

# 4. Existing canopy vegetation cover

## 4.1 Overview

There has been a loss in tree canopy cover between 1992 and 2015, declining from 26 to 22 per cent cover.

This project has measured the canopy vegetation cover for the City of Monash in 2015 and in 1992 (which represents the approximate time the Vegetation Protection Overlay was introduced into the Monash Planning Scheme). The canopy vegetation is made up of trees and then smaller shrubs and ground layer vegetation. The tree canopy cover has been measured in two ways:

- The percentage of tree canopy cover.
- Spatial mapping of the tree canopy cover.

### **Percentage tree canopy cover**

The project has used the industry recognised i-Tree Canopy free-use software. This was selected so that the results can be benchmarked against adjoining municipalities and the international examples. Refer to Appendix A for further information about this method. The i-Tree Canopy software also measures other types of surfaces and features that make up the city. This project measured the 'greenness' of the city along with the tree canopy cover.

### **Spatial mapping of tree canopy cover**

The spatial mapping is based on the 2015 and 1992 aerial photographs. By mapping the tree canopy cover only over the two time periods, it allows a visual comparison of where changes to the canopy cover have occurred.

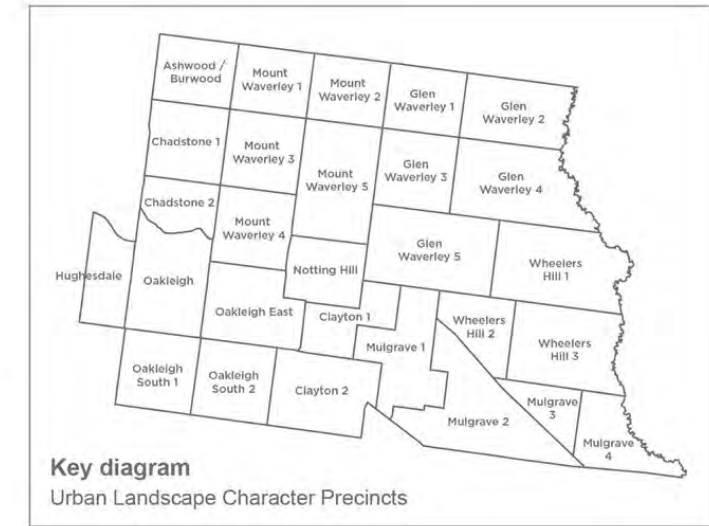
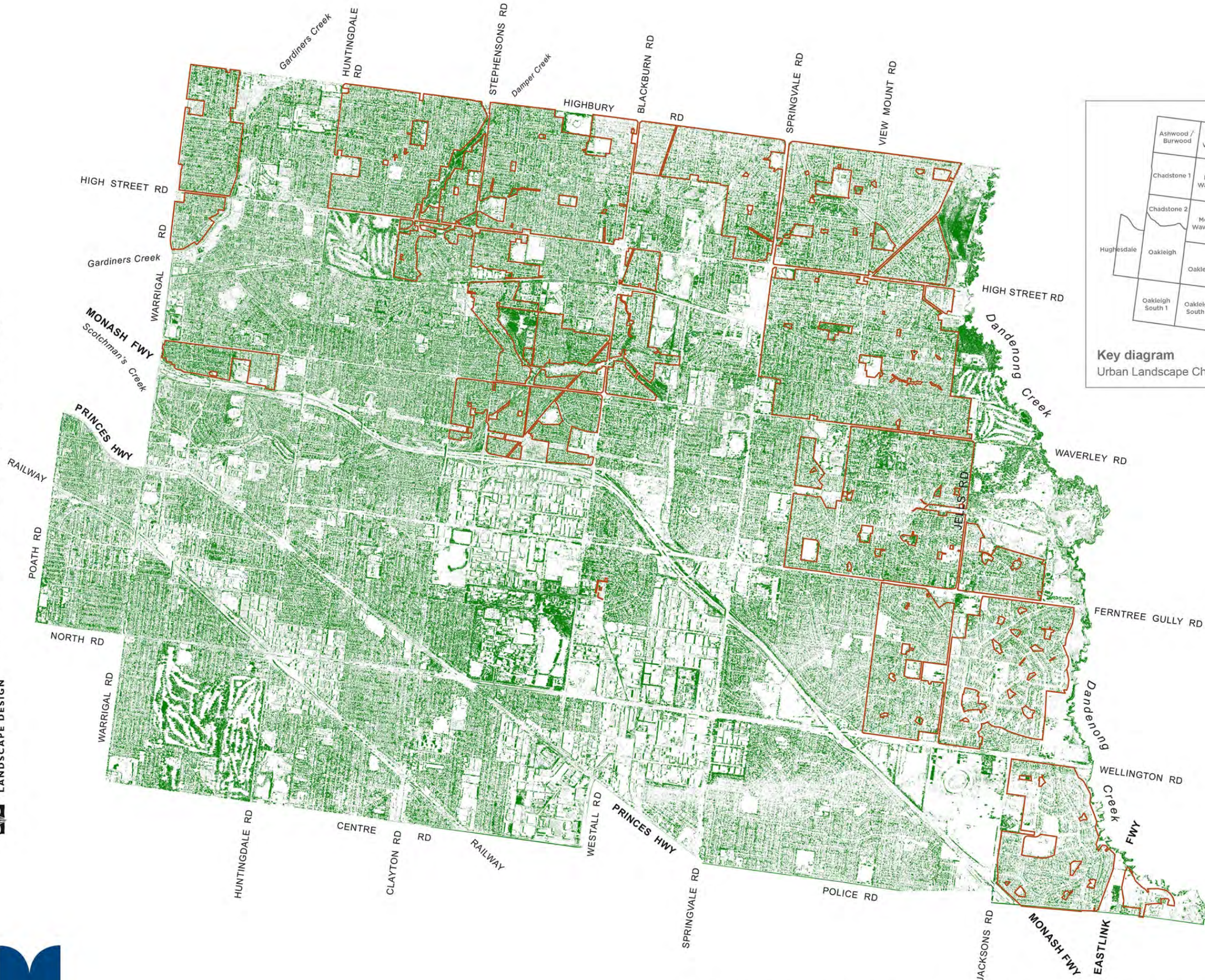
## 4.2 Tree canopy cover in the City of Monash

The 2015 tree canopy cover in the City of Monash has been measured at 22 per cent. This is 4 per cent lower than the tree canopy cover in 1992, which is measured at 26 per cent.

In order to identify where the changes have occurred in tree canopy cover between 1992 and 2015, this project spatially mapped the tree canopy cover on a municipal wide basis. The results of this mapping are shown in Figures 4a and 4b.

As a result of the canopy vegetation cover mapping for this project the following key changes have occurred over the past approximately 23 years in the City of Monash:

- There has been an increase in tree canopy cover on public land along the waterway corridors and in public open space. For example, Figure 4B shows a clear increase in tree canopy cover along the Gardiners Creek open space corridor, Dampier Creek open space corridor, Scotchmans Creek open space corridor, Valley Reserve and the Dandenong Creek floodplain when compared to the same areas in Figure 4A.
- A loss of tree canopy cover on private land and in the streetscapes particularly west of Blackburn and Clayton Roads. This includes through the suburbs of Oakleigh, Oakleigh East, Chadstone and Mount Waverley.
- An increase in tree canopy cover in the south eastern areas of the municipality including in parts of Wheelers Hill (south of Wellington Road and east of Monash Freeway) and Mulgrave. This is mainly due to the completion of urban development during this period on former agricultural land and the subsequent planting of trees on private land, in public open space and in the streetscapes.
- In relation to the loss of tree canopy cover within and outside the Vegetation Protection Overlay (VPO) Figures 4A and 4B illustrates:
  - Tree canopy cover loss has occurred inside the VPO in the western and northern parts of the municipality at a similar rate to the areas without the VPO.
  - There has been an increase in tree canopy cover in the south eastern area of the municipality within the VPO at a similar rate to similar areas outside the VPO.



**Diagram key**

 VPO – Vegetation Protection Overlay  
Monash Planning Scheme

City of Monash Tree Canopy Cover 1992 – Extent of existing VPO

**MONASH URBAN LANDSCAPE CHARACTER AND CANOPY VEGETATION STRATEGY**

**DRAFT**

July 2016  
SCALE 1:40,000 @ A3



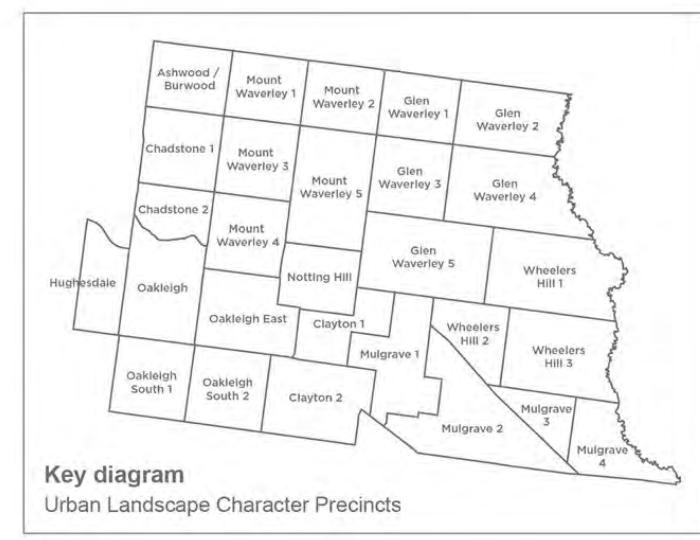
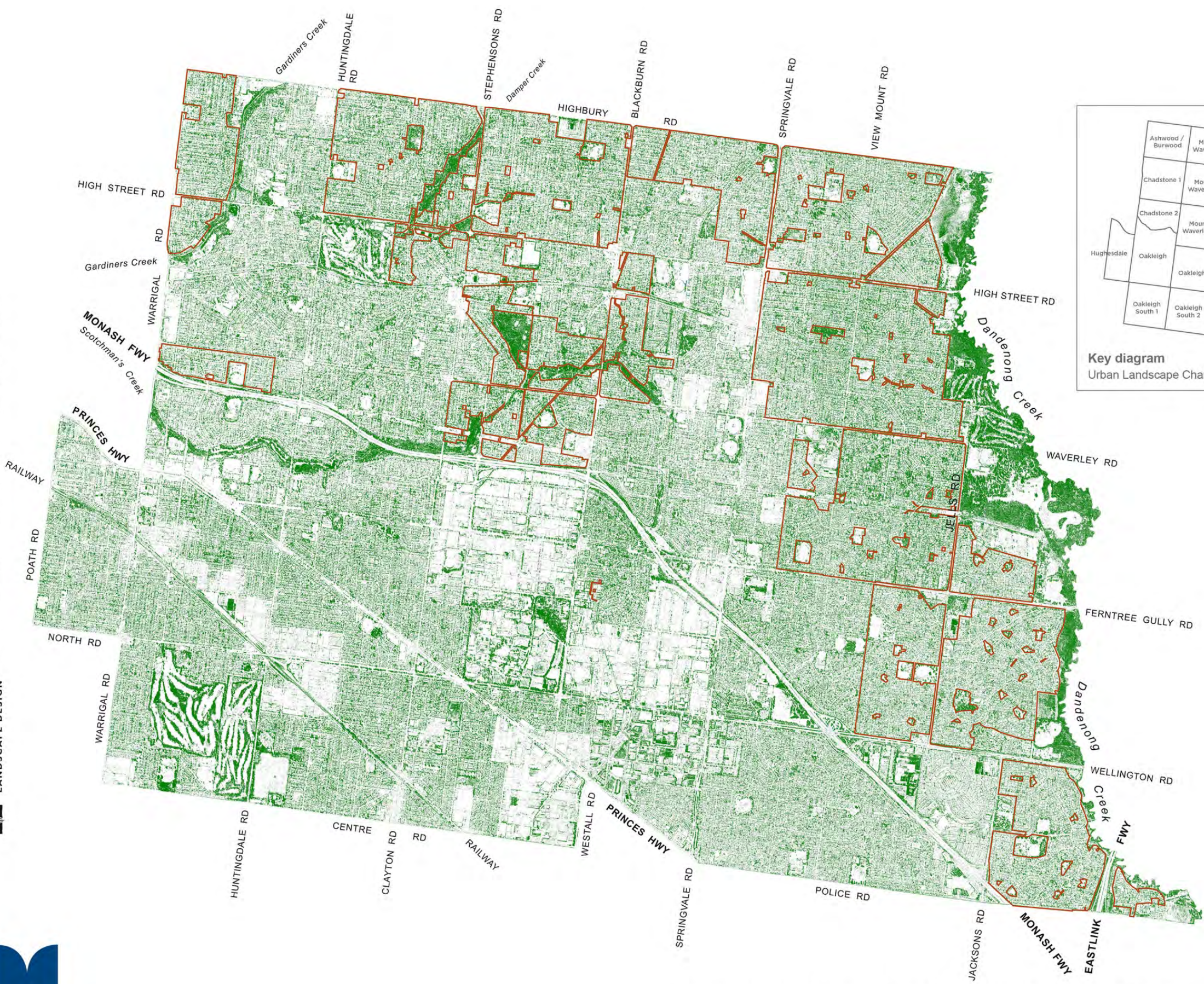



Figure 4A City of Monash Tree Canopy Cover 1992 – Extent of existing VPO



**Diagram key**

VPO – Vegetation Protection Overlay Monash Planning Scheme

2015

Figure 4B City of Monash Tree Canopy Cover 2015 – Extent of existing VPO

## 4.3 Measuring 'greenness'

The i-Tree software measures the percentage coverage of other types of surfaces including differentiating between green areas and built or paved surfaces.

For this project the greenness has been measured on a municipal wide basis, with a comparison between 1992 and 2015. Six of the landscape precincts have also been measured to identify the changes to greenness across different land use types in the city.

### 4.3.1 Municipal wide greenness

Built form including hard paved surfaces comprise 52% of the total municipal area, while unsealed surfaces (including grass, gravel, garden beds and water) comprise 48% of the remaining area. There has been an increase of 10% of built form including hard paved surfaces coverage when compared with the 1992 aerial as shown in Table 4-1.

**Table 4-1 Comparison of tree canopy cover between 1992 and 2015**

| Features                     | Monash 1992 | Monash 2015 | Difference 1992/2015 |
|------------------------------|-------------|-------------|----------------------|
| Trees                        | 26%         | 22%         | -4%                  |
| Grass, garden bed & unsealed | 33%         | 25%         | -8%                  |
| Water                        | 1%          | 1%          | Same                 |
| Roofs                        | 20%         | 25%         | +5%                  |
| Concrete                     | 9%          | 15%         | +6%                  |
| Asphalt                      | 11%         | 12%         | +1%                  |

*Please note, that using the 1,000 point accuracy that is available in i-Tree, there is a statistical error in the results in the order of 2.0 per cent.*

Table 4-1 confirms that the overall the City of Monash has lost tree canopy cover and has also experienced a reduction in the grass, garden bed and unsealed surfaces. During the same period, the City of has experienced an increase in hard surfaces mainly associated with an increase in roof and concrete surfaces.

Based on the preliminary assessment of the dwelling and population forecasts current planning indicates that by 2036 there will be more people living and working in Monash. The additional population is forecast to create a demand for 14% more dwellings over and above the current levels. This is slightly smaller than the 22% proportional increase in dwellings experienced over the past 20 years in Monash. Based on this forecast, if there is no proactive strategy to protect green space and canopy trees, both will continue to decline, affecting a range of issues including:

- Community health and wellbeing in relation to human comfort and aesthetic values.
- Biodiversity values through the loss of canopy trees and natural features and areas.
- Increase in urban heat island effect through a reduction in canopy trees and reduction in moisture absorbing surfaces.
- Environmental implications of greater reliance on heating and cooling.

Therefore, in order for the City of Monash to retain its Garden City identity and liveability, the Strategy focuses the recommendations on protecting the existing trees, encouraging planting of additional canopy trees and increasing the presence of permeable natural grass and garden bed surfaces.

## 4.3.2 Changes in canopy cover in representative individual precincts

### Chadstone 1

Chadstone 1 precinct is representative of similar characteristics in two other precincts being Ashwood/Burwood and Chadstone 2. This precinct type currently contains more greenness than the municipal wide average. The key distinguishing characteristics include:

- Predominantly residential land use combined with a waterway corridor.
- Post WWII development (1945 to 1965)
- Public open space along the waterway along with other distributed open space.
- Compared with the 2015 Municipal wide results, this precinct has **3% more** tree canopy cover and **4% less** built form/paved surfaces.

**Table 4-2**

*Comparison of tree canopy cover between 1992 and 2016 in Chadstone 1*

| Features           | Chadstone 1<br>1992 | Chadstone 1<br>2016 | Difference<br>1992/2016 |
|--------------------|---------------------|---------------------|-------------------------|
| Trees              | 22%                 | 25%                 | + 3%                    |
| Grass & garden bed | 36%                 | 25%                 | - 11%                   |
| Unsealed           | 3%                  | 2%                  | - 1%                    |
| Water              | 0%                  | 0%                  | Same                    |
| Roofs              | 18%                 | 24%                 | + 6%                    |
| Concrete           | 10%                 | 14%                 | + 4%                    |
| Asphalt            | 11%                 | 10%                 | - 1%                    |

Compared to the 1992 data, there is a 3% increase in tree canopy cover, an 11% decrease in grass/garden bed cover, a 4% increase in concrete surfaces and 6% increase in the roof surface cover. The reason for an increase in canopy cover in this precinct is due to the increase in trees along Gardiners Creek open space corridor and in Electra Reserve and Jordan Reserve. The tree canopy mapping identifies there has been a loss of tree canopy across the urban areas outside of open space during this period.

While the tree canopy cover has increased, the overall decline in garden bed and grass and increase in roof and concrete surfaces areas has changed the landscape character. This correlates with the site assessment work in this precinct where there has been an increase in unit developments and larger single dwellings with a higher proportion of paved surfaces within the front set back, particularly larger driveways and correspondingly a decline in the green and natural character.

## Glen Waverley 3

Glen Waverley 3 precinct is representative of similar characteristics in six other precincts being Clayton 1, Mulgrave 2 and Glen Waverley 1 to 4 (excluding the Dandenong Creek open space corridor). This precinct type currently contains less greenness than the municipal wide average. The key distinguishing characteristics include:

- Diversity of land use types including residential, small scale industrial, retail, mixed use, education and open space.
- Post WWII development (1945 to 1965)
- Compared with the 2015 Municipal wide results, this precinct has **3% less** tree canopy cover and **5% more** built form/paved surfaces.

**Table 4-3**

*Comparison of tree canopy cover between 1992 and 2016 in Glen Waverley 3*

| Features           | Glen Waverley 3<br>1992 | Glen Waverley 3<br>2016 | Difference<br>1992/2016 |
|--------------------|-------------------------|-------------------------|-------------------------|
| Trees              | 22%                     | 19%                     | - 3%                    |
| Grass & garden bed | 23%                     | 18%                     | - 5%                    |
| Unsealed           | 4%                      | 5%                      | + 1%                    |
| Water              | 1%                      | 1%                      | Same                    |
| Roofs              | 26%                     | 31%                     | + 5%                    |
| Concrete           | 10%                     | 12%                     | + 2%                    |
| Asphalt            | 14%                     | 14%                     | Same                    |

Compared to the 1992 data, there is a 3% decrease in tree cover, a 5% decrease in grass/garden bed cover, a 2% increase in concrete surfaces and 5% increase in the roof surface cover. This indicates there has been an increase in built form along with some increase in paved surfaces, and a corresponding decrease in grass and garden beds. The tree canopy mapping comparison reveals that there has been some increase in tree canopy cover along Scotchmans Creek and in Bogong Reserve and reduced canopy cover in the urban areas.

This precinct includes the Glen Waverley Activity Centre, and these comparative results indicate that without proactive change, there will continue to be a decline in tree canopy and grass/garden bed areas. This Strategy recommends including planting new canopy trees and also grass and garden bed areas as a priority in future design guidelines for the activity centres and precincts where increased residential densities are encouraged.

## Hughesdale

Hughesdale precinct is representative of similar characteristics in five other precincts being Glen Waverley 5, Oakleigh, Oakleigh East, Oakleigh South 1 and 2 (excluding the Golf Courses). This precinct type currently contains less greenness than the municipal wide average. The key distinguishing characteristics include:

- Predominantly residential land use with a minor component of education and open space.
- Pre WWI and interwar grid subdivision development pattern.
- Compared with the 2015 Municipal wide results, this precinct has **3% less** tree canopy cover and **7% more** built form/paved surfaces.

**Table 4-4***Comparison of Tree Canopy Cover between 1992 and 2016 in Hughesdale*

| Features           | Hughesdale 1992 | Hughesdale 2016 | Difference 1992/2016 |
|--------------------|-----------------|-----------------|----------------------|
| Trees              | 22%             | 19%             | - 3%                 |
| Grass & garden bed | 21%             | 18%             | - 3%                 |
| Unsealed           | 3%              | 3%              | Same                 |
| Water              | 0%              | 0%              | Same                 |
| Roofs              | 33%             | 34%             | + 1%                 |
| Concrete           | 12%             | 15%             | + 3%                 |
| Asphalt            | 9%              | 10%             | + 1%                 |

Compared to the 1992 data, there is a 3% decrease in tree cover, a 3% decrease in grass/garden bed cover, a 3% increase in concrete surfaces, a 1% increase in asphalt and 1% increase in the roof surface cover. The results indicate that the key change has been the increase in paved surfaces in place of grass, garden beds and trees over the 23 year period. The comparison between the canopy tree mapping reveals an overall loss of canopy tree cover from the urban residential areas and an increase in canopy tree cover in Galbally Reserve.

The results correlate with the site assessment work in this precinct where there has been an increase in unit developments and larger single dwellings with a higher proportion of paved surfaces within the front set back, particularly the larger driveways. Introducing effective landscape guidelines that support the retention of and increase in canopy trees within the established urban areas will be addressed by the Strategy.

## Mount Waverley 1

Mount Waverley 1 precinct is representative of similar characteristics for the remainder of Mount Waverley precincts 2 to 5. This precinct type currently contains slightly more greenness than the municipal wide average. The key distinguishing characteristics include:

- Predominantly residential land use located within the Vegetation Protection Overlay.
- Post WWII development (1945 to 1965).
- Includes waterway corridors.
- Compared with the 2015 Municipal wide results, this precinct has **2% more** tree canopy cover and **2% less** built form/paved surfaces.

**Table 4-5***Comparison of tree canopy cover between 1992 and 2016 in Mount Waverley 1*

| Features           | Mount Waverley 1 1992 | Mount Waverley 1 2016 | Difference 1992/2016 |
|--------------------|-----------------------|-----------------------|----------------------|
| Trees              | 34%                   | 24%                   | - 10%                |
| Grass & garden bed | 20%                   | 24%                   | + 4%                 |
| Unsealed           | 1%                    | 2%                    | + 1%                 |
| Water              | 0%                    | 0%                    | Same                 |
| Roofs              | 28%                   | 31%                   | + 3%                 |
| Concrete           | 8%                    | 9%                    | + 1%                 |
| Asphalt            | 9%                    | 10%                   | + 1%                 |



Compared to the 1992 data, there is a 10% decrease in tree cover, a 4% increase in grass/garden bed cover, a 1% increase in both asphalt and concrete, and a 3% increase in the roof surface cover. The significant change in this precinct is the 10% decrease in tree canopy cover, which is the largest of all the precincts. This is of particular concern given that this precinct is entirely located within a VPO. The canopy tree mapping reveals that there is a substantial increase in canopy tree cover along the Gardiners Creek Corridor along with other open space reserves in the precinct. Correspondingly there has been in a decrease in canopy cover across the established urban areas.

The results for this precinct correlate with the site assessment work in this precinct where there has been an increase in unit developments and larger single dwellings with a higher proportion of paved surfaces within the front set back, particularly the larger driveways. Introducing effective landscape guidelines that support the retention of and increase in canopy trees within the established urban areas will be addressed by the Strategy.

## Notting Hill

Notting Hill precinct is representative of similar characteristics of Clayton 2 and Mulgrave 1. This precinct type currently contains significantly less greenness than the municipal wide average. The key distinguishing characteristics include:

- Predominantly contemporary commercial/industrial land use with small pockets of Post WWII residential use.
- Compared with the 2015 Municipal wide results, this precinct has **11% less** tree canopy cover and **19% more** built form/paved surfaces.

**Table 4-6**

*Comparison of tree canopy cover between 1992 and 2016 in Notting Hill*

| Features           | Notting Hill 1992 | Notting Hill 2016 | Difference 1992/2016 |
|--------------------|-------------------|-------------------|----------------------|
| Trees              | 10%               | 11%               | +1                   |
| Grass & garden bed | 18%               | 12%               | -6                   |
| Unsealed           | 8%                | 8%                | Same                 |
| Water              | 0%                | 0%                | Same                 |
| Roofs              | 30%               | 31%               | +1                   |
| Concrete           | 14%               | 15%               | +1                   |
| Asphalt            | 19%               | 26%               | + 7%                 |

There has been a 6% decrease in garden bed and grassed areas and a 7% increase in asphalt between 1992 and 2016 in this precinct. Other minor changes is a slight increase in roofs and concrete surfaces and also a minor increase in tree canopy cover. The overall increase asphalt and decrease in grass is largely due to redevelopment of commercial/industrial sites within this precinct, including the expansion of sealed car parks and hardstand areas.

While the results indicate there was no decline in the tree canopy cover, there is potential to increase the tree canopy cover and green areas in these precincts to improve community health and wellbeing objectives. Opportunities to achieve this will be identified in both the public and private realm. This may include education programs and raising the awareness of improved liveability outcomes through incentives and partnerships with the larger commercial/industrial estates, in addition to improvements to the landscape guidelines in the planning controls.

### Wheelers Hill 3

Wheelers Hill 3 precinct is representative of similar characteristics for Mulgrave 4 and Wheelers Hill 1 (excluding the Dandenong Creek Corridor). This precinct type currently contains slightly more greenness than the municipal wide average. The key distinguishing characteristics include:

- Predominantly residential land use located within the Vegetation Protection Overlay.
- Post WWII development (1945 to 1965).
- Includes waterway corridors.
- Compared with the 2015 Municipal wide results, this precinct **has the same tree canopy cover and 2% less built form/paved surfaces.**

**Table 4-7**

*Comparison of tree canopy cover between 1992 and 2016 in Wheelers Hill 3*

| Features           | Wheelers Hill 3<br>1992 | Wheelers Hill 3<br>2016 | Difference<br>1992/2016 |
|--------------------|-------------------------|-------------------------|-------------------------|
| Trees              | 19%                     | 22%                     | + 3%                    |
| Grass & garden bed | 38%                     | 27%                     | - 11%                   |
| Unsealed           | 1%                      | 2%                      | + 1%                    |
| Water              | 0%                      | 1%                      | + 1%                    |
| Roofs              | 22%                     | 26%                     | + 4%                    |
| Concrete           | 12%                     | 14%                     | + 2%                    |
| Asphalt            | 8%                      | 10%                     | + 2%                    |

Compared to the 1992 data, there is a 3% increase in tree cover, an 11% decrease in grass/garden bed cover, a 2% increase in both asphalt and concrete, and a 4% increase in the roof surface cover. This is the only precinct where this is a change of the percentage of water and there is a substantial decrease in the grass and garden bed area. In 1992 this precinct was still being developed so there were a number of lots that had not been built on in 1992. This accounts for the substantial decrease in the grass and garden bed area. The increase in tree cover has come from both tree canopy growth and additional tree planting as can be seen on the tree canopy mapping.

This precinct is entirely within a VPO, however the comparative tree canopy cover indicates that there has been tree canopy loss in this precinct as part of both unit development and single dwelling redevelopments. The overall increase in canopy cover is mainly due to a combination of tree growth and some additional tree planting in open space.

## 4.4 Benchmarking

### 4.4.1 Comparison of the City of Monash to adjoining LGAs

The following results are extracted from the *Benchmarking Australia's Urban Tree Canopy Report* (May 2014). This report used the i-Tree Canopy free-use software tool, using the 1000-point random sample method used to classify the landscape features within 139 Local Government Areas (LGA) throughout Australia based on 2013 aerial photographs. This study was prepared as part of the 2020 Vision project funded by Horticulture Australia Limited.

Below is an extract from that report of the LGAs that directly adjoin Monash for benchmarking purposes and these are listed in the table below in alphabetical order below Monash.

Please note that the i-Tree Canopy tree cover results in the 2014 report differ from the i-Tree Canopy tree cover results undertaken as part of the MULCVS project. The 2014 report separated shrubs from trees, whereas the i-Tree analysis undertaken for the MULCVS quantified garden beds and grass as these are more easily distinguished than shrubs and small trees which likely accounts for the difference. If we add 50% of the shrubs to trees, the results are similar. Given the discrepancy, we have used the 2014 results below for Monash so that it compares like with like.

**Table 4-8 Benchmarking of tree canopy cover in Monash with adjoining LGAs**

| Local Government Area | Tree % | Shrub % | Grass* % | Hard% |
|-----------------------|--------|---------|----------|-------|
| Monash                | 19.4   | 6.3     | 25.0     | 49.3  |
| Boroondara            | 28.1   | 8.0     | 15.5     | 48.4  |
| Stonnington           | 25.0   | 6.8     | 11.0     | 57.2  |
| Knox                  | 24.2   | 6.2     | 33.1     | 36.5  |
| Whitehorse            | 22.9   | 7.5     | 21.9     | 47.8  |
| Glen Eira             | 20.0   | 6.5     | 15.0     | 58.5  |
| Kingston              | 14.2   | 4.6     | 35.6     | 45.6  |
| Greater Dandenong     | 8.2    | 2.6     | 49.8     | 39.4  |

#### Tree canopy cover

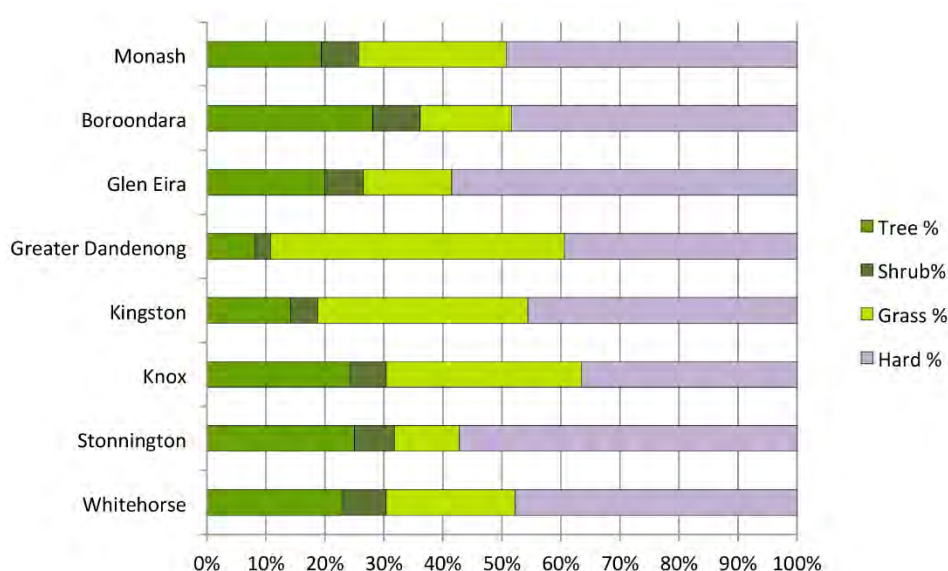
Of all the adjoining LGAs, the City of Boroondara has the highest percentage of canopy tree cover, followed by the City of Stonnington and City of Knox. City of Greater Dandenong has the lowest, which may in part be due to presence of agricultural land and large commercial/industrial precincts. The other factors measured in the i-Tree Canopy analysis are indicators of different land use types and relative urban densities present within each of the LGA's. It is therefore more useful to benchmark the City of Monash with. Refer to Figure 4C, which graphically illustrates the proportion of hard surfaces compared with permeable surfaces.

## Greenness

In considering the proportion of hard and permeable surfaces, the City of Monash is most similar to the Cities of Boroondara and Whitehorse. Both the Cities of Stonnington and Glen Eira have a higher proportion of hard surfaces when compared with the City of Monash, while the Cities of Kingston, Greater Dandenong and Knox have higher proportions of permeable surfaces.

The major land use types across the Cities of Monash, Boroondara and Whitehorse are similar. They are predominantly residential with a range of activity centres, commercial/industrial precincts, education precincts and public open space. Detached dwellings make up the dominant dwelling type with smaller precincts of medium to high density urban development.

At 19 per cent, the City of Monash has the lowest proportion of tree canopy cover compared with 28 per cent for the City of Boroondara and 23 per cent of tree canopy cover in the City of Whitehorse. Overall these three municipalities have similar topography, rainfall, geology and original vegetation types. In viewing the aerial photos of all three municipalities, the key difference is more extensive commercial/industrial and non-residential land use areas in both Monash and Whitehorse which lack canopy cover.



**Figure 4C** Benchmarking of greenness in Monash with adjoining LGAs

### Implications for this Strategy

- There is an opportunity for Monash to increase tree canopy cover given that more than 30 per cent of the total municipal area currently comprises grass/bare ground or garden beds.
- There are similarities between overall land use types, topography, rainfall, geology and original vegetation types between Boroondara, Whitehorse and Monash and these two municipalities provide a useful comparison for tree canopy cover.
- Planting additional trees on the non-residential land will be an important factor in the future redevelopment of the Monash National Employment and Innovation Cluster. Increasing tree canopy cover in this cluster will have many benefits in relation to liveability and environmental values.

## 4.4.2 National Benchmarking

### City of Melbourne

The City of Melbourne Urban Forest Strategy (2012), sets a target of 40% canopy cover by 2040, increasing from 22% at present. The Strategy notes that a recent study on urban heat island effect in Melbourne recommends that one of the most cost efficient and effective mitigation strategies is to ensure a minimum canopy cover of 30% with a leaf area index (a measure of shade density) of 5.3 within the municipality.

### City of Sydney

The City of Sydney Urban Forest Strategy (2013) has differentiated the percentage canopy cover goals across three different land use types including:

- Central Business District and Industrial Areas – 15%
- Urban Residential and Light Commercial Areas – 25%
- Suburban Residential – 50%

Combined, the target canopy cover for the City of Sydney is 22.3%, raising it from the existing average 15.5% cover by 2030.

### Implications for this Strategy

The Cities of Sydney and Melbourne aim to increase tree canopy cover within the context of forecast future population growth and development and increasing urban densities. The historical pattern of mature canopy trees being removed in the City of Monash as site coverage and urban densities needs to be reversed so that tree canopy cover increases as urban development continues.

## 4.4.3 International Benchmarking

Based on the research undertaken for this Strategy there is currently no international standard for setting benchmarks for tree canopy cover. The United States Department of Forestry is well respected in the industry regarding this subject matter. This Department sets target canopy cover by a combination of assessing the existing tree canopy cover, the potential tree canopy cover and then making an assessment of how much of the Potential Tree Canopy Cover area is feasible to plant. Some of the target tree canopy cover provided for cities in the United States is:

### Los Angeles

- Existing average Tree Canopy Cover of 25%
- Target Canopy Cover for suburban areas is 35%
- Target Canopy Cover for urban residential is 18%
- Target Canopy Cover for commercial land use is 9%

### New York City

- Existing Tree Canopy Cover of 23%
- Target Canopy Cover of 30%

**Baltimore**

- Existing Tree Canopy Cover of 20%
- Target Canopy Cover of 46%

**Implications for this Strategy**

The United States and Canada have been managing trees in urban environments for hundreds of years. They have undertaken extensive studies and research into the benefits of canopy trees to community health and wellbeing, and have a range of urban forest strategies that support increasing tree canopy cover in their cities. While the make up of each of these cities will be different from Monash, the key message to take from this is that they are all aiming for target increases in tree canopy cover within an urban environment.