grained quartz sandstone and inter-bedded shale lenses; soils moderately deep, typically loose sandy loams overlying stony, hard-setting sandy clay loam.

Lane Cove River Valley – alluvial floodplain consisting of fine and coarse-grained quartz sands, silts and clays (no streets in this area).

Topography, slope and aspect:

Upper eastern portion – gently undulating to moderately inclined slopes; no rock outcrops; aspect predominantly west to north-west.

Mid-slopes – undulating to rolling rises and low hills on Hawkesbury sandstone; localised steep slopes with rock outcrops on low broken scarps.

Western plateau and ridges – gently undulating crests and ridges; no rock outcrops.

Natural and cultural landscape:

Low density residential/ environmental living (incl. Conservation Areas), bushland reserves, parks and golf course, environmental conservation; Lane Cove River Valley; Pacific Highway (portion), Fullers Road, Mowbray Road West

Presence of remnant native vegetation:

Remnant Blue Gum High Forest (BGHF 6b) community (critically endangered); Sydney-Turpentine Ironbark Forest (STIF 9o) community (endangered); Sydney Sandstone Gully Forest (SSGF) – including 10ag(i) Open Forest/ Woodland and 10ag(ii) Tall Open Forest; Sydney Sandstone Ridgetop Woodland (SSRW) – 10ar(i) including Woodland/ Low Woodland. Ecological communities are in accordance with Benson & Howell (1994). For further details refer to FIGURE 2: Precinct 2 – Native Vegetation Communities Map and *Willoughby Natural Heritage Register*.

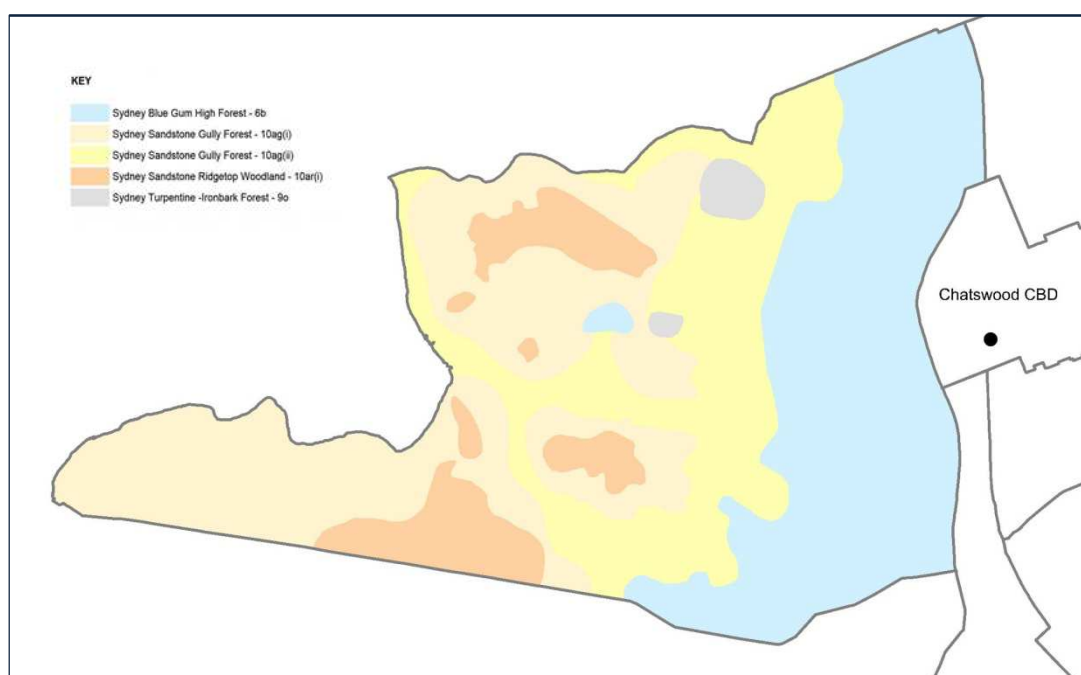


FIGURE 2:
Precinct 2 – Native Vegetation Communities Map

Streetscape type/character:

Remnant native tall forest canopy trees (BGHF/ STIF/ SSGF communities) and open-woodland trees and shrubs (SSRW); Cultural plantations including single or mixed species (native and exotic), evergreen or deciduous avenues; significant Inter-war period plantations.

Heritage Conservation Areas:

1. Blue Gum Heritage Conservation Area: C2 (WDCP 2012 Part H: Heritage Item H3.3); and
2. Findlay and Wyvern Avenues Heritage Conservation Area: C3 (WDCP 2012 Part H: Heritage Item H3.4).

Historic significance:

Timber-getting/ clearing followed by orchards and small farms after 1840; Blue Gum HCA – first residential subdivision in 1897, second in 1906 and last wave in 1913-1920. Residential development is representative of late Federation and Inter-war periods.

HCA-C2 Key period of significance: 1906-1920 (WDCP, 2012, H3-7);

HCA-C3 Key period of significance: 1898-1940 (WDCP, 2012, H3-11).

Ecological significance:

Remnant tall forest canopy trees are representative (regrowth) components of the listed critically endangered Blue Gum High Forest and endangered Sydney-Turpentine Ironbark Forest communities.

Significant Inter-war period (mixed) plantations:

Findlay Avenue

Sutherland Road

Moriarty Road

Sylvia Street

Age structure of remnant native trees and plantations:

Remnant canopy: varies; incl. old growth specimens up to 100-150 years

Conservation Areas: Inter-war period plantations (up to 70-80 years+)

Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 2: NORTH-WEST RIDGES, SLOPES & VALLEYS Existing remnant (typical) native canopy species	
Location	Native Tree Species
Anglo Street/ Peckham Avenue/ Dulwich Road	<i>Eucalyptus saligna</i> (Sydney Blue Gum) <i>Eucalyptus pilularis</i> (Blackbutt) <i>Syncarpia glomulifera</i> (Turpentine)
Eddy Road/ Dalrymple Avenue	<i>Eucalyptus saligna</i> (Sydney Blue Gum) <i>Eucalyptus pilularis</i> (Blackbutt) <i>Angophora costata</i> (Smooth-barked Apple)
Fullers Road	<i>Eucalyptus pilularis</i> (Blackbutt) <i>Syncarpia glomulifera</i> (Turpentine) <i>Angophora costata</i> (Smooth-barked Apple)
Greville Street/ Kooba Avenue	<i>Syncarpia glomulifera</i> (Turpentine) <i>Eucalyptus resinifera</i> (Red Mahogany) <i>Angophora costata</i> (Smooth-barked Apple)
Beaconsfield Road/ Coolaroo Road/ Ferndale Street	<i>Eucalyptus pilularis</i> (Blackbutt) <i>Syncarpia glomulifera</i> (Turpentine) <i>Angophora costata</i> (Smooth-barked Apple)

Mowbray Road West [upper east]	<i>Eucalyptus saligna</i> (Sydney Blue Gum) <i>Eucalyptus pilularis</i> (Blackbutt) <i>Angophora costata</i> (Smooth-barked Apple)
Hart Street/ Farran Street	<i>Eucalyptus racemosa</i> (Narrow-leaved Scribbly Gum) <i>Eucalyptus resinifera</i> (Red Mahogany) <i>Corymbia gummifera</i> (Red Bloodwood)
Avian Crescent/ Mowbray Road West [western ridge]	<i>Eucalyptus piperita</i> (Sydney Peppermint) <i>Eucalyptus racemosa</i> (Narrow-leaved Scribbly Gum) <i>Corymbia gummifera</i> (Red Bloodwood)
Bellevue Street/ Hawthorne Avenue	<i>Eucalyptus punctata</i> (Grey Gum) <i>Eucalyptus racemosa</i> (Narrow-leaved Scribbly Gum) <i>Corymbia gummifera</i> (Red Bloodwood)

PRECINCT 2: NORTH-WEST RIDGES, SLOPES & VALLEYS

Existing typical or dominant planted tree species*

Location	Tree Species (cultivated)
Wyvern Avenue/ Findlay Avenue	<i>Jacaranda mimosifolia</i> (Jacaranda) <i>Lophostemon confertus</i> (Brush Box) <i>Cinnamomum camphora</i> (Camphor Laurel)
Anglo Street/ Dulwich Road	<i>Jacaranda mimosifolia</i> (Jacaranda) <i>Liquidambar styraciflua</i> (Liquidambar) <i>Callistemon viminalis</i> (Weeping Bottlebrush)
Eddy Road/ De Villiers Avenue	<i>Lophostemon confertus</i> (Brush Box) <i>Liquidambar styraciflua</i> (Liquidambar) <i>Jacaranda mimosifolia</i> (Jacaranda)
Sharland Avenue/ Dalrymple Avenue	<i>Jacaranda mimosifolia</i> (Jacaranda) <i>Brachychiton acerifolius</i> (Illawarra Flame Tree)
Sutherland Road/ Moriarty Road/ Centennial Avenue	<i>Lophostemon confertus</i> (Brush Box) <i>Cinnamomum camphora</i> (Camphor Laurel) <i>Jacaranda mimosifolia</i> (Jacaranda)
McLean Avenue/ Glencoe Avenue/ Greville Street	<i>Jacaranda mimosifolia</i> (Jacaranda) <i>Lophostemon confertus</i> (Brush Box) <i>Callistemon viminalis</i> (Weeping Bottlebrush)

* NOTE: Street tree planting is dominated by a wide range of exotic and generic native trees and shrubs, including various cultivars.

Key precinct objectives

- Protect and maintain the significant biodiversity and geodiversity values of this precinct, particularly the diversity of ecological communities and native tree species within the street verges (as scheduled in WNHR);

- Promote strategies to supplement and enhance native tree canopy using provenance-sourced material (including critically endangered Blue Gum High Forest and endangered Sydney Turpentine-Ironbark Forest);
- Avoid the use of generic native species in this precinct (i.e. species native to other geographic areas or of unknown provenance);
- Selection of native species to be in accordance with mapped geology, soils and ecological communities;
- Promote opportunities for natural recruitment of canopy trees and community-based restoration strategies in streetscapes and adjoining bushland reserves;
- Protect and maintain high visual, aesthetic and environmental values including strong physical and historical connections with Heritage Conservation Areas;
- Protect and maintain integrity and intactness of historic single species and mixed species avenues avoiding infill programs using unsympathetic species.

PRECINCT 2: NORTH-WEST RIDGES, SLOPES & VALLEYS Proposed street tree species						
Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i> (ALL)*	Lilly Pilly	E	-	cr	N	N
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Alectryon subcinereus</i> (BGHF/SGF)*	Native Quince	E	-	cr	N	Y
<i>Angophora costata</i> (ALL)*	Smooth-barked Apple	E	-	os	M	N
<i>Angophora floribunda</i> (BGHF)*	Rough-barked Apple	E	-	os	M	N
<i>Backhousia myrtifolia</i> (BGHF)*	Grey Myrtle	E	-	cr	N	Y
<i>Corymbia gummifera</i> (SGF1/SRW)*	Red Bloodwood	E	-	os	M	N
<i>Elaeocarpus eumundi</i>	Eumundi Quandong	E	-	cu	M	N
<i>Eucalyptus capitellata</i> (SRW)*	Brown Stringybark	E	-	os	M	N
<i>Eucalyptus haemastoma</i> (SRW)*	Scribbly Gum	E	-	os	W	N
<i>Eucalyptus paniculata</i> (BGHF/STIF)*	Grey Ironbark	E	-	os	W	N
<i>Eucalyptus pilularis</i> (BGHF/SGF2)*	Blackbutt	E	-	os	W	N

Willoughby Street Tree Master Plan

WILLOUGHBY CITY COUNCIL

October 2014

LandArc Pty Limited

Int. Ref: 82741068

<i>Eucalyptus piperita</i> (SGF1/SRW)*	Sydney Peppermint	E	-	os	W	N
<i>Eucalyptus punctata</i> (SGF1/SGF2)*	Grey Gum	E	-	os	W	N
<i>Eucalyptus racemosa</i> (SGF1/SRW)*	Scribbly Gum	E	-	os	M	N
<i>Eucalyptus resinifera</i> (ALL)*	Narrow-leaved Ironbark	E	-	os	W	N
<i>Eucalyptus saligna</i> (BGHF)*	Sydney Blue Gum	E	-	os	W	N
<i>Gordonia axillaris</i>	Gordonia	E	-	cu	M	Y
<i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Lagerstroemia indica</i> x <i>L. fauriei</i> var.	Crepe Myrtle cv.***	-	D	cu	M	Y
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Magnolia grandiflora</i> 'Exmouth'	Southern Magnolia cv.	E	-	cu	M	N
<i>Magnolia grandiflora</i> 'Little Gem'	Southern Magnolia cv.	E	-	cu	N	Y
<i>Pistacia chinensis</i>	Chinese Pistachio	-	D	cr	M	N
<i>Syncarpia glomulifera</i> (ALL)*	Turpentine	E	-	cs	W	N
<i>Syzygium luehmannii</i>	Cherry Satinash	E	-	cu	N	Y
<i>Tristanopsis laurina</i> 'Luscious'	Water Gum 'Luscious'	E	-	cr	M	Y
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N
<i>Xanthostemon chrysanthus</i>	Golden Penda	E	-	cr	N	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* LOCAL NATIVE SPECIES and ecological community (refer to FIGURE 2)

ALL = all ecological communities in precinct;
 BGHF = Blue Gum High Forest (critically endangered EEC);
 STIF = Sydney Turpentine-Ironbark Forest (endangered EEC);
 SGF1 = Sydney Sandstone Gully Forest (*Eucalyptus piperita*/ *Angophora costata*);
 SGF2 = Sydney Sandstone Gully Forest (*Eucalyptus pilularis*/ *Syncarpia glomulifera*);
 SRW = Sydney Sandstone Ridgetop Woodland.

** *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars "Red Head" (burgundy red new foliage) and "Sublime" (lush green new foliage).

*** *Lagerstroemia indica* x *L. fauriei* select cultivars including "Acoma", "Sioux", "Natchez" and "Tuscarora".

'HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;
 upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

2MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)
 M = medium (2.5-4.0 metres)
 W = wide (>4.0 metres)

Willoughby Street Tree Master Plan

WILLOUGHBY CITY COUNCIL

October 2014

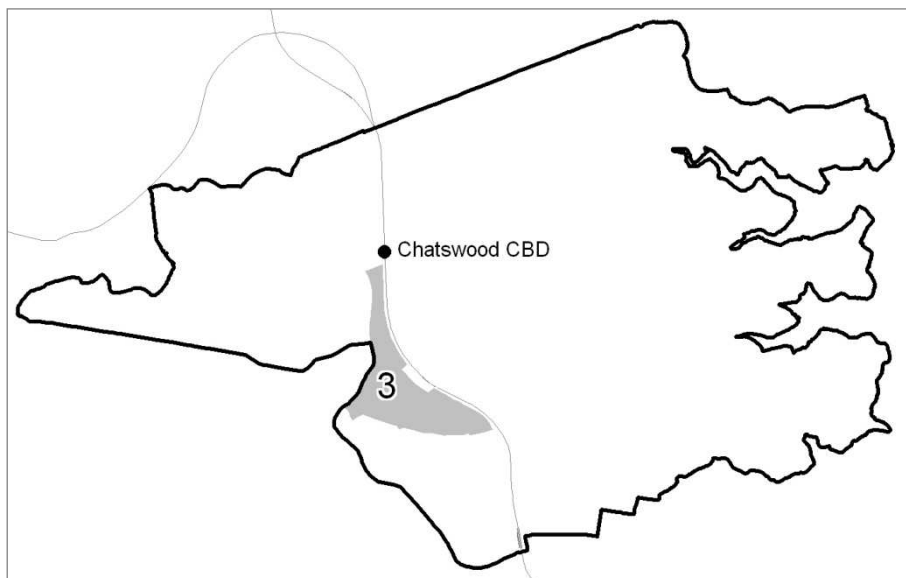
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Int. Ref: 82741068

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:
N = NO; Y = YES

3. West-central – medium to high density residential



Key landscape features

Geology and soils:

Wianamatta Group shales (approx. 90% of precinct) – shallow to moderately deep loams, silty-loams and clay-loam soils of low to moderate fertility;
Hawkesbury sandstone (approx. 5% of precinct) – south-eastern corner near Gore Hill Freeway – fine to medium-grained quartz sandstone and inter-bedded shale lenses; soils are typically shallow, apedal, porous sandy to sandy loams;
Disturbed terrain/ ex situ fill material (approx. 5% of precinct) – south-western edge adjoining Gore Hill Freeway.

Topography, slope and aspect:

Generally, undulating to rolling low hills with no rock outcrops grading to localised steep slopes (southern portion) with some sandstone outcropping and benches in south-east corner; aspect varies (predominantly south-east to south-west in southern portion).

Cultural landscape:

Medium to high density residential (some light industry); Artarmon railway station/ shopping centre (incl. small part of Conservation Area); Pacific Highway (western

boundary), Gore Hill Freeway (southern boundary), rail corridor (eastern boundary) and Chatswood CBD (northern boundary).



Presence of remnant native vegetation:

Parkes Road/ Cleland Road – adjacent to Artarmon Reserve and rail corridor (Remnant Blue Gum High Forest (BGHF) community); and Barton Road – adjacent to Cleland Park (remnant group of old growth *Eucalyptus saligna* (Remnant Blue Gum High Forest (BGHF) community)

Streetscape type/character:

Dominant cultural plantations including single or mixed species (native and exotic), evergreen or deciduous avenues; significant Inter-war period plantations.

PHOTO 4: Artarmon Reserve – Parkes Road streetscape
Remnant BGHF old growth group – Sydney Blue Gums (*Eucalyptus saligna*)

Heritage Conservation Areas:

1. Portion (incl. Hampden Road/ Artarmon railway station) of Artarmon Heritage Conservation Area: C1 (WDCP 2012 Part H: Heritage Item H3.2).

Historic significance:

Earliest land grants 1793-4; Timber-getting/ clearing followed by some livestock grazing during early nineteenth century; some Federation era residential development but largely Inter-war period development; Inter-war period flats (two-storey scale) are clustered near the railway station forming a cohesive and unified residential precinct.

HCA-C1 Key period of significance: 1900-1940 (WDCP, 2012, H3-4).

Significant Inter-war period (single species and mixed) plantations:

Kitchener Road (Brush Box)

Francis Road (Brush Box)

Hampden Road (north/ adjacent to railway station & south of McMillan Road)

Parkes Road (west of Hampden Road – Brush Box)

Age structure of cultural street tree plantations:

Conservation Area: Inter-war period plantations (up to 80-90 years+)

Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 3: WEST-CENTRAL (MEDIUM TO HIGH DENSITY RESIDENTIAL) Existing typical or dominant planted tree species*

Location	Tree Species (cultivated)
Hampden Road/ Cleland Road	<i>Lophostemon confertus</i> (Brush Box) <i>Jacaranda mimosifolia</i> (Jacaranda) <i>Flindersia australis</i> (Crow's Ash or Australian Teak)
Broughton Road/ Rimington Street	<i>Lophostemon confertus</i> (Brush Box) <i>Fraxinus angustifolia</i> subsp. <i>oxycarpa</i> 'Raywood' (Claret Ash) <i>Callistemon viminalis</i> (Weeping Bottlebrush)
Eric Road/ Palmer Street/ Robert Street	<i>Corymbia citriodora</i> (Lemon-scented Gum) <i>Corymbia maculata</i> (Spotted Gum) <i>Acmena smithii</i> var. <i>minor</i> (Dwarf Lilly Pilly)
Jersey Road/ McMillan Road	<i>Eucalyptus microcorys</i> (Tallowwood) <i>Corymbia maculata</i> (Spotted Gum) <i>Corymbia citriodora</i> (Lemon-scented Gum)
Parkes Road/ Barton Road/ Reserve Road	<i>Lophostemon confertus</i> (Brush Box) <i>Corymbia maculata</i> (Spotted Gum) <i>Jacaranda mimosifolia</i> (Jacaranda)
Kitchener Road/ Francis Road/ Buller Road	<i>Lophostemon confertus</i> (Brush Box) <i>Callistemon viminalis</i> (Weeping Bottlebrush)

* NOTE: Street tree planting is dominated by a wide range of exotic and generic native trees and shrubs, including various cultivars.

Key precinct objectives

- Protect and manage historic avenues of high visual and environmental integrity (i.e. Inter-war period heritage streetscapes) and provide consistency in replacement programs in accordance with heritage palettes;
- Protect and maintain the integrity and intactness of historic single species and mixed species avenues;
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;
- Provide appropriate scale in selection of street tree planting consistent with medium and high density residential development in this precinct;
- Avoid infill planting strategies which add further layers of inconsistent, disjunctive and/ or mixed generic native and exotic tree species of varying scale, form and texture;
- Enhance microclimatic conditions and seasonal variation (e.g. maximise shade in summer, sun in winter);
- Promote strategies to supplement and enhance native tree canopy adjacent to Artarmon Reserve/ rail corridor using provenance-sourced material

consistent with critically endangered Blue Gum High Forest (i.e. avoid use of generic native species in this context).

PRECINCT 3: WEST-CENTRAL (MEDIUM TO HIGH DENSITY RESIDENTIAL)						
Proposed street tree species						
Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Angophora costata</i> (BGHF)*	Smooth-barked Apple	E	-	os	M	N
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	E	-	cr	M	N
<i>Backhousia myrtifolia</i> (BGHF)*	Grey Myrtle	E	-	cr	N	Y
<i>Eucalyptus paniculata</i> (BGHF)*	Grey Ironbark	E	-	os	W	N
<i>Eucalyptus pilularis</i> (BGHF)*	Blackbutt	E	-	os	W	N
<i>Eucalyptus saligna</i> (BGHF)*	Sydney Blue Gum	E	-	os	W	N
<i>Flindersia australis</i>	Australian Teak	E	-	cs	M	N
<i>Gordonia axillaris</i>	Gordonia	E	-	cu	M	Y
<i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Lagerstroemia indica</i> x <i>L. fauriei</i> var.	Crepe Myrtle cv.***	-	D	cu	M	Y
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Syncarpia glomulifera</i> (BGHF)*	Turpentine	E	-	cs	W	N
<i>Syzygium luehmannii</i>	Cherry Satinash	E	-	cu	N	Y
<i>Tristaniaopsis laurina</i> 'Luscious'	Water Gum 'Luscious'	E	-	cr	M	Y
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* Local native species and ecological community

BGHF = Blue Gum High Forest (critically endangered EEC)

** *Acmena smithii* var. *minor* including psyllid-resistant cultivars "Red Head" (burgundy red new foliage) and "Sublime" (lush green new foliage).

*** *Lagerstroemia indica* x *L. fauriei* select cultivars including "Acoma", "Sioux", "Natchez" and "Tuscarora".

Willoughby Street Tree Master Plan

WILLOUGHBY CITY COUNCIL

October 2014

LandArc Pty Limited

Int. Ref: 82741068

¹HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;
upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)
M = medium (2.5-4.0 metres)
W = wide (>4.0 metres)

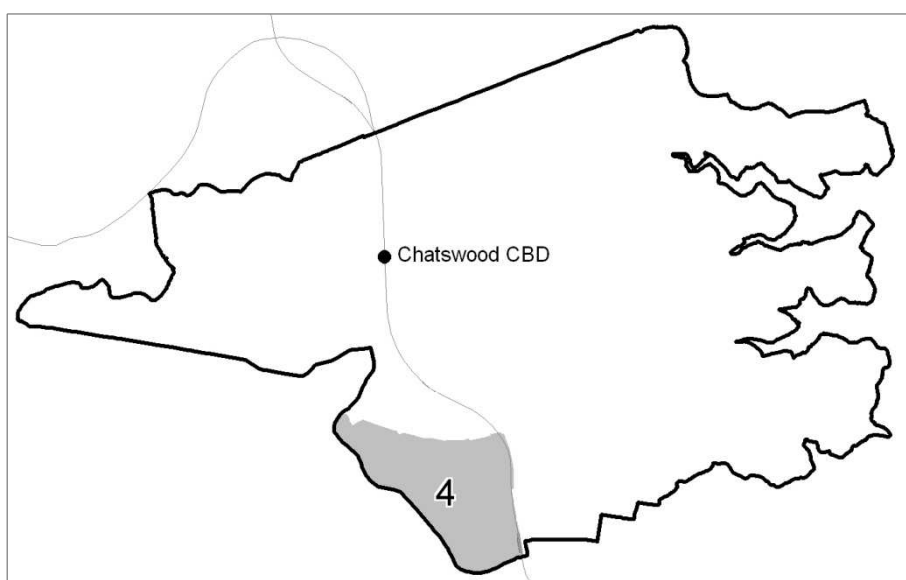
³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

...

4. South-western mixed use and industrial area



Key landscape features

Geology and soils:

Wianamatta Group shales (approx. 60% of precinct) – shallow to moderately deep loams, silty-loams and clay-loam soils of low to moderate fertility;

Hawkesbury sandstone (approx. 10%) – north-eastern corner near Gore Hill Freeway – fine to medium-grained quartz sandstone and inter-bedded shale lenses; soils are typically shallow, apedal, porous sandy to sandy loams.

Disturbed terrain/ ex situ fill material (approx. 30% of precinct/ two areas) – north-western corner adjoining Gore Hill Freeway and large central area.

Topography, slope and aspect:

Undulating to rolling low hills (steeper in northern portion); outcropping sandstone rock benches and broken scarps in north-east portion; disturbed terrain includes significant cut and fill profiles; aspect varies considerably.

Cultural landscape:

General and light industrial; Gore Hill Memorial Cemetery; Royal North Shore Hospital; Pacific Highway (western and southern boundary), rail corridor (eastern boundary) and Gore Hill Freeway (northern boundary)

Presence of remnant native vegetation:

Reserve Road (adjacent to Gore Hill Oval) – mixed species group/ Remnant Blue Gum High Forest (BGHF) community (source: *Willoughby Natural Heritage Register*).

Streetscape type/character:

Dominant cultural plantations/ mixed exotic and native tree species (evergreen and deciduous); typically mixed range of *Eucalyptus*/ *Corymbia* spp. within each street (e.g. Dickson Avenue (approximately 850 metres in length) has 13 different native tree species, of varying age structure, out of a total of 51 planted trees).

Heritage Conservation Areas:

n/a

Significant Inter-war period plantations:

Pacific Highway (Gore Hill Memorial Cemetery boundary row plantation)

Age structure of cultural street tree plantations:

Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 4: SOUTH-WESTERN MIXED USE AND INDUSTRIAL AREA Existing typical or dominant planted tree species*

Location	Tree Species (cultivated)
Herbert Street	<i>Lophostemon confertus</i> (Brush Box) <i>Eucalyptus microcorys</i> (Tallowwood) <i>Corymbia maculata</i> (Spotted Gum)
Cleg Street	<i>Lophostemon confertus</i> (Brush Box) <i>Tristaniopsis laurina</i> (Water Gum) <i>Callistemon viminalis</i> (Weeping Bottlebrush)
Reserve Road	<i>Corymbia maculata</i> (Spotted Gum) <i>Jacaranda mimosifolia</i> (Jacaranda) <i>Cupaniopsis anacardioides</i> (Tuckeroo)

Dickson Avenue	<i>Eucalyptus microcorys</i> (Tallowwood) <i>Eucalyptus nicholii</i> (Narrow-leaved Black Peppermint) <i>Agonis flexuosa</i> (Willow Myrtle)
Campbell Street/ Frederick Street	<i>Ulmus parvifolia</i> (Chinese Elm) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) <i>Corymbia maculata</i> (Spotted Gum)
Clarendon Street/ Hotham Parade	<i>Harpephyllum caffrum</i> (Wild Plum) <i>Eucalyptus microcorys</i> (Tallowwood) <i>Tristanopsis laurina</i> (Water Gum)

* NOTE: Street tree planting is dominated by a wide range of exotic and generic native trees and shrubs, including various cultivars.

Key precinct objectives

- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.) and variety of tree species in many streets;
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;
- Provide appropriate massing of trees to reduce the bulk and scale of industrial buildings and associated infrastructure, where possible;
- Establish a consistent palette of dense, evergreen broadleaf species rather than open or sparse canopy trees of varying forms and shapes within industrial areas;
- Promote a more formal character using single species (deciduous) avenues within the southern urban portion of the precinct (i.e. adjacent to Royal North Shore Hospital/ St. Leonards station);
- Enhance microclimatic conditions and seasonal variation (e.g. maximise shade in summer, sun in winter and provide seasonal colour and texture.

PRECINCT 4: SOUTH-WESTERN MIXED USE AND INDUSTRIAL AREA
Proposed street tree species

Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
Industrial Areas:						
<i>Acmena smithii</i> var. <i>minor</i>	Lilly Pilly (incl. cv)*	E	-	cr	N	Y
<i>Afrocarpus falcatus</i>	Outeniqua Yellowwood	E	-	cs	W	N
<i>Backhousia myrtifolia</i>	Grey Myrtle	E	-	cr	N	Y
<i>Corymbia gummifera</i>	Red Bloodwood	E	-	os	M	N
<i>Cupaniopsis anacardioides</i>	Tuckeroo	E	-	cr	N	Y
<i>Eucalyptus paniculata</i> (BGHF)*	Grey Ironbark	E	-	os	W	N
<i>Flindersia</i> spp.	Ash	E	-	cs	M	N
<i>Glochidion ferdinandi</i>	Cheese Tree	E	-	cs	M	Y
<i>Hibiscus tiliaceus</i> var. <i>rubra</i>	Purple-leaf Hibiscus	E	-	cr	M	Y
<i>Melaleuca</i> spp.	Paperbark / Tea Tree	E	-		M	Y
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	-	cr	M	N
<i>Tristaniopsis</i> spp.	Water Gum	E	-	cr	M	Y
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N
<i>Xanthostemon chrysanthus</i>	Golden Penda	E	-	cr	N	Y
Royal North Shore Hospital/ St. Leonards station streetscapes:						
<i>Caesalpinia ferrea</i>	Leopard Tree	-	D	cr	M	N
<i>Pistacia chinensis</i>	Chinese Pistachio	-	D	cr	M	N
<i>Platanus x acerifolia</i>	London Plane	-	D	os	W	N
<i>Platanus x orientalis</i>	Oriental Plane	-	D	os	W	N
<i>Ulmus parvifolia</i>	Chinese Elm	-	D	os	W	N

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars “Red Head” (burgundy red new foliage) and “Sublime” (lush green new foliage).

¹HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;
upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

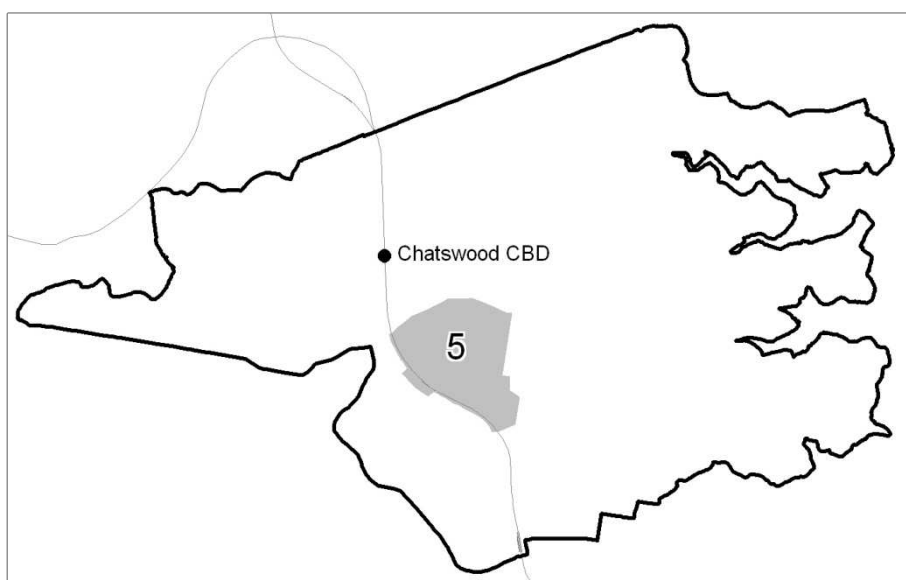
N = narrow (<2.5 metres)
M = medium (2.5-4.0 metres)
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

5. West-central – low density residential (incl. Conservation Areas)



Key landscape features

Geology and soils:

Wianamatta Group shales (approx. 60%) – northern, north-western and central parts of precinct; soils are generally shallow to moderately deep loams, silty-loams and clay-loam soils of low to moderate fertility;

Hawkesbury sandstone (approx. 35%) – eastern and south-eastern portion; fine to coarse grained quartz sandstone with inter-bedded shale lenses; soils are generally shallow, apedal and porous sandy to sandy loams with very low fertility;

Disturbed terrain/ ex situ fill material (approx. 5% of precinct) – southern corner adjoining Gore Hill Freeway (Artarmon Reserve).

Topography, slope and aspect:

Undulating to rolling low hills with moderately steep slopes; some outcropping of sandstone rock benches and broken scarps in south-eastern portion; aspect varies – generally east, south-east to south.

Cultural landscape:

Predominantly low density residential (incl. Artarmon Conservation Area and small southern portion of South Chatswood Conservation Area); Mowbray Road (northern boundary), rail corridor (western boundary), Artarmon Reserve/ Gore Hill Freeway (southern boundary) and Sydney Street (eastern boundary)

Presence of remnant native vegetation:

Burra Road – adjacent to Artarmon Reserve (Remnant Blue Gum High Forest (BGHF) community); also remnant BGHF components in Onyx Road, Shepherd Road and Smith Road associated with drainage reserves (source: *Willoughby Natural Heritage Register*).

Streetscape type/character:

Dominant cultural plantations including single or mixed species (native and exotic), evergreen or deciduous avenues; significant Inter-war period plantations.

Heritage Conservation Areas:

1. Artarmon Heritage Conservation Area: C1 (WDCP 2012 Part H: Heritage Item H3.2); and
2. Portion (incl. Mowbray Road) of South Chatswood Heritage Conservation Area: C11 (WDCP 2012 Part H: Heritage Item H3.12).

Historic significance:

Earliest land grants 1793-4; Timber-getting/ clearing followed by some livestock grazing during early nineteenth century; railway construction in the latter part of the nineteenth century; Mowbray Road – grand Victorian villas (1880s) and later Federation two-storey mansions set in large exotic gardens along this prominent ridgeline; in broader terms, this precinct conserves a rich variety of California and Inter-war period bungalows (1920s-1930s) as well as some earlier Federation era residential development.

HCA-C1 Key period of significance: 1900-1940 (WDCP, 2012, H3-4); and

HCA-C11 Key period of significance: 1880-1930 (WDCP, 2012, H3-43).

Significant Inter-war period (single species and mixed) plantations:

Burra Road

Cameron Avenue

Tindale Road (between Artarmon Road and Cameron Avenue)

Age structure of cultural street tree plantations:

Conservation Area: Inter-war period plantations (up to 80-90 years+)

Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 5: WEST-CENTRAL (LOW DENSITY RESIDENTIAL/ CONSERVATION)
Existing typical or dominant planted tree species*

Location	Tree Species (cultivated)
Burra Road	<i>Lophostemon confertus</i> (Brush Box) <i>Lagerstroemia indica</i> var. (Crepe Myrtle) <i>Phoenix canariensis</i> (Canary Island Date Palm)
Cameron Avenue/ Harden Road	<i>Lophostemon confertus</i> (Brush Box) <i>Jacaranda mimosifolia</i> (Jacaranda) <i>Cinnamomum camphora</i> (Camphor Laurel)
Elizabeth Street/ Muttama Road/ Brand Street	<i>Lophostemon confertus</i> (Brush Box) <i>Jacaranda mimosifolia</i> (Jacaranda) <i>Acmena smithii</i> var. <i>minor</i> (Dwarf Lilly Pilly)
Artarmon Road	<i>Lophostemon confertus</i> (Brush Box) <i>Tristanopsis laurina</i> (Water Gum) <i>Callistemon</i> spp. (Bottlebrush)
Cambridge Road/ Coree Road	<i>Lophostemon confertus</i> (Brush Box) <i>Tristanopsis laurina</i> (Water Gum) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark)
Smith Road/ Godfrey Road/ Onyx Road	<i>Jacaranda mimosifolia</i> (Jacaranda) <i>Melia azedarach</i> var. <i>australasica</i> (White Cedar) <i>Lagerstroemia indica</i> var. (Crepe Myrtle)
Stafford Road/ Shepherd Road	<i>Jacaranda mimosifolia</i> (Jacaranda) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Phoenix canariensis</i> (Canary Island Date Palm)
Mowbray Road	<i>Lophostemon confertus</i> (Brush Box)

* NOTE: Street tree planting is dominated by a wide range of exotic and generic native trees and shrubs, including various cultivars.

Key precinct objectives

- Protect and manage the historic streetscape character and visual amenity of the Heritage Conservation Areas (i.e. Inter-war period plantations) and provide consistency in infill and replacement programs in accordance with heritage palettes;
- Protect and maintain the integrity and intactness of historic single species and mixed species avenues;
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;
- Avoid infill planting strategies which add further layers of inconsistent, disjunctive and/ or mixed generic native and exotic tree species of varying scale, form and texture;

- Promote strategies to supplement and enhance ecological connectivity between Artarmon Reserve, Cordia Way and Marlow Road Reserve (including planting of BGHF canopy trees in Artarmon Road, Onyx Road, Smith Road, Weedon Road, Godfrey Road);
- Implement a strategy using provenance-sourced material consistent with critically endangered Blue Gum High Forest (i.e. avoid use of generic native species in this context).

PRECINCT 5: WEST-CENTRAL (LOW DENSITY RESIDENTIAL/ CONSERVATION) Proposed street tree species						
Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i> (ALL)*	Lilly Pilly	E	-	cr	N	N
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Angophora costata</i> (BGHF)*	Smooth-barked Apple	E	-	os	M	N
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	E	-	cr	M	N
<i>Banksia serrata</i>	Saw-toothed Banksia	E	-	os	M	Y
<i>Callistemon</i> spp.	Bottlebrush	E	-	cn	M	Y
<i>Cupaniopsis anacardioides</i>	Tuckeroo	E	-	cr	N	Y
<i>Eucalyptus haemastoma</i>	Scribbly Gum	E	-	os	W	N
<i>Eucalyptus paniculata</i> (BGHF)*	Grey Ironbark	E	-	os	W	N
<i>Eucalyptus pilularis</i> (BGHF)*	Blackbutt	E	-	os	W	N
<i>Eucalyptus saligna</i> (BGHF)*	Sydney Blue Gum	E	-	os	W	N
<i>Fraxinus</i> spp.	Ash	-	D		M	Y
<i>Glochidion ferdinandi</i>	Cheese Tree	E	-	cs	M	Y
<i>Gordonia axillaris</i>	Gordonia	E	-	cu	M	Y
<i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Lagerstroemia indica</i> x <i>L. fauriei</i> var.	Crepe Myrtle cv.***	-	D	cu	M	Y
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Syncarpia glomulifera</i> (BGHF)*	Turpentine	E	-	cs	W	N

<i>Tristaniopsis</i> spp.	Water Gum	E	-	cr	M	Y
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NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* Local native species and ecological community

BGHF = Blue Gum High Forest (critically endangered EEC)

** *Acmena smithii* var. *minor* including psyllid-resistant cultivars “Red Head” (burgundy red new foliage) and “Sublime” (lush green new foliage).

*** *Lagerstroemia indica* x *L. fauriei* select cultivars including “Acoma”, “Sioux”, “Natchez” and “Tuscarora”.

'HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;

upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)

M = medium (2.5-4.0 metres)

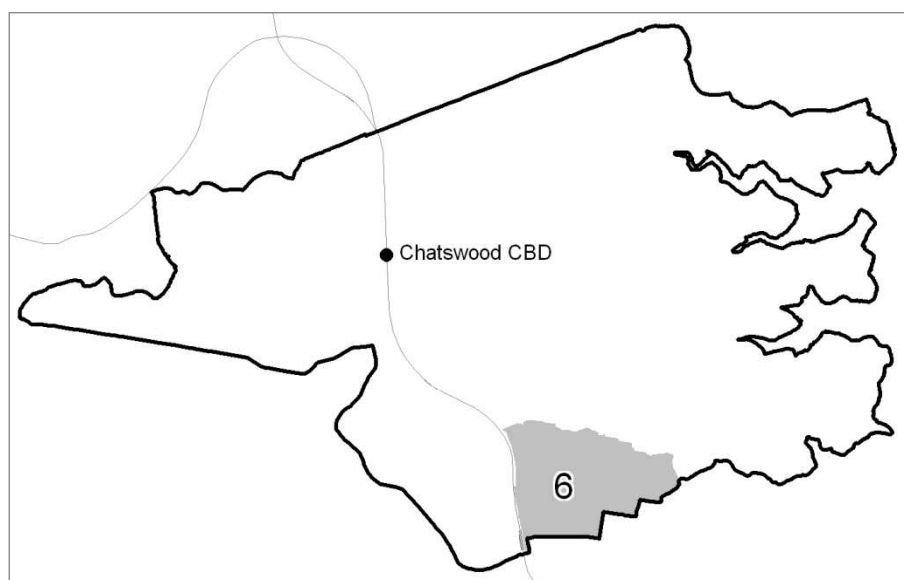
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

6. Southern mixed residential and commercial (incl. Conservation Areas)



Key landscape features

Geology and soils:

Wianamatta Group shales (approximately 50% of precinct) – central and western portions of precinct with shallow to moderately deep loams, silty-loams and clay-loam soils of low to moderate fertility;

Hawkesbury sandstone (45% of precinct) – northern, eastern and south-eastern portions of precinct with fine to medium-grained quartz sandstone and inter-bedded shale; soils are typically shallow, apedal, porous sandy to sandy loams;

Disturbed terrain/ ex situ fill (approx. 5% of precinct/ Bicentennial Reserve).

Topography, slope and aspect:

Central and western areas – undulating to rolling low hills with no rock outcrops, grading to localised steep slopes with some sandstone outcropping and benches (northern and eastern areas);

Eastern edge of precinct (adjoining Flat Rock Gully Reserve) – very steep and rugged sandstone slopes and ridges with rock outcrops, benches and broken scarps (up to 10 metres high); aspect varies – mainly north-west to north-east.

Cultural landscape:

Predominantly low to medium density residential (incl. two Conservation Areas) and commercial areas; Gore Hill Freeway splits the precinct into east and west portions; Gore Hill Freeway and Bicentennial Reserve (northern boundary), Flat Rock Gully Reserve (eastern boundary), Palmer Street/ Wheatleigh Street/ Chandos Street (southern boundary) and rail corridor (western boundary).

Presence of remnant native vegetation:

Eastern boundary/ Flat Rock Gully Reserve – conserves remnant Sydney Sandstone Ridgeline Woodland (10ar (i)) and Sydney Sandstone Gully Forest (10ag (i)) however no remnant native vegetation in streetscapes. Prior to clearing this area would have supported a range of ecological communities including Blue Gum High Forest, Sydney-Turpentine Ironbark Forest, Sydney Sandstone Gully Forest and Sydney Sandstone Ridgeline Woodland (source: *Willoughby Natural Heritage Register*).

Streetscape type/character:

Dominant cultural plantations/ mixed exotic and native tree species (evergreen and deciduous); typically mixed range of *Eucalyptus/ Corymbia* spp. within each street. 15-20+ different tree species per street is typical (e.g. Garland Road has 21 tree species (16 native/ 5 exotic trees) out of a total of 76 planted trees and Dalleys Road has 23 tree species (17 native/ 6 exotic trees) out of a total of 92 planted trees).

Heritage Conservation Areas:

1. Naremburn Heritage Conservation Area: C8 (WDCP 2012 Part H: Heritage Item H3.9); and

2. Naremburn Central Township Heritage Conservation Area: C9 (WDCP 2012 Part H: Heritage Item H3.10).

Historic significance:

Naremburn HCA: Broughton Estate subdivided in 1903 following extension of tramline along Willoughby Road to Willoughby; land subdivided into grid pattern of very small allotments with detached Federation working class cottages; boom period until the 1930s and generally intact Federation suburb.

Darvall Street retains a significant formal avenue plantation of Canary Island Date Palms (WDCP, 2012 HCA-C8/ H3-31). This is possibly one of the oldest formal street tree plantations on the North Shore.



PHOTO 5: Darvall Street – Avenue of Canary Island Date Palms (*Phoenix canariensis*) – a significant heritage plantation

Naremburn Central Township HCA: First settled area in Naremburn (oldest commercial development on North Shore); Market Street – from early 1880s development included small businesses and home industries; area conserves wide range of working class Federation cottages, Californian bungalows, semi-detached housing and some late Victorian residences.

HCA-C8 Key period of significance: 1903-1915 (WDCP, 2012, H3-32);

HCA-C9 Key period of significance: 1880-1930 (WDCP, 2012, H3-35).

Significant Inter-war period (single species and mixed) plantations:

Plunkett Street

Darvall Street

Age structure of cultural street tree plantations:

Conservation Areas: Federation & Inter-war plantations (up to 90-100 years+)

Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 6: SOUTHERN MIXED RESIDENTIAL & COMMERCIAL/ CONSERVATION Existing typical or dominant planted tree species*	
Location	Tree Species (cultivated)
Plunkett Street/ Darvall Street	<i>Lophostemon confertus</i> (Brush Box) <i>Phoenix canariensis</i> (Canary Island Date Palm) <i>Lagerstroemia indica</i> var. (Crepe Myrtle)
Mitchell Street/ Oxley Street	<i>Afrocarpus falcatus</i> (Outeniqua Yellowwood) <i>Callistemon</i> spp. (Bottlebrush) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark)
Dalleys Road	<i>Lagerstroemia indica</i> var. (Crepe Myrtle) <i>Callistemon</i> spp. (Bottlebrush) <i>Triadica sebifera</i> syn. <i>Sapium sebiferum</i> (Chinese Tallow Tree)
Station Street/ Francis Street	<i>Casuarina cunninghamiana</i> (River Oak) <i>Tristaniopsis laurina</i> (Water Gum) <i>Lophostemon confertus</i> (Brush Box)
Dargan Street/ Northcote Street	<i>Tristaniopsis laurina</i> (Water Gum) <i>Callistemon</i> spp. (Bottlebrush) <i>Cupaniopsis anacardioides</i> (Tuckeroo)
Garland Road/ Market Street/ Central Street	<i>Agonis flexuosa</i> (Willow Myrtle) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) <i>Ulmus parvifolia</i> (Chinese Elm)

* NOTE: Street tree planting is dominated by a wide range of exotic and generic native trees and shrubs, including various cultivars (15-20+ tree species per street is typical).

Key precinct objectives

- Protect the historic character, scale and integrity of late Victorian and Federation streetscapes within the two Heritage Conservation Areas (incl. removal of inappropriate infill and replacement species);
- Protect and maintain the integrity and intactness of historic single species avenues (incl. significant Federation/or early Inter-war period avenue of Canary Island Date Palms in Darvall Street);
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.) and variety of tree species in many streets;
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;

- Avoid infill planting strategies which add further layers of inconsistent, disjunctive and/ or mixed generic native and exotic tree species of varying scale, form and texture;
- Consolidate thematic planting approach in commercial centres including use of select cultivars of deciduous species to enhance microclimatic conditions and to provide seasonal colour and texture;
- Prioritise Willoughby Road as a key connector road implementing a planting strategy using single or two (mixed) species within the streetscape (i.e. one species under overhead powerlines/ shop awnings and alternative species with no service restrictions).

PRECINCT 6: SOUTHERN MIXED RESIDENTIAL & COMMERCIAL/ CONSERVATION Proposed street tree species						
Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i>	Lilly Pilly	E	-	cr	N	N
<i>Afrocarpus falcatus</i>	Outeniqua Yellowwood	E	-	cs	W	N
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	E	-	cr	M	N
<i>Banksia integrifolia</i>	Coast Banksia	-	D	no cu	M	Y
<i>Corymbia maculata</i>	Spotted Gum	E	-	no	M	N
<i>Cupaniopsis anacardioides</i>	Tuckeroo	E	-	cr	N	Y
<i>Eucalyptus haemastoma</i>	Scribbly Gum	E	-	os	W	N
<i>Flindersia australis</i>	Australian Teak	E	-	cs	M	N
<i>Gordonia axillaris</i>	Gordonia	E	-	cu	M	Y
<i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Lagerstroemia indica</i> x <i>L. fauriei</i> var.	Crepe Myrtle cv.*	-	D	cu	M	Y
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Melaleuca</i> spp.	Paperbark / Tea Trea	E	-		M	Y
<i>Phoenix canariensis</i> **	Canary Is. Date Palm	E	-	-	M	N
<i>Pistacia chinensis</i>	Chinese Pistachio	-	D	cr	M	N
<i>Pyrus calleryana</i> 'Cleveland Select'	Ornamental Pear	-	D	cr	M	N

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<i>Pyrus calleryana</i> 'Capital'	Ornamental Pear	-	D	cn	N	N
<i>Tristanopsis</i> spp.	Water Gum	E	-	cr	M	Y
<i>Ulmus parvifolia</i>	Chinese Elm	-	D	os	W	N
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N
<i>Xanthostemon chrysanthus</i>	Golden Penda	E	-	cr	N	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* *Lagerstroemia indica* x *L. fauriei* select cultivars including "Acoma", "Sioux", "Natchez" and "Tuscarora".

** *Phoenix canariensis* to be used only within existing plantations in Conservation Areas.

¹HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;

upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)

M = medium (2.5-4.0 metres)

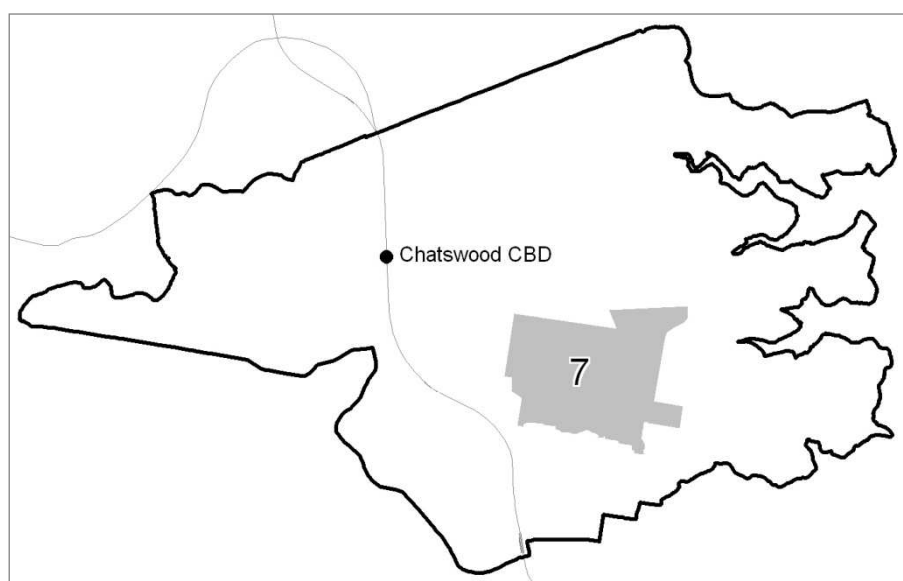
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

7. South-central mixed residential and commercial



Key landscape features

Geology and soils:

Hawkesbury sandstone (approx. 60%) – typically fine to coarse grained quartz sandstone with inter-bedded shale lenses; soils are generally shallow, apedal and porous sandy to sandy loams with very low fertility;

Wianamatta Group shale (approx. 20% of precinct) – along northern boundary of precinct; shallow to moderately deep loams, silty-loams and clay-loam soils of low to moderate fertility;

Disturbed terrain/ ex situ fill material (approx. 20% of precinct/ two areas) – SCEGGS War Memorial Playing Fields and local area; and Hallstrom Park, Bicentennial Reserve & Flat Rock Gully Reserve

Topography, slope and aspect:

Central ridges and slopes – undulating to rolling low hills with no rock outcrops grading to localised steep slopes with some sandstone outcropping and benches; Southern and south-eastern areas – moderate to very steep sandstone slopes with rock outcrops, benches and broken scarps (up to 10 metres high); aspect varies – mainly south-west to south-east.

Cultural landscape:

Predominantly low density residential (incl. eastern portion of South Chatswood Conservation Area), also medium density residential/ commercial along central and eastern road corridors (Willoughby Road and Eastern Valley Way); Mowbray Road/ Edinburgh Road (northern boundary), Sydney Road/ Chelmsford Avenue (western boundary), Gore Hill Freeway/ Bicentennial Reserve & Flat Rock Gully Reserve (southern boundary) and Eastern Valley Way (eastern boundary)

Presence of remnant native vegetation:

Flat Rock Gully Reserve – conserves remnant Sydney Sandstone Ridgetop Woodland (10ar (i)) and Sydney Sandstone Gully Forest (10ag (i)). No remnant native vegetation in any streetscapes. Prior to clearing, this precinct would have supported a range of ecological communities including Blue Gum High Forest, Sydney-Turpentine Ironbark Forest, Sydney Sandstone Gully Forest and Sydney Sandstone Ridgetop Woodland (source: *Willoughby Natural Heritage Register*).

Streetscape type/character:

Dominant cultural plantations/ mixed exotic and native tree species (evergreen and deciduous); some fine avenues (e.g. Marlborough Road/ north of Frenchs Road – Broad-leaved Paperbarks in wide verges); typically mixed range of generic native species (e.g. *Eucalyptus*, *Corymbia*, *Melaleuca*, *Banksia*, *Callistemon*, *Tristanopsis* spp.). For example, Hector Street has 22 tree species (12 native/ 10 exotic trees) out of a total of 77 planted trees).

Heritage Conservation Area:

1. Portion (incl. Sydney Road) of Artarmon Heritage Conservation Area: C1 (WDCP 2012 Part H: Heritage Item H3.2).

Historic significance:

HCA-C1 Key period of significance: 1900-1940 (WDCP, 2012, H3-4)
For further details refer to Precinct 5.

Significant Inter-war period (single species and mixed) plantations:

Alpha Road (SCEGGS Playing Fields – Brush Box boundary plantation)
Edinburgh Road (western portion)

Age structure of cultural street tree plantations:

Conservation Area: Inter-war period plantations (up to 80-90 years+)
Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 7: SOUTH-CENTRAL MIXED RESIDENTIAL & COMMERCIAL Existing typical or dominant planted tree species*	
Location	Tree Species (cultivated)
Edinburgh Road	<i>Lophostemon confertus</i> (Brush Box) <i>Fraxinus angustifolia</i> subsp. <i>oxycarpa</i> 'Raywood' (Claret Ash) <i>Lagerstroemia indica</i> var. (Crepe Myrtle)
Alpha Road	<i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) <i>Tristaniopsis laurina</i> (Water Gum) <i>Callistemon viminalis</i> (Weeping Bottlebrush)
Eastern Valley Way (southern portion)	<i>Corymbia maculata</i> (Spotted Gum) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) <i>Lophostemon confertus</i> (Brush Box)
Nulgarra Street/ Pyalla Street	<i>Tristaniopsis laurina</i> (Water Gum) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Eucalyptus haemastoma</i> (Scribbly Gum)
Tulloh Street/ Chiltern Road	<i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Triadica sebifera</i> syn. <i>Sapium sebiferum</i> (Chinese Tallow Tree) <i>Eucalyptus</i> spp. (mixed generic Eucalypts)
Salisbury Road/ Marlborough Road	<i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Buckinghamia celsissima</i> (Ivory Curl Tree) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark)
Willoughby Road (northern portion)	<i>Ulmus parvifolia</i> (Chinese Elm) <i>Pyrus calleryana</i> 'Chanticleer' (Ornamental Pear) <i>Tristaniopsis laurina</i> (Water Gum)
Hector Road/ Wyalong Street	<i>Lophostemon confertus</i> (Brush Box) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Eucalyptus</i> spp. (mixed generic Eucalypts)

* NOTE: Street tree planting is dominated by a wide range of exotic and generic native trees and shrubs, including various cultivars (15-20+ tree species per street is typical).

Key precinct objectives

- Protect and maintain the integrity and intactness of Inter-war period avenues and row plantations;
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.) and variety of tree species in many streets;
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;
- Avoid infill planting strategies which add further layers of inconsistent, disjunctive and/ or mixed generic native and exotic tree species of varying scale, form and texture;
- Consolidate thematic planting approach in commercial centres including use of select cultivars of deciduous species to enhance microclimatic conditions and to provide seasonal colour and texture;
- Prioritise key connector roads including Willoughby Road and Eastern Valley Way implementing a planting strategy using single or two (mixed) species within the streetscape (i.e. one species under overhead powerlines/ shop awnings and alternative species with no service restrictions).

PRECINCT 7: SOUTH-CENTRAL MIXED RESIDENTIAL & COMMERCIAL Proposed street tree species						
Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i>	Lilly Pilly	E	-	cr	N	N
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)*	E	-	cr	N	Y
<i>Backhousia myrtifolia</i>	Grey Myrtle	E	-	cr	N	Y
<i>Banksia serrata</i>	Saw-toothed Banksia	E	-	os	M	Y
<i>Eucalyptus haemastoma</i>	Scribbly Gum	E	-	os	W	N
<i>Eucalyptus racemosa</i>	Scribbly Gum	E	-	os	M	N
<i>Flindersia schottiana</i>	Bumpy Ash	E	-	cs	M	N

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<i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Metrosideros spp.</i>	NZ Christmas Bush	E	-	us	M	Y
<i>Olea spp.</i>	Olive	E	-	cn	N	Y
<i>Pyrus calleryana</i> 'Cleveland Select'	Ornamental Pear	-	D	cr	M	N
<i>Pyrus calleryana</i> 'Capital'	Ornamental Pear	-	D	cn	N	N
<i>Syzygium luehmannii</i>	Cherry Satinash	E	-	cu	N	Y
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	-	cr	M	N
<i>Tristanopsis laurina</i>	Water Gum	E	-	cr	M	Y
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N
<i>Xanthostemon chrysanthus</i>	Golden Penda	E	-	cr	N	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars "Red Head" (burgundy red new foliage) and "Sublime" (lush green new foliage).

'HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;

upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)

M = medium (2.5-4.0 metres)

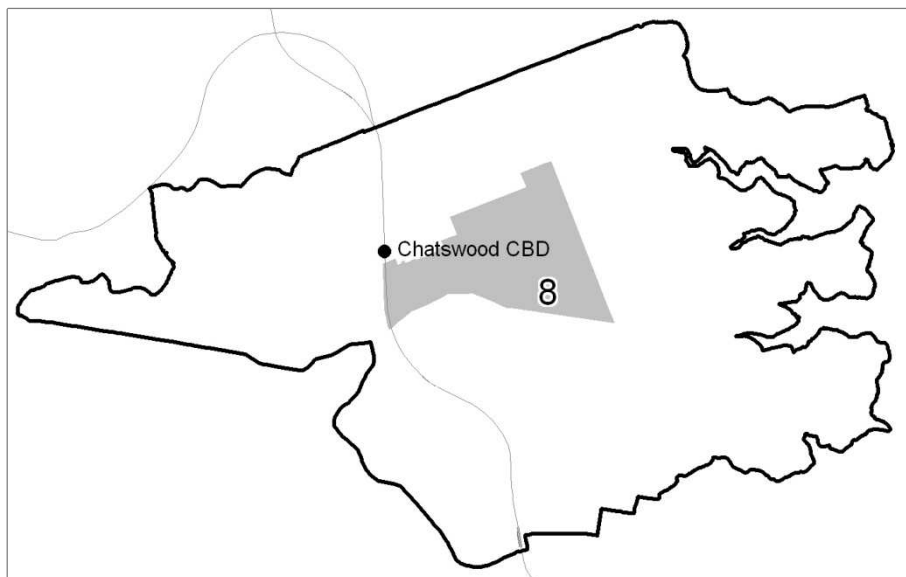
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

8. North-central mixed residential (incl. Conservation Areas)



Key landscape features

Geology and soils:

Wianamatta Group shales – shallow to moderately deep loams, silty-loams and clay-loam soils of low to moderate fertility.

Topography, slope and aspect:

Gently undulating to moderately inclined slopes; no rock outcrops; aspect varies.

Cultural landscape:

Predominantly low density residential (incl. four Conservation Areas); also medium density residential/ commercial along northern and eastern road corridors (Victoria Avenue and Penshurst Street) and high density residential/ mixed use (adjacent to Chatswood CBD); Albert Avenue/ Victoria Avenue/ Harwood Avenue (northern boundary), High Street (eastern boundary), Mowbray Road (southern boundary) and rail corridor (western boundary).

Presence of remnant native vegetation:

The Blue Gum High Forest (BGHF) community of this precinct was largely cleared during the nineteenth century (i.e. timber-getting was followed by small farms, orchards, market gardens and housing).

A few forest (regrowth) remnants including old growth Turpentine (*Syncarpia glomulifera*) have been retained in the street verges and adjoining properties in the following locations:



- entry/ verge to St Stephens Anglican Church (adj. to 211 Mowbray Road);
- corner of Stanley and Jacques Streets;
- corner of Stanley and Johnson Streets;
- corner of Holland and Johnson Streets.

PHOTO 6: Mowbray Road – remnant old growth Turpentine (*Syncarpia glomulifera*) group near St. Stephens Anglican Church

Streetscape type/character:

Dominant cultural plantations including single or mixed species (native and exotic), evergreen or deciduous avenues; significant Inter-war period plantations (see below). This precinct has a number of fine single and mixed species avenues including Sydney Street, Victoria Avenue, Oakville Road and Neridah Street. Recent

plantations include Forsyth Street, Laurel Street and Eaton Street.

Heritage Conservation Areas:

1. South Chatswood Heritage Conservation Area: C11 (WDCP 2012 Part H: Heritage Item H3.12);
2. Harwood Avenue Heritage Conservation Area: C5 (WDCP 2012 Part H: Heritage Item H3.6);
3. Hollywood Crescent Heritage Conservation Area: C6 (WDCP 2012 Part H: Heritage Item H3.7); and
4. Horsley Avenue Heritage Conservation Area: C7 (WDCP 2012 Part H: Heritage Item H3.8).

Historic significance:

Earliest land grants in the area were in 1825 and 1840; timber getting/ clearing followed by development of small farms, orchards, flower growing, vegetables and Chinese market gardens; proposed construction of the railway generated a land subdivision boom during the 1880s. This precinct conserves a rich variety of Victorian, Federation and California bungalow styles including a number of large estates with late-Victorian villas and Federation two-storey mansions.

Harwood Avenue was developed in the 1920s in the California bungalow or transitional style of the Inter-war period. This Conservation Area is significant in terms of its integrity and consistency in scale, style, detailing, spacing, setbacks and subdivision pattern. The mature, single species, avenue of Brush Box (dating from this period) is an integral component providing uniformity and cohesiveness to

the streetscape. The avenue is highly significant at the local level. THE WDCP states that any street tree renewal should be with brush box (WDCP, 2012, H3-22).

Hollywood Crescent, an unusual “U”-shaped subdivision, also retains an original tree-lined avenue and consistent bungalow style of the Inter-war period. The mature, single species, avenue of Brush Box “*creates a picturesque sequence of vistas along the Crescent*” (WDCP, 2012, H3-25) and is highly significant at the local level. Any renewal or replacement planting should be with Brush Box and unsympathetic infill planting should be phased out (WDCP, 2012, H3-25). Horsley Avenue and Summerville Crescent similarly conserve a consistent and coherent character dating from the Inter-war period however the streetscape plantations (including Crepe Myrtle) are later introductions.



PHOTO 7: Harwood Avenue –
Brush Box (*Lophostemon confertus*)
significant single species heritage
avenue in Conservation Area

HCA-C11	Key period of significance: 1880-1930 (WDCP, 2012, H3-43);
HCA-C5	Key period of significance: 1921-1930 (WDCP, 2012, H3-22);
HCA-C6	Key period of significance: 1926-1935 (WDCP, 2012, H3-25);
HCA-C7	Key period of significance: 1926-1940 (WDCP, 2012, H3-28).

Significant Inter-war period (single species and mixed) plantations:

Orchard Road/ Chapman Avenue (Chatswood Park – boundary plantation)

Harwood Avenue

Hollywood Crescent

Ward Street

Age structure of cultural street tree plantations:

Conservation Area: Inter-war period plantations (up to 80-90 years+)

Dominant planting: varies; generic native planting (up to 30-40 years+)



PHOTO 8: Hollywood Crescent –
Brush Box (*Lophostemon confertus*)
A significant single species heritage
avenue in Conservation Area

PRECINCT 8: NORTH-CENTRAL MIXED RESIDENTIAL/ CONSERVATION

Existing typical or dominant tree species

Location	Tree Species (cultivated)
Victoria Avenue	<i>Platanus x acerifolia</i> (London Plane) <i>Ulmus</i> spp. (mixed Elms)
Penshurst Street	<i>Ulmus glabra</i> 'Lutescens' (Golden Elm) <i>Lagerstroemia indica</i> var. (Crepe Myrtle) <i>Fraxinus angustifolia</i> subsp. <i>oxycarpa</i> 'Raywood' (Claret Ash)
Harwood Avenue/ Hollywood Crescent/ Horsley Avenue	<i>Lophostemon confertus</i> (Brush Box) <i>Lagerstroemia indica</i> var. (Crepe Myrtle)
Oakville Road/ Laurel Street	<i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) <i>Eucalyptus sideroxylon</i> (Mugga Ironbark) <i>Lagerstroemia indica</i> var. (Crepe Myrtle)
High Street	<i>Eucalyptus</i> spp. (mixed Eucalypts) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Auranticarpa rhombifolia</i> (Hollywood/ Diamond-leaf Pittosporum)
Sydney Street/ Stanley Street	<i>Lophostemon confertus</i> (Brush Box) <i>Ficus microcarpa</i> var. <i>hillii</i> (Hill's Weeping Fig) <i>Tristanopsis laurina</i> (Water Gum)
Clanwilliam Street/ Church Street	<i>Callistemon</i> spp. (Bottlebrush) <i>Jacaranda mimosifolia</i> (Jacaranda) <i>Eucalyptus haemastoma</i> (Scribbly Gum)
Neridah Street/ Hercules Street	<i>Pyrus calleryana</i> 'Chanticleer' (Ornamental Pear) <i>Lagerstroemia indica</i> var. (Crepe Myrtle) <i>Lophostemon confertus</i> (Brush Box)
Saywell Street/ Tryon Street	<i>Fraxinus angustifolia</i> subsp. <i>oxycarpa</i> 'Raywood' (Claret Ash) <i>Eucalyptus sideroxylon</i> (Mugga Ironbark) <i>Nerium oleander</i> (Oleander)

Key precinct objectives

- Protect the historic character, scale and integrity of Victorian, Federation and Inter-war period streetscapes particularly within Heritage Conservation Areas (incl. removal of inappropriate infill and replacement species);
- Protect and maintain the integrity and intactness of mature single species avenues (incl. Inter-war period avenues of Brush Box);
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.);
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;
- Avoid infill planting strategies which add further layers of inconsistent, disjunctive and/ or mixed generic native and exotic tree species of varying scale, form and texture;
- Consolidate thematic planting approach in commercial centres including use of select cultivars of deciduous species to enhance microclimatic conditions and to provide seasonal colour and texture;
- Prioritise Penshurst Street as a key connector road implementing a planting strategy using single or two (mixed) species within the streetscape (i.e. one species under overhead powerlines/ shop awnings and alternative species with no service restrictions);
- Promote strategies to supplement and enhance ecological connectivity focussing on the Bales Park area (incl. Sydney Street, Stanley Street and Johnson Street) – see discussion on remnant BGHF components);
- Implement a strategy using provenance-sourced material consistent with critically endangered Blue Gum High Forest (i.e. avoid use of generic native species in this context).

PRECINCT 8: NORTH-CENTRAL MIXED RESIDENTIAL/ CONSERVATION
Proposed street tree species

Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Alloxylon flammeum</i>	Tree Waratah	E	-	cu	M	N
<i>Angophora costata</i> (BGHF)*	Smooth-barked Apple	E	-	os	M	N
<i>Angophora floribunda</i> (BGHF)*	Rough-barked Apple	E	-	os	M	N
<i>Backhousia myrtifolia</i> (BGHF)*	Grey Myrtle	E	-	cr	N	Y
<i>Callistemon</i> spp.	Bottlebrush	E	-	cn	M	Y
<i>Caesalpinia ferrea</i>	Leopard Tree	-	D	cs	M	N
<i>Cupaniopsis anacardioides</i>	Tuckeroo	E	-	cr	N	Y
<i>Elaeocarpus eumundi</i>	Eumundi Quandong	E	-	cu	M	N
<i>Eucalyptus haemastoma</i>	Scribbly Gum	E	-	os	W	N
<i>Eucalyptus paniculata</i> (BGHF)*	Grey Ironbark	E	-	os	W	N
<i>Eucalyptus pilularis</i> (BGHF)*	Blackbutt	E	-	os	W	N
<i>Eucalyptus saligna</i> (BGHF)*	Sydney Blue Gum	E	-	os	W	N
<i>Flindersia australis</i>	Australian Teak	E	-	cs	M	N
<i>Flindersia schottiana</i>	Bumpy Ash	E	-	cs	M	N
<i>Fraxinus</i> spp.	Ash	-	D		M	Y
<i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Lagerstroemia indica</i> x <i>L. fauriei</i> var.	Crepe Myrtle cv.***	-	D	cu	M	Y
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Magnolia grandiflora</i> 'Exmouth'	Southern Magnolia cv.	E	-	cu	M	N
<i>Magnolia grandiflora</i> 'Little Gem'	Southern Magnolia cv.	E	-	cu	N	Y
<i>Michelia</i> spp.	Magnolia	E	-		M	N
<i>Olea europaea</i> var. <i>europaea</i>	Olive	E	-	cn	M	Y
<i>Pistacia chinensis</i>	Chinese Pistachio	-	D	cr	M	N
<i>Platanus x acerifolia</i>	London Plane	-	D	os	W	N

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<i>Podocarpus elatus</i>	Plum Pine	E	-	cn	M	N
<i>Pyrus calleryana</i> 'Cleveland Select'	Ornamental Pear	-	D	cr	M	N
<i>Pyrus calleryana</i> 'Capital'	Ornamental Pear	-	D	cn	N	N
<i>Pyrus calleryana</i> 'Chanticleer'	Ornamental Pear	-	D	cn	M	N
<i>Syncarpia glomulifera</i> (BGHF)*	Turpentine	E	-	cs	W	N
<i>Tristania laurina</i>	Water Gum	E	-	cr	M	Y
<i>Ulmus glabra</i> 'Lutescens'	Golden Elm	-	D	cu	M	N
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N
<i>Xanthostemon chrysanthus</i>	Golden Penda	E	-	cr	N	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

*BGHF LOCAL NATIVE SPECIES recommended for Bales Park area (Sydney, Stanley and Johnson Streets).

BGHF = Blue Gum High Forest (critically endangered EEC);

** *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars "Red Head" (burgundy red new foliage) and "Sublime" (lush green new foliage).

*** *Lagerstroemia indica* x *L. fauriei* select cultivars including "Acoma", "Sioux", "Natchez" and "Tuscarora".

'HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;

upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)

M = medium (2.5-4.0 metres)

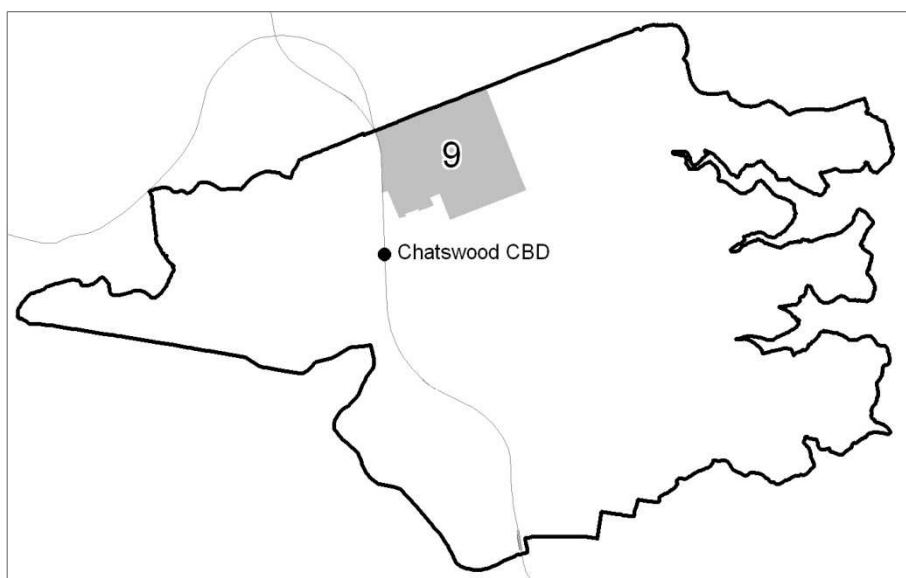
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

9. Northern mixed residential (incl. Conservation Area)



Key landscape features

Geology and soils:

Wianamatta Group shales (approx. 90% of precinct) – shallow to moderately deep loams, silty-loams and clay-loam soils of low to moderate fertility;
Hawkesbury sandstone (approx. 10% of precinct) – eastern area/ Lamette Street – fine to medium-grained quartz sandstone and inter-bedded shale lenses; soils are typically shallow, apedal, porous sandy to sandy loams.

Topography, slope and aspect:

Generally, undulating to rolling low hills with no rock outcrops grading to localised steep slopes (eastern portion) with some sandstone outcropping and benches; aspect varies (predominantly south to south-east).

Cultural landscape:

Predominantly low density residential (incl. single large Conservation Area); some medium density residential/ commercial (along Victoria Avenue, adjacent to Chatswood CBD and Pacific Highway; Boundary Street (northern boundary), Penshurst Street (eastern boundary), Victoria Avenue/ CBD (southern boundary) and Pacific Highway (western boundary)

Presence of remnant native vegetation:

The Blue Gum High Forest (BGHF) and Sydney Turpentine-Ironbark Forest (STIF) communities of this precinct were largely cleared during the nineteenth century. Some remnant canopy trees (regrowth) have been retained in Beauchamp Park (adjacent to Beauchamp Avenue, Nicholson Street and eastern side of the Oval). Tree species include Blackbutt (*Eucalyptus pilularis*), Red Mahogany (*Eucalyptus*

resinifera), Rough-barked Apple (*Angophora floribunda*), Grey Ironbark (*Eucalyptus paniculata*) and Turpentine (*Syncarpia glomulifera*); also BGHF tree species have been planted in the park (unknown provenance).

Streetscape type/character:

Dominant cultural plantations including single or mixed species (native and exotic), evergreen or deciduous avenues; significant Inter-war period plantations (see below). This precinct has a number of fine single and mixed species avenues including Fontaine Street, Lamette Street, Macquarie Street, Baldry Street, (sections of) Ashley and William Streets, Melnotte Avenue, Nicholson Street and Victoria Avenue.

Heritage Conservation Area:

1. North Chatswood Heritage Conservation Area: C10 (WDCP 2012 Part H: Heritage Item H3.11).

Historic significance:

Earliest land grant was in 1825; timber getting and land clearing followed however development was slow after first subdivision in 1854. Proposed construction of the railway generated a land subdivision boom during the 1880s. Small farms and orchards, flowers/ vegetable growing and Chinese market gardens gradually gave way to housing particularly after the First World War. This precinct conserves a rich variety of predominantly Federation and Inter-war period bungalow style dwellings as well as some Federation two-storey mansions and late-Victorian houses.

THE WDCP notes the importance of Beauchamp Park (1899) as the original central square. It also highlights the significance of established street trees dating from the Inter-war period including Brush Box (*Lophostemon confertus*) and Canary Island Date Palms (*Phoenix canariensis*) (WDCP, 2012, H3-38). Together these species reinforce a sense of cohesiveness, order and formality. These mature, single species avenues are an integral part of the town centre design and highly significant at the local level. Renewal or replacement planting should be in accordance with heritage palettes (i.e. using original species in this context) and any unsympathetic infill planting should be phased out.

HCA-C10 Key period of significance: 1880-1930 (WDCP, 2012, H3-38)

Significant Inter-war period (single species and mixed) plantations:

Penshurst Street
Fontaine Street
Lamette Street
Macquarie Street
Nicholson Street
Ashley Street

Melnotte Avenue

Note: Baldry Street (*Podocarpus elatus*) is a Post-war plantation.

Age structure of cultural street tree plantations:

Conservation Area: Inter-war period plantations (up to 80-90 years+)

Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 9: NORTHERN MIXED RESIDENTIAL/ CONSERVATION Existing typical or dominant tree species	
Location	Tree Species (cultivated)
Victoria Avenue	<i>Platanus x acerifolia</i> (London Plane) <i>Ulmus</i> spp. (mixed Elms)
Penshurst Street	<i>Lophostemon confertus</i> (Brush Box) <i>Tristanopsis laurina</i> (Water Gum)
William Street/ Melnotte Avenue	<i>Lophostemon confertus</i> (Brush Box) <i>Phoenix canariensis</i> (Canary Island Date Palm) <i>Jacaranda mimosifolia</i> (Jacaranda)
Ashley Street	<i>Lophostemon confertus</i> (Brush Box) <i>Harpephyllum caffrum</i> (Wild Plum) <i>Eucalyptus</i> spp. (Eucalypts)
Nicholson Street	<i>Callistemon</i> spp. (Bottlebrush) <i>Gordonia axillaris</i> (Gordonia) <i>Phoenix canariensis</i> (Canary Island Date Palm)
Baldry Street	<i>Podocarpus elatus</i> (Plum Pine)
Blakesley Street	<i>Gordonia axillaris</i> (Gordonia) <i>Bauhinia</i> sp. (Butterfly or Orchid Tree) <i>Harpulia pendula</i> (Tulipwood)
Havilah Street	<i>Flindersia australis</i> (Australian Teak) <i>Geijera parviflora</i> (Wilga)
Macquarie Street/ Fontaine Street	<i>Lophostemon confertus</i> (Brush Box) <i>Liquidambar styraciflua</i> (Liquidambar)

Key precinct objectives

- Protect the historic character, scale and integrity of Victorian, Federation and Inter-war period streetscapes within the North Chatswood Heritage Conservation Area;
- Protect and maintain the integrity and intactness of mature single species avenues (incl. Inter-war period avenues of Brush Box and Canary Island Date Palms);
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.);
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;
- Avoid infill planting strategies which add further layers of inconsistent, disjunctive and/ or mixed generic native and exotic tree species of varying scale, form and texture;
- Promote strategies to supplement and enhance ecological connectivity focussing on Beauchamp Park to Scotts Creek corridor (incl. eastern end of Nicholson Street, Milton, Crick, Lamette and Royal Streets);
- Implement a strategy using provenance-sourced material consistent with Blue Gum High Forest and Sydney Turpentine-Ironbark Forest (i.e. avoid use of generic native species in this context and progressively phase-out generic native planting in these streets).

PRECINCT 9: NORTHERN MIXED RESIDENTIAL/ CONSERVATION
Proposed street tree species

Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i> (BGHF/STIF)*	Lilly Pilly	E	-	cr	N	N
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Alectryon subcinereus</i> (BGHF/STIF)*	Native Quince	E	-	cr	N	Y
<i>Angophora costata</i> (BGHF/STIF)*	Smooth-barked Apple	E	-	os	M	N
<i>Angophora floribunda</i> (BGHF)*	Rough-barked Apple	E	-	os	M	N
<i>Backhousia myrtifolia</i> (BGHF/STIF)*	Grey Myrtle	E	-	cr	N	Y
<i>Corymbia maculata</i>	Spotted Gum	E	-	no	M	N
<i>Elaeocarpus eumundi</i>	Eumundi Quandong	E	-	cu	M	N
<i>Eucalyptus paniculata</i> (BGHF/STIF)*	Grey Ironbark	E	-	os	W	N
<i>Eucalyptus pilularis</i> (BGHF/STIF)*	Blackbutt	E	-	os	W	N
<i>Eucalyptus resinifera</i> (BGHF/STIF)*	Narrow-leaved Ironbark	E	-	os	W	N
<i>Eucalyptus saligna</i> (BGHF)*	Sydney Blue Gum	E	-	os	W	N
<i>Flindersia australis</i>	Australian Teak	E	-	cs	M	N
<i>Flindersia schottiana</i>	Bumpy Ash	E	-	cs	M	N
<i>Ginkgo biloba</i>	Maidenhair Tree	-	D		M	N
<i>Gordonia axillaris</i>	Gordonia	E	-	cu	M	Y
<i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Lagerstroemia indica</i> x <i>L. fauriei</i> var.	Crepe Myrtle cv.***	-	D	cu	M	Y
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Magnolia grandiflora</i>	Southern Magnolia cv.	E	-	cu	M	N
# <i>Phoenix canariensis</i>	Canary Is. Date Palm	E	-	-	M	N
<i>Pistacia chinensis</i>	Chinese Pistachio	-	D	cr	M	N
<i>Platanus x acerifolia</i>	London Plane	-	D	os	W	N
<i>Podocarpus elatus</i>	Plum Pine	E	-	cn	M	N
<i>Pyrus calleryana</i> 'Cleveland Select'	Ornamental Pear	-	D	cr	M	N

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<i>Pyrus calleryana</i> 'Capital'	Ornamental Pear	-	D	cn	N	N
<i>Quercus palustris</i>	Pin Oak	-	D	or	W	N
<i>Syncarpia glomulifera</i> (BGHF/STIF)*	Turpentine	E	-	cs	W	N
<i>Syzygium luehmannii</i>	Cherry Satinash	E	-	cu	N	Y
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	-	cr	M	N
<i>Tristanopsis laurina</i>	Water Gum	E	-	cr	M	Y
<i>Ulmus parvifolia</i>	Chinese Elm	-	D	os	W	N
<i>Ulmus glabra</i> 'Lutescens'	Golden Elm	-	D	cu	M	N

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

*BGHF/ STIF LOCAL NATIVE SPECIES recommended for Beauchamp Park to Scotts Creek corridor (incl. eastern end of Nicholson Street, Milton, Crick, Lamette and Royal Streets).

BGHF = Blue Gum High Forest (critically endangered EEC);
STIF = Sydney Turpentine-Ironbark Forest (endangered EEC).

** *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars "Red Head" (burgundy red new foliage) and "Sublime" (lush green new foliage).

*** *Lagerstroemia indica* x *L. fauriei* select cultivars including "Acoma", "Sioux", "Natchez" and "Tuscarora".

Phoenix canariensis to be used only within existing plantations in Conservation Area

'HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;
upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

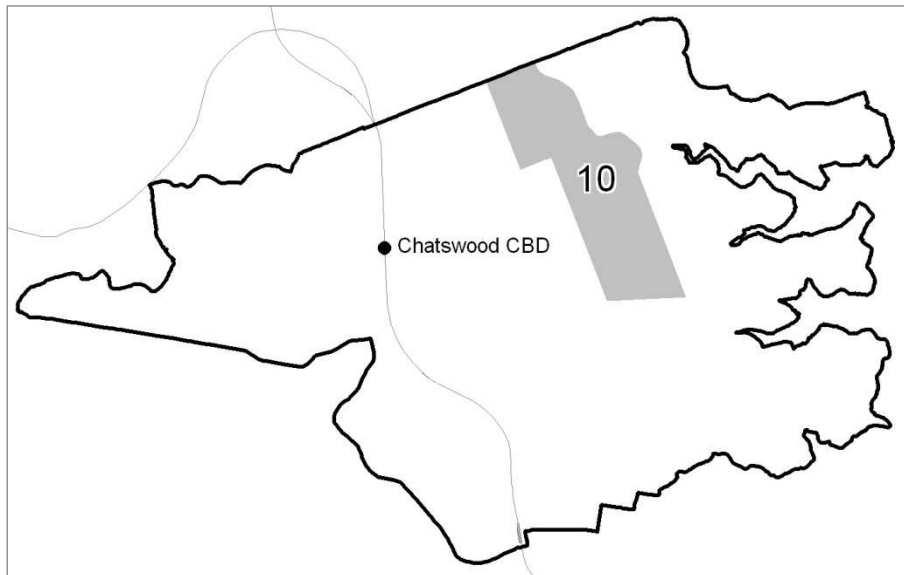
N = narrow (<2.5 metres)
M = medium (2.5-4.0 metres)
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:
N = NO; Y = YES

Willoughby Street Tree Master Plan

10. North-central light industrial and residential (incl. Conservation Areas)



Key landscape features

Geology and soils:

Central ridge and eastern slopes – Wianamatta Group shale (approx. 45% of precinct); shallow to moderately deep loams, silty-loams and clay-loam soils of low to moderate fertility;

Northern and north-eastern steep slopes and valleys – Hawkesbury sandstone (approx. 35% of precinct) – typically fine to coarse grained quartz sandstone with inter-bedded shale lenses; soils are generally shallow, apedal and porous sandy to sandy loams with very low fertility;

South-eastern slopes – Mittagong Formation (approx. 20% of precinct) with alternating bands of fine to medium grained quartz sandstone and inter-bedded shale lenses; sandy loams overlying hard-setting sandy clay loam

Topography, slope and aspect:

Gently undulating to moderately inclined slopes along central ridge with no rock outcrops; grading to localised steep slopes with some sandstone outcropping and benches along northern and eastern slopes; gently undulating crests and ridges with no rock outcropping on south-eastern slopes; aspect varies – mainly north-east to south-east.

Cultural landscape:

Predominantly low density residential (incl. Willoughby Park Heritage Conservation Area), also light industrial (approx. 20% of precinct) in north-eastern corner; Boundary Street (northern boundary), Eastern Valley Way (eastern boundary), Edinburgh Road (southern boundary), High Street/ Penshurst Street (western boundary).



PHOTO 9: Mann Street – single species avenue of Outeniqua Yellowwood (*Afrocarpus falcatus*)

Presence of remnant native vegetation:

This precinct would have originally supported a range of vegetation communities including Blue Gum High Forest (BGHF), Sydney Turpentine-Ironbark Forest (STIF), Sydney Sandstone Gully Forest and Sandstone Ridgeway Woodland. Almost all native vegetation has been cleared. No remnant native vegetation occurs on any street verges in this precinct.

Streetscape type/character:

Dominant cultural plantations/ mixed exotic and native tree species (evergreen and deciduous); some fine avenues in wide verges (e.g. Mann Street – Outeniqua Yellowwood and Cambridge Street – Broad-leaved Paperbark); typically mixed generic native species within each street (e.g. *Eucalyptus*, *Corymbia*, *Melaleuca*, *Banksia*, *Callistemon*, *Tristanopsis* spp.). For example, Tyneside Avenue has 26 tree species including 13 generic native species and 13 exotic species (i.e. 8 deciduous/ 5 evergreen spp.); total of 88 planted trees.

Heritage Conservation Area:

1. Willoughby Park Heritage Conservation Area: C12 (WDCP 2012 Part H: Heritage Item H3.13).

Historic significance:

HCA-C12 Key period of significance: 1907-1930 (WDCP, 2012, H3-47)

Significant Inter-war period (single species and mixed) plantations:

Edinburgh Road (western portion)

Glover Street

Penshurst Street

Willoughby Park (boundary plantations to Fourth Avenue, McLelland Street and Warrane Road)

Age structure of cultural street tree plantations:

Conservation Area: Inter-war period plantations (up to 80-90 years+)

Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 10: NORTH-CENTRAL INDUSTRIAL & RESIDENTIAL/ CONSERVATION Existing typical or dominant tree species	
Location	Tree Species (cultivated)
High Street	<i>Eucalyptus/ Corymbia</i> spp. (mixed generic Eucalypts) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Auranticarpa rhombifolia</i> (Hollywood/ Diamond-leaf Pittosporum)
Alleyne Street/ Smith Street	<i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Triadica sebifera</i> syn. <i>Sapium sebiferum</i> (Chinese Tallow Tree) <i>Fraxinus angustifolia</i> subsp. <i>oxycarpa</i> 'Raywood' (Claret Ash)
Mann Street	<i>Afrocarpus falcatus</i> (Outeniqua Yellowwood)
Chaley Street/ Cambridge Street	<i>Tristanopsis laurina</i> (Water Gum) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark)
Warrane Street/ Tyneside Avenue	<i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark) <i>Eucalyptus sideroxylon</i> (Mugga Ironbark) <i>Lagerstroemia indica</i> var. (Crepe Myrtle)
Glover Street/ McClelland Street	<i>Lophostemon confertus</i> (Brush Box) <i>Afrocarpus falcatus</i> (Outeniqua Yellowwood) <i>Tristanopsis laurina</i> (Water Gum)
Third Avenue/ Fourth Avenue	<i>Eucalyptus</i> spp. (mixed generic Eucalypts) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Tristanopsis laurina</i> (Water Gum)

Key precinct objectives

- Protect and maintain the integrity and intactness of Inter-war period avenues and row plantations;
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.) and variety of tree species in many streets;
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street and across the precinct;

- Avoid infill planting strategies which add further layers of inconsistent, disjunctive and/ or mixed generic native and exotic tree species of varying scale, form and texture;
- Within the light industrial area, provide appropriate massing of street trees to reduce the bulk and scale of industrial buildings and associated infrastructure;
- Establish a consistent palette of dense, evergreen broadleaf species rather than open or sparse canopy trees of varying forms and shapes in the industrial area;
- Prioritise key connector roads including Eastern Valley Way and Penshurst Street implementing a planting strategy using single or two (mixed) species within the streetscape (i.e. one species under overhead powerlines/ shop awnings and alternative species with no service restrictions);
- Promote strategies to supplement and enhance ecological connectivity within the streetscapes adjoining Scott's Creek corridor (see Precinct 9);
- Implement a strategy using provenance-sourced material consistent with Sydney Turpentine-Ironbark Forest and Sydney Sandstone Gully Forest (i.e. avoid use of generic native species in this context and progressively phase-out generic native planting in these streets).

PRECINCT 10: NORTH-CENTRAL INDUSTRIAL & RESIDENTIAL/ CONSERVATION
Proposed street tree species

Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i>	Lilly Pilly	E	-	cr	N	N
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Afrocarpus falcatus</i>	Outeniqua Yellowwood	E	-	cs	W	N
<i>Alectryon subcinereus</i> (SGF1)*	Native Quince	E	-	cr	N	Y
<i>Angophora costata</i> (STIF/SGF1)*	Smooth-barked Apple	E	-	os	M	N
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	E	-	cr	M	N
<i>Backhousia myrtifolia</i> (SGF1)*	Grey Myrtle	E	-	cr	N	Y
<i>Betula nigra</i>	Black Birch	-	D	ou	M	N
<i>Cupaniopsis anacardioides</i>	Tuckeroo	E	-	cr	N	Y
<i>Corymbia gummifera</i> (SGF1)*	Red Bloodwood	E	-	os	M	N
<i>Elaeocarpus eumundi</i>	Eumundi Quandong	E	-	cu	M	N
<i>Eucalyptus haemastoma</i>	Scribbly Gum	E	-	os	W	N
<i>Eucalyptus piperita</i> (SGF1)*	Sydney Peppermint	E	-	os	W	N
<i>Eucalyptus punctata</i> (SGF1)*	Grey Gum	E	-	os	W	N
<i>Eucalyptus racemosa</i>	Scribbly Gum	E	-	os	M	N
<i>Eucalyptus resinifera</i> (STIF)*	Narrow-leaved Ironbark	E	-	os	W	N
<i>Fraxinus</i> spp.	Ash	-	D		M	Y
<i>Glochidion ferdinandi</i> (SGF1)*	Cheese Tree	E	-	cs	M	Y
<i>Lagerstroemia indica</i> x <i>L. fauriei</i> var.	Crepe Myrtle cv.***	-	D	cu	M	Y
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Metrosideros</i> spp.	NZ Christmas Bush	E	-	us	M	Y
<i>Pistacia chinensis</i>	Chinese Pistachio	-	D	cr	M	N
<i>Pyrus</i> spp	Ornamental Pear	-	D	cn	N	N
<i>Syncarpia glomulifera</i> (STIF/SGF1)*	Turpentine	E	-	cs	W	N
<i>Syzygium luehmannii</i>	Cherry Satinash	E	-	cu	N	Y

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Int. Ref: 82741068

<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	-	cr	M	N
<i>Tristaniaopsis laurina</i>	Water Gum	E	-	cr	M	Y
<i>Ulmus spp.</i>	Chinese Elm	-	D	os	W	N
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N
<i>Xanthostemon chrysanthus</i>	Golden Penda	E	-	cr	N	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

*STIF/SGF1 LOCAL NATIVE SPECIES recommended for Scotts Creek corridor and adjoining streetscapes.

STIF = Sydney Turpentine-Ironbark Forest (endangered EEC);

SGF1 = Sydney Sandstone Gully Forest (*Eucalyptus piperita*/ *Angophora costata*);

** *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars “Red Head” (burgundy red new foliage) and “Sublime” (lush green new foliage).

¹HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;

upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)

M = medium (2.5-4.0 metres)

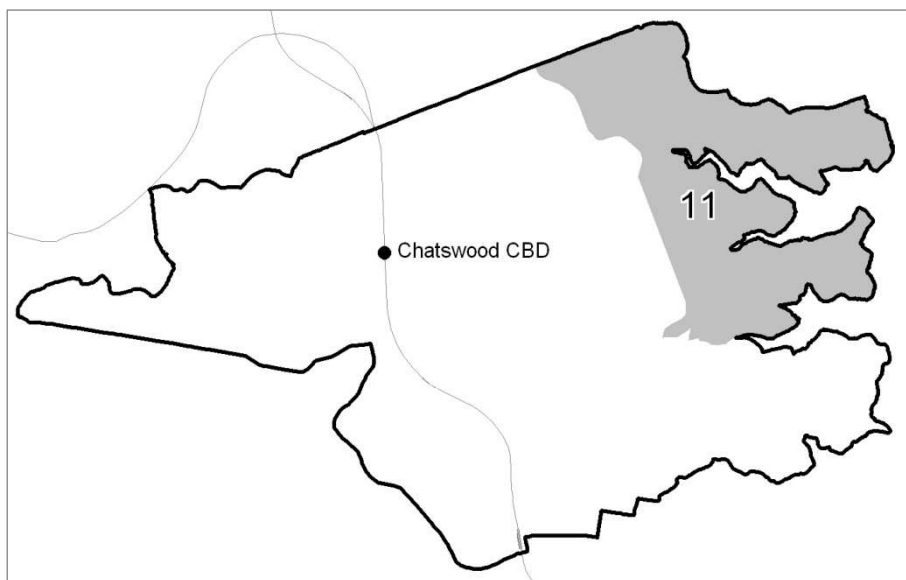
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

11. Upper Middle Harbour bushland and residential (incl. Conservation Area)



Key landscape features

Geology and soils:

Hawkesbury sandstone with typically fine to coarse grained quartz sandstone with inter-bedded shale lenses; soils are generally shallow, apedal and porous sandy to sandy loams with very low fertility.

Topography, slope and aspect:

Upper plateau and central ridges – undulating to rolling low hills with no rock outcrops grading to localised steep slopes with some sandstone outcropping and benches;

Steep slopes and valleys – moderate to very steep sandstone slopes with rock outcrops, benches and broken scarps (up to 10 metres high); aspect varies.

Natural and cultural landscape:

Low density residential/ environmental living (incl. Griffin Conservation Area); two small commercial areas (neighbourhood centres); significant bushland reserves; parks and golf course; environmental conservation; Middle Harbour foreshores (eastern boundary); Eastern Valley Way (western boundary); Castle Cove, Middle Cove and Castlecrag.

Presence of remnant native vegetation:

Sydney Sandstone Gully Forest (SSGF) – including 10ag(i) Open Forest/ Woodland and 10ag(iii) Closed-forest; Sydney Sandstone Ridgetop Woodland (SSRW) – 10ar(i) including Woodland/ Low Woodland. Ecological communities are in accordance with Benson & Howell (1994). For further details see [Vegetation Communities mapping](#) and *Willoughby Natural Heritage Register*.

Streetscape type/character:

Remnant native forest canopy trees (SSGF communities) and open-woodland trees and shrubs (SSRW);

Cultural plantations including single or mixed species (native and exotic), evergreen or deciduous avenues; no significant Inter-war period plantations.



PHOTO 10: The streetscapes in this precinct retain a natural bushland character and aesthetic.

The Scarp, Castlecrag – remnant old growth group of Smooth-barked Apple (*Angophora costata*)

Heritage Conservation Areas:

1. Griffin Heritage Conservation Area: C4 (WDCP 2012 Part H: Heritage Item H3.5).

Historic significance:

The bushland of these rugged sandstone ridges and valleys remained largely undisturbed with minimal development until the Inter-war and Post-war periods;

1904: construction of “Innisfallen Castle”, Castle Cove;

1921-26: Walter Burley Griffin and Marion Mahony Griffin designed the Castlecrag and adjoining Haven Estates (now known as Griffin HCA). The design aimed to protect natural heritage values (i.e. biodiversity and geodiversity) with narrow carriageways along contours, sympathetic housing and set-backs, and large bushland reserves connected via public easements and pathways;

1930s: construction of the Harbour Bridge, Eastern Valley Way and rebuilding of Northbridge Suspension Bridge; housing development along Edinburgh Road and adjacent streets (east of Eastern Valley Way); Post-war residential boom.

HCA-C4 Key period of significance: 1921-1935 (WDCP, 2012, H3-15);

Ecological significance:

This precinct and its streetscapes conserve significant forest and woodland canopy trees (including many old growth specimens) representative of Sydney Sandstone Ridgetop Woodland, Sydney Sandstone Gully Forest and some rare examples of Temperate Rainforest communities. The streetscapes are surrounded by a network of major bushland reserves including H.D. Robb Reserve, Explosives Reserve, North Arm Reserve and Willis Park (Castle Cove), Harold Reid Reserve (Middle Cove) and Castlecrag Reserves.

Significant Inter-war period plantations:

n/a

Age structure of remnant native trees and plantations:

Native canopy: varies; incl. old growth specimens up to 100-150 years
Conservation Area: Retained bushland/ no Inter-war period plantations.
Dominant planting: varies; generic native planting (up to 30-40 years+)

PRECINCT 11: UPPER MIDDLE HARBOUR BUSHLAND & RESIDENTIAL Existing remnant (typical) native canopy species	
Location	Native Tree Species
Castle Cove: Eastern Valley Way	<i>Eucalyptus sieberi</i> (Silvertop Ash) <i>Corymbia gummifera</i> (Red Bloodwood) <i>Angophora costata</i> (Smooth-barked Apple)
Warrane Place/ Kendall Road	<i>Eucalyptus racemosa</i> (Narrow-leaved Scribbly Gum) <i>Eucalyptus camfieldii</i> (Heart-leaved Stringybark) <i>Corymbia gummifera</i> (Red Bloodwood)
Headland Road/ Neerim Road	<i>Eucalyptus punctata</i> (Grey Gum) <i>Corymbia gummifera</i> (Red Bloodwood) <i>Angophora costata</i> (Smooth-barked Apple)
Emerstan Drive/ Willis Road	<i>Angophora costata</i> (Smooth-barked Apple) <i>Eucalyptus piperita</i> (Sydney Peppermint) <i>Allocasuarina littoralis</i> (Black She-oak)
Castlecrag: Edinburgh Road/ Linden Way	<i>Eucalyptus racemosa</i> (Narrow-leaved Scribbly Gum) <i>Angophora costata</i> (Smooth-barked Apple) <i>Corymbia gummifera</i> (Red Bloodwood)
The Bulwark/ The Scarp	<i>Eucalyptus piperita</i> (Sydney Peppermint) <i>Angophora costata</i> (Smooth-barked Apple) <i>Eucalyptus racemosa</i> (Narrow-leaved Scribbly Gum)
The Citadel/ The High Tor	<i>Eucalyptus piperita</i> (Sydney Peppermint) <i>Banksia serrata</i> (Saw-toothed Banksia) <i>Angophora costata</i> (Smooth-barked Apple)
Rockley Street/ The Barbette/ The Bastion	<i>Angophora costata</i> (Smooth-barked Apple) <i>Eucalyptus racemosa</i> (Narrow-leaved Scribbly Gum) <i>Corymbia gummifera</i> (Red Bloodwood)

PRECINCT 11: UPPER MIDDLE HARBOUR BUSHLAND & RESIDENTIAL
Existing typical or dominant planted tree species*

Location	Tree Species (cultivated)
Eastern Valley Way	<i>Eucalyptus/ Corymbia</i> spp. (mixed generic Eucalypts) <i>Lophostemon confertus</i> (Brush Box) <i>Tristanopsis laurina</i> (Water Gum)
Deepwater Road	<i>Leptospermum petersonii</i> (Lemon-scented Teatree) <i>Tristanopsis laurina</i> (Water Gum) <i>Callistemon viminalis</i> (Weeping Bottlebrush)
Neerim Road/ Allambie Road/ Warrawee Avenue	<i>Tristanopsis laurina</i> (Water Gum) <i>Callistemon</i> spp. (Bottlebrush)
Greenfield Avenue/ Rembrandt Drive/ North Arm Road	<i>Eucalyptus/ Corymbia</i> spp. (mixed generic Eucalypts) <i>Callistemon viminalis</i> (Weeping Bottlebrush)
Edinburgh Road/ Charles Street/ Raeburn Avenue	<i>Eucalyptus/ Corymbia</i> spp. (mixed generic Eucalypts) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Jacaranda mimosifolia</i> (Jacaranda)
The Parapet/ The Rampart/ Sortie Port	<i>Eucalyptus/ Corymbia</i> spp. (mixed generic Eucalypts) <i>Nerium oleander</i> (Oleander) <i>Callistemon viminalis</i> (Weeping Bottlebrush)

* NOTE: Street tree planting is dominated by a wide range of exotic and generic native trees and shrubs, including various cultivars.

Key precinct objectives

- Protect and maintain the significant biodiversity and geodiversity values of this precinct, particularly the diversity of ecological communities and native tree species within the street verges (as scheduled in WNHR);
- Protect, maintain and enhance the high visual, aesthetic and environmental values associated with the Griffin Heritage Conservation Area;
- Investigate opportunities for extending current bush regeneration and restoration strategies in consultation with local Bushcare groups;
- Promote opportunities for natural recruitment of canopy trees and community-based restoration strategies in streetscapes and adjoining bushland reserves;
- Selection of native species to be in accordance with mapped geology, soils and ecological communities, noting the highly variable local conditions (e.g. bedrock pavement and often shallow, porous coarse-grained sandy soils);

- Promote strategies to supplement and enhance native tree canopy using provenance-sourced material;
- Avoid the use of generic native species in this precinct (i.e. species native to other geographic areas or of unknown provenance);
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.) and variety of tree species in many streets;
- Protect scenic vistas, particularly along the verges of connector roads traversing ridgelines and upper scarps, promoting in these locations the use of native broadleaf species (under overhead powerlines) and open-canopied local native species (no powerlines);
- Target Eastern Valley Way as a key connector road implementing a planting strategy using single or two (mixed) species within the streetscape (i.e. one species under overhead powerlines/ shop awnings and alternative species with no service restrictions).

PRECINCT 11: UPPER MIDDLE HARBOUR BUSHLAND & RESIDENTIAL
Proposed street tree species

Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i>	Lilly Pilly	E	-	cr	N	N
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Angophora costata</i> (SGF1/SRW)*	Smooth-barked Apple	E	-	os	M	N
<i>Angophora hispida</i>	Dwarf Apple	E	-	cr	M	Y
<i>Backhousia myrtifolia</i> (SGF1)*	Grey Myrtle	E	-	cr	N	Y
<i>Banksia integrifolia</i>	Coast Banksia	-	D	no cu	M	Y
<i>Banksia serrata</i> (SGF1/SRW)*	Saw-toothed Banksia	E	-	os	M	Y
<i>Callistemon</i> spp.	Bottlebrush	E	-	cn	M	Y
<i>Ceratopetalum gummiferum</i>	NSW Christmas Bush	E	-	cn	N	Y
<i>Corymbia gummifera</i> (SGF1/SRW)*	Red Bloodwood	E	-	os	M	N
<i>Eucalyptus camfieldii</i> (SRW)*	Heart-leaf Stringybark	E	-	os	N	Y
<i>Eucalyptus capitellata</i> (SRW)*	Brown Stringybark	E	-	os	M	N
<i>Eucalyptus crebra</i>	Narrow Leaved Ironbark	E	-	os	M	N
<i>Eucalyptus haemastoma</i>	Scribbly Gum	E	-	os	W	N
<i>Eucalyptus piperita</i> (SGF1/SRW)*	Sydney Peppermint	E	-	os	W	N
<i>Eucalyptus punctata</i>	Grey Gum	E	-	os	W	N
<i>Eucalyptus racemosa</i> (SGF1/SRW)*	Scribbly Gum	E	-	os	M	N
<i>Eucalyptus sieberi</i> (SGF1/SRW)*	Silvertop Ash	E	-	os	M	N
<i>Glochidion ferdinandi</i>	Cheese Tree	E	-	cs	M	Y
# <i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Tristanopsis laurina</i> spp.	Water Gum	E	-	cr	M	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* SGF1/SRW LOCAL NATIVE SPECIES recommended for most streets in this precinct.

SGF1 = Sydney Sandstone Gully Forest (*Eucalyptus piperita*/ *Angophora costata*);

SRW = Sydney Sandstone Ridgetop Woodland.

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** *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars “Red Head” (burgundy red new foliage) and “Sublime” (lush green new foliage).

Jacaranda mimosifolia to be used only within existing plantations or urban context (e.g. Raeburn Avenue, Castlecrag)

'HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;

upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)

M = medium (2.5-4.0 metres)

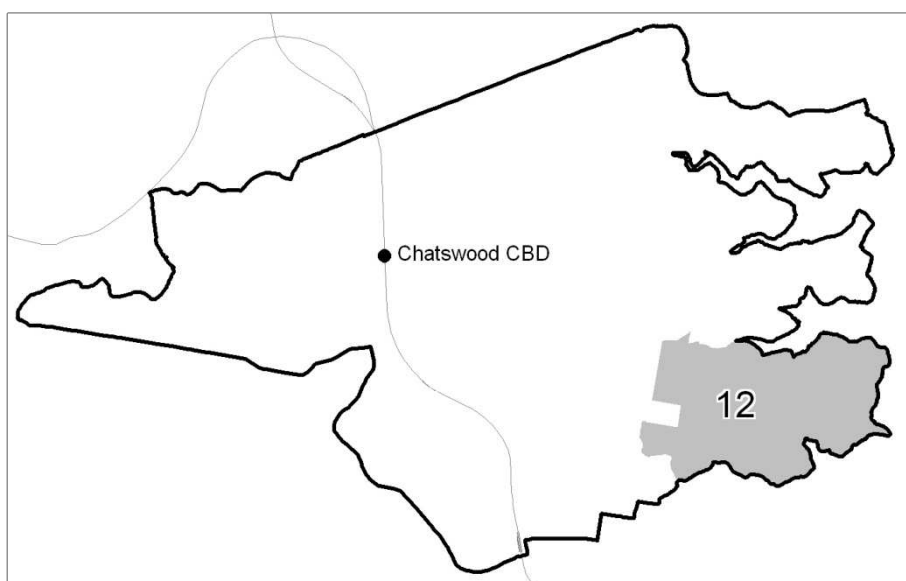
W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

12. Northbridge residential and steep bushland slopes



Key landscape features

Geology and soils:

Central plateau and ridges – Mittagong Formation (approx. 25% of precinct) with alternating bands of fine to medium grained quartz sandstone and inter-bedded shale lenses; sandy loams overlying hard-setting sandy clay loam;
Northern, eastern and southern steep slopes and valleys – Hawkesbury sandstone (approx. 65% of precinct) – typically fine to coarse grained quartz sandstone with

inter-bedded shale lenses; soils are generally shallow, apedal and porous sandy to sandy loams with very low fertility; south-eastern and eastern upper slopes – typically stony, sandy to clay loams with gleyed soils along poorly drained benches;

Topography, slope and aspect:

Gently undulating to moderately inclined slopes along central ridge; localised knolls with rock outcrops; grading to moderate to very steep sandstone slopes with rock outcrops, bedrock pavements, benches, tors and broken scarps (up to 10 metres high); aspect varies.

Natural and cultural landscape:

Predominantly low density residential/ environmental living; some commercial (local and neighbourhood centre) and medium density residential; significant bushland reserves; parks and golf course; environmental conservation; Middle Harbour foreshores (eastern boundary); Eastern Valley Way/ Flat Rock Gully Reserve (western boundary).

Presence of remnant native vegetation:

Sydney Sandstone Gully Forest (SSGF) – including 10ag(i) Open Forest/ Woodland and 10ag(iii) Closed-forest; Sydney Sandstone Ridgetop Woodland (SSRW) – 10ar(i) including Woodland/ Low Woodland. Ecological communities are in accordance with Benson & Howell (1994). For further details see *Natural Heritage Register*.

Streetscape type/character:

Remnant native forest canopy trees (SSGF communities) and open-woodland trees and shrubs (SSRW);

Cultural plantations including single or mixed species (native and exotic), evergreen or deciduous avenues; significant 1930s-1950s avenue plantations

Heritage Conservation Areas:

n/a

Historic significance:

1930s: construction of the Harbour Bridge, Eastern Valley Way and rebuilding of Northbridge Suspension Bridge created a boom period for residential development; Brush Box avenue plantations; notably the major bushland reserves and the steeper foreshore slopes retained significant bushland.

Ecological significance:

This precinct and its streetscapes conserve significant forest and woodland canopy trees (including many old growth specimens) representative of Sydney Sandstone Ridgetop Woodland and Sydney Sandstone Gully Forest. These remnant canopy trees are largely restricted to the lower steep slopes and foreshores. Opportunities

exist to enhance ecological connectivity between major bushland reserves (i.e. Flat Rock Gully reserve/ Tunks Park, Northbridge Golf Course, Clive Park, Warners Park/ Keep Reserve), other smaller bushland reserves and surrounding streetscapes.

Significant Inter-war and early Post-war period plantations:

Baringa Road – Brush Box
 Baroona Road – Brush Box
 Euroka Street – Brush Box
 Harden Avenue – Brush Box
 Weetawa Road – Brush Box
 Weetalibah Road – Brush Box
 Miowera Road – Brush Box
 Bligh Street - Jacaranda

Age structure of remnant native trees and plantations:

Native canopy: varies; incl. old growth specimens up to 100-150 years
 Dominant planting: Brush Box avenues (up to 60-75years+); and
 generic native planting (up to 30-40 years+)

PRECINCT 12: NORTHBRIDGE RESIDENTIAL AND STEEP BUSHLAND SLOPES Existing remnant (typical) native canopy species	
Location	Native Tree Species
Cliff Avenue/ Upper Cliff Avenue/ Lower Cliff Avenue	<i>Angophora costata</i> (Smooth-barked Apple) <i>Eucalyptus piperita</i> (Sydney Peppermint) <i>Eucalyptus sieberi</i> (Silvertop Ash)
Sailors Bay Road	<i>Eucalyptus piperita</i> (Sydney Peppermint) <i>Eucalyptus haemastoma</i> (Broad-leaved Scribbly Gum)
Narooma Road/ Noonbinna Crescent	<i>Eucalyptus haemastoma</i> (Broad-leaved Scribbly Gum) <i>Angophora costata</i> (Smooth-barked Apple) <i>Eucalyptus piperita</i> (Sydney Peppermint)
Byora Crescent	<i>Eucalyptus racemosa</i> (Narrow-leaved Scribbly Gum) <i>Corymbia gummifera</i> (Red Bloodwood) <i>Angophora costata</i> (Smooth-barked Apple)
Kameruka Road	<i>Angophora costata</i> (Smooth-barked Apple) <i>Eucalyptus piperita</i> (Sydney Peppermint) <i>Eucalyptus sieberi</i> (Silvertop Ash)
Coolawin Road	<i>Angophora costata</i> (Smooth-barked Apple) <i>Ficus rubiginosa</i> f. <i>rubiginosa</i> (Port Jackson Fig)
Minnamurra Road/ Minimbah Road/ Courallie Road	<i>Angophora costata</i> (Smooth-barked Apple) <i>Eucalyptus piperita</i> (Sydney Peppermint) <i>Corymbia gummifera</i> (Red Bloodwood)

PRECINCT 12: NORTHBRIDGE RESIDENTIAL AND STEEP BUSHLAND SLOPES
Existing typical or dominant planted tree species*

Location	Tree Species (cultivated)
Eastern Valley Way	<i>Eucalyptus/ Corymbia</i> spp. (mixed generic Eucalypts) <i>Lophostemon confertus</i> (Brush Box) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark)
Baringa Road/ Barooka Road	<i>Lophostemon confertus</i> (Brush Box) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Tristaniopsis laurina</i> (Water Gum)
Harden Avenue/ Euroka Street/ Bligh Street	<i>Lophostemon confertus</i> (Brush Box) <i>Jacaranda mimosifolia</i> (Jacaranda)
Sailors Bay Road	<i>Platanus x acerifolia</i> (London Plane) <i>Eucalyptus/ Corymbia</i> spp. (mixed generic Eucalypts) <i>Lophostemon confertus</i> (Brush Box)
Kameruka Road/ Tenilba Avenue	<i>Tristaniopsis laurina</i> (Water Gum) <i>Callistemon</i> spp. (Bottlebrush) <i>Jacaranda mimosifolia</i> (Jacaranda)
Weetawa Road/ Weetalibah Road	<i>Tristaniopsis laurina</i> (Water Gum) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Melaleuca quinquenervia</i> (Broad-leaved Paperbark)
Miowera Road/ Bourmac Avenue/ Aubrey Street	<i>Lophostemon confertus</i> (Brush Box) <i>Callistemon viminalis</i> (Weeping Bottlebrush) <i>Robinia pseudoacacia</i> 'Frisia' (Golden Robinia)

* NOTE: Street tree planting is dominated by a wide range of exotic and generic native trees and shrubs, including various cultivars.

Key precinct objectives

Cultural streetscapes (incl. Inter-war and early Post-war period single species avenues):

- Protect and maintain the integrity and intactness of Inter-war and early Post-war period (1930s-1950s) single species avenues;
- Implement a program to phase-out unsuitable and/ or poorly performing street trees including removal of disparate elements (i.e. varying forms, habit, structure, texture, etc.) and variety of tree species;
- Promote consistency in tree species selection ensuring continuity, unity and cohesiveness in the palettes for each street;
- Avoid infill planting strategies which add further layers of inconsistent, disjunctive and/ or mixed generic native and exotic tree species of varying scale, form and texture;

- Prioritise Eastern Valley Way and Sailors Bay Road as key connector roads implementing a planting strategy using single or two (mixed) species within the streetscape (i.e. one species under overhead powerlines/ shop awnings and alternative species with no service restrictions).

Streetscapes conserving a strong 'natural landscape' character:

- Protect and maintain the significant biodiversity and geodiversity values of this precinct, particularly the diversity of ecological communities and native tree species within the street verges (as scheduled in WNHR);
- Investigate opportunities for extending current bush regeneration and restoration strategies in consultation with local Bushcare groups;
- Promote opportunities for natural recruitment of canopy trees and community-based restoration strategies in streetscapes linking to adjoining bushland reserves;
- Selection of native species to be in accordance with mapped geology, soils and ecological communities, noting the highly variable local conditions (e.g. bedrock pavement and often shallow, porous coarse-grained sandy soils);
- Promote strategies to supplement and enhance native tree canopy using provenance-sourced material;
- Avoid the use of generic native species in this precinct (i.e. species native to other geographic areas or of unknown provenance) and phase-out unsuitable and/ or poorly performing street trees;
- Protect scenic vistas, particularly along elevated ridges and scarps.
Promote the use of native broadleaf species (under overhead powerlines) and open-canopied local native species (no powerlines) in these locations.

PRECINCT 12: NORTHBRIDGE RESIDENTIAL AND STEEP BUSHLAND SLOPES
Proposed street tree species

Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
Cultural streetscapes (including mature single species avenues):						
<i>Callistemon spp.</i>	Bottlebrush	E	-	cn	M	Y
<i>Ceratopetalum gummiferum</i>	NSW Christmas Bush	E	-	cn	N	Y
<i>Cupaniopsis anacardioides</i>	Tuckeroo	E	-	cr	N	Y
<i>Glochidion ferdinandi</i>	Cheese Tree	E	-	cs	M	Y
# <i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
# <i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Tristanopsis laurina</i>	Water Gum	E	-	cr	M	Y
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N
Streetscapes conserving a strong natural (bushland) landscape character:						
<i>Acmena smithii</i>	Lilly Pilly	E	-	cr	N	N
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Angophora costata</i> (SGF1/SRW)*	Smooth-barked Apple	E	-	os	M	N
<i>Backhousia myrtifolia</i> (SGF1)*	Grey Myrtle	E	-	cr	N	Y
<i>Banksia spp.</i>	Banksia	E	-	os	M	Y
<i>Ceratopetalum gummiferum</i>	NSW Christmas Bush	E	-	cn	N	Y
<i>Corymbia gummifera</i> (SGF1/SRW)*	Red Bloodwood	E	-	os	M	N
<i>Eucalyptus camfieldii</i> (SRW)*	Heart-leaf Stringybark	E	-	os	N	Y
<i>Eucalyptus capitellata</i> (SRW)*	Brown Stringybark	E	-	os	M	N
<i>Eucalyptus haemastoma</i> (SRW)*	Scribbly Gum	E	-	os	W	N
<i>Eucalyptus piperita</i> (SGF1/SRW)*	Sydney Peppermint	E	-	os	W	N
<i>Eucalyptus racemosa</i> (SGF1/SRW)*	Scribbly Gum	E	-	os	M	N
<i>Eucalyptus resinifera</i> (SGF1)*	Narrow-leaved Ironbark	E	-	os	W	N
<i>Eucalyptus sieberi</i> (SGF1/SRW)*	Silvertop Ash	E	-	os	M	N
<i>Glochidion ferdinandi</i> (SGF1/SRW)*	Cheese Tree	E	-	cs	M	Y

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<i>Melaleuca linariifolia</i>	Snow in Summer	E	cr	M	N	
<i>Tristaniopsis laurina</i>	Water Gum	E	-	cr	M	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* SGF1/SRW LOCAL NATIVE SPECIES recommended for this precinct.

SGF1 = Sydney Sandstone Gully Forest (*Eucalyptus piperita*/ *Angophora costata*);

SRW = Sydney Sandstone Ridgetop Woodland.

** *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars “Red Head” (burgundy red new foliage) and “Sublime” (lush green new foliage).

Jacaranda mimosifolia and *Lophostemon confertus* to be planted only within existing single species Inter-war and early Post-war period plantations (i.e. cultural context)

¹HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;

upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)

M = medium (2.5-4.0 metres)

W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:

N = NO; Y = YES

...

Part D: Appendices

TABLE A1: SUMMARY OF RECOMMENDED SPECIES
Proposed street tree species

Tree Species	Common Name	evergreen	deciduous	habit/form ¹	verge width ²	power-lines ³
<i>Acmena smithii</i> (ALL)*	Lilly Pilly	E	-	cr	N	N
<i>Acmena smithii</i> var. minor	Lilly Pilly (incl. cv)**	E	-	cr	N	Y
<i>Afrocarpus falcatus</i>	Outeniqua Yellowwood	E	-	cs	W	N
<i>Alectryon subcinereus</i> (BGHF)*	Native Quince	E	-	cr	N	Y
<i>Alloxylon flammeum</i>	Tree Waratah	E	-	cu	M	N
<i>Angophora costata</i> (ALL)*	Smooth-barked Apple	E	-	os	M	N
<i>Angophora floribunda</i> (BGHF)*	Rough-barked Apple	E	-	os	M	N
<i>Angophora hispida</i>	Dwarf Apple	E	-	cr	M	Y
<i>Backhousia citriodora</i>	Lemon-scented Myrtle	E	-	cr	M	N
<i>Backhousia myrtifolia</i> (BGHF)*	Grey Myrtle	E	-	cr	N	Y
<i>Banksia integrifolia</i>	Coast Banksia	E	-	no cu	M	Y
<i>Banksia serrata</i> (SGF1/SRW)*	Saw-toothed Banksia	E	-	os	M	Y
<i>Betula nigra</i>	Black Birch	-	D	ou	M	N
<i>Caesalpinia ferrea</i>	Leopard Tree	-	D	cs	M	N
<i>Callistemon</i> spp.	Bottlebrush	E	-	cn	M	Y
<i>Ceratopetalum gummiiferum</i>	NSW Christmas Bush	E	-	cn	N	Y
<i>Cupaniopsis anacardioides</i>	Tuckeroo	E	-	cr	N	Y
<i>Corymbia gummiifera</i> (SGF1/SRW)*	Red Bloodwood	E	-	os	M	N
<i>Elaeocarpus eumundi</i>	Eumundi Quandong	E	-	cu	M	N
<i>Eucalyptus camfieldii</i> (SRW)*	Heart-leaf Stringybark	E	-	os	N	Y

<i>Eucalyptus capitellata</i> (SRW)*	Brown Stringybark	E	-	os	M	N
<i>Eucalyptus crebra</i>	Narrow Leaved Ironbark	E	-	os	M	N
<i>Eucalyptus haemastoma</i> (SRW)*	Scribbly Gum	E	-	os	W	N
<i>Eucalyptus paniculata</i> (BGHF/STIF)*	Grey Ironbark	E	-	os	W	N
<i>Eucalyptus pilularis</i> (BGHF/SGF2)*	Blackbutt	E	-	os	W	N
<i>Eucalyptus piperita</i> (SGF1/SRW)*	Sydney Peppermint	E	-	os	W	N
<i>Eucalyptus punctata</i> (SGF1/SGF2)*	Grey Gum	E	-	os	W	N
<i>Eucalyptus racemosa</i> (SGF1/SRW)*	Scribbly Gum	E	-	os	M	N
<i>Eucalyptus resinifera</i> (ALL)*	Narrow-leaved Ironbark	E	-	os	W	N
<i>Eucalyptus saligna</i> (BGHF)*	Sydney Blue Gum	E	-	os	W	N
<i>Eucalyptus sieberi</i> (SGF1/SRW)*	Silvertop Ash	E	-	os	M	N
<i>Flindersia australis</i>	Australian Teak	E	-	cs	M	N
<i>Flindersia spp.</i>	Bumpy Ash	E	-	cs	M	N
<i>Fraxinus spp.</i>	Ash	-	D		M	Y
<i>Glochidion ferdinandi</i>	Cheese Tree	E	-	cs	M	Y
<i>Gordonia axillaris</i>	Gordonia	E	-	cu	M	Y
<i>Hibiscus tiliaceus</i> var. <i>rubra</i>	Purple-leaf Hibiscus	E	-	cr	M	Y
<i>Jacaranda mimosifolia</i>	Jacaranda	-	D	os	M	N
<i>Lagerstroemia indica</i> x <i>L. fauriei</i> var.	Crepe Myrtle cv.***	-	D	cu	M	Y
<i>Lophostemon confertus</i>	Brush Box	E	-	cr	W	N
<i>Magnolia grandiflora</i> 'Exmouth'	Southern Magnolia cv.	E	-	cu	M	N
<i>Magnolia grandiflora</i> 'Little Gem'	Southern Magnolia cv.	E	-	cu	N	Y
<i>Metrosideros spp.</i>	NZ Christmas Bush	E	-	us	M	Y
<i>Michelia spp.</i>	Magnolia	E	-		M	N
<i>Phoenix canariensis</i>	Canary Is. Date Palm	E	-	-	M	N
<i>Pistacia chinensis</i>	Chinese Pistachio	-	D	cr	M	N
<i>Platanus x acerifolia</i>	London Plane	-	D	os	W	N
<i>Platanus x orientalis</i>	Oriental Plane	-	D	os	W	N
<i>Podocarpus elatus</i>	Plum Pine	E	-	cn	M	N
<i>Pyrus calleryana</i> 'Cleveland Select'	Ornamental Pear	-	D	cr	M	N
<i>Pyrus calleryana</i> 'Capital'	Ornamental Pear	-	D	cn	N	N
<i>Pyrus calleryana</i> 'Chanticleer'	Ornamental Pear	-	D	cn	M	N

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<i>Quercus palustris</i>	Pin Oak	-	D	or	W	N
<i>Syncarpia glomulifera</i> (ALL)*	Turpentine	E	-	cs	W	N
<i>Syzygium luehmannii</i>	Cherry Satinash	E	-	cu	N	Y
<i>Syzygium paniculatum</i>	Magenta Lilly Pilly	E	-	cr	M	N
<i>Tristaniaopsis laurina</i> 'Luscious'	Water Gum 'Luscious'	E	-	cr	M	Y
<i>Ulmus parvifolia</i>	Chinese Elm	-	D	os	W	N
<i>Ulmus glabra</i> 'Lutescens'	Golden Elm	-	D	cu	M	N
<i>Waterhousea floribunda</i>	Weeping Lilly Pilly	E	-	cs	M	N
<i>Xanthostemon chrysanthus</i>	Golden Penda	E	-	cr	N	Y

NOTES: Species are shown in alphabetical order and do not denote dominance or ranking.

* Local native species and ecological community

ALL = all ecological communities;
 BGHF = Blue Gum High Forest (critically endangered EEC);
 STIF = Sydney Turpentine-Ironbark Forest (endangered EEC);
 SGF1 = Sydney Sandstone Gully Forest (*Eucalyptus piperita*/ *Angophora costata*);
 SGF2 = Sydney Sandstone Gully Forest (*Eucalyptus pilularis*/ *Syncarpia glomulifera*);
 SRW = Sydney Sandstone Ridgetop Woodland.

** *Acmena smithii* var. *minor* including extremely psyllid-resistant cultivars "Red Head" (burgundy red new foliage) and "Sublime" (lush green new foliage).

*** *Lagerstroemia indica* x *L. fauriei* select cultivars including "Acoma", "Sioux", "Natchez" and "Tuscarora".

'HABIT/ FORM OF TREE

c = compact/dense foliage; o = open crown/ canopy;
 upright = u; r = rounded; s = spreading; n = narrow/columnar or pyramidal.

²MINIMUM VERGE WIDTH (incl. footpath):

N = narrow (<2.5 metres)
 M = medium (2.5-4.0 metres)
 W = wide (>4.0 metres)

³PLANTING UNDER POWER-LINES (incl. ABC):

Item denotes suitability for planting under overhead power-lines or aerial bundled cabling:
 N = NO; Y = YES

TABLE A2: PRECINCT/ SPECIES SUMMARY
Proposed street tree species

Tree Species	PRECINCT											
	1	2	3	4	5	6	7	8	9	10	11	12
<i>Acmena smithii</i>												
<i>Acmena smithii</i> var. minor												
<i>Afrocarpus falcatus</i>												
<i>Alectryon subcinereus</i>												
<i>Alloxylon flammeum</i>												
<i>Angophora costata</i>												
<i>Angophora floribunda</i>												
<i>Angophora hispida</i>												
<i>Backhousia citriodora</i>												
<i>Backhousia myrtifolia</i>												
<i>Banksia integrifolia</i>												
<i>Banksia serrata</i>												
<i>Betula nigra</i>												
<i>Caesalpinia ferrea</i>												
<i>Callistemon</i> spp.												
<i>Ceratopetalum gummiferum</i>												
<i>Cupaniopsis anacardioides</i>												
<i>Corymbia gummifera</i>												
<i>Elaeocarpus eumundi</i>												
<i>Eucalyptus camfieldii</i>												
<i>Eucalyptus capitellata</i>												
<i>Eucalyptus crebra</i>												
<i>Eucalyptus haemastoma</i>												
<i>Eucalyptus paniculata</i>												
<i>Eucalyptus pilularis</i>												
<i>Eucalyptus piperita</i>												

<i>Eucalyptus punctata</i>												
<i>Eucalyptus racemosa</i>												
<i>Eucalyptus resinifera</i>												
<i>Eucalyptus saligna</i>												
<i>Eucalyptus sieberi</i>												
<i>Flindersia australis</i>												
<i>Flindersia spp.</i>												
<i>Fraxinus spp.</i>												
<i>Ginkgo biloba</i>												
<i>Glochidion ferdinandi</i>												
<i>Gordonia axillaris</i>												
<i>Hibiscus tiliaceus</i> var. <i>rubra</i>												
<i>Jacaranda mimosifolia</i>												
<i>Lagerstroemia indica</i> x <i>L.fauriei</i>												
<i>Lophostemon confertus</i>												
<i>Magnolia grandiflora</i> 'Exmouth'												
<i>Magnolia grandiflora</i> 'Little G'												
<i>Melaleuca spp.</i>												
<i>Metrosideros spp.</i>												
<i>Michelia spp</i>												
<i>Olea spp.</i>												
<i>Phoenix canariensis</i>												
<i>Pistacia chinensis</i>												
<i>Platanus x acerifolia</i>												
<i>Platanus x orientalis</i>												
<i>Podocarpus elatus</i>												
<i>Pyrus calleryana</i> 'Cleveland S'												
<i>Pyrus calleryana</i> 'Capital'												
<i>Pyrus calleryana</i> 'Chanticleer'												
<i>Quercus palustris</i>												
<i>Syncarpia glomulifera</i>												
<i>Syzygium luehmannii</i>												

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<i>Syzygium paniculatum</i>												
<i>Tristaniopsis laurina</i> 'Luscious'												
<i>Ulmus parvifolia</i>												
<i>Ulmus glabra</i> 'Lutescens'												
<i>Waterhousea floribunda</i>												
<i>Xanthostemon chrysanthus</i>												

NOTE: Species shown in bold are native to identified precincts.

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Lilly Pilly
Acmena smithii



Outeniqua Yellowwood
Afrocarpus falcatus



Tree Waratah
Alloxylon flammeum



Smooth-barked Apple
Angophora costata



Lemon-scented Myrtle
Backhousia citriodora



Grey Myrtle (immature)
Backhousia myrtifolia



Tuckeroo
Cupaniopsis anacardioides



Red Bloodwood – bark detail
Corymbia gummiifera



Eumundi Quandong
Elaeocarpus eumundi



Heart-leaf Stringybark – leaf detail
Eucalyptus camfieldii



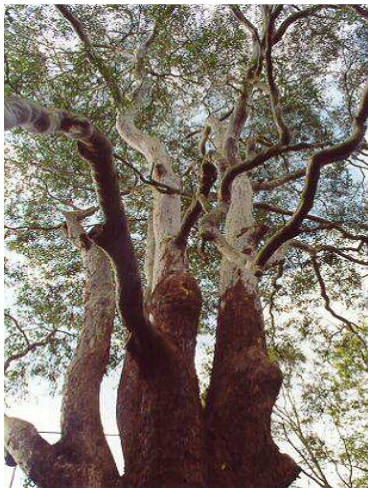
Broad-leaved Scribbly Gum
Eucalyptus haemastoma



Sydney Peppermint
Eucalyptus piperita



Narrow-leaved Scribbly Gum
Eucalyptus racemosa



Sydney Blue Gum
Eucalyptus saligna



Australian Teak
Flindersia australis



Bumpy Ash
Flindersia schottiana



Cheese Tree
Glochidion ferdinandi



Gordonia
Gordonia axillaris

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Purple-leaf Hibiscus
Hibiscus tiliaceus var. *rubra*



Jacaranda
Jacaranda mimosifolia



Crepe Myrtle cv. Yuma
Lagerstroemia indica x *L. fauriei*



Southern Magnolia cv. Exmouth
Magnolia grandiflora 'Exmouth'



Ornamental Pear – autumn foliage
Pyrus calleryana 'Chanticleer'



Turpentine
Syncarpia glomulifera

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Cherry Satinash
Syzygium luehmannii



Weeping Lilly Pilly
Waterhousea floribunda



Water Gum cv. Luscious
Tristanopsis laurina 'Luscious'



Golden Penda
Xanthostemon chrysanthus



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