City of Greater Dandenong

Activity Centres 10-year Planting Plan

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Treelogic

GREATER DANDENONG
City of Opportunity

Activity Centres 10 Year Tree Planting Plan

The Activity Centres 10 Year Tree Planting Plan was developed by Treelogic Pty LTD, in association with Urban Forest Consulting and the City of Greater Dandenong. April 2021.

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Context

The trees growing in the Greater Dandenong Activity Centres form part of the broader urban forest within the municipality. This urban forest, particularly the canopy trees, deliver immense economic, social and environmental benefits including shade, streetscape amenity, air pollution reduction, habitat for wildlife and help tackle and respond to climate change.

However, the City of Greater Dandenong currently receives relatively little of these benefits, as it has been recognised by a number of studies to have the lowest canopy cover of all metropolitan municipalities on the eastern side of Melbourne. This low canopy cover is a significant contributing factor in Greater Dandenong also being identified as one of the hottest municipalities in Metropolitan Melbourne.

There is significant evidence that the urban heat island is a major issue facing all Australian cities and is likely to worsen with more extreme weather events. The urban heat island has significant impacts on human health and vulnerable communities who are more susceptible to extreme heat and its effects. Urban heat islands are worsened by a lack of shade trees and higher proportion of hard and dark surfaces which retain and radiate heat.
Plan Melbourne 2017-2050 and Living Melbourne: Our Metropolitan Urban Forest Strategy 2019 recognise an urgent need for Melbourne to adapt to climate change and increase canopy cover to respond to and mitigate the impacts of the urban heat island.

The Greater Dandenong community will be impacted by climate change's effects on our local urban heat island due to our very low canopy cover (9.9 per cent). Unless we increase canopy cover in Greater Dandenong, our community, already recognised as the most disadvantaged municipality in metropolitan Melbourne, will be further impacted. This is because vulnerable people, such as the elderly, children and those from low socio-economic backgrounds are at a greater risk to extreme heat events and changing climate with less ability to prepare for and respond to the extreme weather events exacerbated by climate change.

In January 2020 Greater Dandenong City Council declared a 'Climate and Ecological Emergency' committing to emergency action on climate change. Enhancing canopy cover will play a significant role in mitigating against the impacts of climate change.

Additionally, Council has a suite of strategies which set clear objectives to respond to climate change through mitigation and adaptation, including increasing canopy cover. Greening Our City sets out to increase the canopy cover across public and private land to 15 per cent by 2028. The 2021 Urban Forest Strategy aims to ensure a holistic approach to managing and enhancing our urban forest.

Trees are part of the solution as they provide a range of interconnected environmental, social and economic benefits to the community, these include shade, streetscape amenity, air pollution reduction and habitat for wildlife. Therefore, providing shade and thermal comfort is a key focus for activity centres and creating great places for people in highly built- up areas.

Greater Dandenong's three Activity Centres (Dandenong, Springvale and Noble Park) already contain the highest levels of hard surfaces across the municipality with higher temperatures at a microclimate level. Ongoing development in the activity centres may result in further loss of tree canopy cover on private land. Therefore, the anticipated loss of trees on private land will need to be offset through new plantings in streets and the public domain.

Whilst increasing the number of trees and increasing the tree canopy coverage is the primary objective moving forward; planting more trees, requires careful planning to ensure that our streetscapes and public spaces contain a healthy, and sustainable tree population. The Activity Centres 10 Year Planting Plan makes recommendations on tree expansion, maintenance and retention.

Overview

The City of Greater Dandenong commissioned Treelogic to undertake a comprehensive tree audit of three Activity Centres located in the municipality. Data collection was to identify tree numbers, canopy cover, gap analysis, and heat map data. Treelogic were then asked to provide recommendations on a 10-year planting plan for each Activity Centre, species selection and initiatives to support tree health, maintenance and retention.

Purpose of the Activity Centre Planting Plan

While the City of Greater Dandenong's Greening Our City - Urban Tree Strategy 2018–28 provides a plan that considers the current status, issues and opportunities for Council managed trees, it is municipal wide in its approach. The strategy's tree planting program does not sufficiently articulate a planting program that focusses on the Activity Centres.

The main purposes of the assessment and data collection and development of a tree planting program for the Activity Centres is to meet the following:

- Establishing consistent tree data and baseline measures for each activity centre to better monitor tree conditions and change over time.
- Providing an evidence base that supports decision making around capital investment in planting programs in each centre.
- Sharing key insights about gaps in tree canopy coverage with internal and external stakeholders.
- Identifying initiatives to improve shade and thermal comfort of streets and key public places thereby improving their staying power.
- Supporting appropriate public spaces to improve health outcomes of expanding activity centre population cohorts, such as young people aged 5-14 years.
- Addressing the heat island effect in built up urban areas.
- Improving resilience to the increasing impacts of climate change.
- Monitoring, measuring and tracking changes in public spaces to inform placemaking and capital investment in each centre.

The tree planting plan and proposed tree placement is predominately for public land. Private land was considered in the assessment and some sites on private land were identified for further investigation. Private landholders should also be encouraged to green the city and support trees, especially in wide, open sites adjacent to streets.

Outcomes of the Activity Centre Planting Plan

- Provide data on existing street trees and proposed sites that can be used for future benchmarking and analysis. Data can be updated annually with Council's asset management systems (recording trees planted each year).
- Increase the number of trees within the Activity Centres.
- Increase tree canopy and vegetation coverage within the Activity Centres. The percentage target will be estimated based on existing canopy coverage and an achievable target based on the identification of additional opportunity sites (for both trees and other vegetation layers). Measured every 2-years (2021, 2024, 2026, 2028).
- Decrease the heat island effect in activity centres. Monitor conditions utilising LANDSAT Satellite Images for Thermal Mapping.
- Support placemaking and peoples experience of place by improving, look and function; sense of welcome; things to do; uniqueness and care, in Activity Centres measured every 5 years via Place Score PX Assessments (2025, 2030).

The Activity Centres Tree Planting Plan also aligns with the Victorian Government's Plan Melbourne, and one of its priority areas: Cooling and Greening Melbourne. The importance of green infrastructure to create more liveable and climate-adapted communities.

Structure of the document

Part I of this report will provide a background and context to the general recommendations regarding tree planting in the Activity Centres.

Part II will provide the details of the data collection methodology, the results and the subsequent planting plan recommendations.

Appendix 1 contains the method used to assess the Activity Centres for tree planting opportunity sites.

Appendix 2 provides tree species selections for the Activity Centres.

Appendix 3 provides shrub species selections for the Activity Centres.

PART 1

Introduction and discussion on successful plant establishment

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Introduction

Trees provide essential environmental, economic, social and health benefits to cities and communities. Trees are important to people especially through symbolizing personal, local, community and cultural meanings.

Urban trees also contribute to an attractive green townscape and consequently communicate the image of a positive, nature-oriented city. Indirectly, urban trees can promote tourism and enhance economic development. At the local level trees contribute to the quality of housing and working environments and their benefits are reflected in property values. (Tyrväinen, Pauleit, Seeland & de Vries, 2005).

The environmental services and functions that trees provide are well documented, and these include the ability to reduce greenhouse gases through carbon storage, decrease stormwater runoff through interception and absorption of rainwater, and reduce the urban heat island (UHI) effect by cooling surfaces and air temperatures at a local scale. Trees can provide benefits for both carbon mitigation (removing carbon dioxide from the atmosphere via photosynthesis and reducing greenhouse gas emissions) and climate adaptation (helping human and natural communities adapt to changing conditions, such as more frequent and longer periods of extreme heat).

There is a growing recognition that exposure to trees and nature plays a critical role in promoting human health. These benefits are wide-ranging and affect individuals and communities. Human connection to trees and nature can also be restorative to psychological and physical health, improving mindfulness and mental health while also reducing stress. Access to nature also promotes wellness by encouraging physical activity and facilitating social cohesion.

Cities create their own microclimates by influencing the surrounding atmosphere and interacting with climate processes. The most striking characteristic of an urban microclimate is the urban heat island (UHI) effect. Urban areas become significantly warmer than surrounding areas when there is less green cover and more hard surfaces which absorb, store and radiate heat. Studies across the world's major cities show that a systematic higher average temperature of 2°C to 12°C exists in highly-urbanised areas compared with their rural surroundings. Climate change will likely lead to more frequent, more severe, and longer heat waves during summer months leading to increased urban heat, which consequently increases energy costs (e.g., for air conditioning), air pollution levels, and heat-related illness and mortality.

UHI mitigation aims to provide more habitable urban settings by improving thermal comfort and reducing energy demand. Existing UHI mitigation techniques recommend cool materials (high solar reflectance and high infrared emittance), urban vegetation, water and shading as potential solutions to moderate temperatures and increase the adaptive capacity of cities to the warming climate. The effectiveness of each UHI mitigation technique varies according to the location, urban context (density, scale) and climate zone (Osmond & Sharifi, 2017).

Healthy trees are most effective at creating cooler streets by shading pedestrian areas, road surfaces and adjacent buildings. Research indicates that tree canopy cover has the strongest inverse correlations with UHI (the higher the canopy cover, the lower the UHI indicators). Tree canopies can reduce the temperature of surfaces they shade, such as buildings and roads, by 10-25°C (DELWP, 2019). An increase of approximately 10% tree canopy coverage could contribute to surface temperature reduction of around 15°C by providing shade over paving, walls, and roofs. This can result in a UHI reduction of 1.5°C at the precinct scale. (CRC LCL)

Streetscapes and road corridors are the largest and most utilised public spaces in a city. These major public spaces are predominately hard surface paved environments that have limited greenery. Hard surfaced pavements are functionally required to facilitate movement of people and vehicles in a safe and efficient manner. However, large areas of pavements across a city exacerbate the UHI, increase runoff of stormwater, and effect human health by inhibiting natural ecosystem services.

There is significant potential for trees in streetscapes and road corridors to reduce the urban heat island effect (UHI) and improve local microclimates. A line of trees along a street becomes a 'green corridor', supporting active transport while creating cooler microclimate grids across the municipality.

The City of Greater Dandenong has identified the importance of trees to the liveability of its city. Greening our City – Urban tree strategy 2018-28 is the municipal wide plan to increase canopy cover to 15% by 2028. CGD has also identified three activity centres that are demonstrated hotspots, they are places of high pedestrian activity and are major public transport hubs. These areas are a challenge for Council as they are predominantly made up of hard surfaces and contain many pieces of hard infrastructure such as buildings, awnings, overhead powerlines, and underground services.

As well as the health benefits, well-treed or vegetated commercial precincts are an important contributor to positive consumer experiences. The design of a commercial district that uses landscaping and trees can enhance a customer's experience and further strengthen the retail zone's competitive edge.

However, it must be stated that these hard-surfaced, engineered spaces are hostile to optimal tree growth. If we want trees to genuinely add value to our landscapes, it is vital that we acknowledge the way trees work in their natural environment and their biological needs. The wide-ranging ecosystem services that trees provide (as opposed to just one element) are a product of their being a living organism (Hirons and Thomas, 2018).

Trees are autotrophs, meaning that they produce their own carbohydrate. What trees do need to survive are light, water, carbon dioxide and oxygen, and essential nutrients. Herein lies the critical consideration for increasing tree numbers in the urban environment. Each planting site needs to provide for these basic biological needs.

Accordingly, this plan will emphasise the importance of optimising the planting system for each site. Appropriate soil, which can hold and move water and air, and hold nutrients. Passive irrigation which ensures that water is supplied to the root mass. Appropriate soil volume so that the resource reservoir can support healthy growth and therefore provision of ecosystem services.

Increasing tree canopy by planting more trees in systems that allow them to thrive in the Activity Centre streets, car parks and public spaces will create cooler and greener public spaces, addressing the negative aspects of hard surfaces. (DELWP, 2019).

Tree establishment and growth

For the plan to meet its goals trees must be planted in a way that allows them to grow successfully. Trees are a living organism and require their biological needs to be met in order for them to stay alive. The basic requirements for tree survival are described below.

Water

Given appropriate levels of light and air temperature, which varies by species, water is the factor that most constrains the development and growth of all plants, including trees (Hirons and Thomas, 2018). The availability of water is critical to the success of trees in all landscapes. In the urban landscape, with its preponderance of other limiting factors it is essential that consistency of water supply over the lifetime of the tree is at the forethought of every planting installation. This does not have to mean irrigation, ensuring that rainfall can enter the soil surface over a large enough area may be enough. Different species have different water requirements, and so species selection must be informed by how much water is available in a planting site. Passive irrigation strategies will be discussed later in this report.

Oxygen

Tree roots are constantly growing, developing where conditions are conducive to survival, dying where there is a lack of resources. Like all living organisms, tree roots need oxygen to survive. They emit carbon dioxide and use oxygen in cell respiration. Tree roots access oxygen from the spaces (pores) in the soil in which they grown. The carbon dioxide they emit also fills these pore spaces.

Air exchange between the atmosphere outside of the soil and the pore spaces within the soil ensures that oxygen levels are sufficient, and the concentration of CO2 doesn't become too great. This natural process relies on the pores in the soil being of sufficient size and connectivity to allow such a flow. If a soil is compacted, pores are greatly reduced, and connectivity is disrupted. CO2 builds up and oxygen is depleted. The environment is no longer conducive to survival and the roots will die.

Light

Plants use light to manufacture the very substance of their form and to provide the energy for their function and growth. Through photosynthesis, carbon dioxide and water molecules are rearranged to create carbohydrate and energy. Without adequate light growth will be reduced and functions will cease. Different species require different levels of light for optimal growth. This is an important consideration in the plant selection process, especially in challenging sites with either very low amounts of light or those that are extremely exposed to very high levels of light.

Nutrients

Trees need a range of elemental nutrients to complete the building of their tissues or allow for proper functioning of their cellular processes. These nutrients are taken up by the roots in the soil solution. Not only do these essential elements need to be present, but the pH of the soil needs to be within a normal range to ensure they are available for uptake. For most plants, most nutrients are adequately available at pH ranges of 5.5 to 7.0.

The organic matter cycle is a major contributor to nutrient levels in soil. In the urban environment where the surface of the soil is often closed, or organic material is removed to maintain tidiness, the organic matter cycle is severely disrupted. Soil organisms rely on organic matter as food and their decomposition of that matter is how nutrients are released, or mineralised, to become available to plants.

Biodiverse community

Our understanding of the minutiae of ecosystems has developed dramatically in the past decade. It is now widely accepted that the soil environment is a teeming metropolis of interdependent organisms as much as the ecosystems we observe above ground. Tree roots have evolved to function optimally in this diverse environment. As stated previously, organic matter reaching the soil is critical to the foundation of this ecosystem. Plant roots also provide a source of organic matter to the system, but greater volume will see greater populations and greater soil resilience due to the functions of the microorganisms. Best practice would see open surface plantings installed wherever it was feasible. Underplanting in these open beds with shrubs and grasses would increase the diversity of vegetation and commensurately increase the diversity of life in the soil.

Success of trees in public landscapes

It is worth discussing some of the varied aspects that can impact on whether a tree is seen as successful in the landscape, or as a failure.

Constraints of the environment

The identified Activity Centres in Greater Dandenong are places of high pedestrian activity, being major public transport hubs, public spaces and commercial precincts. These areas are a challenge for Council as they are predominantly made up of hard surfaces and contain many pieces of hard infrastructure. The environment is thermally uncomfortable and so urban design and renewal in these centres must prioritise the planting of natural shade. Finding adequate space to plant trees so that they will thrive and grow to their maximum potential will be the challenge.

For a tree to provide the ecosystem and public services that are the desired outcome, they must be able to grow well. Each season they need to be able to increase their girth, height and width. They must be able to produce a sufficient canopy to support this growth. They must have all of their biological needs met. Some sites will have more constraints than others but creating the optimal root environment in each situation will advance the chances of success for that site.

Site constraints and community expectations will differ from site to site. This will require a design approach that considers site-specific constraints within each Activity Centre. Examples of site constraints and community expectations can include:

- Limited space between shop fronts and back of kerb to maintain access requirements.
- Concentrations of underground services that prevent or reduce planting spaces.
- Height limitations due to overhead services, eaves, awnings, covered walkways.
- Maintenance of sightlines associated with intersections, road signage, bus stops and crossings.
- Shop-front visibility.

As a result of these constraints, the range of tree species that can be used in Activity Centres is limited. There may be instances in which the use of trees is not physically possible or is not warranted.

Trees may require engineering solutions such as specialised planting systems due to underground constraints or tree guards for protection in areas in which vandalism and higher volumes of traffic occur.

The issues and challenges associated with managing trees and other vegetation in the context of intensive activity centres are different to a typical street in a residential area.

The means by which Council manages vegetation, including street trees, within the Activity Centres will be different to residential streetscapes. General principles include:

- Trees may be selected for particular form and shape.
- Vegetation may be chosen to be manipulated such as topiary trees and hedges.
- Trees may have shorter natural life spans due to heavy pruning techniques or due to root disturbance resulting from underground infrastructure works.
- The dynamic nature of commercial precincts may result in frequent replacement cycles as infrastructure refurbishment/replacement programmes are implemented at shorter intervals than would be the case in residential areas.

Provision of shade

The City of Greater Dandenong has identified provision of shade as one of its key outcomes. Shading is the most immediate, tangible benefit from trees with regard to UHI. Radiation from the sun can be reduced by up to 90% under the canopy of a tree, directly cooling the road and pavement beneath. How hot a person feels is far more dependent on the radiation balance with their surroundings than on air temperature. This means that the shade from trees makes people feel cooler, even on days with high air temperature. A person in tree-shade will take up less short-wave radiation from the sun and will emit much more long-wave radiation the surroundings, resulting in feeling 10-15°C cooler than the air temperature (Hirons and Thomas, 2018).

To provide such a benefit, the canopy density needs to be higher. Higher canopy densities are a product of species attributes and vigour. A tree can be selected for its canopy density, but if it is growing poorly this aspect of the design intent will not be met. The function is absent.

Using large-statured trees

Considering the tree selection process and site constraints, the larger (at maturity) the tree that can be accommodated within a given location the greater the benefits.

Large trees with crown heights greater than 12 metres in height and width with trunk diameters greater than 75 cm, can deliver 8 times the benefits of a small 6 metre tree (See figure 1).

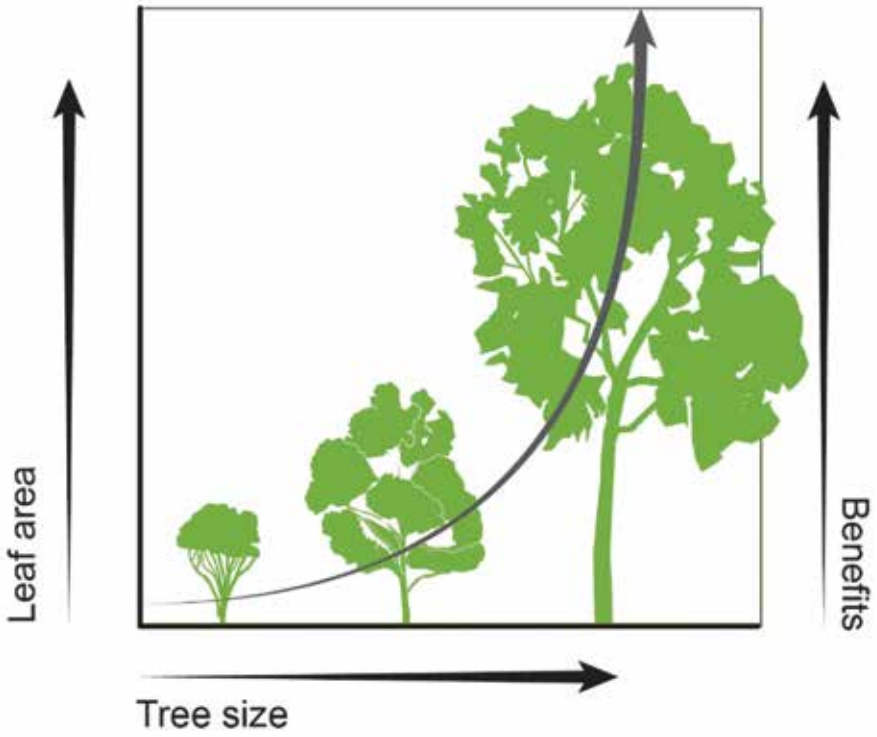


Figure 1. The larger the tree the greater the benefits (urbantreealliance.org/resources/why-trees/)
Image developed by Treelogic.

Compared to a small-stature tree, a strategically located large-stature tree has a bigger impact on conserving energy and mitigating an urban heat island. They do more to reduce stormwater run-off; extend the life of streets; improve local air, soil and water quality; reduce atmospheric carbon dioxide; provide wildlife habitat; increase property values; enhance the attractiveness of a community; and promote human health and well-being.

Wherever possible, large statured trees should be planted within the streets of the Activity Centres. In some cases, this may require the development of specialised planting systems to accommodate larger trees.

Size of tree stock at planting

There is often a need for expediency in the establishment of urban landscapes. This often results in designers using larger tree stock planted at denser spacing. This has impacts on the tree species available, i.e., a limited palette of tree species, and can also result in poor tree establishment, performance, and management requirements.

The larger a tree is at the time of planting, the longer it will take to recover from transplant shock and establish in the landscape. (Urban, 2008). Urban (2008) estimates that the time to recover from transplanting is between 6 - 12 months per 25 mm of trunk diameter (dependent on latitude). It is estimated to take a transplanted tree approximately 9 months per 25 mm trunk diameter to recover in Melbourne.

The larger the tree the more watering and after-care maintenance is required. The bigger the tree the more resources required to move it and install it. This is not a sustainable procedure.

Maximum tree size at planting depends on several criteria. The maximum size of the nursery stock recommended for planting at a particular site should be governed not only by the budget for the job, but by the irrigation capabilities after planting, and climate. If irrigation cannot be provided for the recommended period after planting, choose smaller nursery stock to ensure survival. Planting trees too large for irrigation capabilities leads to increased mortality (Struve 1999). Small nursery stock (50 mm calliper) can grow to match larger nursery stock (100 mm calliper) several years after planting (Gilman et al. 1998).

Site drainage also should govern maximum tree size at planting. Large-sized nursery trees (more than 50 mm in trunk diameter) may be poorly suited for wet sites because roots in the bottom portion of the root ball could become submerged in water. This can stress the tree by killing the deeper roots in the root ball. Smaller trees have a shallower root ball and so they are better suited for planting on wet sites.

A tree with a trunk diameter between 50 mm to 75 mm is considered the optimum size to plant in the Activity Centre areas. A transplanted tree of this size will establish quickly and more easily, is large enough to have an impact in the landscape and survive urban abuse.

Money that could be used to purchase larger trees may be better used to create more optimum planting systems, for example improved soil conditions, drainage, irrigation, and surface treatments.

Tree selection considerations for a changing climate

The changing climate will inevitably impact trees growing in Greater Dandenong, potentially reducing their capacity to deliver their aesthetic and ecosystem services to our community.

Projected changes in climate in response to rising atmospheric CO2 concentrations presents significant challenges for urban trees. Specifically, the interactive effects of ongoing physical and climatological change in urban tree environments may lead to large-scale tree and urban forest decline. The combination of heat output from built infrastructure and climate-change related variability in rainfall and temperature regimes mean that tree decline associated with increasing urban drought severity and frequency is a principal concern for urban tree managers (Diamond Head Consulting Ltd., 2017).

However, there is currently no clear understanding of plant response to climate change with limited testing of potential planting stock. This lack of clarity is due to variation of conditions across regions, variation of plant response due to provenance, uncertainty about the effects of climate change, and because the urban environment presents other challenges to successful tree selection.

Potentially, the greatest risk to urban trees from climate change is the likely long-term change in soil moisture availability that threatens tree vitality, establishment success, summer canopy cover and annual growth. Scientific literature agrees that less precipitation, particularly during winter and spring, warmer temperatures and intensified urban heat island effect will increase evaporation, reduce plant available soil moisture, and reduce reservoir water supplies. The trees within the Activity Centres are vulnerable to this risk because supplying supplemental water to individual trees is logistically difficult and expensive.

In urban environments, the availability of water is negatively impacted upon by impermeable built urban infrastructure. These impermeable surfaces can create or intensify drought conditions simply through preventing infiltration of rainfall and increasing surface run-off. In addition, through vastly reducing total evapotranspiration, urban infrastructure increases vapour pressure deficit (the difference between the saturation of the leaf and ambient environment), significantly increasing plant water use, intensifying urban heat, and increasing water loss from the remaining vegetation. Each of these factors may contribute to increasing frequency, duration and severity of water deficit stress experienced in urban environments (Schneemann, et al. 2019, Xu, et al, 2010).

The increased frequency and duration of water stress conditions and dealing with increased heat (increasing temperatures) appear to be determinant factors for plant performance under climate change scenarios. Previous studies (Jenerette et al., 2016; Kendal et al., 2018) also demonstrate that temperature is a key filter on trees in urban environments (Burley, et. al., 2019).

Therefore, tree selections must consider the species or cultivar's ability to tolerate extended dry periods and heat.

Public perceptions

Community consultation for the Sustainability Strategy and Climate Emergency Strategy highlighted the community's desire for more trees.

Measures of success must also refer to the perceptions of the inhabitants of a space. Cultural norms and beliefs can impact on an individual's perception of a tree being 'good' as much as the species, health and aesthetic of a tree. Consultation indicated that the community in Greater Dandenong had concerns about the planting of trees meeting the requirements of feng shui traditions. Feng shui is a traditional practice originating from ancient China, which seeks to use energy forces to harmonize individuals with their surrounding environment. Historically, feng shui was widely used to orient buildings in an auspicious manner (Wikipedia, 2021).

Feng shui considerations for trees

Never plant a tree directly between the front door/entrance and the road. Conversely, when the tree is to the left of the front door (as you look out from inside the building), this can create auspicious energy. This is especially true if the tree is tall and lush with a powerful presence. If the tree is to the right of the door as viewed from inside the building, consider planting a taller tree on the left side to create a more balanced energy for the building.

Where possible have trees planted on both sides of the building to provide balance and harmony.

Ensure there are no branches touching the building and that there is plenty of room between the building and the trees.

Trees and infrastructure

Above-ground conflicts and considerations

According to Randrup, McPherson and Costello, (2001), the potential for conflicts between trees and footpaths and kerbs is high when one or more of these factors are present: tree species that are large at maturity, fast growing trees, trees planted in restricted soil volumes, shallow topsoil (hard-pan underneath top-soil), shallow sub-base underneath the pavement (limited or no base materials), shallow irrigation, distances between the tree and footpath of less than 2.0–3.0 m., trees greater than 15 to 20 years old.

The further a tree is away from infrastructure the less likely damage will occur. Combined with this is the understanding that the smaller the size of the mature tree the narrower the planting site can be, within reason.

Table 1 can be used as a guide in the selection of appropriate sized species for planting areas within the Activity Centres. Larger trees could be considered for smaller sites only if engineering solutions, such as modified soil profiles and permeable pavements, were incorporated into the planting site.

Table 1. Planting area considerations in Activity Centres (Adapted from Gilman, 1997)

Total Planting Area	Planting site width	Distance from trunk to pavement or wall	Maximum tree size at maturity
Less than 9.5m^2	1.2m to 1.5m	1.2m (minimum DDA)	Small (Less than 9m tall) No planting where the 1.2m wide footpath cannot be achieved.
9.5m2 to 18.5m^2	1.5m to 2.5m	≥1.2m	Medium (Less than 15m tall)
More than 18.5m^2	2.5m	1.5m	Large (Taller than 15m)

Note that the distances are estimates only to be used as a guide when placing trees within streets in Activity Centres.

A tree's mature size and mass, rate of growth (size change rate), and mechanical adjustments generated to remain structurally stable, all interact closely with available rooting volume, soil strength, and distance to infrastructures. Potentially large trees planted in small soil volumes will be quick to exert mechanical forces on surrounding infrastructures (Coder, 1998).

The further a tree is away from infrastructure the less likely damage will occur. Combined with this is the understanding that the smaller the size of the mature tree the narrower the planting site can be, within reason.

Other above-ground infrastructure to consider when placing trees are CCTV (Wi-Fi version), awnings, powerlines, sight lines, and traffic offsets.

Footpath widths and meeting DDA access requirements

Austroads, the collective of the Australian and New Zealand transport agencies, representing all levels of government, have published *Austroad's Guide to Road Design (2009).* In "Part 6a: Paths for walking and cycling", they recommend an absolute minimum width of 1.2 m for wheelchair access if there is low demand or it is for a short distance. 1.2 m is not considered adequate for commercial or shopping environments. 1.8 to 1.5 m is the desired minimum, increasing to 2.4 - 4.5 m in shopping streets.

Disability (Access to Premises - Buildings) Standards 2010, known as the Premises Standards, were created under the Disability Discrimination Act 1992. According to the Premises Standards, the unobstructed width of an accessway must be a minimum of 1.2 m *(H2.2 Disability (Access to Premises - Buildings) Standards 2010).* The Premises Standards refer to AS1428.2 Part 2: Enhanced and additional requirements – Buildings and facilities regarding accessways, and the standard states that the Building Type/Facility "Streets" requires a continuous accessible path of travel. This is defined as an uninterrupted path of travel to, into or within a building providing access to all accessible facilities. So, while public footpaths do not have a building classification, they are considered accessways and remain subject to the general non-discrimination provisions of the DDA.

To meet DDA requirements and best practice guidelines, no tree planting should occur within an Activity Centre in a footpath where the remaining width for unobstructed travel would be less than 1.2 m (measured from the tree's trunk at maturity to the shop front/property boundary). Preferably, footpaths should have a minimum unobstructed width of 1.5-1.8 m, increasing to 2.4-4.5 m on shopping streets or where pedestrians gather such as in the vicinity of schools and associated road crossings, at recreation facilities and at important bus stops (Austroads, 2009).

Carparks

Parking areas are an integral part of the built landscape and take up a large component of the surface area of Activity centres. Parking space is often viewed as being essential to the market success of commercial areas. Yet city planners must balance this commercial need for parking with other community desires such as a more compact urban form, a more pedestrian-oriented urban design and an improved environment.

The issue of canopy tree planting is covered under the City of Greater Dandenong Planning Scheme Clause 22.04 Urban Design in Activity Centres under 22.04-3 Policy, Car parks, which states, *Incorporating larger canopy trees, at a ratio of at least one tree to each 10 car spaces and avoiding large areas of shrubby plants.*

Open-air car parks are areas that experience particularly high surface temperatures during the day and contribute to the formation of urban heat islands (UHIs). Furthermore, they have high rates of pedestrian use and access. Parking areas can contribute to drainage and flooding problems (storm water runoff), typically have low landscape/aesthetic value, and encourage people to abandon public transport, thereby accentuating air quality problems (Wolf, 2004). Typically, car parking spaces are covered in impervious hard surfaces with narrow open areas available for planting of vegetation. Occasionally, small cut outs are incorporated for tree planting that invariably fail due to lack of suitable soil volumes, reradiated heat and mechanical damage from vehicles.

Significant temperature reductions have been achieved in car parks by implementing tree and shrub planting and cool surfaces. A well-designed parking area will produce beneficial effects in a short time, allowing

for a better liveability of urban areas. This fundamentally requires the allocation of appropriate space for tree planting. In some cases, this may require the incorporation of load bearing or structural soil systems to provide the space for vehicles while providing suitable soil volume for tree growth.

In order to achieve a demonstrable increase in canopy coverage, this would require the reduction in the overall number of car parking spaces. Therefore, a reasonable, strategic design approach needs to be adopted to achieve a balanced outcome for the commercial precincts.

Opportunity sites for tree planting have been identified within the car park areas of the Activity Centres.

Figure 2. Well treed car park in McCrae Street with median and perimeter planting. Car park on the right is the Langhorne Street car park, which has reduced perimeter planting. A redesign of this car park would be required to accommodate canopy trees.

Below-ground conflicts and considerations

BSI (British) Standards have considered separation distances for trees and underground services. To avoid direct damage to main stormwater drains and sewers, BS 5837:2012 recommends certain minimum distances at which newly planted trees and drains should be separated. These vary for different mature size trees (Table 2) and for shallow drains (e.g., sewer laterals) or deeper pipes (e.g., sewer mains). Biddle (1998) notes that as the likelihood of damage is often unpredictable, trees that are closer to pipes and drains than these recommendations should not automatically be suspected of causing damage.

Table 2. BS 5837 recommended minimum distances between new trees and drains to avoid direct damage. (Adapted from BSI, 2012).

Diameter of stem at 1.5 m above ground level at maturity	Drain installed ‹1 m deep	Drain installed ›1 m deep
‹30 cm	0.5 m	N/A
30-60 cm	1.5 m	1.0 m
›60 cm	3.0 m	2.0 m

Other underground services, such as electricity, data and communications, and gas are to be considered. All underground services should be located and identified during the design process for planting of new trees. Dial-before-you-dig services should also be used prior to tree planting works to confirm location of underground services.

Planting systems

Without proper growth conditions, trees cannot provide ecological functions in a sustainable manner. Equally, a successful road and footpath pavement requires a safe and durable surface that can handle the loads. However, this leads to a conflict between trees and hard surfacing; access to usable soil is the most limiting factor for urban tree growth, and few street trees have access to soil beyond what is provided in their opening. This is a common reason why street trees often do not grow to maturity, or simply fail to thrive. Rooting space becomes limited due to the soil compaction that is a result of paved surfaces and high pedestrian traffic. For trees to thrive, they require soil volume, air and water, protection from disturbances and no physical obstacles to growth.

Designers must reject the notion that paving right up to the base of a tree and using tree grates is a reasonable design choice (Urban, 2017).

Innovative planting systems work to allow both requirements – appropriate structural bases and appropriate growing conditions.

At the simplest end of innovation is to make the hole or cut out in the pavement much larger and better understand water harvesting/passive irrigation design.

Critical points to remember when deciding on a planting system:

- More appropriate soil yields larger, healthier trees (appropriate volumes and, if off-site soil is required then preferably a sandy/loam soil)
- Larger pavement openings yield larger, healthier trees.
- Provision of passive irrigation yields larger, healthier trees.

Nature strips

Nature strips generally present the easiest and cheapest sites for street tree planting and comprise the majority of site types across a municipality. The Activity Centres all have streets within or adjacent that have nature strips suitable for tree planting.

A nature strip is an area of public land between the property boundary and the back of kerb, excluding any public pavement. In most cases a nature strip is grassed, but under certain conditions, it can be modified by an alternative landscape treatment. Unpaved nature strips absorb rainwater and improve the health of soils and trees.

Apart from street tree planting, nature strips have a variety of other uses as a functional part of the urban environment. They provide a place for underground services, electricity, and public lighting poles. Service personnel, including postal staff or service maintenance staff, also require access. The area generally offers a location for the collection of garbage, recycling, and green waste bins. Nature strip areas can also provide for open and safe access for pedestrians and wheelchairs from motor vehicles and public transport. They allow extra visibility for motorists, cyclists and pedestrians at intersections, driveways and around curves.

Planting trees in nature strips:

- Apply best practice tree planting techniques and within existing contract requirements.
- Soils within nature strips and open space can be compacted and may require cultivation and amendments to improve soil structure.
- Nature strips in activity centres that are less than 1.2 m wide should not be planted with trees.
- Tree selection must suit the width of the nature strip.

Cut-outs

Soils under pavements are highly compacted to meet load-bearing requirements and engineering standards. This inhibits roots from growing, causing them to be contained within a very small useable volume of soil without adequate moisture, nutrients and oxygen. In dense urban areas, the amount of soil installed will, to a large extent, determine the size that a planted tree can reach and consequently the success of the landscape.

Trees are a capital investment, and the use of integrative tree pavement approaches to ensure a viable urban canopy represents an investment cost for improved urban environments (Grabosky & Bassuk, 2017).

Design options can be combined in several ways to achieve greater soil volumes. Any design approach requires a complete understanding of available solutions to achieve good compatibility between all underground components, such as surfacing materials, sub-base, soil media and drainage, underground services, structure foundations, and tree roots.

Generally, tree pits should be as large as possible to allow for ample growing space for tree roots and trunk development. The larger the tree pit opening the healthier the tree. The overall width of a footpath can limit the size (specifically width) of a tree pit. It will be easier to increase the length of the tree pit parallel with the kerb. Preferred tree pit sizes would be 1.2 metres by 2 metres to 1.7 metres by 3 metres.

For commercial activity areas a minimum of 1.5 metres is needed between the back of the tree pit and the building/boundary line for pedestrian access.

The installer shall determine the root ball depth of each tree to be planted to determine the appropriate tree pit depth. Allow additional depth to achieve specified falls for subsoil drainage lines and to satisfy finished levels. Species must be selected to suit the size of the planting pit.

If the existing soil is unsuitable then it can be replaced with modified soils as listed under Urban Soil Considerations.

Tree pit coverings should be permeable and could include granitic gravel, porous concrete or pavers or a resin bound aggregate. Any tree pit surface material must allow for trunk growth and expansion.

Interconnected tree pits

Soil volumes can be increased by interconnecting soil volumes from tree to tree where possible.

This could be achieved via connected channels or trenches between tree pits or through continuous, interconnected tree vaults.

If such shared root channels or spaces are incorporated, less soil volume may be required around individual trees.

Continuous vaults

Individual planters could be joined via a trench to increase soil volume, which allows for a shared root space. Pavements can be placed on top of the existing soil or a manufactured soil profile.

Figure 3. Example of continuous vault with pavement, preferably permeable, covering the soil (City of Toronto, 2013)

Continuous vaults can have suspended pavements by utilising a soil cell system or structural soil. These systems support a pavement system above the growing medium. The pavement surface and base can be built directly on top of the chosen system. This would require a whole street or section of street to be rebuilt to accommodate the system. This could be coordinated with planned street refurbishment or upgrades and other opportunities for joint-work scheduling.

Root channels

If a continuous vault is not possible, consider the use of root channels to link individual pits. These channels can allow root development through the soil profile. It can also aid in directing root growth, at least initially, towards desired areas and away from adjacent infrastructure.

Excavating root paths, created by excavating narrow trenches approximately 10 cm wide and 30 to 60 cm deep, between the planting holes can allow roots to grow in uncompacted soil conditions. Trenches are dug between the individual tree pits and filled with a low compacted soil mix. The soil would be brought up to a level where the pavement system, such as reinforced concrete slab or permeable pavement, could be placed on top. Gravel can also be used on top of the slightly compacted soil mix.

Perforations through compacted soil layers at a relatively low frequency may be a practical solution to allow root development into deeper parts of the soil and allow greater soil water exploration by roots.

Trenches are cut away from the tree pit to provide root growth channels into the surrounding soil. These trenches are filled with a different soil to the tree pit and could comprise a coarse sand that can be compacted to high load levels to support the surface paving of choice but still have some permeability to roots, water and oxygen. The amount of modified soil provided is less than a vault or open planter system but is greater than simply cutting a tree pit. This soil will be coarser than the backfill soil for the tree pits and in addition to providing channels for root growth will provide some drainage at the base of the root ball.

Figure 4. Excavating tree root channels during pavement reconstruction works

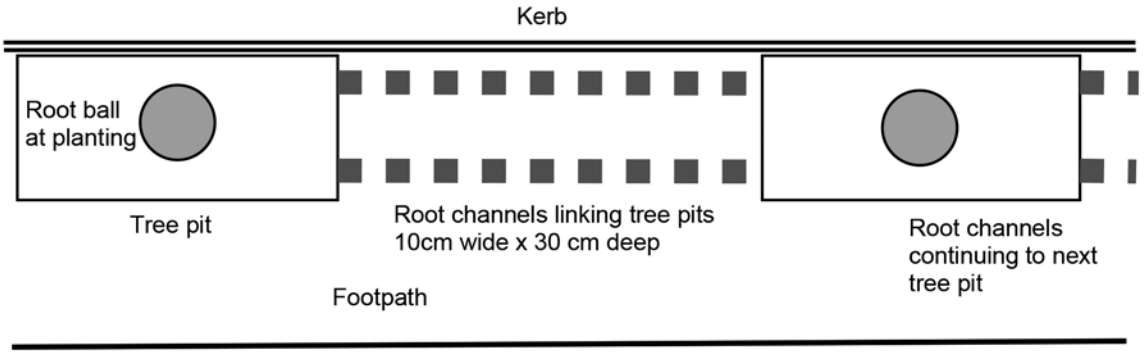


Figure 5. Indicative root channel arrangement in a paved situation

Where possible, incorporate a permeable pavement around the tree pit and, if applicable, between the tree planters. A variety of permeable pavements could be used. Permeable pavements are advantageous where there is no sub-grade compaction, and any sub-base is also porous.

There is a strong recommendation that civil engineers be consulted about the compaction levels required for the paving solutions being considered to establish whether any of these options meet their requirements.

Figure 6. Permeable pavement incorporated into linear planting vault Nuytsia Way, Brabham, Western Australia (New Water Ways, seen at newwaterways.org.au/projects/nuytsia-way-brabham)

Figure 7. Section of narrow pavement in Buckley Street, Noble Park where permeable pavement incorporated into a linear planting vault could be considered.

Planting systems similar to one shown in Figure 7 can also be used for narrow planting sites, such as Buckley Street, Noble Park. To meet DDA requirements for clearance and to provide optimum growing conditions for trees, the section of permeable pavement could extend from back of kerb to the property line where trees are located.

Open planters

Similar to planting trees in nature strips, as there is no paving around the tree base. These types of plantings can incorporate understorey vegetation and some form of surface mulch. Where there is space for this system within the footpath or road pavement, it is the most cost-efficient option available for growing large urban trees. The open planter covers a larger area than the typical tree cut-out in paving.

Trees in the open planters or pits can grow twice as fast as those in small, covered pits and 1.5 times as fast as trees in large, covered pits (Rahman, Stringer, & Ennos, 2013). The study found that by having significantly higher canopy density, canopy spread, and stomatal conductivity, the trees in the open pits provided up to 1 kW of cooling, compared to around 350 and 650 W by small and large covered pits, respectively.

Figure 8. Open planter system (City of Toronto, 2013)

Figure 9. Open planter bioretention system used in road pavement (Strataflow). Right, median open planter in Holtom Street East, Princes Hill.

Open planters can also be incorporated into kerb outstands and road pavement planters. Examples of these can be seen in Walker Street, Dandenong.

Figure 10. Open planters used in the road pavement of Walker Street, Dandenong

Trees could be incorporated into open planters on the south side of Clow Street, Dandenong, east of Lonsdale Street.

Figure 11. Clow Street, Dandenong on left. No trees within the footpath. On the right, an example of open planters with permeable pavement used in the United States
(Image from James Urban, seen at thefield.asla.org/2016/01/05/urban-design-and-tree-planting)

Soils for open planters

Sandy soils are specified instead of the highly organic landscape or planter mixes that are common in the landscape trade. This is for three reasons. Firstly, large amounts of organic matter buried deeper than 200 mm can undergo anaerobic decomposition leading to poor plant growth and even plant death. Secondly, highly organic mixes will lose volume and undergo changes in porosity and other physical properties as the organic matter decomposes. This can also lead to problems with plant growth. It is essential that the growing medium maintain its specified characteristics for a significant period of time. A third benefit of a sandy soil is that it has inherent capacity to resist compaction and thus is more resilient to compaction damage during the construction process than a loam or clay loam soil would be.

A number of different soil media and other engineered solutions are now available for this type of situation. See Leake and Haege (2014) for sample specifications.

Raised planters

Typically, an open planter composed of a curb or low seat wall. Has the advantage of expanding the volume of appropriate soil and where there are underground constraints. Above-ground planting structures allow the integration of other design elements such as seating and lighting. Raised planters create more substantial barriers from vehicles. Positive drainage below the planting soil is essential. Any impermeable layers of concrete or asphalt must be removed, and appropriately designed drainage must be included. Smaller species need to be selected to suit the narrower planter dimensions.

Figure 12. Raised planter with seat (City of Toronto, 2013)

Containers

An increasingly common urban landscaping practice is to plant trees in above ground containers where in-ground planting is not practical. Containerised trees are typically considered a temporary planting that is replaced at regular intervals.

Plant selection should be sensitive to the limited amount of soil available for root growth in a raised planter. Due to the limited soil volume, plants should be small-statured and more drought-tolerant and will need to be watered more often.

The limited volume of soil in containers reduces the potential reservoir of water for root uptake, which can result in extreme water stress when evaporative demand is high.

Figure 13. Examples of containerised planters. Left, containerised plantings in Springvale (also see below). Right, containerised Native Frangipani in Palm Mall, Dandenong

Figure 14. Water stressed containerised plantings in Springvale.

The use of tree guards and grates

The use of street furniture such as tree guards and grates are commonplace within commercial areas. Tree grates allow a greater area to be available for pedestrian traffic while maintaining infiltration capacity, and tree guards can help protect trees from the high volume of traffic and pedestrians in busy commercial settings. However, tree guards and grates can be expensive and there is a concern that the cost is sometimes mitigated by reducing budget for the actual planting system. The tree guard becomes the feature rather than the tree.

We would like to emphasise that the focus and expenditure should always be on achieving the best possible planting system. This is what will lead to enhanced plant performance, which will in turn lead to successful landscapes that result in the increase of canopy coverage in the Activity Centres.

Urban soil considerations

Urban soils are often highly altered from the natural state, and human activity is the primary agent of the disturbance. They generally have high vertical and spatial variability, modified and compacted soil structure, an impermeable crust on the soil surface, restricted aeration and water drainage, interrupted nutrient cycling, altered soil organism activity, presence of anthropogenic materials and other contaminants, and altered temperatures. The loss of natural soil structure is one of the most important limitations to tree growth in urban areas (Stewart & Scullion, 1989).

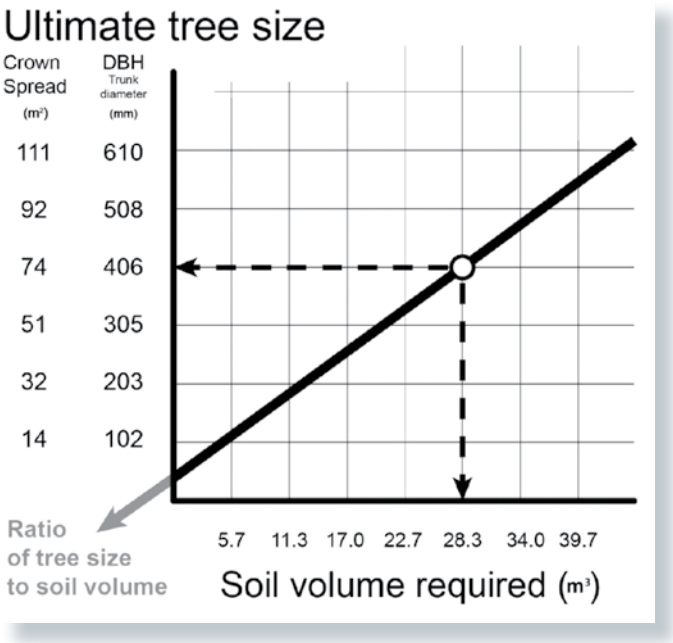
Soil aeration is impacted by urban landscape features. When not paved, vegetated and non-vegetated urban sites can be as well-aerated as forest stands (Gaertig et al. 2002). However, if topsoils are sealed or compacted, gas exchange between the soil and the atmosphere is interrupted (Gaertig et al. 2002, Watson, Hewitt, Custic, Lo, 2014).

The soil temperatures under sealed or paved root zones can also be up to 100C higher than adjacent unpaved areas (Watson, Hewitt, Custic, Lo, 2014). Higher soil temperatures will slow root growth.

Soil volume and trees

When trees are planted in paved areas, the limited root space available in planting pits will ultimately limit the size and longevity of the tree.

Trees need significant soil volumes of low compacted soil with suitable pore space, drainage, nutrients, and organic matter to provide for their long-term growth. There are many methods for calculating appropriate soil volumes for tree growth.



A method developed by James Urban (2008) is recommended for use as a guideline. It is based on the crown projection method, which as a general guide recommends that root space should be 60 cm deep within the projected crown area of a maturing tree. The amount of soil required for trees of different sizes is depicted on Figure 16. As indicated on this graph, a large tree with a trunk diameter of approximately 40 cm requires more than 28 m3 of soil to reach the size where it becomes a significant contributor to a healthy urban landscape.

Figure 15. Soil volume estimator based on estimated tree size. (Urban, 2008)

Soil volume estimation by Urban (2008) is reiterated by the University of Florida (2009) (hort.ifas.ufl.edu/woody/urban_design.shtml)

Minimum soil volume required to support reasonably healthy trees can be summarised in the table to the right. This soil should be at least 0.9 m deep and must have a bulk density below the critical value for the soil type. Rooting space needs to be wider if it cannot be 0.9 m deep.

Mature DBH (cm)	Soil volume (m3)
30	20
40	28.3
60	48

Australian method for estimating soil volumes

While the soil volume estimation method put forward by Leake and Haege (2014) is more complicated, it produces results that are comparable to the simple Urban estimation. However, the factors that they include are worth considering in conjunction with the Urban method.

Influencing factors on tree volume include:

1. tree design size,
2. climate,
3. soil within the tree pit,
4. maintenance including irrigation,
5. design life (considering acceptability of tree stunting)

The full Leake and Haege method can be seen at elkeh.com.au/soils/

Caveat on calculating soil volumes

The soil volumes generated are estimates and should only be used to generate an order of magnitude as a guide or target volume. Calculating soil volumes will always be a non-precise science based on the multitude of natural and contrived influencing factors.

Water, oxygen, mechanical resistance, temperature, soil reaction, cation exchange capacity, contaminants, and biology are soil factors that directly affect root growth. Water can be a dominant controlling factor, but all are interconnected. Altering one factor can affect the quality of the others, and management practices to improve root growth must consider the effects on all factors interacting together (Watson, Hewitt, Custic, Lo, 2014).

We have all observed trees growing in available soil volumes that are much less in volume than the commonly recommended soil volumes from the literature. For the most part, trees will stunt according to the volume of soil (and hence water and nutrients) available to them and yet still provide adequate function as a street tree (Leake and Haege, 2014).

When soil volume is restricted, soil quality becomes very important. High-quality soil and intensive maintenance can compensate for limited root space volume to a limited extent.

Load-bearing soil solutions

Structural soil is a load-bearing soil used under pavements that can also sustain root growth due to the large voids created in the mix. Structural soils are made up of larger aggregate (up to 25 mm diameter) at approximately 80% and 20% loam to clay-loam soil. The aggregate can be compacted to weight loading requirements while still maintaining large pore spaces between the aggregates for root growth. Water-holding and nutrient exchange is a function of the 20% soil component.

As structural soils comprise a large component of rock, a large proportion of the soil volume will not be available for tree root growth. This may require larger volumes being required to meet the trees growing requirements. Only the amount of soil in the mix, approximately 20% of the total mix volume, should be considered in the calculation for soil volumes.

Trees generally grow well until the amount of soil in the mix is exhausted, the trees must then either find a way out of the soil provided or they will begin to decline.

An advantage of structural soil is that, as a loose fill material, it can fill odd-shaped excavations and fit in places where structural cells are limited by their dimensional constraints. Structural soil has been used in conjunction with structural cells to bridge spaces around utility lines and obtain incremental improvement to rooting volume around the edges and underneath structural cells in tight spaces.

Structural cells can be used to create suspended pavements. The cells are a series of frames which are stacked on top of each other to form a load bearing matrix which is then subsequently filled with an appropriate soil media. Structural cells can provide ideal soil conditions in a smaller volume than structural soils, however, can inhibit access to underground services for maintenance purposes.

Structural cells offer the opportunity to install very large volumes of soil in compact urban environments to help grow mature street trees and also manage rainwater on site. Three cubic metres of structural cells and soil will require 11 to 14 cubic metres of structural soil to provide for equal tree growth.

The soil used in conjunction with structural cells can be high quality loam topsoil or other soil types that meet the project and tree species requirements including specialty bio-retention soils and recycled or reused soil harvested from the project site or nearby locations.

The system has been found to be the most efficient and cost-effective approach to deliver good quality soil under pavements (Urban and Bassuk, 2013).

Costs should be sought for both systems where the design requires the use of a modified soil profile for use beneath a paved surface.

Water sensitive design and passive irrigation

In urban environments where there are surrounding impervious surfaces such as roads and pavement, there is limited opportunity for rainfall to penetrate soils and replenish soil moisture. Street trees are also typically disconnected from local water sources by the kerb and channel.

Trees inherently contribute to surface water management, through canopy interception, evapotranspiration, infiltration and bioretention. Trees in hard landscapes can significantly contribute to and benefit from water sensitive design. Passive irrigation systems use gravity to direct stormwater from adjacent surfaces into the vegetated system.

All passively irrigated landscapes will provide both cooling and stormwater management outcomes. The extent to which these outcomes are achieved will depend on the design.

Adopting passive irrigation principles when working with trees in hard landscape might translate into:

- Harvesting storm water to help ensure adequate water supply to the tree from surface water runoff.
- Encouraging the growth of healthy trees with large canopies and increased evapotranspiration rates from trees.
- Improved soil moisture.
- Designed systems that can assist with the reduction of volume and rate of surface water runoff entering the drainage system. Results in improved stormwater quality entering downstream environments as well as helping to mimic a more natural hydrologic cycle.
- Designed systems that can assist with removal of pollutants from surface water runoffs.

Must ensure that harvested storm water entering the tree planting system has the capacity to drain away. Waterlogged conditions are to be avoided.

Passive irrigation

The E2design Lab in their report for the NSW Department of Planning, Industry and Environment detail a number of passive irrigation treatments appropriate for different scenarios and circumstances. All are engineering solutions that create a system that provides irrigation without active intervention. The general understanding is that the irrigation source is the diversion of stormwater runoff to a vegetated space (E2DesignLab, 2020).

The simplest design involves installation of a slotted pipe around the tree. The slotted pipe is connected to the kerb via adaptors or kerb openings. Permeable pavement is probably the most widespread passive irrigation solution (see below for details). The more complicated systems involve structural cells overlaid by permeable paving (E2DesignLab, 2020).

Such systems should always consider overflow and drainage components to deal with excess water in high rainfall events.

Permeable pavements

Permeable pavements are a type of pavement that does not contain fine particles, and which is designed to allow the infiltration of water into underlying soils, thereby producing less runoff than conventional pavements. The increase in water penetration can assist with tree growth. Using permeable pavement over a larger area can also benefit trees by extending the catchment area for rainfall penetration. This is particularly important in narrow, hard paved sites.

Permeable pavements can be designed to allow water to infiltrate into the subsoil with underdrainage systems that collect water for reuse or discharge. They can be designed for a range of traffic loadings, from pedestrians to heavy vehicles.

There is a broad range of paving technologies that allow water to permeate through a trafficable surface, such as permeable asphalt, permeable concrete, permeable interlocking concrete pavement and grid pavement systems (plastic/fibreglass or concrete).

Permeable pavements are best suited for low traffic loads which are subject to direct rainfall only, rather than receiving runoff from high sediment areas. As such, car parks, driveways, and pedestrian areas are well suited for this technology.

A key risk with permeable pavement is clogging from the sediment they retain, thereby substantially reducing their own permeability. Maintenance of permeable pavements needs to be taken into consideration. Pervious concrete produces higher permeability and better clogging resistance than porous asphalt. There are significant gains in permeability and clogging resistance when the porosity of the selected material is raised beyond 20%.

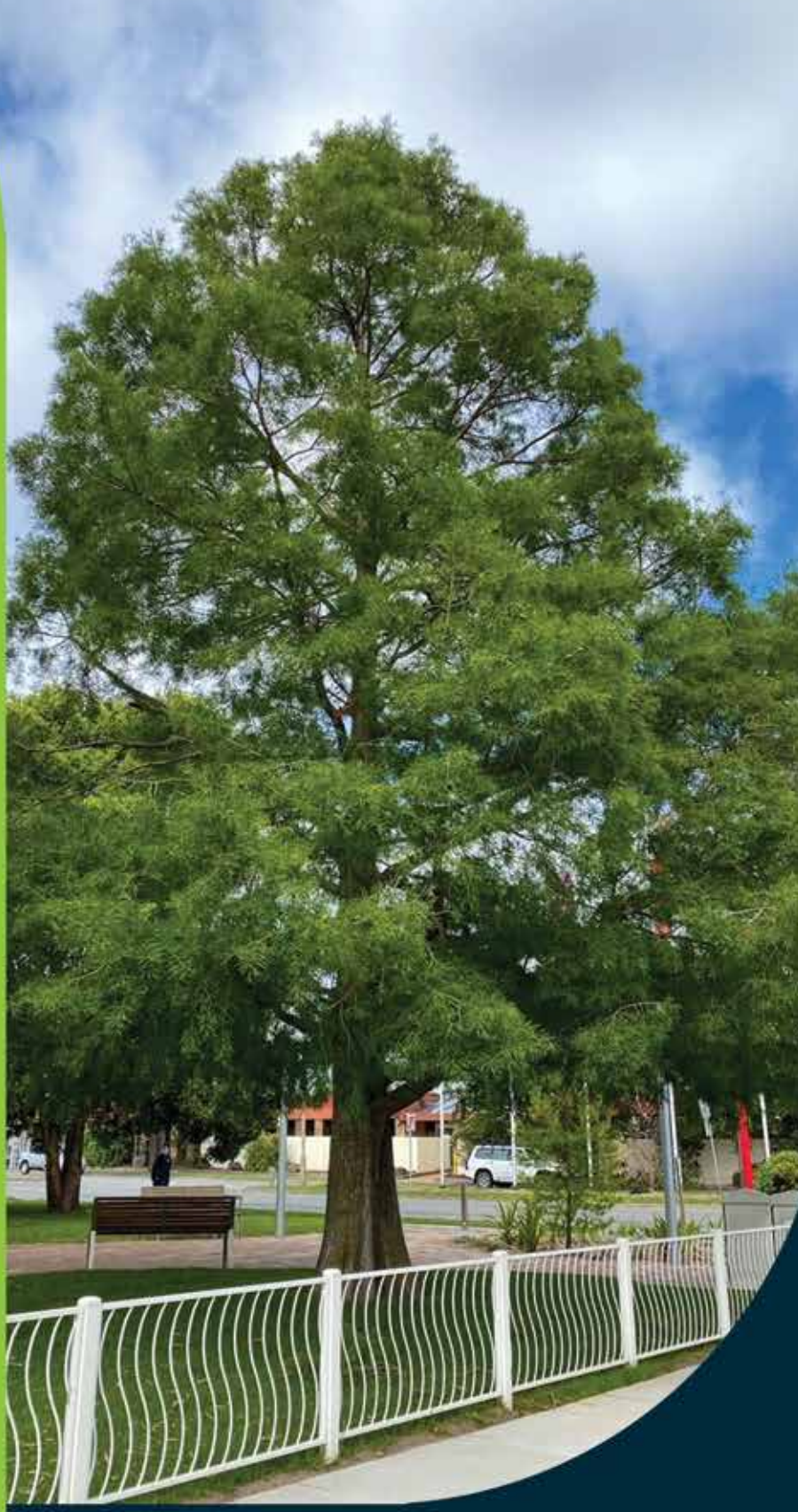
Figure 16. Example of permeable concrete tree planting pits.

Summary of recommendations for planting systems

Each scenario will invite a choice of specific solutions to optimise the planting. However, in general, the most effective initiatives will involve:

- Increasing the size of pavement openings
- Increasing the soil volume available to each tree
- Increasing the quality of the soil in each planting space – minimising compaction, maximise a sandy loam texture, and incorporate appropriate organic matter content
- Increasing the amount of open surface around each tree
- Providing mulch or organic matter as a surface treatment
- Providing effective passive irrigation systems that use stormwater runoff
- Careful species selection around biological tolerances and physiological traits

Recommend the development of a tree pit and passive watering (WSUD) design package to provide uniform construction of tree planting systems within the various street typologies presented within the Activity Centres.



PART 2

Assessment, observations and 10-year planting plan

PART 2 –
Assessment, observations and 10-year planting plan

Purpose of the Activity Centre Planting Plan

While the City of Greater Dandenong's Greening Our City - Urban Tree Strategy 2018–28 provides a plan that considers the current status, issues and opportunities for Council managed trees, it is municipal wide in its approach. The strategy's tree planting program does not sufficiently articulate a planting program that focusses on the Activity Centres.

The main purposes of the assessment and data collection and development of a tree planting program for the Activity Centres is for:

- Establishing consistent tree data and baseline measures for each activity centre to better monitor tree conditions and change over time.
- Providing an evidence base that supports decision making around capital investment in planting programs in each centre.
- Sharing key insights about gaps in tree canopy coverage with internal and external stakeholders.
- Identifying initiatives to improve shade and thermal comfort of streets and key public places thereby improving their staying power.
- Supporting appropriate public spaces to improve health outcomes of expanding activity centre population cohorts, such as young people aged 5-14 years.
- Addressing the heat island effect in built up urban areas.
- Improving resilience to the increasing impacts of climate change.
- Monitoring, measuring and tracking changes in public spaces to inform placemaking and capital investment in each centre.

The tree planting plan and proposed tree placement is predominately for public land. Private land was considered in the assessment and some sites on private land were identified for further investigation. Private landholders should also be encouraged to support trees, especially in wide, open sites adjacent to streets.

Method of assessment

The purpose of developing the planting site assessment criteria was to identify existing and potential (opportunity) vacant sites within the three Activity Centres (tree planting gap analysis) that when incorporated with other site considerations, such as heat island mapping, can help determine their priority for planting within each activity centre and lead to the development of the 10-year planting plan.

The process for developing the field collection guidelines and form for the purposes of three main areas:

- Identifying viable tree planting sites
- Prioritising viable tree planting sites; and
- Recommending planting system options.

There are two components for the collection of data for development of the Activity Centres Tree Planting Plan:

1. Field assessment which concentrated on identifying viable tree planting sites and recording site characteristics and constraints. Preferences for tree species will also be provided. This component of the data collection will be undertaken by arborists.

2. Desktop assessment for land use, road hierarchy, pedestrian traffic, heat mapping etc. This component of data collection and analysis was undertaken by the project urban forester in conjunction with arborists and Council officers.

The weighting for each opportunity site was divided in two between the ease at which a tree could be planted within the site and secondly, the perceived environmental benefits that could be achieved if the site were to be planted out.

Each characteristic has a score which when totalled will provide an indication of the preference for tree planting at a given site which will assist in development of a prioritised program.

The overall weighting given to a site is not a definitive indication of a sites priority, other factors such as Council strategies and policies, design requirements, costings, and community requirements will need to be considered when prioritising the planting of a site.

Opportunity sites were nominated that, in the opinion of the assessors, were currently viable for the planting of a tree. In most cases, this did not include the removal of existing car parking spaces. In order to increase the number of street trees within some streets, such as Balmoral and Windsor Avenues, Springvale or Scott Street, Dandenong, car parks would have to be sacrificed. Within commercial areas, there are often multiple site constraints, including awnings, traffic flow, public transport and a profusion of underground services, that removing car parks is the only alternative to opening up opportunities for street tree planting. As there are many factors and opinions that should be sought on foregoing car parks, it would be better dealt with during the design process associated with any streetscape enhancement works.

Details and an outline of the methodology of the planting site assessment can be seen in Appendix 1.

Other Council policies, guidelines and Australian Standards

A broad range of Council policies, guidelines and strategies are relevant to the Activity Centres 10 Year Planting Plan, including but not limited to:

- Council Plan, 2017-21
- Greater Dandenong Climate Emergency Strategy and Action Plan, 2020-2030
- Greening our City – Urban Tree Strategy 2018-2028
- Greater Dandenong Sustainability Strategy, 2016
- Springvale Structure Plan
- (Draft) Noble Park Structure Plan
- Revitalising Central Dandenong Master Plan, 2012
- City of Greater Dandenong Planting Fact Sheet
- Greater Dandenong Planning Scheme
- Vic Roads Planting Policy, 2016

Consultation with VicRoads is required for tree planting within declared main and collector roads. Tree planting may need to comply with VicRoads Tree Planting Policy May 2016.

Applicable Australian Standards:

- AS 2303:2018 Tree stock for landscape use
- AS 4419:2018 - Soils for landscaping and garden use
- AS 4454-2012 Composts, soil conditioners and mulches.

Dandenong

Background

Within the City of Greater Dandenong there are three activity centres; Dandenong, Springvale and Noble Park, which are respectively located northwest to southeast along the Cranbourne/Pakenham Railway Line. Dandenong, Springvale and Noble Park are very different centres ranging in scale, role and function. In addition, they have varying characteristics in terms of population demographics and historical influences.

Dandenong is a principal activity centre and the civic and administrative centre in the region. It was traditionally the social and economic centre of Melbourne's south east, until the early 2000s when factors including retail and entertainment competition from surrounding areas as well as traffic and amenity concerns impacted on central Dandenong. This in part led to the Victorian Government committing $290 million to the 'Revitalising Central Dandenong' initiative, a partnership between Development Victoria and the City of Greater Dandenong. It aimed to revitalise central Dandenong and attract more than $1 billion in private sector investment. The initiative saw the assembly of land parcels to attract development, triggered infrastructure investment and created new streetscapes and pedestrian friendly spaces. In recent years a public square, library and several government agencies and private enterprises have all contributed to the changing architectural and employment landscape of the activity centre. The revitalisation project is delivering visible outcomes and achieving private investment and housing targets.

Lonsdale Street was planted out in 2010 and 2011 with approximately 250 Pin Oaks (Quercus palustris) into suspended pavement vaults using Stratacell™ structural cells.

Another good example of tree planting was in Walker Street, east of Lonsdale Street, which has had recent construction of planters within the road pavement.

Other recent streetscape redevelopment includes Afghan Bazaar Streetscape Enhancement Project – Thomas Street completed in 2016 and Walker Street streetscape (Lonsdale to Langhorne), which was completed in 2020. One-hundred and ninety-six vacant and opportunity sites were identified during the assessment. Depending on budget allocations and a commitment to pursue trees in hard / low value sites the plan informs a capacity to add between 10%-15% additional trees in the Dandenong Activity Centre.

Based on the observation below:

- 196 vacant sites are identified, representing a potential 15% addition to the existing 1298 trees.
- If the 'realistic' scenario involves the exclusion of the 22 trees located in the hard sites, then this means 174 additional trees or 13% addition.
- If the 'strategic' scenario involves the exclusion of the 33 trees with the low benefit, then this means 141 additional trees or 10% addition.

Other issues to consider include:

- The pavement cut outs in Langhorne and Thomas Streets are too small to accommodate expected tree growth. These could be expanded.
- Palm Plaza segmented pavement was being lifted by the Plane trees (Platanus x acerifolia). Segmented pavers were also being lifted in Langhorne Street. Need to investigate other hard surface treatments adjacent to trees to reduce conflicts/
- Poor species selection (too shaded) and planting technique in Halpin Way (Eucalyptus scoparia).

Overview of existing trees

Number of trees; streets, open space

Tree location	Number	Total %
Street	1070	82.4%
Park	228	17.6%
Total existing trees	1298	

Dominant species (›1% of total trees)

Species	Count	%
Pin Oak *(Quercus palustris)*	259	20.0%
Callery's Pear *(Pyrus calleryana)*	173	13.3%
Red Maple *(Acer rubrum)*	78	6.0%
Pacific Sunset Maple *(Acer truncatum x A. platanoides 'Warrenred')*	59	4.5%
Capital Callery Pear *(Pyrus calleryana 'Capital')*	51	3.9%
Weeping Lilly Pilly *(Syzygium floribundum syn. Waterhousea floribunda)*	51	3.9%
London Plane Tree *(Platanus X acerifolia)*	46	3.5%
Crepe Myrtle *(Lagerstroemia indica)*	41	3.2%
Spotted Gum *(Corymbia maculata)*	33	2.5%
Freeman's Maple *(Acer Xfreemanii)*	25	1.9%
Oriental plane *(Platanus orientalis)*	25	1.9%
Canary Island Date Palm *(Phoenix canariensis)*	21	1.6%
Sensation Box Elder maple *(Acer negundo 'Sensation')*	19	1.5%
River Red Gum *(Eucalyptus camaldulensis)*	18	1.4%
Wallangarra White Gum *(Eucalyptus scoparia)*	18	1.4%
Chinese Elm *(Ulmus parvifolia)*	18	1.4%
Yellow Gum *(Eucalyptus leucoxylon)*	17	1.3%
Lemon-scented Gum *(Corymbia citriodora)*	14	1.1%
Honey Locust *(Gleditsia triacanthos)*	13	1.0%

Canopy coverage

Tree Canopy cover as of 2018 for the Dandenong Activity Centre was 8.4% or 112,601m2 which is considered low for an Activity Centre, though not unreasonable. This is an increase since 2014, when tree canopy cover was 8.1%. Therefore 0.3% or 4,387m2 of tree canopy grew over the Dandenong Activity Centre over that four-year period. The map below shows where canopy was lost and gained eg., gained along Lonsdale Street due to the planting of 250 Pin Oaks and the lost along Pultney Street and the northern section of the Dandenong Park.

Source: DELWP , Vegetation_Cover_2018, Spatial Datamart, 2020

There is no clear benchmarking around what a "healthy" average is for an activity centre, though ideally it would be above 15-20% for heat mitigation.

The benefits of increased canopy coverage will be determined during subsequent measurements every 2-years (2021, 2024, 2026, 2028).

Heat Island Mapping

Dandenong's entire activity centre is registered as a thermal hotspot. This is to be expected given the highly urbanised and densified nature of the area.

Source: DELWP, Heat_Urban_Heat_2018, Spatial Datamart, 2020.

Social Vulnerability to Heat

The assessment of heat vulnerability for the Dandenong Activity Centre also shows high risk areas with intensified heat health risks. The majority of the centre records the highest heat vulnerability score (as derived by the Department of Environment, Land, Water and Planning mapping).

Scheduled Streetscape Projects

- Vanity Lane Project (Lonsdale and Thomas Streets)
- Robinson and Mason Street Realignment
- Arkana Public Realm (corner of Lonsdale Street and Cheltenham Road)
- Thomas Street Afghan Bazaar Streetscape Enhancement Project (Stage 4)
- Scott Street (between Lonsdale & Thomas Streets)
- Cleeland and Clow Street streetscape upgrades
- Pultney Street Streetscape upgrade
- Thomas Street south streetscape upgrades (development sites interface)
- Boyd Lane upgrade
- Palm Plaza / McCrae Street Streetscape upgrade

Figure 17. Examples of tree planting in Dandenong.

Angophora in Lonsdale Street.

Melia in Thomas Street, Afghan Bazaar.

Opportunity sites in Cleeland Street.

Good example of planting in road pavement planters in Walker Street.

Planting opportunities in Scott Street.

Small cut out in Langhorne Street.

Dandenong Activity Centre 10-year planting plan opportunity sites data

Table of the planting opportunity site data for Dandenong Activity centre. 196 trees, 191 vacant opportunity sites, 5 sites with existing poor/unsuitable trees. The Total score is a combination of site that factors that are weighted to gain a score to indicate a priority for opportunity planting. The higher the total score, the higher the priority. Details of the method of assessment can be seen in Appendix 1.

Table 3. Opportunity site data for Dandenong Activity Centre

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D1	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	18	Palm plaza, vacant astroturf plot	Dandenong arcade
D2	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	18	Palm plaza, vacant astroturf plot	Dandenong arcade
D3	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	18	Palm plaza, vacant astroturf plot	Dandenong arcade
D4	Existing avenue	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; public open space; transport hub	Medium	14	Large canopy/ feature tree candidate	Mccrae street
D5	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; school; transport hub	High	20		Foster street
D6	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; school; transport hub	Medium	18		Foster street
D7	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; school; transport hub	Medium	18		Foster street
D8	Main / collector	1. Simple	2.5m +	None	Signage	Easy	Retail centre / plaza; school; transport hub	Medium	16	Understorey plantings if intersection/ signage visibility is problematic with new tree	Stud road
D9	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities	Low	14	Small tree	Clow street
D10	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities	Medium	19	Private site (rsl)	Walker street
D11	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	Low	15	Declining pittosporum eugeniodes, remove and replace	Sleeth avenue
D12	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Low	14	Tilia stump resprout, remove and replace	Sleeth avenue
D13	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Low	14	Small tree in nature strip	Sleeth avenue

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D14	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	Low	15		Sleeth avenue
D15	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities	Low	13	Small tree in nature strip	King street
D16	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	16	Medium tree in nature strip	King street
D17	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Medium	18	Pioneer memorial gardens, large canopy tree	King street
D18	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Medium	18	Pioneer memorial gardens, large canopy tree	Stuart street
D19	Local / residential	1. Simple	2.5m +	Multiple	None	Easy	Retail centre / plaza; community facilities; public open space	Low	15	Small tree in nature strip	Stuart street
D20	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Medium	18	Large canopy tree in existing pocket park	Stuart street
D21	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	16	Small/medium tree in nature strip	King street
D22	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	16	Small/medium tree in nature strip	King street
D23	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	16	Small/medium tree in granitic gravel	King street
D24	Local / residential	3. Complex	2.5m +	None	Awnings	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	12	Footpath cutout and wsud solution utilising stormwater flows for tree pit infiltration	Cleeland street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D25	Local / residential	2. Medium	<2.5m	Multiple	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	13	Continue with acer campestre planting	Cleeland street
D26	Local / residential	3. Complex	2.5m +	None	Signage; street lights	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	12	Ccutout into 1/4 hr parking spot and pavement to create larger planter size to establish medium/large canopy tree	Cleeland street
D27	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	13	New footpath cutout for small/medium tree	Cleeland street
D28	Local / residential	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	15	New footpath cutout for medium tree	Cleeland street
D29	Existing avenue	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities	Medium	13	Convert traffic void into large planter, potential wsud solution for canopy tree planting	Princes highway
D30	Main / collector	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities ;public open space	High	15	Convert void carpark secrion to pit for large canopy tree	Clow street
D31	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space; transport hub	Medium	19	Large canopy tree	Clow street
D32	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space; transport hub	Medium	19	Medium tree	Clow street
D33	Main / collector	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	16	Cutout asphalt and possibly delete 1 parking spot and install canopy tree and understorey planting beds	Clow street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D34	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	New footpath cutout	Clow street
D35	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space; transport hub	Medium	19	Large canopy tree (elm)	Clow street
D36	Main / collector	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; public open space	Medium	17	Vacant tree plot	Clow street
D37	Other (see comments)	1. Simple	<2.5m	None	Awnings	Easy	Retail centre / plaza; community facilities; transport hub	High	18	Vacant tree plot, continue acer negundo planting theme	The hub
D38	Laneway	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; transport hub; urban square	High	17	Outstand planter cutout from existing concrete	Crump lane
D39	Laneway	2. Medium	<2.5m	None	None	Moderate	Community facilities; transport hub; urban square	High	16	Outstand planter cutout from existing concrete	Crump lane
D40	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Community facilities; transport hub; urban square	High	16	Large canopy tree	Lonsdale street
D41	Local / residential	3. Complex	<2.5m	None	Awnings	Hard	Retail centre / plaza; community facilities; transport hub; urban square	High	14	Road cutout and install planting pit	Pultney street
D42	Local / residential	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; transport hub; urban square	High	17	Replace asphalt with tree pit	Pultney street
D43	Local / residential	3. Complex	<2.5m	None	Awnings	Hard	Retail centre / plaza; community facilities; transport hub ;urban square	High	14	Cutout tree pit in footpath	Pultney street
D44	Local / residential	1. Simple	2.5m +	None	Awnings	Easy	Community facilities; transport hub; urban square	High	19	Small/medium tree in nature strip	Pultney street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D45	Local / residential	1. Simple	<2.5m	None	Street lights	Easy	Community facilities; public open space; transport hub; urban square	High	19	Medium tree	Pultney street
D46	Local / residential	1. Simple	<2.5m	None	None	Easy	Community facilities; public open space; transport hub; urban square	High	21	Medium/large tree	Pultney street
D47	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Community facilities; public open space; transport hub; urban square	Medium	18	Dandenong park frontage (ash/ oak)	Foster street
D48	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Community facilities; public open space; transport hub; urban square	Medium	18	Dandenong park frontage (ash/ oak)	Foster street
D49	Existing avenue	2. Medium	<2.5m	Lv	Awnings	Hard	Retail centre / plaza; community facilities; public open space	High	12	Vacant tree pit, remove edge pavers to expand size	Langhorne street
D50	Existing avenue	2. Medium	<2.5m	Lv	Awnings	Hard	Retail centre / plaza; community facilities; public open space; transport hub	High	13	Vacant tree pit, remove edge pavers to expand size	Langhorne street
D51	Other (see comments)	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza	Medium	18	Carpark, small/ medium tree	Patchell lane carpark
D52	Other (see comments)	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza	Medium	18	Carpark, small/ medium tree	Patchell lane carpark
D53	Existing avenue	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	16	Vacant tree pit, remove edge pavers to expand size	Langhorne street
D54	Existing avenue	2. Medium	<2.5m	Lv	None	Moderate	Community facilities; public open space	Medium	12	Vacant tree pit concreted in	Lonsdale street
D55	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Community facilities; public open space; urban square	High	21	Large feature tree	Thomas street
D56	Local / residential	1. Simple	2.5m +	None	None	Easy	Community facilities; public open space; urban square	High	21	Vacant mulched planter 'tree ready'	Thomas street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D57	Laneway	1. Simple	2.5m +	None	None	Easy	Community facilities; public open space; urban square	High	21	Remove and replace existing poor e. Scoparia with w. Floribunda	Halpin way
D58	Local / residential	2. Medium	2.5m +	None	Street lights	Moderate	Community facilities; public open space; urban square	High	14	Tree pit cutout in bluestone paving	Halpin way
D59	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Community facilities; public open space; transport hub	High	17		Foster street
D60	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Community facilities; public open space; transport hub	High	17		Foster street
D61	Local / residential	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; community facilities	Medium	13	Small tree	Clow street
D62	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	17	Open space near boundary of vacant allotment	Stuart street
D63	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	17	Open space near boundary of vacant allotment	Stuart street
D64	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	17	Open space near boundary of vacant allotment	King street
D65	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	17	Open space near boundary of vacant allotment	Clow street
D66	Local / residential	1. Simple	2.5m +	None	Signage	Easy	Retail centre / plaza; community facilities	Medium	17		Scott street
D67	Local / residential	1. Simple	2.5m +	Multiple	None	Easy	Retail centre / plaza; community facilities	High	18		Scott street
D68	Main / collector	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities	High	17	Existing tree dead	Robinson street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D69	Other (see comments)	2. Medium	<2.5m	Multiple	None	Moderate	Retail centre / plaza; community facilities	Medium	12	Entrance to car park	Robinson street
D70	Other (see comments)	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	Medium	18	Car park. Use smaller tree, mulch garden bed	Robinson street
D71	Other (see comments)	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities	Medium	14		Robinson street
D72	Other (see comments)	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities	Medium	14	Car park	Robinson street
D73	Main / collector	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	High	19		Robinson street
D74	Local / residential	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities	High	14	Could plant in narrow nature strip however planting in road will provide greater separation to building provide more shade	Hemmings street
D75	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities	High	20	Near bus stop	Hemmings street
D76	Local / residential	3. Complex	<2.5m	Multiple	None	Hard	Retail centre / plaza; community facilities	High	12	Would match one on southern side. Greater separation from building & hv lines. More shade	Hemmings street
D77	Local / residential	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities	High	14	Tree or shrubs, strap leaf plants	Hemmings street
D78	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities	High	20		Robinson street
D79	Main / collector	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities	Medium	15		Princes highway
D80	Main / collector	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities	Medium	15		Princes highway
D81	Main / collector	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities	Medium	15		Princes highway

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D82	Main / collector	1. Simple	<2.5m	Lv	Signage	Moderate	Retail centre / plaza; community facilities	Medium	13		Princes highway
D83	Laneway	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; community facilities	High	12		Lois lane
D84	Main / collector	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; community facilities	High	13		Clow street
D85	Main / collector	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities	High	17		Clow street
D86	Main / collector	1. Simple	<2.5m	Lv	Signage	Moderate	Retail centre / plaza; community facilities	High	15	Increase size of planting pit	Thomas street
D87	Local / residential	3. Complex	2.5m +	Lv	Signage	Hard	Retail centre / plaza; community facilities	High	11	Kerb outstand	Scott street
D88	Local / residential	2. Medium	<2.5m	Lv	Signage	Hard	Retail centre / plaza	Medium	10		Scott street
D89	Local / residential	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza	Medium	14		Scott street
D90	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza	Medium	12		Scott street
D91	Local / residential	2. Medium	<2.5m	Lv	None	Moderate	Retail centre / plaza	Medium	12		Scott street
D92	Main / collector	3. Complex	<2.5m	None	Signage; awnings; street lights	Hard	Retail centre / plaza	Medium	11	Create shade for seating area	Thomas street
D93	Main / collector	3. Complex	<2.5m	None	Street lights	Hard	Retail centre / plaza	Medium	10	Underground services may constrain planting	Thomas street
D94	Local / residential	2. Medium	<2.5m	Lv	Street lights	Hard	Retail centre / plaza	Medium	9		Scott street
D95	Local / residential	2. Medium	<2.5m	Lv	Street lights	Hard	Retail centre / plaza	Medium	9		Scott street
D96	Local / residential	2. Medium	<2.5m	Lv	Street lights	Hard	Retail centre / plaza	Medium	9		Scott street
D97	Local / residential	2. Medium	<2.5m	Lv	Street lights	Hard	Retail centre / plaza; community facilities	Medium	10		Scott street
D98	Local / residential	2. Medium	<2.5m	Lv	Street lights	Hard	Retail centre / plaza; community facilities	Medium	10		Scott street
D99	Laneway	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; community facilities	High	12		Oldham lane

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D100	Laneway	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; community facilities	High	12		Oldham lane
D101	Laneway	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; community facilities	High	12	Could be private land	Oldham lane
D102	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities	Medium	13		Oldham lane
D103	Laneway	2. Medium	2.5m +	None	Street lights	Moderate	Retail centre / plaza	Medium	12		Oldham lane
D104	Laneway	2. Medium	2.5m +	None	Street lights	Moderate	Retail centre / plaza	Medium	12	Remove paving	Oldham lane
D105	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza	Medium	13		Oldham lane
D106	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza	Medium	13		Oldham lane
D107	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza	Medium	12	Could be difficult to implement	Oldham lane
D108	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza	Low	15		Rodd street
D109	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza	Low	15		Rodd street
D110	Local / residential	1. Simple	2.5m +	Multiple	None	Easy	Retail centre / plaza	Medium	17		Rodd street
D111	Main / collector	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities; public open space	Medium	16		Robinson street
D112	Main / collector	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	Medium	17		Robinson street
D113	Main / collector	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	Medium	17		Robinson street
D114	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; public open space	Medium	18		Cadle street
D115	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; public open space	Medium	18		Cadle street
D116	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities	Medium	18		Hutton street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D117	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities	Medium	18		Hutton street
D118	Main / collector	3. Complex	<2.5m	None	Signage; street lights	Hard	Retail centre / plaza; community facilities	Medium	11	Needs kerb outstand	Thomas street
D119	Main / collector	2. Medium	<2.5m	Lv	Signage; street lights	Hard	Retail centre / plaza; community facilities	Medium	10		Thomas street
D120	Main / collector	2. Medium	<2.5m	Lv	Signage; street lights	Hard	Retail centre / plaza; community facilities	Medium	10		Thomas street
D121	Existing avenue	3. Complex	2.5m +	Lv	Signage; street lights	Hard	Retail centre / plaza; community facilities	High	11	Large area of pavement near intersection, high pedestrian use. Recreate a. Costata planting from corner lonsdale/walker st	Lonsdale street
D122	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza	Medium	13	May be difficult to implement. Use narrow tree	Lois lane
D123	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza	Medium	13	May be difficult to implement	Lois lane
D124	Other (see comments)	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; public open space; transport hub	Medium	14	Existing tree, modify to extend tree plot incorporating garden bed style around tree directly to south east	Dandenong arcade
D125	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities	Low	13	Small tree in nature strip	Clow street
D126	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities	Low	13	Small tree in nature strip	Clow street
D127	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities	Low	13	Small tree in nature strip	Clow street
D128	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities	Low	13	Small tree in nature strip	Clow street
D129	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities	Low	13	Small tree in nature strip	Clow street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D130	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Low	14	Small tree in nature strip	Sleeth avenue
D131	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Low	14	Small tree in nature strip	Sleeth avenue
D132	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Low	14	Small tree in nature strip	Sleeth avenue
D133	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Low	14	Small tree in nature strip	Sleeth avenue
D134	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	17	Medium/large tree in nature strip	Stuart street
D135	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	17	Medium/large tree in nature strip	Stuart street
D136	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	17	Medium/large tree in nature strip	Stuart street
D137	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space	Low	17	Medium/large tree in nature strip	Stuart street
D138	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; public open space	Medium	15	Small tree in nature strip	King street
D139	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; public open space	Medium	15	Small tree in nature strip	King street
D140	Local / residential	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	New footpath cutout for small/medium tree	Cleeland street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D141	Local / residential	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	New footpath cutout for small/medium tree	Cleeland street
D142	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities; public open space; transport hub	High	17	Vacant traffic island	Cleeland street
D143	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities; public open space; transport hub	High	17	Vacant traffic island	Cleeland street
D144	Existing avenue	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Medium	15	Continue tristaniopsis planting	Princes highway
D145	Existing avenue	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Medium	15	Continue tristaniopsis planting	Princes highway
D146	Existing avenue	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities	Medium	15	Continue tristaniopsis planting	Princes highway
D147	Other (see comments)	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	15	Convert heaved pavement to garden bed understorey as around other planes along the plaza (see photo examples)	Dandenong arcade
D148	Other (see comments)	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	15	Convert heaved pavement to garden bed understorey as around other planes along the plaza (see photo examples)	Clow street
D149	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space; transport hub	High	20	Large canopy tree	Clow street
D150	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space; transport hub	High	20	Large canopy tree	Clow street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D151	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space; transport hub	High	20	Large canopy tree	Clow street
D152	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	Cut concrete and install raised semi-continuous planter beds along footpath	Clow street
D153	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	Cut concrete and install raised semi-continuous planter beds along footpath	Clow street
D154	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	Cut concrete and install raised semi-continuous planter beds along footpath	Clow street
D155	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	Cut concrete and install raised semi-continuous planter beds along footpath	Clow street
D156	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	Cut concrete and install raised semi-continuous planter beds along footpath	Clow street
D157	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	Medium	14	Cut concrete and install raised semi-continuous planter beds along footpath	Clow street
D158	Main / collector	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	16	Cutout asphalt and install large canopy trees and understorey planter beds	Clow street
D159	Main / collector	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	16	Cutout asphalt and install large canopy trees and understorey planter beds	Clow street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D160	Other (see comments)	3. Complex	2.5m +	None	Signage	Moderate	Retail centre / plaza; community facilities; urban square	High	13	Public gathering place, ample for large shade tree	Lonsdale street
D161	Other (see comments)	3. Complex	2.5m +	None	Signage	Moderate	Retail centre / plaza; community facilities; urban square	High	13	Public gathering place, ample for large shade tree	Lonsdale street
D162	Other (see comments)	3. Complex	2.5m +	None	Signage	Moderate	Retail centre / plaza; community facilities; urban square	High	13	Public gathering place, ample for large shade tree	Lonsdale street
D163	Main / collector	1. Simple	<2.5m	None	Awnings	Easy	Community facilities; public open space; transport hub; urban square	High	17	Small tree (crepe myrtle)	Foster street
D164	Main / collector	1. Simple	<2.5m	None	Awnings	Easy	Community facilities; public open space; transport hub; urban square	High	17	Small tree (crepe myrtle)	Foster street
D165	Main / collector	1. Simple	<2.5m	None	Awnings	Easy	Community facilities; public open space; transport hub; urban square	High	17	Small tree (crepe myrtle)	Foster street
D166	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D167	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D168	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D169	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D170	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D171	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D172	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D173	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D174	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D175	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D176	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D177	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza	Medium	14	Carpark needs redesign, create 1 way loop with continuous tree planted medians	Patchell lane carpark
D178	Existing avenue	2. Medium	2.5m +	None	None	Moderate	Community facilities; public open space	Medium	15	Large canopy tree in existing gravel	Lonsdale street
D179	Existing avenue	2. Medium	2.5m +	None	None	Moderate	Community facilities; public open space	Medium	15	Large canopy tree in existing gravel	Lonsdale street
D180	Existing avenue	1. Simple	<2.5m	None	None	Easy	Community facilities; public open space	Low	15		Lonsdale street
D181	Existing avenue	1. Simple	<2.5m	None	None	Easy	Community facilities; public open space	Low	15		Lonsdale street
D182	Existing avenue	1. Simple	<2.5m	None	None	Easy	Community facilities; public open space	Low	15		Lonsdale street
D183	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Community facilities; public open space; urban square	High	21	Large shade tree (a. Costata)	Walker street
D184	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Community facilities; public open space; urban square	High	21	Large shade tree (a. Costata)	Walker street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
D185	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Community facilities; public open space; urban square	High	21	Large shade tree (a. Costata)	Walker street
D186	Local / residential	3. Complex	2.5m +	None	None	Moderate	Community facilities; public open space; urban square	High	16	Kerb planter outstand in existing chevron, road cutout	Thomas street
D187	Local / residential	3. Complex	2.5m +	None	None	Moderate	Community facilities; public open space; urban square	High	16	Kerb planter outstand in existing chevron, road cutout	Thomas street
D188	Local / residential	3. Complex	2.5m +	Hv	None	Moderate	Community facilities; public open space; urban square	High	14	Cutout tree planter in existing brick paving	Thomas street
D189	Local / residential	3. Complex	2.5m +	Hv	None	Moderate	Community facilities; public open space; urban square	High	14	Cutout tree planter in existing brick paving	Thomas street
D190	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Public open space; transport hub	Medium	16	Small tree in nature strip (tristaniopsis?)	Foster street
D191	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Public open space; transport hub	Medium	16	Small tree in nature strip (tristaniopsis?)	Foster street
D192	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Public open space; transport hub	Medium	16	Small tree in nature strip (tristaniopsis?)	Foster street
D193	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Public open space; transport hub	Medium	16	Small tree in nature strip (tristaniopsis?)	Foster street
D194	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Public open space; transport hub	Medium	15	Small tree in nature strip (tristaniopsis?)	Railway parade
D195	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Public open space; transport hub	Medium	15	Small tree in nature strip (tristaniopsis?)	Railway parade
D196	Main / collector	3. Complex	2.5m +	None	Signage	Moderate	Retail centre / plaza	Medium	12	Asphalt cutout and wsud solution utilising stormwater flows for tree pit infiltration	Scott street

LEGEND

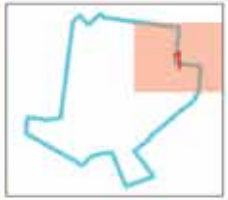
Planting Difficulty

- EASY
- MODERATE
- HARD

Perceived Benefits

- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Dandenong Activity Centre

TL REF.	MAP NO.
010684	1 / 6
CLIENT	**DATE**
City of Greater Dandenong	17-05-2021

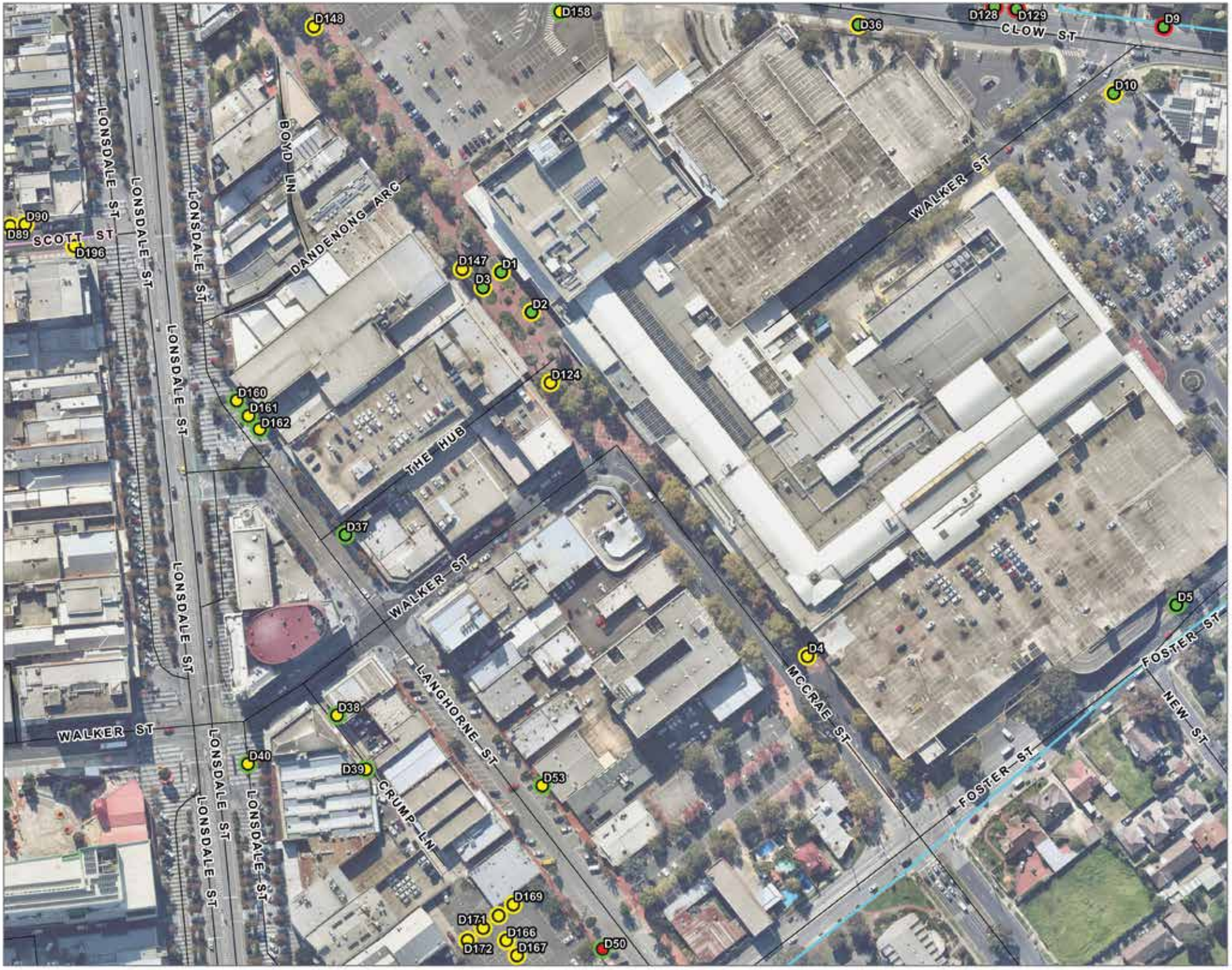
DATA SOURCES
Aerial image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
EPSG:28355 | GDA 94 MGA Zone 55

TREELOGIC PTY LTD
ABN: 85 090 025 810
TEL: 1300 055 520
4 / 21 Eugene Tce
Ringwood, VIC
Australia 3134

Treelogic
Plan, manage, protect



LEGEND

Planting Difficulty
- EASY
- MODERATE
- HARD

Perceived Benefits
- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area

APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Dandenong Activity Centre

TL REF.
010684

MAP NO.
2 / 6

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

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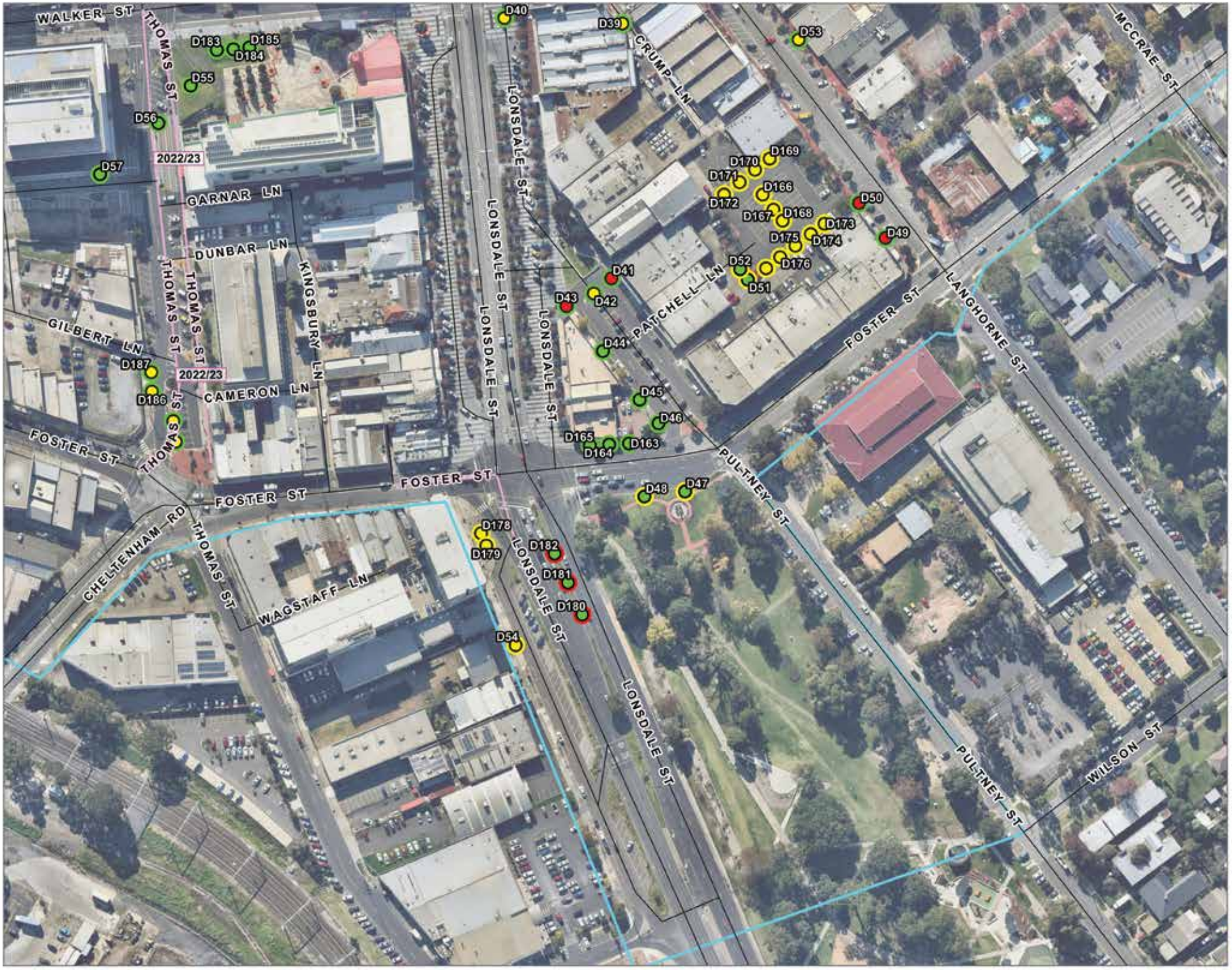

LEGEND

Planting Difficulty
- EASY
- MODERATE
- HARD

Perceived Benefits
- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area

APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Dandenong Activity Centre

TL REF.
010684

MAP NO.
3 / 6

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

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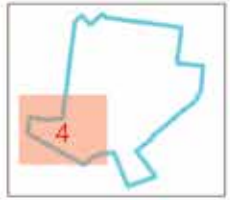
LEGEND

Planting Difficulty
- EASY
- MODERATE
- HARD

Perceived Benefits
- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Dandenong Activity Centre

TL REF.	MAP NO.
010684	4 / 6
CLIENT	**DATE**
City of Greater Dandenong	17-05-2021

DATA SOURCES
Aerial image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
EPSG:28355 | GDA 94 MGA Zone 55

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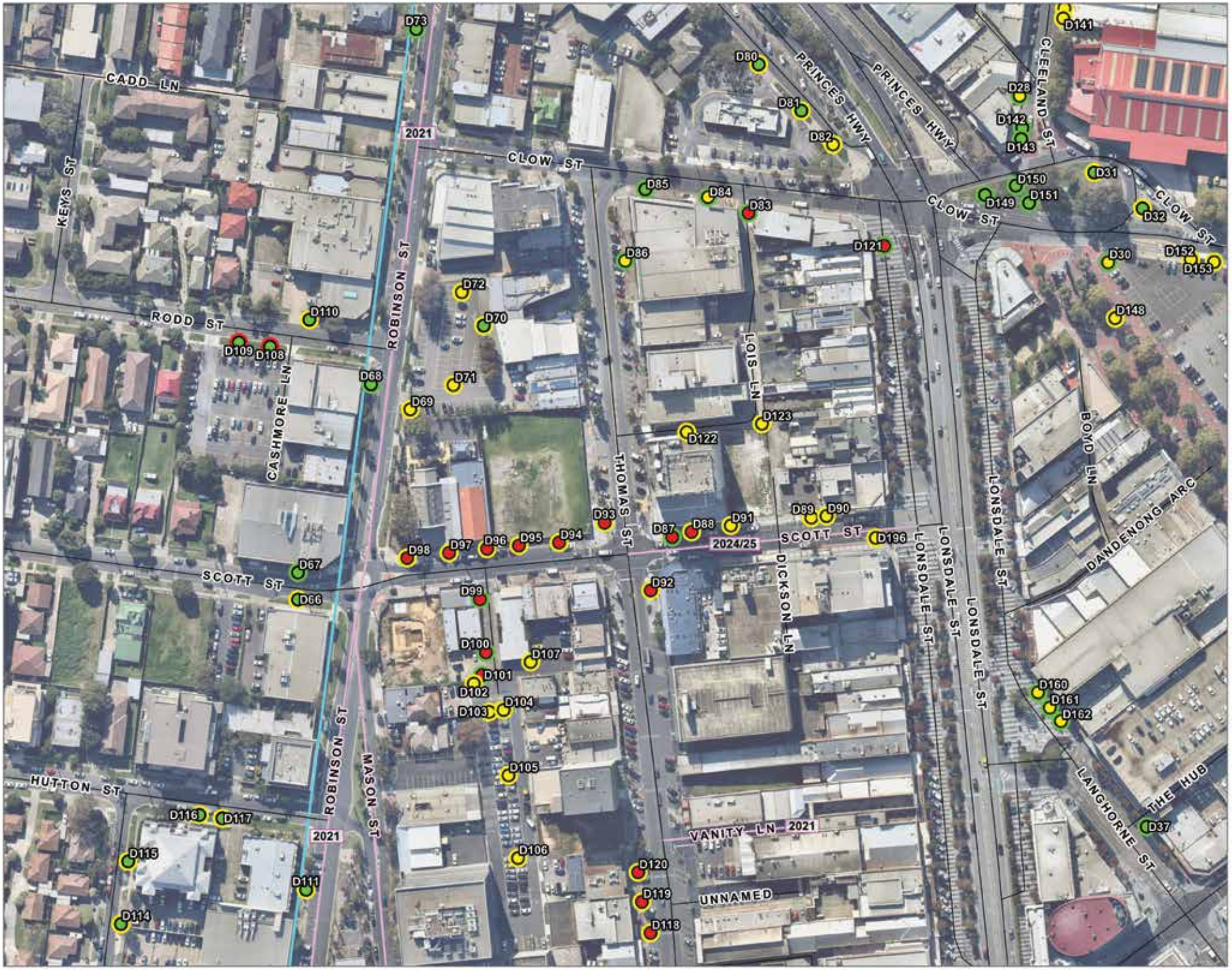

LEGEND

Planting Difficulty
- EASY
- MODERATE
- HARD

Perceived Benefits
- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area

APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Dandenong Activity Centre

TL REF.
010684

MAP NO.
5 / 6

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

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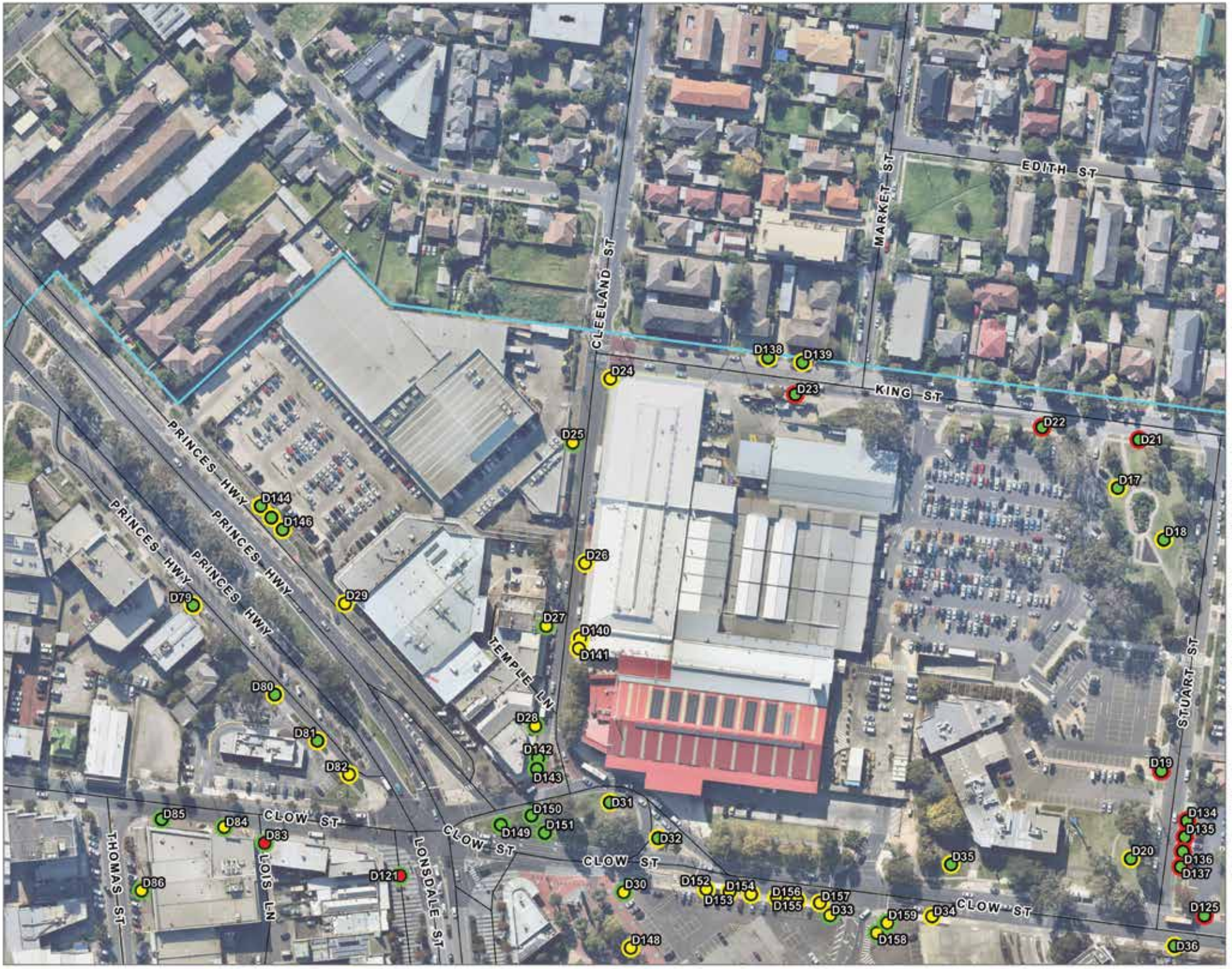


LEGEND

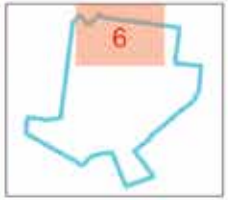
Planting Difficulty

- EASY
- MODERATE
- HARD

Perceived Benefits

- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Dandenong Activity Centre

TL REF.
010684

MAP NO.
6 / 6

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
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Springvale

Background

Within the City of Greater Dandenong there are three activity centres; Dandenong, Springvale and Noble Park, which are respectively located northwest to southeast along the Cranbourne/Pakenham Railway Line. Dandenong, Springvale and Noble Park are very different centres ranging in scale, role and function. In addition, they have varying characteristics in terms of population demographics and historical influences.

Springvale is a major activity centre located approximately 4km north-west of Noble Park and 7km north-west of Dandenong. Its residential catchment of approximately 21,000 people begins within a five-minute walk of the activity centre. With the significant waves of migration and settlement of predominantly South East Asian communities from the late 1970s, their subsequent successful settlement in Springvale has seen an established Vietnamese influence. This has shaped the activity centre giving it a unique and palpable vibe around food and culture that is underpinned by an energetic trader/customer exchange.

One-hundred and twenty-one (121) vacant and opportunity sites were identified during the assessment. Depending on budget allocations and a commitment to pursue trees in hard / low value sites the plan informs a capacity to add between 25%-28% additional trees in the Springvale Activity Centre.

Based on the observation below:

- 121 vacant sites are identified, representing a potential 28% addition to the existing 426 trees.
- If the 'realistic' scenario involves the exclusion of the 15 trees located in the hard sites, then this means 107 additional trees or 25% addition.
- If the strategic scenario involves the exclusion of the 4 trees with the low benefit, then this means 103 additional trees or 24% addition.
- As the quantity of the opportunity sites with a low benefit is very low (i.e. only 4 trees), I think we should still pursue all the easy and moderate (planting difficulty) opportunity sites even if they have a low benefit.

Other issues to consider include:

- Inappropriate planting under awnings – Honey Locust (Gleditsia sp.) in Buckingham Ave.
- Poor maintenance of containerised planters. Dried out – Springvale Rd and Lightwood Rd.

Overview of existing trees

Number of trees; streets, open space

Tree location	Number	Total %
Street	393	92.3%
Park	33	7.7%
Total existing trees	426	

Dominant species (>1% of total trees)

Species	Count	%
Crepe Myrtle *(Lagerstroemia indica)*	57	13.4%
Honey Locust *(Gleditsia triacanthos)*	56	13.1%
Water Gum *(Tristaniopsis laurina 'Luscious')*	49	11.5%
Wallangarra White Gum *(Eucalyptus scoparia)*	23	5.4%
Callery's Pear *(Pyrus calleryana)*	18	4.2%
Weeping Lilly Pilly *(Waterhousea floribunda)*	18	4.2%
Narrow-leafed Ash *(Fraxinus angustifolia)*	16	3.8%
Round Leaf Moort *(Eucalyptus platypus)*	11	2.6%
Desert Ash *(Fraxinus angustifolia ssp. angustifolia)*	10	2.3%
Chinese Pistachio *(Pistacia chinensis)*	10	2.3%
Field Maple *(Acer campestre)*	9	2.1%
Weeping Bottlebrush *(Callistemon viminalis)*	8	1.9%
River Red Gum *(Eucalyptus camaldulensis)*	8	1.9%
Trident Maple *(Acer buergerianum)*	7	1.6%
Kurrajong *(Brachychiton populneus)*	7	1.6%
Queensland Brush Box *(Lophostemon confertus)*	7	1.6%
Snow-in-summer *(Melaleuca linariifolia)*	7	1.6%
Crimson Sentry Norway Maple *(Acer platanoides 'Crimson Sentry')*	6	1.4%
Canary Island Date Palm *(Phoenix canariensis)*	6	1.4%
London Plane (Platanus X acerifolia)	6	1.4%
Lightwood (Acacia implexa)	5	1.2%
Pacific Sunset Maple (Acer truncatum x A. platanoides 'Warrenred' Pacific Sunset)	5	1.2%
Southern Mahogany (Eucalyptus botryoides)	5	1.2%

Canopy coverage

Tree canopy cover as of 2018 for the Springvale Activity Centre was 6.4% or 60,579m2 which is considered very low for an Activity Centre. This is a decrease since 2014, when tree canopy cover was 6.6%. Therefore 0.2% or 2,291m2 of tree canopy was lost from the Springvale Activity Centre over that four-year period. This was predominately due to the Level Crossing Removal Project. The map below shows where canopy was lost and gained eg., gained in the plaza where the Djerring Trail meets Springvale Station and lost along the Djerring Trail further north west.

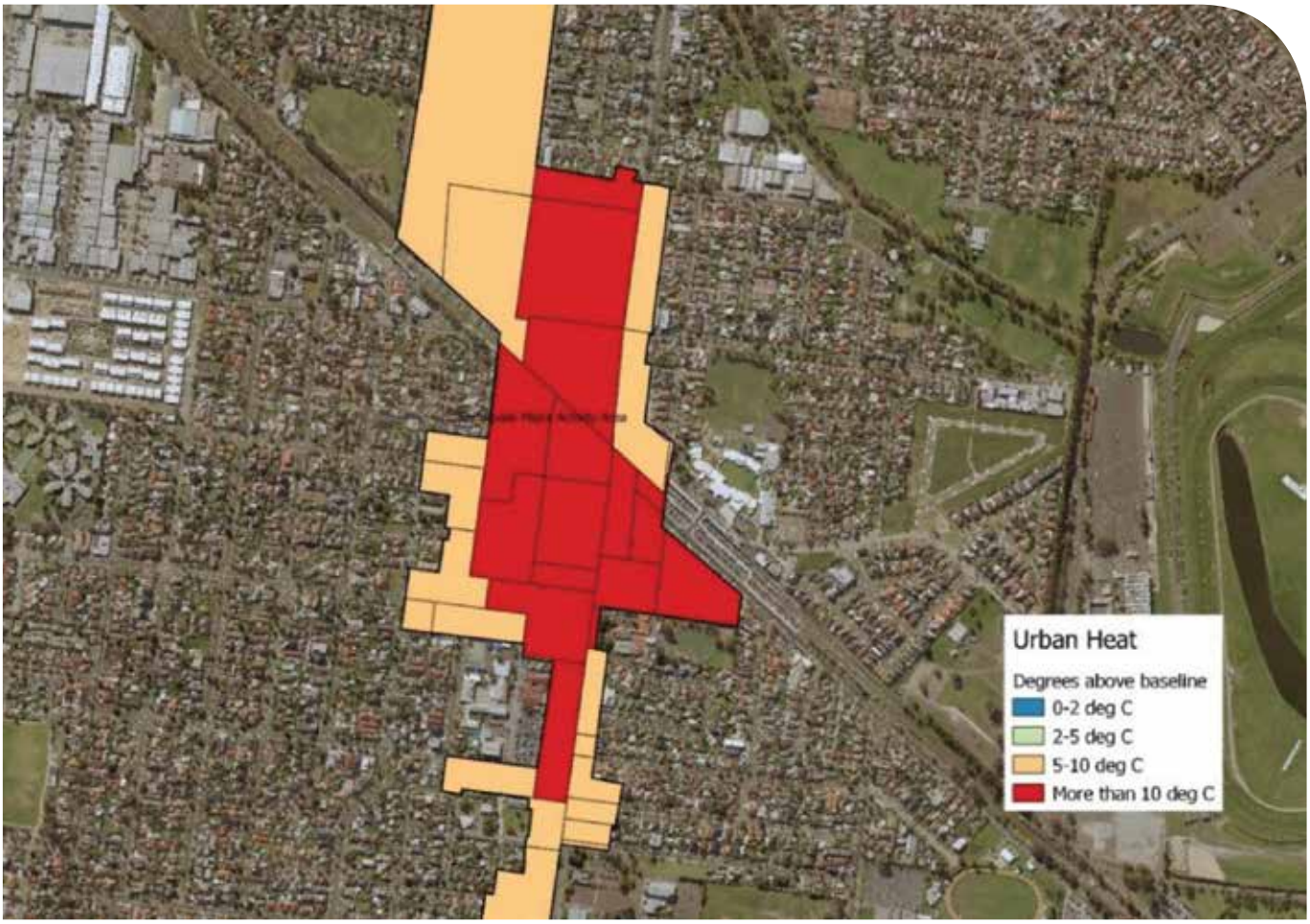
Source: DELWP, Vegetation_Cover_2018, Spatial Datamart, 2020

There is no clear benchmarking around what a "healthy" average is for an activity centre, though ideally it would be above 15-20% for heat mitigation.

The benefits of increased canopy coverage will be determined during subsequent measurements every 2-years (2021, 2024, 2026, 2028).

Heat Island Mapping

Springvale's entire activity centre is registered as a thermal hotspot. This is to be expected given the highly urbanised and densified nature of the area.



Source: DELWP, Heat_Urban_Heat_2018, Spatial Datamart, 2020.

Social Vulnerability to Heat

The assessment of heat vulnerability for the Springvale Activity Centre also shows high risk areas with intensified heat health risks. Half of the activity centre records the highest heat vulnerability score (as derived by the Department of Environment, Land, Water and Planning mapping) while the other half recording the next highest score of 4.

Scheduled Streetscape Projects

- Springvale Road Boulevard Project
- Balmoral Avenue Streetscape Upgrade
- Windsor Avenue Streetscape Upgrade
- St James Avenue Streetscape Upgrade
- Queens Avenue Streetscape Upgrade
- Multicultural Place Laneway link
- Warwick Avenue Precinct Upgrade

Figure 18. Images of trees and opportunities in Springvale

Buckingham Avenue. Note Gleditsia trees under the awnings are not appropriate because they will be suppressed and conflict with the infrastructure.

Opportunity sites in Warwick Avenue, car park south.

Planting opportunities in pavements on corner of Buckingham & Windsor Avenues

Substation in Warwick Avenue car park north.

Springvale Activity Centre 10-year planting plan opportunity sites data

Table of the planting opportunity site data for Springvale Activity Centre. 121 vacant opportunity sites. The Total score is a combination of site that factors that are weighted to gain a score to indicate a priority for opportunity planting. The higher the total score, the higher the priority. Details of the method of assessment can be seen in Appendix 1.

Table 4. Opportunity site data for Springvale Activity Centre

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S1	Local / residential	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; transport hub	High	15	Crepe myrtle	Warwick avenue
S2	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; transport hub	High	17	Crepe myrtle	Warwick avenue
S3	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; transport hub	High	17	Crepe myrtle	Warwick avenue
S4	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; transport hub	High	17		Warwick avenue
S5	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; transport hub	High	17		Warwick avenue
S6	Local / residential	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; transport hub	High	15	Crepe myrtle	Warwick avenue
S7	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Warwick avenue
S8	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Warwick avenue
S9	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Warwick avenue
S10	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; transport hub	High	17		Warwick avenue
S11	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Warwick avenue
S12	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; transport hub	High	20	Private property, canopy tree potential	Warwick avenue
S13	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; transport hub	High	20	Private property, canopy tree potential	Warwick avenue
S14	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Warwick avenue
S15	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Warwick avenue
S16	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; transport hub	High	20		Warwick avenue
S17	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; transport hub	High	20		Warwick avenue

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S18	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; transport hub	High	20		Warwick avenue
S19	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Warwick avenue
S20	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	Medium	18	Heavily compacted	Warwick avenue
S21	Main / collector	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; transport hub	Medium	14	Relocate/ redesign existing carpark signage	Lightwood road
S22	Main / collector	2. Medium	<2.5m	Multiple	Signage	Hard	Retail centre / plaza; transport hub	High	11	Remove existing concrete path to create tree plot	Lightwood road
S23	Local / residential	1. Simple	<2.5m	None	None	Easy	Transport hub	Medium	18		Kintore street
S24	Local / residential	1. Simple	<2.5m	None	None	Easy	Transport hub	Medium	18		Kintore street
S25	Local / residential	1. Simple	<2.5m	None	None	Easy	Transport hub	Medium	18		Kintore street
S26	Local / residential	1. Simple	<2.5m	None	None	Easy	Transport hub	Medium	18		Kintore street
S27	Local / residential	1. Simple	<2.5m	None	None	Easy	Transport hub	Medium	17		Kintore street
S28	Main / collector	2. Medium	<2.5m	Multiple	Signage	Hard	Transport hub	Medium	9	Remove existing concrete path to create tree plot	Lightwood road
S29	Local / residential	2. Medium	2.5m +	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	13	Cutout existing asphalt to create tree plot	Sandown road
S30	Main / collector	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; transport hub	Medium	15	Cutout existing concrete to create tree plot	Springvale road
S31	Main / collector	2. Medium	2.5m +	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	13	Cutout existing concrete to create tree plot	Springvale road
S32	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; transport hub	Medium	19	Large canopy tree in median	Springvale road
S33	Main / collector	2. Medium	2.5m +	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	13	Cutout existing concrete to create tree plot	Springvale road
S34	Main / collector	2. Medium	2.5m +	Lv	Signage	Hard	Retail centre / plaza; transport hub	Medium	11	Cutout existing concrete to create tree plot	Springvale road
S35	Main / collector	2. Medium	2.5m +	Lv	Signage	Hard	Retail centre / plaza; transport hub	Medium	11	Cutout existing concrete to create tree plot	Springvale road
S36	Main / collector	1. Simple	2.5m +	Lv	Signage	Moderate	Retail centre / plaza; transport hub	Medium	15	Private property, large canopy tree	Springvale road
S37	Main / collector	2. Medium	2.5m +	Lv	Signage	Hard	Retail centre / plaza; transport hub	Medium	11	Cutout existing concrete to create tree plot	Springvale road
S38	Main / collector	2. Medium	2.5m +	Lv	Signage	Hard	Retail centre / plaza; transport hub	High	12	Cutout existing concrete to create tree plot	Springvale road

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S39	Main / collector	2. Medium	2.5m +	None	Signage; awnings	Moderate	Retail centre / plaza; transport hub	High	14	Cutout existing concrete to create tree plot	Lightwood road
S40	Local / residential	2. Medium	<2.5m	Multiple	Signage	Hard	Retail centre / plaza; transport hub	Medium	9	Cutout existing concrete to create tree plot	Lightwood road
S41	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; transport hub	Medium	16		Union grove
S42	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; transport hub	Medium	18		Springvale road
S43	Main / collector	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; transport hub	Medium	18		Springvale road
S44	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	Medium	17		Maine hey crescent
S45	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	Medium	17		Maine hey crescent
S46	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities	Low	15		Maine hey crescent
S48	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; public open space; transport hub	High	22	Within school property. Large canopy tree (a. Costata?)	Springvale road
S49	Local / residential	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; school; transport hub	High	18	Soil replacement in existing kerb outstand	Warwick avenue rowy
S50	Local / residential	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; school; transport hub	High	18	Soil replacement in existing kerb outstand	Warwick avenue rowy
S51	Local / residential	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; school; transport hub	High	18	Feature tree in roundabout	Buckingham avenue
S52	Local / residential	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; transport hub	Medium	14	Cutout existing concrete to create tree plot	Windsor avenue

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S52	Local / residential	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; transport hub	Medium	14	Cutout existing concrete to create tree plot	Windsor avenue
S53	Local / residential	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; transport hub	Medium	14	Cutout existing concrete to create tree plot	Windsor avenue
S54	Local / residential	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities	Low	13	Feature tree in roundabout	St johns avenue
S55	Local / residential	1. Simple	2.5m +	Lv	None	Easy	Retail centre / plaza; community facilities	Low	14		St johns avenue
S56	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; school	Medium	18		St johns avenue
S57	Local / residential	1. Simple	2.5m +	Multiple	Signage	Moderate	Retail centre / plaza; community facilities; school	Medium	14	May obscure school signage	St johns avenue
S58	Local / residential	1. Simple	2.5m +	Multiple	None	Easy	Retail centre / plaza; community facilities; school	Medium	16		St johns avenue
S59	Local / residential	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; school	Medium	14	Feature tree in roundabout	St james avenue
S60	Local / residential	1. Simple	2.5m +	Lv	Signage	Moderate	Retail centre / plaza; community facilities; school	Medium	15		St james avenue
S61	Local / residential	1. Simple	2.5m +	Multiple	Signage	Moderate	Retail centre / plaza; community facilities; school	Medium	15		St james avenue
S62	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; school	Medium	19	Large canopy tree	Buckingham avenue
S63	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; school	Medium	18	Large canopy tree	Buckingham avenue
S64	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; school	Medium	18		St james avenue

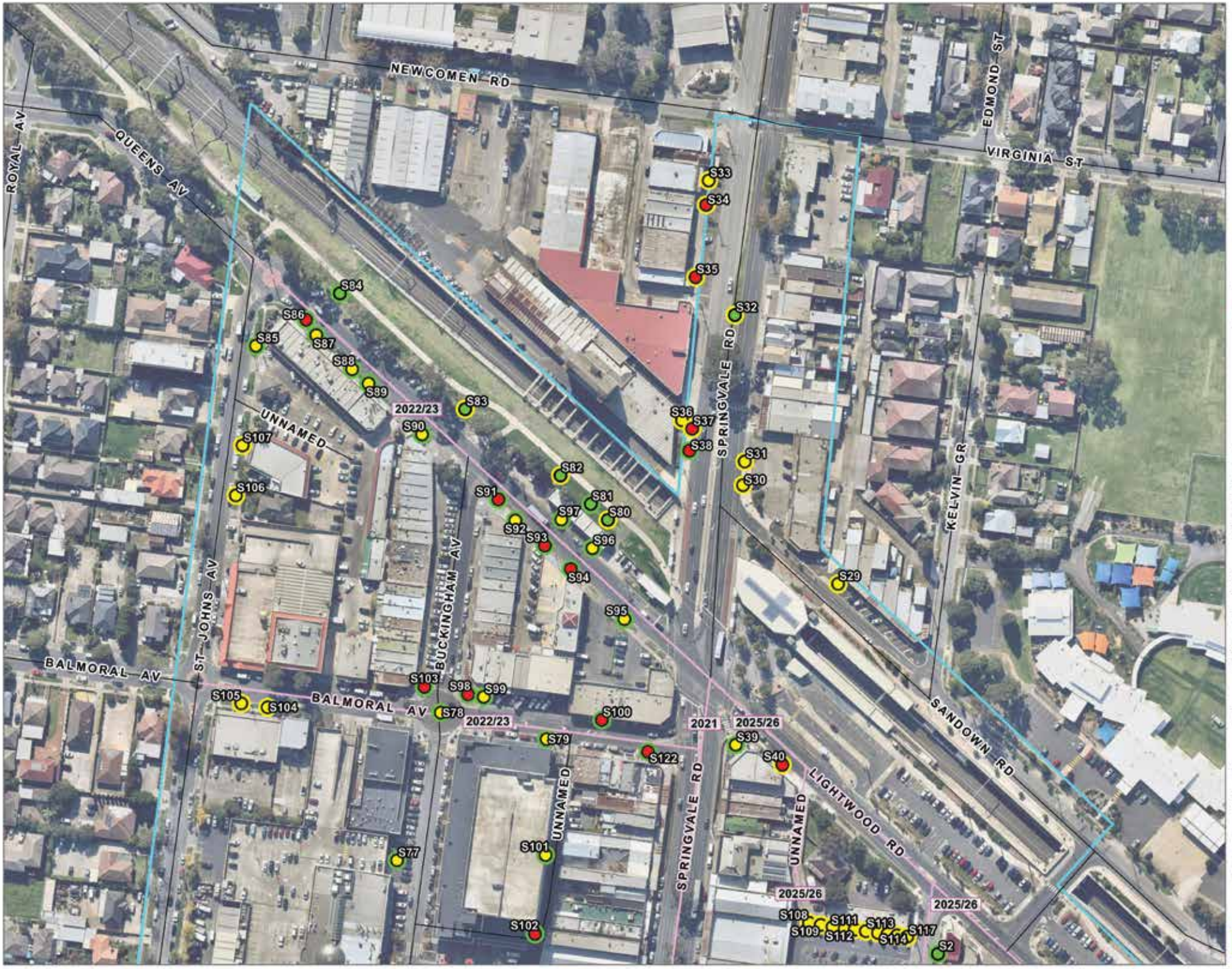
Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S65	Local / residential	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; community facilities; school	High	20		St james avenue
S66	Local / residential	1. Simple	2.5m +	None	Signage; awnings	Easy	Retail centre / plaza; community facilities; school	High	18		St james avenue
S67	Local / residential	1. Simple	2.5m +	Multiple	None	Easy	Retail centre / plaza; community facilities	Low	15		St james avenue
S68	Main / collector	1. Simple	2.5m +	Lv	Signage	Moderate	Retail centre / plaza; community facilities; public open space	Medium	14		Springvale road
S69	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; community facilities; public open space	High	17		Boonah street
S70	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; school; public open space	High	20		Buckingham avenue
S71	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; school; public open space	High	20		Buckingham avenue
S72	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; community facilities; school; public open space	Medium	18		Buckingham avenue
S73	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; school; public open space	High	18		Buckingham avenue
S74	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities; school; public open space	High	18		Buckingham avenue
S75	Local / residential	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities; school; public open space	Medium	16		Buckingham avenue

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S76	Local / residential	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; community facilities; school; public open space	High	17		Buckingham avenue
S77	Main / collector	3. Complex	2.5m +	None	Signage; streetlights	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	15	Create engineered tree plot for large canopy tree	Buckingham avenue
S78	Main / collector	2. Medium	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	18	Feature tree in roundabout	Buckingham avenue
S79	Main / collector	2. Medium	<2.5m	None	Signage; awnings; streetlights	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	13	Columnar tree, replace pebblecrete with granitic gravel	Balmoral avenue
S80	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	19		Queens avenue
S81	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	High	20		Queens avenue
S82	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	19		Springvale road
S83	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	19	Railway reserve	Queens avenue
S84	Other (see comments)	1. Simple	2.5m +	Hv	None	Easy	Retail centre / plaza; public open space; transport hub	High	19	Railway reserve next to car park	Queens avenue
S85	Local / residential	1. Simple	2.5m +	Lv	Signage	Moderate	Retail centre / plaza; community facilities	High	16		St johns avenue
S86	Main / collector	3. Complex	<2.5m	Hv	Signage; awnings; streetlights	Hard	Retail centre / plaza; transport hub	High	10	Replace island with planter	Queens avenue
S87	Main / collector	1. Simple	<2.5m	Hv	Signage; awnings	Moderate	Retail centre / plaza; transport hub	High	15		Queens avenue
S88	Main / collector	1. Simple	<2.5m	Hv	Signage; awnings	Moderate	Retail centre / plaza; transport hub	High	15		Queens avenue
S89	Main / collector	1. Simple	<2.5m	Hv	Signage; awnings	Moderate	Retail centre / plaza; transport hub	High	15		Queens avenue

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S90	Main / collector	1. Simple	2.5m +	Hv	Signage; awnings	Moderate	Retail centre / plaza; transport hub	High	16		Queens avenue
S91	Main / collector	2. Medium	2.5m +	Hv	Signage; awnings	Hard	Retail centre / plaza; transport hub	High	12	Would need to remove decorative pebble paving	Queens avenue
S92	Main / collector	2. Medium	<2.5m	Hv	None		Retail centre / plaza; transport hub	High	13		Queens avenue
S93	Main / collector	2. Medium	<2.5m	Hv	Signage; awnings	Hard	Retail centre / plaza; transport hub	High	11		Queens avenue
S94	Main / collector	2. Medium	<2.5m	Hv	Signage; awnings	Hard	Retail centre / plaza; transport hub	High	11		Queens avenue
S95	Main / collector	1. Simple	2.5m +	Hv	Signage	Moderate	Retail centre / plaza; transport hub	High	16		Queens avenue
S96	Main / collector	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; transport hub	High	15		Queens avenue
S97	Main / collector	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; transport hub	High	15		Queens avenue
S98	Main / collector	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; transport hub	High	12	Would need to remove decorative pebble paving	Balmoral avenue
S99	Local / residential	3. Complex	2.5m +	None	Signage	Moderate	Retail centre / plaza; transport hub	High	13	Planting in asphalt. No parking area. Could incorporate wsud	Balmoral avenue
D100	Local / residential	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; transport hub	High	12	Create planter in no standing area (chevrons)	Balmoral avenue
S101	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; urban square	High	14	Difficult site. Need to design planters. Narrow formed tree	Balmoral avenue laneway
S102	Laneway	3. Complex	<2.5m	None	Streetlights	Hard	Retail centre / plaza; urban square	High	12	Difficult site. Need to design planters. Narrow formed tree	Balmoral avenue laneway
S103	Main / collector	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; transport hub	High	12	Would need to remove decorative pebble paving	Buckingham avenue
S104	Local / residential	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza	Medium	14		Balmoral avenue
S105	Local / residential	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza	Medium	14		Balmoral avenue
S106	Local / residential	1. Simple	2.5m +	Lv	Signage	Moderate	Retail centre / plaza	Medium	15		St Johns avenue
S107	Local / residential	1. Simple	2.5m +	Lv	Signage	Moderate	Retail centre / plaza	Medium	15		St Johns avenue

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S108	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S109	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S110	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S111	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S112	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S113	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S114	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S115	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S116	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S117	Local / residential	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	Medium	12	Narrow tree planting along existing vacant strip. Soil replacement	Warwick avenue carpark
S118	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; school	Medium	15		Buckingham avenue
S119	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; school	Medium	15		Buckingham avenue

Site no.	Road hierarchy	Site viability	Site width	P/Is	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
S120	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; school	Medium	15		Buckingham avenue
S121	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; school	Medium	15		Buckingham avenue
S122	Local / residential	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; transport hub	High	12	Added on request 18/2/2021. Create planter (cutout) in front of parking bay	Balmoral avenue

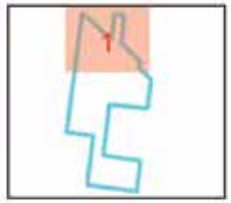


LEGEND

Planting Difficulty
- EASY
- MODERATE
- HARD

Perceived Benefits
- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Springvale Activity Centre

TL REF.	MAP NO.
010884	1 / 5
CLIENT	**DATE**
City of Greater Dandenong	17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
EPSG:28355 | GDA 94 MGA Zone 55

TREELOGIC PTY LTD
ABN: 85 090 025 810
TEL: 1300 055 520
4 / 21 Eugene Tce
Ringwood, VIC
Australia 3134

Treelogic
Plan, manage, protect

LEGEND

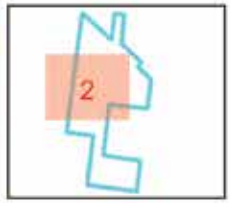
Planting Difficulty

- EASY
- MODERATE
- HARD

Perceived Benefits

- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Springvale Activity Centre

TL REF.
010884

MAP NO.
2 / 5

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
EPSG:28355 | GDA 94 MGA Zone 55

TREELOGIC PTY LTD
ABN: 85 080 025 810
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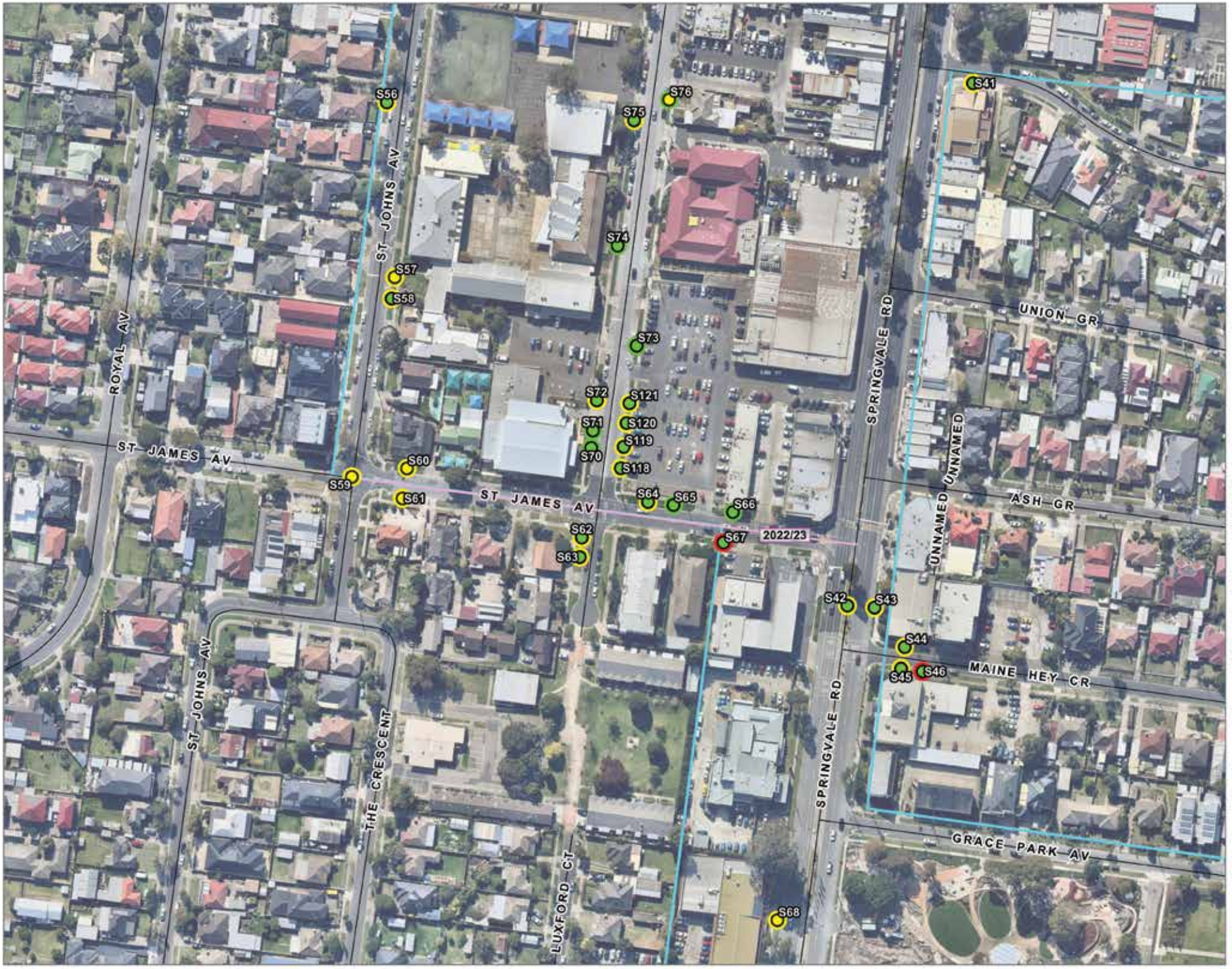
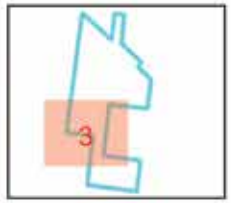


LEGEND

Planting Difficulty
- EASY
- MODERATE
- HARD

Perceived Benefits
- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Springvale Activity Centre

TL REF.
010884

MAP NO.
3 / 5

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
EPSG:28355 | GDA 94 MGA Zone 55

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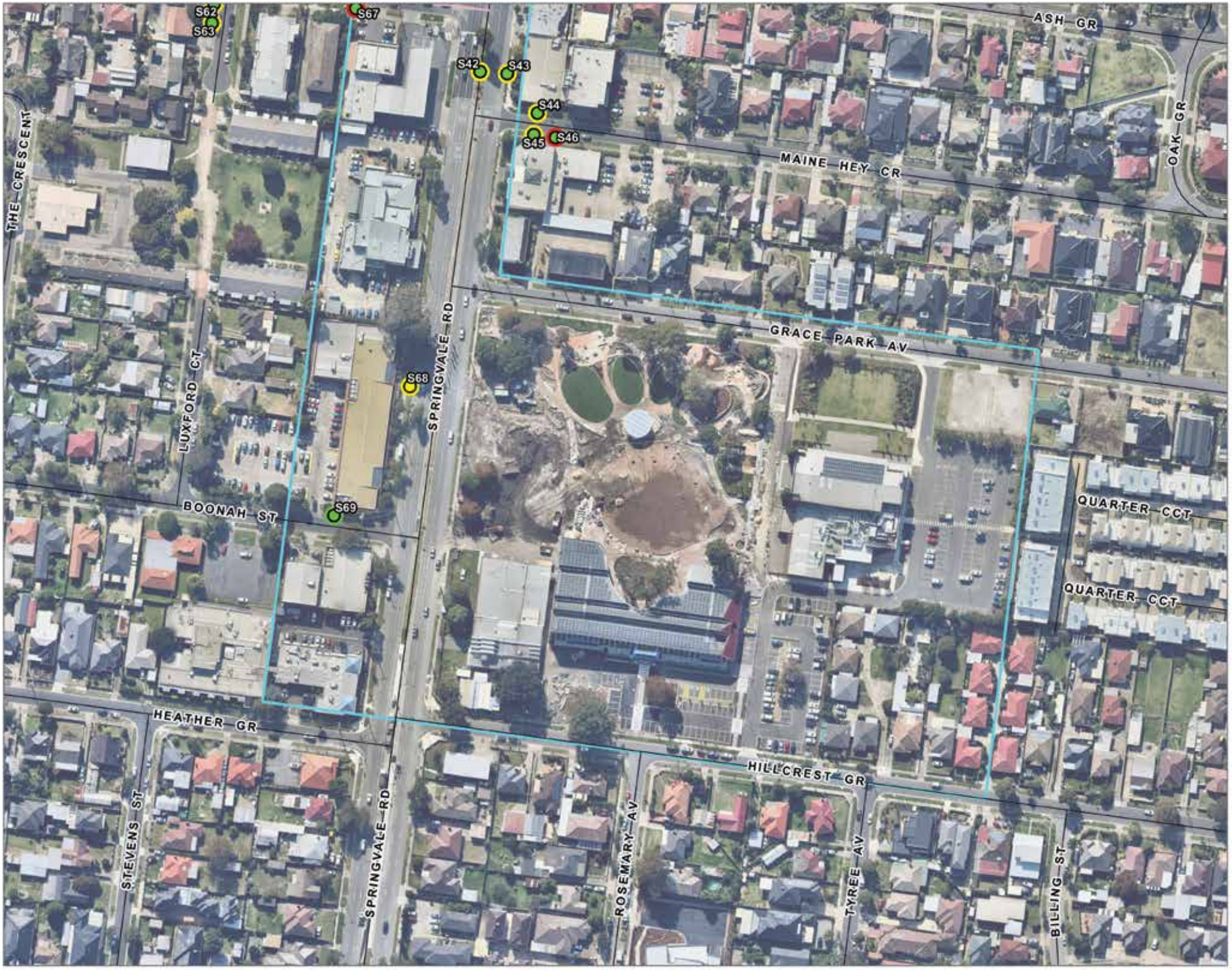

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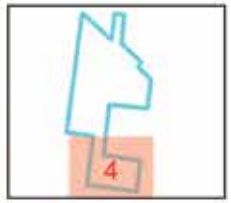

APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Springvale Activity Centre

TL REF.	MAP NO.
010884	4 / 5
CLIENT	**DATE**
City of Greater Dandenong	17-05-2021

DATA SOURCES
Aerial image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
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COORDINATE REFERENCE SYSTEM
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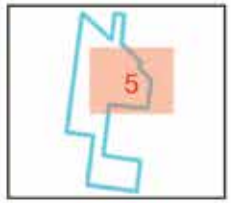

APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Springvale Activity Centre

TL REF.	MAP NO.
010884	5 / 5
CLIENT	**DATE**
City of Greater Dandenong	17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
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Noble Park

Background

Within the City of Greater Dandenong there are three activity centres; Dandenong, Springvale and Noble Park, which are respectively located northwest to southeast along the Cranbourne/Pakenham Railway Line. Dandenong, Springvale and Noble Park are very different centres ranging in scale, role and function. In addition, they have varying characteristics in terms of population demographics and historical influences.

Noble Park is a neighbourhood activity centre with a fine grain village feel, located between Springvale and Dandenong. It is a smaller centre in terms of scale, role and function however it services a large residential catchment covering approximately 31,000 people. Noble Park has a friendly walkable character and is used by local shoppers, commuters and employees. This is reflected in the 194 individual tenancies which are primarily retail and a higher-than-expected number of businesses engaged in evening trading. Recent changes to Noble Park have been enabled through the Level crossings removal project, creating new pedestrian pathways, public space and visual links between Douglas and Ian Streets.

One-hundred and twenty-three (123) vacant and opportunity sites were identified during the assessment. This has the potential to increase the tree population of the Noble Park Activity Centre by 38%.

Other considerations:

Good use of trees and other vegetation in Douglas Street, Noble Park. Crepe Myrtle (Lagerstroemia indica) and other vegetation plantings.

Planting under awnings; Crepe Myrtles in Ian St., Noble Park.

Overview of existing trees

Number of trees; streets, open space

Tree location	Number	Total %
Street	202	62.7%
Park	120	37.3%
Total existing trees	322	

Dominant species (>1% of total trees)

Species	Count	%
Crepe Myrtle *(Lagerstroemia indica)*	52	16.1%
Freeman's Maple *(Acer Xfreemanii)*	35	10.9%
Chinese Elm *(Ulmus parvifolia)*	32	9.9%
River Red Gum *(Eucalyptus camaldulensis)*	24	7.5%
Lemon-scented Gum *(Corymbia citriodora)*	19	5.9%
Callery's Pear *(Pyrus calleryana)*	18	5.6%
Flowering Ash *(Fraxinus ornus)*	14	4.3%
Green Ash *(Fraxinus pennsylvanica)*	14	4.3%
Pin Oak *(Quercus palustris)*	13	4.0%
Yellow Gum *(Eucalyptus leucoxylon)*	11	3.4%
Blackwood *(Acacia melanoxylon)*	7	2.2%
Coastal Banksia *(Banksia integrifolia)*	6	1.9%
Yellow Box *(Eucalyptus melliodora)*	6	1.9%
Black Locust *(Robinia pseudoacacia)*	6	1.9%
Field Maple *(Acer campestre)*	5	1.6%
Prickly-leaved Paperbark *(Melaleuca styphelioides)*	5	1.6%
Magenta Brush Cherry *(Syzygium paniculatum)*	5	1.6%
Wallangarra White Gum *(Eucalyptus scoparia)*	4	1.2%

Canopy coverage

Tree Canopy cover as of 2018 for the Noble Park Activity Centre was 10.5% or 55,302m2 which is considered low for an Activity Centre, though not unreasonable. This is a decrease since 2014, when tree canopy cover was 12.3%. Therefore 1.8% or 9,968m2 of tree canopy was lost from the Noble Park Activity Centre over that four-year period. This was predominantly due to the Level Crossing Removal Project. The map below shows where canopy was lost and gained eg., significant loss on Mons Parade and the Heatherton Road recreation space to accommodate Noble Park Station and line upgrades. Gains were in the residential pocket bordered by Mons Rd, Pau St, and Mills Reserve.

Source: DELWP, Vegetation_Cover_2018, Spatial Datamart, 2020

There is no clear benchmarking around what a "healthy" canopy coverage average is for an activity centre, though ideally it would be above 15-20% for heat mitigation.

The benefits of increased canopy coverage will be determined during subsequent measurements every 2-years (2021, 2024, 2026, 2028).

Heat Island Mapping

Noble Park's entire activity centre is registered as a thermal hotspot. This is to be expected given the highly urbanised and densified nature of the area.

Source: DELWP, Heat_Urban_Heat_2018, Spatial Datamart, 2020.

Social Vulnerability to Heat

The Noble Activity Centre also showed significant social vulnerability to heat. The majority of the centre records the highest heat vulnerability score (as derived by the Department of Environment, Land, Water and Planning mapping).

Scheduled Streetscape Projects

- Douglas Street Streetscape upgrade
- Ian Street Streetscape upgrade
- Leonard Avenue Streetscape upgrade (Douglas to Noble Street)
- Frank Street open space redevelopment
- Noble Street (Frank St to Leonard Ave) Streetscape upgrade
- Laneway upgrades
- Station Precinct enhancements

Figure 19. Images from Noble Park.

Crepe Myrtles and seating in Douglas St.

Bottom left. Planting opportunities in Buckley St, which would require a designed planting response

Planting under awnings in Ian Street. This street is proposed for streetscape enhancement.

Planting opportunities in Buckley Lane

Noble Park Activity Centre 10-year planting plan opportunity sites data

Table of the planting opportunity site data for Noble Park Activity Centre. 123 trees, 121 vacant opportunity sites, 2 sites with existing poor/unsuitable trees. The Total score is a combination of site that factors that are weighted to gain a score to indicate a priority for opportunity planting. The higher the total score, the higher the priority. Details of the method of assessment can be seen in Appendix 1.

Table 5. Opportunity site data for Springvale Activity Centre

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP1	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; school	Medium	15	Small evergreen	Douglas street
NP2	Other (see comments)	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities; transport hub	High	18	Private property. Existing site with grate	Douglas street
NP3	Other (see comments)	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities; transport hub	High	18	Private property. Existing site with grate	Douglas street
NP4	Other (see comments)	1. Simple	<2.5m	None	Signage	Easy	Retail centre / plaza; community facilities; transport hub	High	18	Private property. Existing site with grate	Douglas street
NP5	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	Low	16		Stuart street
NP6	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	Low	16		Stuart street
NP7	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	Low	16		Stuart street
NP8	Main / collector	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Douglas street
NP9	Main / collector	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19		Douglas street
NP10	Other (see comments)	1. Simple	2.5m +	None	Signage	Easy	Retail centre / plaza; transport hub	High	18	Private property. Existing open planter	Douglas street
NP11	Main / collector	1. Simple	<2.5m	Lv	Street lights	Moderate	Retail centre / plaza; transport hub	High	15		Leonard avenue
NP12	Main / collector	2. Medium	<2.5m	Lv	Street lights	Hard	Retail centre / plaza; transport hub	High	11		Leonard avenue
NP13	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; transport hub	High	17		Leonard avenue
NP14	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; transport hub	High	17		Leonard avenue

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP15	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	Medium	14		Leonard avenue
NP16	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	Medium	14		Leonard avenue
NP17	Main / collector	2. Medium	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	Medium	14		Leonard avenue
NP18	Main / collector	3. Complex	2.5m +	None	Signage	Moderate	Retail centre / plaza; transport hub	High	13	Replace carpark with planter	Leonard avenue
NP19	Main / collector	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	High	13	Need to remove concrete footpath	Leonard avenue
NP20	Main / collector	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	High	14	Could incorporate wsud planter	Leonard avenue
NP21	Main / collector	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	High	14	Could incorporate wsud planter	Leonard avenue
NP22	Main / collector	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	High	13	Remove concrete path	Leonard avenue
NP23	Main / collector	2. Medium	<2.5m	None	Signage	Moderate	Retail centre / plaza; transport hub	High	13	Remove concrete path	Leonard avenue
NP24	Main / collector	2. Medium	<2.5m	None	Signage; street lights	Moderate	Retail centre / plaza; transport hub	High	13	Remove concrete path	Leonard avenue
NP25	Laneway	3. Complex	<2.5m	Lv	Signage; street lights	Hard	Retail centre / plaza; transport hub	High	10	Would need to create planter and remark laneway entrance	Buckleys lane
NP26	Local / residential	3. Complex	<2.5m	Lv	Signage	Hard	Retail centre / plaza; aged care / hospital; transport hub	High	11	Need to create kerb outstand	Buckley street
NP27	Other (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	19		Noble street
NP28	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; transport hub	High	17		Noble street
NP29	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; transport hub	High	17		Noble street
NP30	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; transport hub	High	17		Noble street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP30	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; community facilities; transport hub	High	17		Noble street
NP31	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	19		Joy parade
NP32	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	21		Joy parade
NP33	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	21		Joy parade
NP34	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	21		Joy parade
NP35	Local / residential	1. Simple	<2.5m	Lv	Street lights	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	17		Joy parade
NP36	Local / residential	1. Simple	<2.5m	Lv	Street lights	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	15		Joy parade
NP37	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	17		Joy parade
NP38	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	17		Joy parade

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP39	Local / residential	1. Simple	<2.5m	Lv	Street lights	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	Medium	14		Joy parade
NP40	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	18		Frank street
NP41	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	18		Frank street
NP42	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	19		Frank street
NP43	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	19	Narrow site 1.1m	Frank street
NP44	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	18	Narrow site 1.1m	Frank street
NP45	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	18		Frank street
NP46	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	18		Frank street
NP47	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	18		Frank street
NP50	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	18		Frank street
NP51	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	18		Frank street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP52	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	18		Frank street
NP53	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	18		Frank street
NP54	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	High	17	1.5m wide	Noble street
NP55	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	High	17		Noble street
NP56	Local / residential	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	High	17		Noble street
NP57	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; aged care / hospital; transport hub	Medium	17		Noble street
NP58	Other (see comments)	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	Medium	14	Sie in roundabout, needs design development. Narrow-domed species	Noble street
NP59	Local / residential	2. Medium	<2.5m	Multiple	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	14	Need to create planter in footpath	Buckley street
NP60	Local / residential	2. Medium	<2.5m	Multiple	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	14	Need to create planter in footpath	Buckley street
NP61	Local / residential	2. Medium	<2.5m	Multiple	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	14	Need to create planter in footpath	Buckley street
NP62	Local / residential	2. Medium	<2.5m	Multiple	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	14	Need to create planter in footpath	Buckley street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP63	Local / residential	2. Medium	<2.5m	Multiple	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	14	Need to create planter in footpath	Buckley street
NP64	Local / residential	2. Medium	<2.5m	Multiple	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	14	Need to create planter in footpath	Buckley street
NP65	Local / residential	2. Medium	<2.5m	Lv	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	15	Need to create planter in footpath. Move parking sign	Buckley street
NP66	Local / residential	2. Medium	<2.5m	Lv	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	15	Need to create planter in footpath. Move parking sign	Buckley street
NP67	Local / residential	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	16	Kerb outstand	Buckley street
NP68	Local / residential	2. Medium	<2.5m	Lv	Street lights	Hard	Retail centre / plaza; aged care / hospital; community facilities; transport hub	High	13	Need to create planter in footpath	Buckley street
NP69	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	High	14	Underground drains may be a constraint	Buckleys lane
NP70	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	High	14	Underground drains may be a constraint	Buckleys lane
NP71	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	High	14	Underground drains may be a constraint	Buckleys lane
NP72	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; transport hub	High	14	Underground drains may be a constraint	Buckleys lane
NP73	Laneway	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19	Small tree	Buckleys lane
NP74	Laneway	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	High	19	Small tree	Leonard avenue
NP75	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	18	Tree recently removed	Douglas street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP76	Main / collector	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; public open space; transport hub	High	17	1.3m wide nature strip	Mons parade
NP77	Main / collector	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; public open space; transport hub	High	17	1.3m wide nature strip	Mons parade
NP78	Local / residential	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	16		Roberts street
NP79	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	18		Roberts street
NP80	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	18		Roberts street
NP81	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	Low	15		Pau street
NP82	Local / residential	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; transport hub	Low	15		Pau street
NP83	OTHER (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Low	17	In park	Pau street
NP84	Main / collector	1. Simple	2.5m +	Lv	Signage	Moderate	Retail centre / plaza; public open space; transport hub	Medium	15	Childcare centre	Heatherton road
NP85	Main / collector	1. Simple	2.5m +	Lv	Signage	Moderate	Retail centre / plaza; public open space; transport hub	Medium	15		Heatherton road
NP86	Main / collector	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; public open space; transport hub	Medium	14		Heatherton road
NP87	Main / collector	1. Simple	<2.5m	Lv	None	Easy	Retail centre / plaza; public open space; transport hub	Low	14		Heatherton road
NP88	Local / residential	2. Medium	<2.5m	Lv	None	Moderate	Retail centre / plaza; public open space; transport hub	Low	10		Jasper street
NP89	Main / collector	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; public open space; transport hub	High	15		Heatherton road
NP90	Laneway	3. Complex	<2.5m	None	Signage	Hard	Retail centre / plaza; public open space; transport hub	Medium	10	In laneway next to rsl	Heatherton road laneway
NP91	Main / collector	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; public open space; transport hub	High	15		Heatherton road

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP92	Main / collector	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; public open space; transport hub	High	15		Heatherton road
NP93	Main / collector	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Low	17		Heatherton road
NP94	Main / collector	1. Simple	2.5m +	None	Signage	Easy	Retail centre / plaza; public open space; transport hub	Low	15		Heatherton road
NP95	Local / residential	1. Simple	2.5m +	Multiple	None	Easy	Retail centre / plaza; public open space; transport hub	Low	15		Memorial drive
NP96	Local / residential	1. Simple	2.5m +	Multiple	None	Easy	Retail centre / plaza; public open space; transport hub	Low	15		Memorial drive
NP97	Local / residential	1. Simple	2.5m +	Multiple	None	Easy	Retail centre / plaza; public open space; transport hub	Low	15		Memorial drive
NP98	Main / collector	1. Simple	<2.5m	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	17		Heatherton road
NP99	Main / collector	1. Simple	<2.5m	Multiple	Signage	Moderate	Retail centre / plaza; public open space; transport hub	High	16		Heatherton road
NP100	Main / collector	1. Simple	2.5m +	None	Signage; street lights	Easy	Retail centre / plaza; public open space; transport hub	High	19		Douglas street
NP101	OTHER (see comments)	1. Simple	2.5m +	None	None	Easy	Retail centre / plaza; public open space; transport hub	Medium	19	Private site	DOUGLAS STREET
NP102	Laneway	3. Complex	<2.5m	None	None	Moderate	Retail centre / plaza; public open space; transport hub	Medium	12		Heatherton road laneway
NP103	Local / residential	3. Complex	<2.5m	None	Street lights	Hard	Retail centre / plaza; community facilities; public open space; transport hub	High	13	Near entrance to rsl car park	Mons parade
NP104	Local / residential	3. Complex	2.5m +	None	None	Moderate	Retail centre / plaza; community facilities; public open space; transport hub	High	16		Mons parade
NP105	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP106	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street

Site no.	Road hierarchy	Site viability	Site width	P/ls	Shop-front conflicts	Planting difficulty rating	Pedestrian links	Perceived benefits rating	Total score	Comments	Street
NP107	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP108	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP109	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP110	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP111	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP112	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP113	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP114	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP115	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP116	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP117	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP118	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP119	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP120	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP121	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP122	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street
NP123	Main / collector	1. Simple	<2.5m	Multiple	None	Easy	Retail centre / plaza; school; transport hub	Medium	15	Small/medium tree in nature strip	Douglas street

LEGEND

Planting Difficulty
- EASY
- MODERATE
- HARD

Perceived Benefits
- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area

APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Noble Park Activity Centre

TL REF.	MAP NO.
010884	1 / 4
CLIENT	**DATE**
City of Greater Dandenong	17-05-2021

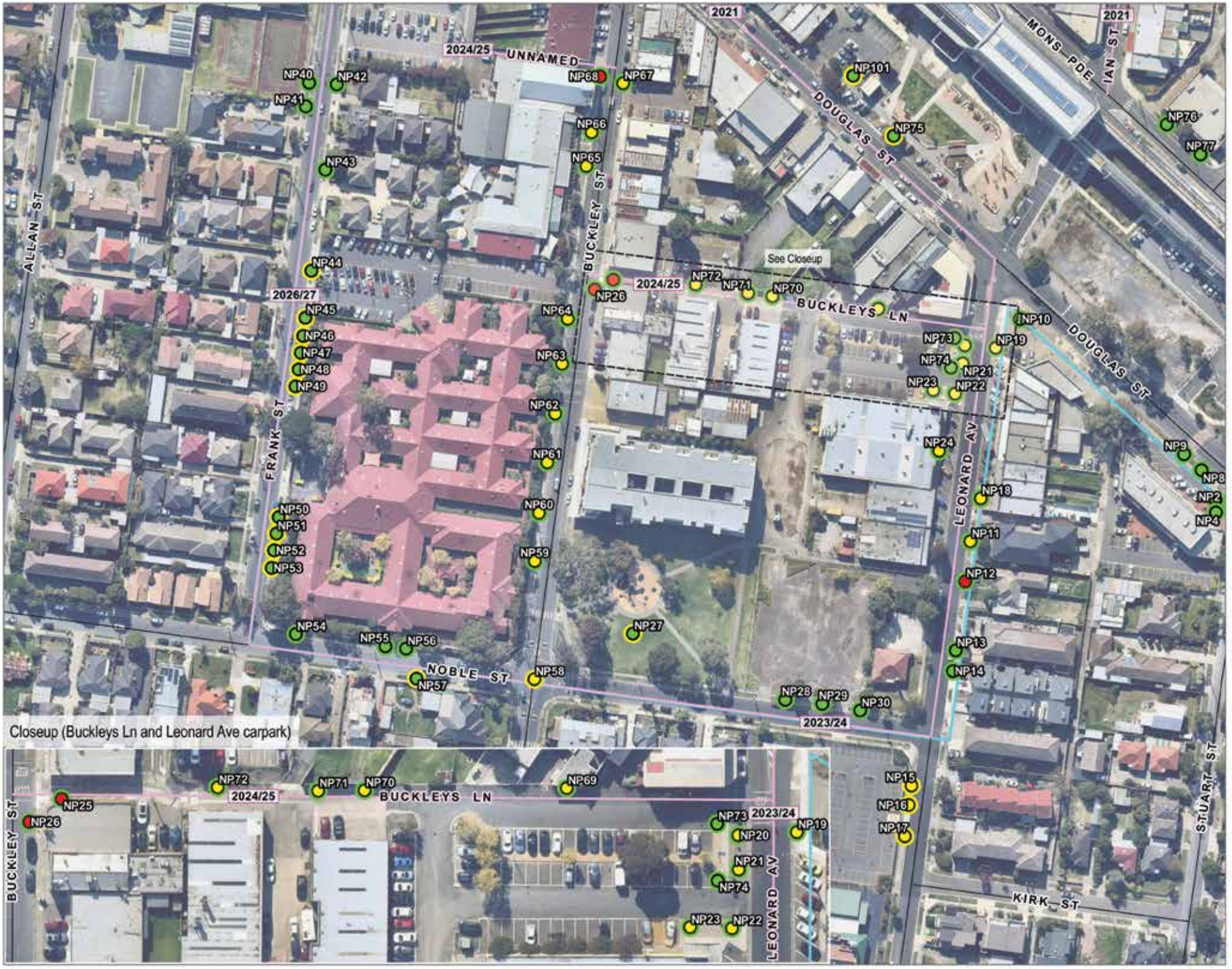
DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
EPSG:28355 | GDA 94 MGA Zone 55

TREELOGIC PTY LTD
ABN: 85 080 025 810
TEL: 1300 055 520
4 / 21 Eugene Tce
Ringwood, VIC
Australia 3134

Treelogic
Plan, manage, protect



LEGEND

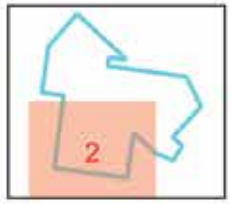
Planting Difficulty

- EASY
- MODERATE
- HARD

Perceived Benefits

- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Noble Park Activity Centre

TL REF.
010884

MAP NO.
2 / 4

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
EPSG:28355 | GDA 94 MGA Zone 55

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4 / 21 Eugene Tce
Ringwood, VIC
Australia 3134

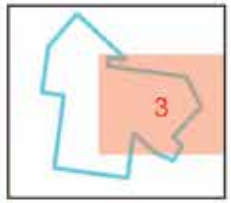
Treelogic
Plan, manage, protect

LEGEND

Planting Difficulty
- EASY
- MODERATE
- HARD

Perceived Benefits
- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Noble Park Activity Centre

TL REF.
010884

MAP NO.
3 / 4

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
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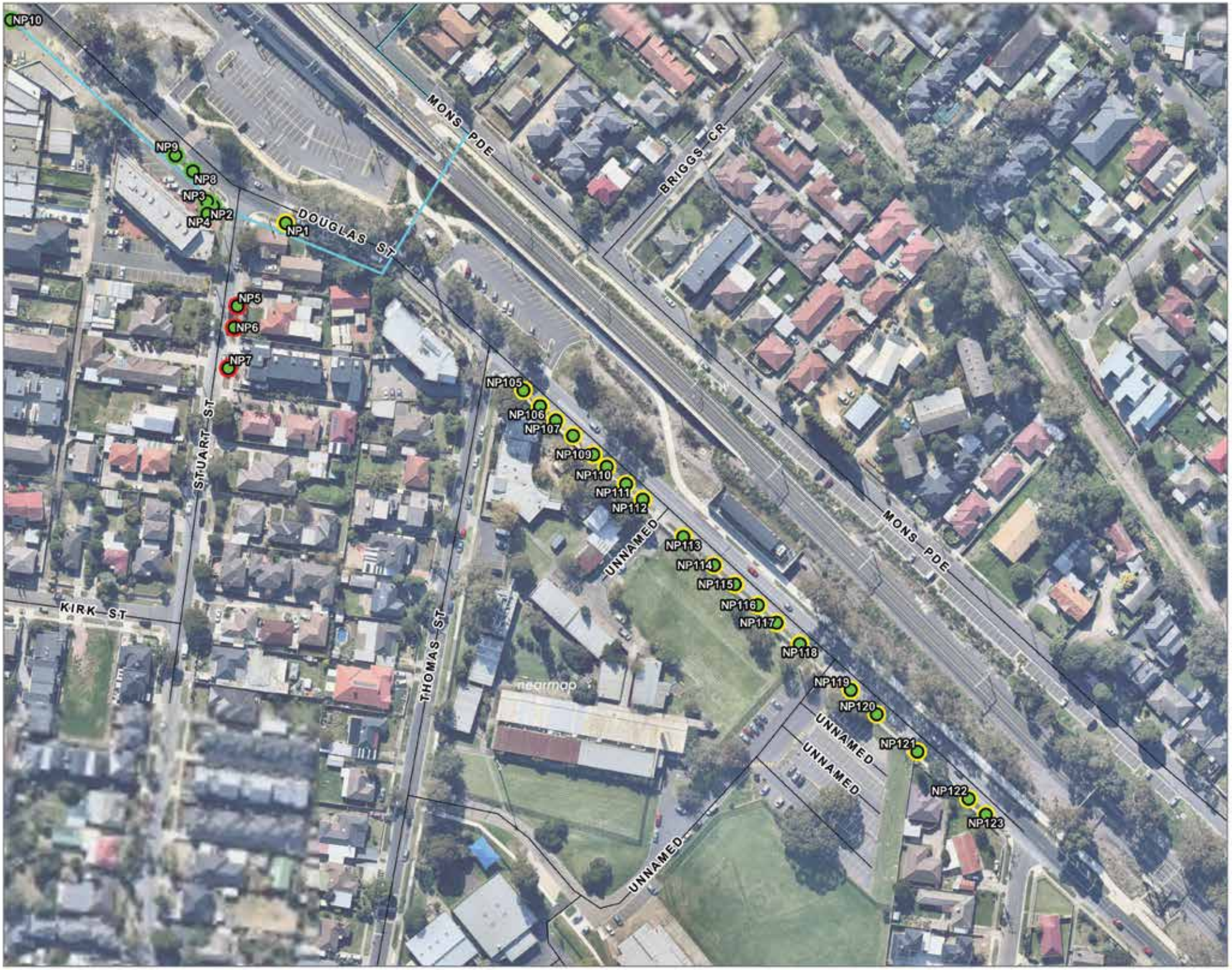


LEGEND

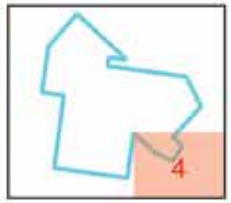
Planting Difficulty

- EASY
- MODERATE
- HARD

Perceived Benefits

- LOW
- MEDIUM
- HIGH

- Future Streetscape Projects (Tree locations not specified)
- CGD roads
- Study Area



APPENDIX 2
PRIORITISED VACANT TREE PLANTING SITES

PROJECT
Noble Park Activity Centre

TL REF.
010884

MAP NO.
4 / 4

CLIENT
City of Greater Dandenong

DATE
17-05-2021

DATA SOURCES
Aerial Image: Nearmap 2020-04-26

TREE LOCATION DISCLAIMER
Tree locations are approximate

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Overview of 10-year planting plan

The details associated with the 10-year planting plan can be seen under each of the three Activity Centre details in Part II, along with the associated maps.

A total of 440 opportunity sites were identified through the assessment of the Activity Centres. If all were to be implemented, this would increase the overall tree population of the Activity Centres by approximately 18% (estimated existing tree numbers within the Activity Centres 2,487).

To assist in determining the priorities for the planting plan, the assessed data was divided into the ease at which you could plant a tree and secondly, the perceived benefits that could be returned from the tree in the nominated location.

Some of the nominated opportunity sites will be more easily planted out than others, with most sites (238, 54%) being easy, i.e., vacant sites in nature strips, vacant tree pits in paved areas and open space areas.

Forty-three (43 or 9.75% of nominated sites) of the nominated opportunity sites would be considered hard, i.e., a new tree site requiring design and engineering input to implement.

See Figure 21 for breakdown of tree planting ease.

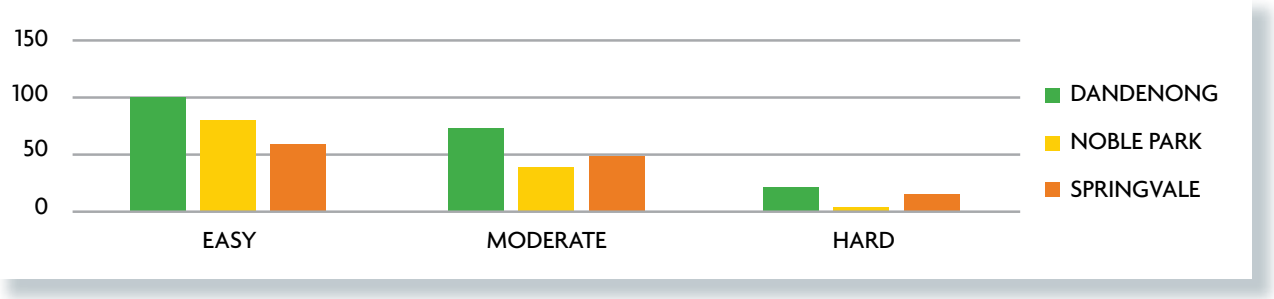

Figure 20. Perceived ease of planting the nominated opportunity sites

Easy – Vacant sites that require little to no modification in order to plant a tree, such as a vacant site in an existing nature strip or tree missing from an existing pavement cut-out.

Moderate – Vacant or opportunity sites that require minor modification to plant a tree, or also removal of an existing which is performing poorly. This could be sites within existing hard paved areas where removal of the pavement is required to create a tree pit. There may also be a requirement for some form of soil amelioration.

Hard - Opportunity sites that require a design and engineered solution. These would be interpreted as new tree sites to be constructed within a road pavement, such as a kerb outstand, a roundabout or within an existing car park.

Perceived benefits

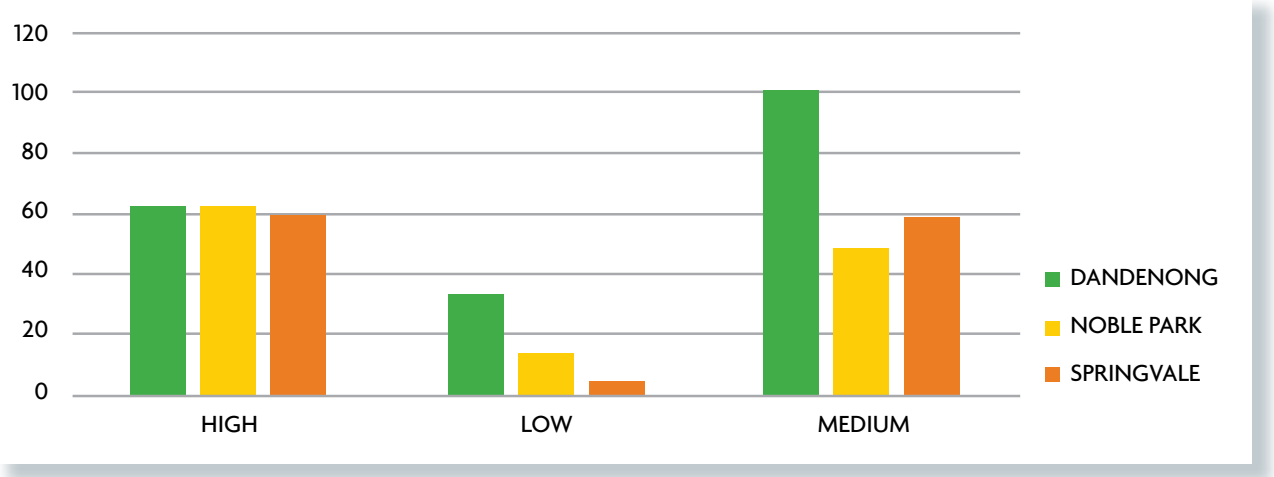

Figure 21. Perceived benefits from planting nominated opportunity sites.

Table 5. Combined ease of planting and perceived benefits

Planting difficulty/benefits	Dandenong	Noble park	Springvale	Total
Easy	**102**	**79**	**57**	**238**
High	27	29	27	83
Low	33	12	3	48
Medium	42	38	27	107
Moderate	**72**	**38**	**49**	**159**
High	24	28	21	73
Low		1	1	2
Medium	48	9	27	84
Hard	**22**	**6**	**15**	**43**
High	11	5	10	26
Medium	11	1	5	17
Grand total	**196**	**123**	**121**	**440**

Costing estimates

The following are estimated costings only but could assist in the development of budgeting for the planting plan. Council should seek costs from internal departments and existing contracts. Note that the costings include an establishment maintenance period of 2-years.

Costs have been developed in 2020 and derived from wholesale nursery lists, contractors and the recently developed 'Tree Costing Tool', (Hort Innovation). See the tool at: horticulture.com.au/growers/help-your-business-grow/research-reports-publications-fact-sheets-and-more/tree-costing-tool-and-instruction-manual/

Planting a tree in a nature strip

Tree planting - 45 litre stock	Cost (Avg.)	Units	Avg. cost
Stock size (45 ltr)	$115.00	1	$115.00
Delivery	$23.00	1	$23.00
Planting ($60-$100)	$80.00	1	$80.00
Establishment maintenance (per visit estimate 25 visits)	$20.00	25	$500.00
		Per tree	**$718.00**

Tree planting - 100 litre stock	Cost (Avg.)	Units	Avg. cost
Stock size (100 ltr)	$220.00	1	$220.00
Delivery	$45.00	1	$45.00
Planting ($130-$180)	$155.00	1	$155.00
Establishment maintenance (per visit estimate 25 visits)	$20.00	25	$500.00
		Per tree	**$920.00**

Planting the nominated 238 easy sites (typically sites in nature strips, existing tree pits and open space areas) would be $170,884.00 for 45 litre stock and $218,960 for 100 litre stock.

Planting a tree in a paved area

Covers the additional cost of cutting and removing the hard pavement. It may require some soil amelioration work. These costs do not include costs associated with reinstating concrete edging if planter is in road pavement. The cost does not include any design or engineering input.

Tree planting - 45 litre stock	Cost (Avg.)	Units	Avg. cost
Stock size (45 ltr)	$115.00	1	$115.00
Delivery	$23.00	1	$23.00
Planting ($60-$100)	$80.00	1	$80.00
Concrete cutting	$725.00	1	$725.00
Imported soil (per m3)	$77.00	2	$154.00
Establishment maintenance (per visit estimate 25 visits)	$20.00	25	$500.00
		Per tree	**$1,597.00**

Tree planting - 100 litre stock	Cost (Avg.)	Units	Avg. cost
Stock size (100 ltr)	$220.00	1	$220.00
Delivery	$45.00	1	$45.00
Planting ($130-$180)	$155.00	1	$155.00
Concrete cutting	$725.00	1	$725.00
Imported soil (per m3)	$77.00	2	$154.00
Establishment maintenance (per visit estimate 25 visits)	$20.00	25	$500.00
		Per tree	**$1,799.00**

Planting a tree in a paved area with permeable pavement

Tree planting - 45 litre stock	Cost (Avg.)	Units	Avg. cost
Stock size (45 ltr)	$115.00	1	$115.00
Delivery	$23.00	1	$23.00
Planting ($60-$100)	$80.00	1	$80.00
Concrete cutting	$725.00	1	$725.00
Imported soil ($/m3)	$77.00	2	$154.00
Permeable pavement Average area est. 4m2 ($/m2)	$175.00	4	$700.00
Establishment maintenance (per visit estimate 25 visits)	$20.00	25	$500.00
		Per tree	**$2,297.00**

Tree planting - 100 litre stock	Cost (Avg.)	Units	Avg. cost
Stock size (100 ltr)	$220.00	1	$220.00
Delivery	$45.00	1	$45.00
Planting ($130-$180)	$155.00	1	$155.00
Concrete cutting	$725.00	1	$725.00
Imported soil ($/m3)	$77.00	2	$154.00
Permeable pavement Average area est. 4m2 ($/m2)	$175.00	4	$700.00
Establishment maintenance (per visit estimate 25 visits)	$20.00	25	$500.00
		Per tree	**$2,499.00**

Street tree selection process

While tree species selection alone cannot make up for a poor design strategy or inadequate underground growing conditions, choosing the right tree for the location is an essential component for success.

Gerhold and Porter (2007) developed a logical five-step process for selecting a species or cultivar of tree. It provides an organised way of dealing with the various types of information needed for making thorough selections.

1. Define the purpose of the tree in the landscape
2. Evaluate existing and predicted site conditions that will affect the selection
3. Consider arboricultural practices that can impact the tree
4. Develop selection criteria based on purpose, site conditions, and managerial impacts
5. Match characteristics of candidate trees to the criteria to identify suitable species and/or cultivars, leading to the final selection.

A thoughtful, thorough analysis in matching species characteristics to selection criteria is more important than the sequence in which the steps are considered. There is also variability of the importance of individual criteria in the selection process (Behrens, 2011).

In this sorting process a long list of candidate species is reduced to a small number that meet important constraints. The number of alternative species from which the final choice can be made will depend on the severity of these constraints.

For tree selection purposes, species-level data should be compiled from a broad range of sources including horticultural texts and journal articles; commercial nursery websites; local and international botanic garden and herbarium websites; Council factsheets and databases; local and international Government department websites; University and research centre websites; Atlas of Living Australia (ALA); Analogous Explorer-Climate Change in Australia, and the Global Biodiversity Information Facility (GBIF) (Burley et. al. 2019). This information should be used in conjunction with the personal experience and knowledge of the horticulturist.

Recommended tree species

The selected species and cultivars will include trees deemed to be appropriate for planting within the Activity Centre's streets considering neighbourhood landscape character, climatic and soil factors, as well as site constraints and mitigating potential for infrastructure impacts. Species consideration will also reflect any current, best practise research.

The species selection list will be based on existing street species, landscape aspirations, adaptability to site and for change and availability of stock.

Tree selection, incorporated with good design and siting of trees, will aim to mitigate impacts on adjacent infrastructure and reduce onerous management requirements.

The list of tree species will never be definitive. Continual development of species and cultivars combined with changing climatic conditions and the urban fabric, requires a dynamic approach to tree selection. Council's arborist will periodically review and investigate new tree species in line with aesthetic, functional, climatic and environmental requirements.

Appendix 2 has a table of tree species that could be considered the 'signature' species that will contribute to the pervading landscape character of the City's Activity Centres. Many of these species are already existing in the City's streets, parks, gardens and reserves. Some are more recent introductions which could enhance the pervading landscape character but also have other characteristics and tolerances that make them suitable for future selections.

Appendix 3 has a table of shrub species that could be considered as understorey or traffic island plantings.

Tree diversity

It is important that a diversity of trees, both in age and species, be maintained across urban areas to promote resilience to climate variability, resistance to pests and diseases, and management of resource allocation (normalising of budgetary requirements). How does one achieve this?

A simple answer is to plant lots of trees. Indeed, plant lots of different kinds of trees. Through a process of elimination, species that are better adapted to the site conditions will come to the fore. However, in cities where there are varied microclimates, a limitation on available spaces for trees and often restricted resources, there is not the luxury of using the process of elimination on a bulk scale.

Species diversity should be related to the diversity of site conditions, predicted climatic changes and functional requirements, rather than to simple numerical standards (Richards, 1993). Diversity targets should be set as high as realistically possible but with the understanding that urban environments are typically difficult, with limitations on the number of species that perform well in those environments. Species that are proven performers should not be replaced by underperforming trees or taxa that have not undergone sufficient scientific scrutiny to establish their suitability for the purpose (Watson, 2018).

Species diversity will generally evolve based on the dynamic nature of tree removal and replacement works. As trees are replaced over time there will be natural changes in species/variety availability, environmental conditions or planting sites and in community expectations.

The following factors will dictate species diversity:

- Existing landscape character
- Proven adaptability/tolerances and suitability of species
- Availability of selected tree species
- Personal and community preferences over time
- Ability to fulfil functional requirements.
- Predicted changes to climate and environmental conditions.

In street tree populations, stability depends primarily on the longevity of individual trees and enough numbers of successfully planted replacements. Species diversity contributes to the stability of a street tree population only to the extent that individual species or cultivars prove successful. Therefore, species diversity must be used cautiously to maintain a population likely to be adapted to the diverse and changing street environments of an area.

Consider planting principles that improve diversity at the local scale, such as:

- Planting a single species on a street but not planting that species in connected streets.
- Planting multiple species of similar form and appearance on a single street.
- Planting a high diversity of species in parks where growing conditions are easier.
- Planting trees with diverse life-expectancies and planting over a long period of time to promote age diversity.
- Planting trees of diverse genetic stock to promote resistance to pests and disease; and,
- Planting a diversity of species in layers (understorey to overstory) to promote vertical structure and biodiversity.

(Diamond Head Consulting Ltd., 2017)

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Appendix 1. Methodology – Planting site assessment criteria

Identify Viable Planting Sites

This assessment will identify and geolocate viable vacant sites. Each site will be categorised as follows and will be identified by different coloured point data on supplied plans:

I. **Easy (Simple):** Vacant sites that require little to no modification in order to plant a tree, such as a vacant site in an existing nature strip or tree missing from an existing pavement cut-out. If applicable in hard surface locations, a comment could be entered to make the existing planting pit in larger.

II. **Moderate:** Vacant or opportunity sites that require minor modification to plant a tree, or also removal of an existing which is performing poorly. This could be sites within existing hard paved areas where removal of the pavement is required to create a tree pit. There may also be a requirement for some form of soil amelioration.

III. **Hard (Complex):** Opportunity sites that require a design and engineered solution. These would be interpreted as new tree sites to be constructed within a road pavement, such as a kerb outstand, a roundabout or within an existing car park, which may also require relinquishing a car parking space.

Where numerous vacant sites within a street are identified or a significant street section requires attention, then this could be highlighted on the plan as a polygon.

Viable Site Prioritisation

These assessment criteria are split between field work and desktop evaluation and seek to prioritise each viable site based on:

- site specific opportunities and physical constraints for tree planting / establishment; and
- community need for increased shade, amenity and reduced urban heat.

Other potential consideration (to be discussed): Identify viable vacant sites on private land (typically front setbacks where the planting could complement the streetscape). Council could negotiate with relevant landowners whether a tree could be planted to enhance the overall character of the activity centre.

Table 1. Assessment criteria to be considered.

Field Assessment	Site-specific opportunities and physical constraints for tree planting / establishment to be collected during site visits and inspections.	
Planting Difficulty factors		
Criteria	**Factors**	**Score**
Site viability	Simple	5
	Medium	1
	Complex	0
Site width	<2.5m	0
	2.5m +	1
Powerlines	None	3
	LV	1
	Multiple	1
Shopfront conflicts	None	2
	Any number of conflicts	0

Perceived Benefits factors		
Criteria	**Factors**	**Score**
Site in street or adjacent to:		
Pedestrian Links	Retail shopping centre / plaza	1 or 0
	Aged care facility, hospital or other medical centre	1 or 0
	Community facilities (post office, library, neighbourhood house supermarket etc.)	1 or 0
	School / kindergarten / childcare centre	1 or 0
	Public open space, park or defined shared user path / trail	1 or 0
	Transport hub (buses, trains, taxi rank etc.)	1 or 0
	Urban square	1 or 0
Criteria	**Threshold**	**Score**
Thermal Hotspot[1]	Within hotspot that is 10 degrees Celsius above baseline	2
	Within hotspot that is 5-10 degrees Celsius above baseline	1
Tree Canopy Cover	Within meshblock that has very low canopy cover of less than 5%	2
	Within meshblock that has low canopy cover of between 5% and 10%	1
	Within meshblock that has above 10% tree canopy cover	0
Heat Vulnerability[2]	Very high heat vulnerability and very low resilience (score of 5 on the HVI)	2
	High heat vulnerability and low resilience (score of 4 on the HVI)	1
Pedestrian Count	Within activity centre boundary	1
	Outside of activity centre boundary	0

[1] All identified tree planting sites were within a thermal hotspot

[2] All identified tree planting sites were within a heat vulnerable area

Planting Difficulty

1-3: Hard (pink)

4-7: Moderate (orange)

8-11: Easy (green)

Perceived Benefits

2-6: Low (mauve)

7-8: Medium (yellow)

9-14: High (blue)

Based on the listed criteria, each site is then given an overall prioritisation score out of 25 (Planting Difficulty factors highest score = 11. Perceived benefit high score = 14), with a score of 25 being the highest priority. The final scores may be modified based on review and feedback during post-processing of data.

Solutions (see Section 3) can then be offered based on site planting complexity and priority score rating.

Data collection form design (*subject to change)

Incorporating the combination of site factors into a data collection form for use in the field. Site point data will be collected overlaid with orthorectified aerial imagery, cadastre, activity centre boundaries and road data.

Table 2. Data collection form

Criteria	Fields						
Site type	Vacant	Existing tree (unsuitable)	Other (see comments)				
Street name	Drop-down list (autofill)						
Suburb	Drop-down list (autofill)						
Road hierarchy	Existing avenue	Main / collector	Local / residential	Laneway	Other (see comments)		
Site viability	Simple	Medium	Complex				
Site width	≤2.5m	2.5m +					
Powerlines	None	Lv	Hv	Multiple			
Shopfront conflicts	None	Signage	Awnings	Streetlights	Borrowed landscape		
Pedestrian links	Retail centre / plaza	Aged care / hospital	Community facilities	School	Public open space	Transport hub	Urban square
Comments							
Site photographs							

Appendix 2 - Tree selections for the Activity Centres

The list of tree species will never be definitive. Continual development of species and cultivars combined with changing climatic conditions and the urban fabric, requires a dynamic approach to tree selection. Council's arborist will periodically review and investigate new tree species in line with aesthetic, functional, climatic and environmental requirements.

The selected taxa include trees deemed to be appropriate for planting within the Activity Centre's streets considering neighbourhood landscape character, existing street species, climatic and soil factors, as well as site constraints and mitigating potential for infrastructure impacts. Species consideration reflects current, best practise research, predicted climate change, and current availability of stock. The selected trees have moderate or higher tolerance of drought and heat.

Tree selection, incorporated with good design and siting of trees, will aim to mitigate impacts on adjacent infrastructure and reduce onerous management requirements while providing maximum environmental benefits.

Table 1 Small trees (Approximately <9m tall)

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Acer campestre 'Elsrijk'	Elsrijk Maple	Cultivated variety	8-10	6-7	Narrow domed. Dense crown	Deciduous. Small dark green leaves, colouring yellow in autumn. Bark grey-black, lightly ridged and furrowed.	Tolerates a wide range of conditions including both alkaline and acid soils, some dryness and soil compaction. Prefers well-drained soils.	Sites where vertical space is limited. Very suitable for narrow streets. Very good urban tolerances and adaptable to paved areas. Car parks, kerb outstands.	Yes
Acer platanoides 'Crimson Sentry'	Crimson Sentry Norway Maple	Cultivated variety	8-10	5-6	Ascending branches, upright oval to broad oval. Dark, dense crown	Deciduous. Leaves are bright purple-burgundy when young, and deep crimson red throughout the summer. In the autumn they change to coppery brown or honey-yellow. The bark is grey.	Adaptable to most free draining soils; clay or sand. Can tolerate temporary inundation but does not tolerate stagnating groundwater.	Form lends itself to more narrow sites, although tree will develop canopy width as it matures. Tolerates partially paved areas (provide suitably sized planter opening).	No
Brachychiton populneus x acerifolius 'Jerilderrie Red'	Cultivated hybrid of B. populneus & acerifolius	Grafted cultivar	6-10	4-8	Pyramidal	Semi-evergreen. Stout trunk and large, glossy lobed leaves. The leaves vary somewhat in size. During the summer months, the tree produces panicles of powdery-red bell-shaped flowers followed by black seed pods.	Adaptable to various well-drained soil types. Low maintenance.	Suitable for many urban situations including commercial landscapes, avenues and streetscapes, car parks.	Yes
Corymbia citriodora 'Scentuous'	Lemon-Scented Gum	Cultivar. A grafted form of the species.	6-8	3-4	Narrow-domed.	Evergreen. Aromatic narrow leaves. Smooth white/pink bark may be slightly mottled. Cream-white flowers.	Tolerates a range of soils and grows rapidly with or without moisture. Prefers a well-drained soil in a full sun position.	Versatile, smaller form of the species. Ideal for streetscapes, car parks, feature plantings. The bark and flowers add colour and native habitat all year round. Tolerates paved areas.	No

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Elaeocarpus reticulatus	Blueberry Ash (could also use the cultivar 'Prima Donna', which has pink flowers)	East coast of Australia. From moist gullies through to rocky ridge outcrops and sandy coastal scrubs.	9-10	3-5	Narrow, pyramidal. Dense canopy.	Evergreen. Masses of white or pinkish fringed flowers. Followed by small blue oval fruits. Leathery dark green leaves with serrated margins. Older leaves turn a bright red whilst still on the tree, providing a colour contrast with the dark green foliage.	Adaptable to a wide range of climatic conditions & soils, including infertile soils and dry sites. Does not tolerate waterlogged soils or infertile sandy soils. Tolerant of paved areas. Tolerant of full sun to heavy shade. Low maintenance.	Specimen planting. Laneways (shaded sites). Hedges or informal rows. Large containers. Branching tends to ground level, although lower branches can be pruned to provide clear trunk.	Yes
Elaeocarpus umundi	Eumundi Quandong or Smooth-leaved Quandong	NSW and Qld. rainforest areas	8-10	3-5	Narrow, columnar to pyramidal. Dense canopy.	Evergreen. Attractive glossy dense foliage and bronze new growth. Cream coloured scented finely fringed flowers form on racemes over summer. Smooth grey bark.	Prefers well-drained fertile, loamy/sandy soils but can adapt to poorer soils. Grows best in a warm climate but can tolerate cooler conditions, including some frost. Full sun to partial shade. Low maintenance.	Street trees, informal screens, shaded sites, laneways. Large containers. Responds well to pruning.	Yes
Hymenosporum flavum	Native Frangipani	Qld., NSW, extending into Papua New Guinea	8-10	3-5	Narrow, upright, pyramidal	Evergreen. Lustrous, dark green leaves are alternately grouped at the ends of the twiggy branchlets. Fragrant, open, tubular flowers are yellow-cream-coloured.	Adapts to a wide range of soil textures and climatic conditions. Tolerant of part shade.	For narrow sites. Can be used in containers (Dandenong). Could be used in laneways.	No
Koelreuteria paniculata 'Fastigiata'	Fastigiate Golden Rain Tree	Cultivated variety	4-8	1-2	Column-shaped, light, open crown	Pinnate, dull green foliage turning yellow-orange in autumn. Yellow flowers in terminal panicles. Grey-brown, slightly grooved bark	Good urban tree due to tolerance to air pollution and ability to withstand drought, heat and alkaline soils. Tolerates a range of soil types but requires well-drained soil.	A good tree particularly where above ground or soil space is limited, due to its narrow crown and adaptive abilities. Recommended for strips around parking lots or for median strip plantings; specimen; footpath cutout (tree pit); street tree, tree has been successfully grown in urban areas where air pollution, poor drainage, compacted soil, and/or drought are common.	No
Lagerstroemia fauriei 'Fantasy'	Fantasy Crepe Myrtle	Cultivated variety	6-9	5-8	Upright Vase becoming oval	Deciduous. Oval leaves, good autumn colour. Ornamental bark. Panicles of white flowers.	Prefers moist soil but will tolerate less hospitable positions in the landscape just as well. Plants defoliate in severe drought, but new foliage typically emerges when rain returns	Street trees, moderate sized Avenues, specimen planting. Suited to sites with limited soil, such as car parks.	Yes

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Lagerstroemia indica x L. fauriei 'Sioux'	Sioux Crepe Myrtle	Cultivated variety	4-5	3-4	Upright Vase becoming rounded	Deciduous. Oval leaves, foliage is the darkest green of any crepe myrtle and turns to a purple colour in autumn. Ornamental bark. Panicles of pink flowers. Long flowering period.	Adapts to a range of soils. Tolerant of paved areas. Transplants easily.	For narrow sites. Can be used in large containers. Street trees, group plantings and car parks.	Yes
Magnolia grandiflora 'Alta'	Alta™ Southern Magnolia	Cultivated variety	8-10	3-5	Fastigiate when young, broadening slightly with age, to become narrowly conical.	Evergreen. Slender more upright form with a dense crown of glossy green leathery foliage, fine red-brown fine hair below. Large fragrant creamy white flowers in summer.	Adaptable to a wide range of conditions. Prefers constant moisture (or soils with good moisture retention) but well-drained and slightly acidic soils.	For narrow sites. Can be used in large containers. Street trees and group plantings. Could also consider using 'Exmouth' which is more upright than other cultivars.	Yes
Parrotia persica	Persian Witchhazel, Persian Ironwood	Northern Iran	8-10	6-8	Rounded to vase shaped canopy with irregular branching	Deciduous. Oval, dark green shiny leaves with wavy margins colouring red, yellow and orange in autumn. The grey bark is smooth, pinkish-brown flaking/ peeling to leave cinnamon, pink, green, and pale-yellow patches.	Prefers a partly acidic soil although it will tolerate most well-drained soil types. Hot northerly winds can cause marginal scorching to the leaves. Not tolerant of paved areas. Will not tolerate wet soil conditions	Street tree, specimen. Used in Thomas St Dandenong (Little Afghan?)	Yes
Pistacia chinensis	Chinese Pistachio	China & Taiwan	6-10	5-8	Rounded to open, can be irregular when young becoming more rounded with age.	Deciduous. Dark rich green pinnate leaves in summer with autumn colour being orange to red and bright crimson with colour lasting quite late into the winter. Dark grey bark. Trees are dioecious; females develop profuse small reddish blue fruits.	Grows in full sun or part shade, with high tolerance of droughts and heat. Tolerant of paved areas. No serious insect or disease problems.	Street tree, specimen planting, car parks. Regarded as an environmental weed in NSW and the ACT.	Yes
Prunus cerasifera 'Oakville Crimson Spire'	Purple Leaf Cherry Plum	Hybrid	5-7	4-6	Narrow, fastigiate upright form with ascending branches.	Deciduous. Reddish-bronze foliage makes for a good landscape contrast. Clusters of white to pale pink flowers in spring. Dark grey bark, slightly fissured.	Will adapt to most well-drained, moist soils. It will flower best when in full sun exposure.	Street tree for narrow sites. Screening. Foliage contrast.	Yes
Pyrus betulaefolia 'Southworth' Dancer™	Southworth Dancer Pear	Cultivated variety	5-8	4-7	Oval to pyramidal shaped	Deciduous. New foliage silver/grey turning shiny pale green with serrated margins. Shades of yellow in autumn. Clusters of white flowers in spring. Grey-brown bark - fissured, scaly.	Will tolerate drought, dry conditions once it is established. Adaptable to a wide range of site conditions including, slightly alkaline soils and air pollution. Able to handle intermittently wet, heavy soils.	Street tree, moderate sized Avenues, car parks, specimen planting.	Yes

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Syzygium australe 'SAN01'	Straight and Narrow™	Cultivated variety	5-8	1-1.5	Narrow, columnar. Dense canopy.	Evergreen. Attractive leaves and white flowers that proceeds to beautiful pink/red fruit. Full sun to part shade.	Adaptable to a range of well-drained soils; sandy loams to clays. Not tolerant of waterlogged soils. Resistance to the psyllid insects. Full sun to moderate shade.	Perfect for constricted planting areas. Narrow garden beds along fence lines, car park boundaries. Narrow sreen or hedge. Laneways	Yes
Tristaniopsis laurina 'DOW10' Luscious®	Kanooka, Water Gum	Qld, NSW, Vic	7-9	3-6	Rounded, dense	Evergreen. Dark green leaves, glossy above, with a distinctive copper coloured new growth. Larger leaves than the species. Clusters of yellow flowers in summer. Bark smooth, mottled, cream, brown.	Adaptable to a wide range of soil conditions from well drained rocky soils to heavy clay loams. It will tolerate frosts and periods of drought, but it is not suited to very dry areas which are exposed to hot dry winds without regular irrigation.	Suited for use in street tree plantings, parks. Needs rigorous establishment maintenance and watering to establish.	Yes

Examples of small trees

Elsrijk Hedge Maple *(Acer campestre 'Elsrijk').*

Scentuous Lemon-scented Gum *(Corymbia citriodora 'Scentuous').*

Eumundi Quandong *(Elaeocarpus umundi).*

Native Frangipani *(Hymenospermum flavum)*

Sioux Crepe Myrtle *(Lagerstroemia indica x L. fauriei 'Sioux')*

Persian Witchhazel *(Parrotica persica).*

Southworth Dancer Pear *(Pyrus betulaefolia 'Southworth' Dancer™').*

Watergum *(Tristaniopsis laurinai).*

Table 2. Medium sized trees (9-15 m in height)

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Acer negundo 'Sensation'	Box Elder variety	Cultivated variety	8-12	7-9	Upright oval form to Broad-domed. Dark, dense crown	Deciduous. Pinnate leaves with red petioles. Reddish-brown tinge to new growth. Autumn colours Turn bright red, orange and yellow in Autumn. Greyish-brown bark with smooth, greenish upper branches. Good form and structure.	Tolerates a wide range of conditions including both alkaline and acid soils, some dryness and soil compaction.	Needs vertical space to develop form. Use in areas where good summer shade and winter sun is required. More open areas.	No
Acer x freemanii Celebration 'Celzam'	Celebration Freeman's maple	Cultivated variety	10-15	6-8	Ascending branches forming compact, dense narrow pyramidal to oval crown	Deciduous. Bright green, lobed foliage turns yellow and red hues in autumn. 'Celzam' does not produce seeds	Very tolerant to any soil, heavy clay to sands, acid to alkaline. Good urban tolerances.	Needs vertical space to develop form. Good for broad avenues, car parks, kerb outstands and public squares. Tolerates paving.	No
Brachychiton populneus	Kurrajong	Inland Vic., NSW, & Qld.	10-12	8-10	Stout small to medium tree Pyramidal to broad form with dense canopy.	Evergreen. Trees are typically stout with variable, glossy-green foliage. Flowers are bell-shaped and whitish in colour with the inner flower tube streaked purple-brown, in summer. Seeds are borne within woody, boat-shaped fruit 1-7 cm long and are surrounded by fine hairs that can cause skin and eye irritation. Dark grey bark.	Adaptable to various well-drained soil types. Low maintenance.	Good street tree. Needs vertical space. Car parks, kerb outstands.	Yes, with pruning
Celtis australis	European Nettle Tree	Southern Europe, North Africa, and Asia Minor	10-15	6-8	Broad-domed, with gracefully hanging branches Dense canopy.	Deciduous. A medium deciduous tree with smooth grey bark. Alternating leaves are narrow and sharp-toothed on margins. Dark green and rough above, pubescent, grey-green below. Foliage turns yellow in autumn. Small, green flowers, either singly or in small clusters followed by a small, dark-purple berry-like drupe.	Adapts to most soils. Prefers light well-drained, sandy, and loamy soils, including those nutritionally poor; it can tolerate drought but not shade.	Suitable for many urban situations including commercial and industrial landscapes, avenues, and car parks. Tolerant of paved areas.	No

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Corymbia maculata ' ST1' Lowanna	Spotted Gum	Cultivar. selection from Sale in Victoria	7-10	5-7	Narrow-domed	Evergreen. A smaller, denser version of Spotted Gum. Cream/grey smooth trunk. Dark green foliage that forms a dense canopy. Clustered small white flowers.	Adaptable to a wide range of climatic conditions & soils, including infertile soils and dry sites. Tolerant of paved areas.	Due to its compact form, it may be more appropriate to urban landscapes than the species. Avenues, specimen trees, traffic islands, car parks.	No
Ginkgo biloba 'Princeton Sentry'	Upright Maidenhair Tree	Variety	12-15	5-6	Fastigiate with ascending branches that broadens with age	Deciduous. Slow-growing, particularly when young. Fan-shaped leaves and flower buds are on short shoots. The leaves grow in bundles of 3-5 and have an incised top. The autumn colour is golden yellow. Male selection so does not develop fruit.	Adaptable to a broad range of soil types except permanently wet. Can tolerate compaction and extremes in pH. Tolerates paving. Transplants easily.	Avenues and broad streets, squares, tree containers, commercial and industrial areas, car parks. Tolerates paving and confined soil spaces. Casts light shade due to the narrow crown.	No
Gleditsia triacanthos var. inermis 'Sunburst'	Golden Honey Locust	Garden origin. Ohio, USA	9-11	7-9	Vase-shaped to rounded with weeping branchlets	Deciduous tree with open, spreading crown, distinctive horizontal, zigzag branches. Thornless. Leaves golden on new growth changing to bright green over summer. Seedless.	Adapts to a wide range of conditions & soil. Prefers rich, moist soil. Defoliates easily in response to temperature changes and drought.	Avenues and broad streets, squares. Used in Buckingham Ave, Springvale	No
Melia azedarach 'Elite'	White Cedar	Cultivated variety	6-10	5-8	Broad to Rounded	Deciduous. Dark grey-brown bark, becoming fissured with age. Deep green glossy foliage turning yellow in autumn. Reputed to have very low numbers of flowers or fruit, unlike the common seedling grown Melia	Tolerates a wide range of soils from clays to sandy loams. Tolerant of paved areas.	Street trees, avenues, car parks. Tolerates pruning to shape.	Yes
Pyrus calleryana 'Chanticleer'	Chanticleer Callery Pear	Hybrid	12-15	6-8	Upright, conical to pyramidal. Dense canopy	Deciduous. Glossy, dark-green foliage turning scarlet to vivid red before falling in autumn. Mass of white flowers in spring.	Adaptable to a wide range of soil conditions including heavy clays. Generally tolerant of urban conditions. Tolerant of paved areas. Tolerant of pollution. Noted for its resistance to fireblight. Mature specimens cab be susceptible to limb breakage or splitting from strong wind but has better structure than other ornamental Pear varieties.	Street tree, moderate sized Avenues, car parks, specimen planting. Good for narrow sites.	No

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Quercus palustris 'Pringreen'	Green Pillar Pin Oak	Cultivated variety	12-15	2-4	Narrow upright columnar	Deciduous. Furrowed grey bark. Dark green lobed foliage which turns red in autumn and drops quickly. Stout acorns with a shallow, saucer-like cap.	Readily transplants. Tolerant of wet soils and heavy clay soils. Prefers moist, acid, well-drained, fertile soils. But has good urban tolerances and is regularly used as a street tree. Intolerant of high pH soil causing chlorosis.	Narrow sites where vertical space allows. Street tree. Traffic islands. Car parks.	No
Quercus x bimundorum 'Crimschmidt' Crimson Spire™	Crimson Spire Oak	Cultivar; originated as a hybrid of Q. robur and Q. alba.	10-15	4-6	Columnar, fastigiate, Dense canopy	Deciduous. Dark green round-lobed leaves stay fresh & bright through the heat of summer, turning rusty red to bright red in mid to late autumn. White oak parentage provides dark green foliage & reddish autumn colour. Bark is dark brown & furrowed.	Adaptable to a wide range of soils, climates and growing conditions. More tolerant of wet sites than its white oak parent. This fast growing, cold hardy, drought tolerant and disease resistant tree adapts to varied soils and tough urban growing conditions.	Columnar form is a perfect fit for narrow or confined spaces. Planted alone, in groves, or in rows, it's the perfect vertical design element. Street tree, car park, specimen.	No
Ulmus minor x parvifolia 'Frontier'	Frontier Elm	A cultivated hybrid between Ulmus minor (Smooth leaf Elm) and U. parvifolia (Chinese Elm).	10-12	5-10	Vase or pyramidal shape with ascending branches.	Deciduous. Alternate leaves with toothed edges; glossy dark green reportedly turning to red-burgundy in autumn, which is unusual for elms. Seldom flowers and fruits. Bark is relatively smooth, grey-green in colour and marked with orange lenticels.	Performs best in well-drained, moist soils. However, it is very adaptable to a range of soil types including poorly drained (The Morton Arboretum, 2018) and paved areas. Tolerant of alkaline soils. Very tolerant of urban conditions.	Avenues, specimen trees. Car parks. Good resistance to Dutch elm disease (DED) and moderate resistance to elm leaf beetle.	Yes, with pruning
Ulmus parvifolia 'Emer II' Allee	Allee Chinese Elm	Cultivated variety	12-15	8-12	Vase-shaped, ascending branches	Deciduous. Leaves alternate, simple, elliptical, with serrated margins and medium glossy green, autumn colour yellow-orange to rust red. Bark is a mosaic of orange, tan and grey.	Good urban tolerances. Prefers rich, moist loams but adapts to most soil types, including poor soils, heavy clays, and limited soil volume. Tolerates both wet and dry sites. Tolerant of light shade. Adaptable to paved areas.	Highly attractive tree that has very good urban tolerances. Its dense root system with many fine roots makes it very efficient even in landscape sites with poor soils and limited soil volume.	No
Ulmus parvifolia 'Inspire'	Inspire Chinese Elm	Cultivated variety	10-12	4-8	Narrower form with ascending branches	Small, glossy green, serrated leaves turning yellow gold in autumn. Peeling bark in plates, revealing tones of yellow, grey & green.	Good urban tolerances. Prefers rich, moist loams but adapts to most soil types, including poor soils, heavy clays, and limited soil volume. Tolerates both wet and dry sites. Tolerant of light shade. Adaptable to paved areas.	This upright, smaller form of Chinese Elm is ideal for compact spaces where vertical space is restricted.	No

Examples of medium sized trees

Acer negundo 'Sensation'

Kurrajong
(Brachychiton populneus)

Celtis australis

White Cedar *(Melia azedarach)*

Firewheel Tree
(Stenocarpus sinuatus)

Pyrus calleryana 'Chanticleer'

Table 3. Large trees › 15m in height

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Acer platanoides 'Columnare'	Norway Maple var.	Cultivated variety	15-20	4-5	Ascending, upright branching; columnar. Dark, dense crown	Deciduous. Lobed green foliage; red-brown when young and turns golden in autumn. Dark grey bark. Develops seeds.	Very tolerant to any soil. Can tolerate temporary inundation but does not tolerate stagnating groundwater. Good urban tolerances and can adapt to paved areas.	The columnar crown makes this tree very suitable for narrow streets and avenues. Tolerates partially paved areas (provide suitably sized planter opening).	No
Angophora costata	Smooth-Barked Apple	Qld, NSW	18-20	13-15	Broad-domed, wide spreading crown.	Evergreen. Dense crown of dark green foliage. Smooth rusty-red bark. White flowers.	Moderate tolerance of drought. Low tolerance of waterlogged conditions.	Needs vertical space to develop form. Broad avenues, specimen trees, public squares. Can be pruned successfully from under LV electric lines. Has brittle timber and large, old specimens can shed limbs.	Yes, with pruning
Corymbia maculata	Spotted Gum	S/E Qld & coastal NSW	18-20	12-15	Narrow to broad-domed. Dense canopy.	Evergreen. Dense crown of glossy dark-green leaves. Smooth mottled grey trunk.	Adaptable to a wide range of climatic conditions & soils. Tolerant of paved areas.	Avenues, specimen trees, traffic islands, car parks.	No
Fraxinus pennsylvanica 'Cimmaron'	Cimmaron Green Ash	Cultivated variety	15-20	8-10	Oval to narrow-domed. Dense canopy	Deciduous. The dark green leaf has a striking stone-red to orange autumn colouring. Does not produce seed. Attractive dark grey bark.	Transplants easily. Adaptable to a wide range of climatic conditions & soils, including dry and wet sites. Tolerant of paved areas.	Avenues, car parks, traffic islands. Needs space to develop form. Good shade tree.	No
Phoenix canariensis	Canary Island Date Palm	Canary Islands, Spain.	10-15	5-8	Palm	Evergreen. Solitary palm. Large deep green fronds. Thick trunk with persistent frond bases. Fruit is orange berry (male palms are preferred to avoid fruit production in urban landscapes)	CIDP is adapted to more habitats and soils than almost any other palm. It has relative tolerance to cold. It can tolerate a wide range of exposures, including deep shade, and a wide range of soil types, including sand and heavy clay. It has a unique ability to tolerate both severe drought and flooding very well, which makes them ideal to plant in housing tracts in which the soil was heavily compacted.	Street tree, specimen planting, car parks. (Male specimens should be sought).	No

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses	Use under P/Ls
Platanus x acerifolia	London Plane Tree	Hybrid	20-25	15-20	Horizontal branching and a rounded habit	Deciduous tree with 3-5 lobed medium to dark green leaves turn yellow-brown in autumn. Spherical fruit clusters in 2. The main ornamental feature of this tree is its brown bark which exfoliates in irregular pieces to reveal creamy white inner bark.	Will grow in a range of moist, well-drained soils in full sun. Prefers rich, humus, consistently moist soils. Tolerates light shade. Generally tolerant of most urban pollutants. Tolerant of paved areas and compacted soils. Hot northerly winds can desiccate foliage.	Needs large space to develop full canopy. Street tree, avenues, specimen planting. Fine hairs on new growth & in fruit can cause allergic and respiratory reactions. Susceptible to anthracnose.	No
Quercus palustris	Pin Oak	Eastern USA	20-25	10-15	Pyramidal, typically with central leader. Oval pyramidal with age.	Deciduous tree with 5-7 lobed glossy dark green leaves. Foliage turns red to russet bronze in autumn, dead foliage can persist on trees over winter. Bark greyish-brown, smooth with narrow ridges. Fast growth rate for an oak.	Readily transplants. Tolerant of wet soils and heavy clay soils. Prefers moist, acid, well-drained, fertile soils. But has good urban tolerances and is regularly used as a street tree. Intolerant of high pH soil causing chlorosis.	Street tree for large sites. Specimen planting. Integral component of Lonsdale Street Boulevard.	No
Syzygium floribundum (syn. Waterhousea floribunda)	Weeping Lilly Pilly	Qld, NSW	15-20	8-15	Rounded to broad form with pendulous branchlets. Dense canopy	Evergreen. Glossy, undulate foliage with a long tip. new growth can have orange, red and copper tones. An occasional senescent red leaf may be seen. Cream-white flowers, profuse	Prefers moist, well drained soils. Will adapt to a wide range of soils. Tolerant of paved areas. Tolerant of part to full shade.	Street tree, car park, specimen. Suitable for shaded areas, such as laneways and streets between taller buildings. Could consider using the cultivar 'Green Avenue', which has pendulous branchlets.	No
Taxodium distichum	Bald cypress	South and South-east America	15-20	6-12	Conical while young widening to pyramidal	Reddish-brown to grey-brown, fissured, fibrous bark. Trunk can be strongly buttressed (more so in wet soils). Deciduous. Soft, feathery, fine-textured, needle-like bright, light green foliage (5-6 mm long, flat needles in two ranks) changing to a rusty orange in late autumn then brown before falling. Globular (25 mm spherical) shaped purplish-green cones mature to brown.	Extraordinarily adaptable tree that tolerates a wide range of soil and climatic conditions. Adapted to drier, urban soils. Adaptable to any soil other than high pH (high alkaline). The bald cypress grows in full sunlight to partial shade. It can tolerate atmospheric pollution. Tolerant of paved areas.	Specimen tree. Large avenues. A particularly resilient, reliable, and adaptable tree that still has high aesthetic qualities.	No

Examples of large sized trees

Smooth-barked Apple *(Angophora costata)*

Spotted Gum *(Corymbia maculata)*

Pin Oak *(Quercus palustris)*

Bald Cypress *(Taxodium distichum)*

Weeping Lilly Pilly *(Syzygium loribundum)*

Appendix 3 – Shrub and under storey planting selections for the Activity Centres

Trees may not be able to be planted in every situation within the Activity Centres. Open garden beds planted with shrubs, perennials and strap leaf plants also have a role in increasing biodiversity and ameliorating the effects of the UHI. The establishment of understorey vegetation is an important step in the reinstatement of a healthy ecosystem. Plants have been chosen for their adaptability to urban landscape with moderate or higher tolerances to drought and heat.

Table Recommended shrubs, perennials and strap leaf plants for Activity Centres

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses
Aloe hybrid 'ANDsea'	Sea Urchin™ Aloe	Exotic. Cultivated variety	0.3 (0.5 flower spikes)	0.3	Clumping succulent	Contemporary, architectural and clean blue/green foliage, with prolific spikes of orange flowers in winter and spring	Full sun to part shade. Most well-drained soil types, but if in clay soils, try to improve drainage or use in a raised garden beds. Frost, heat and drought tolerant. Low maintenance.	More compact, tight and dense form of Aloe. Mass planting, specimens, hot and dry urban landscapes. Containers.
Aloe hybrid 'AL02'	Mighty Gold™ Aloe.	Exotic. Cultivated variety	0.25 (0.5 flower spikes)	0.3	Clumping succulent	Gold flowers in cooler months. White/silver spotted green leaves.	Full sun to part shade. Most well-drained soil types, but if in clay soils, try to improve drainage or use in a raised garden beds. Frost, heat and drought tolerant. Low maintenance.	Mass planting, specimens, hot and dry urban landscapes. Containers.
Callistemon viminalis 'Wee Johnnie'	Wee Johnnie Weeping Bottlebrush	Australian native. Cultivated variety	0.5 -1	0.5 -1.5	Rounded small shrub. it is compact and smaller in habit than other varieties	Attractive grey foliage and mass of bottlebrush red flowers from middle to late spring;	Grows well in both dappled shade and full sun. It is adaptable to most well drained soils. Once established it will tolerate short periods of dry.	Excellent for rockeries, hedges and borders. Mass plantings.
Carpobrotus glaucescens 'CAR10'	Aussie Rambler™ Carpobrotus. Giant native pig face	Australian native. Cultivated variety	0.2	2	Prostrate spreading succulent	Green succulent with dark green leaves with purple stems and large deep pink showy flowers in spring and autumn.	Full sun to light shade. Suits most soil types. Tolerates frost, drought, humidity and salt. Avoid waterlogged soils.	Ground cover, low mass plantings
Gazania hybrid 'GT20'	Double Gold™ Gazania	Exotic. Cultivated variety	0.2	0.6-1.0	Spreading ground cover	Golden yellow large double daisy flowers massed on silver-grey compact foliage. Sterile	Very drought, cold and humidity tolerant. Full sun to partial shade. Adapts to all soil types from sandy to heavy clay soil. Little to no maintenance required. Does not seed.	Extremely adaptable ground cover, ideal for control (suppression) of weeds. Double Gold™ is a sterile Gazania that doesn't spread from seed
Liriope muscari 'LIRJ'	Just Right® Liriope	Exotic. Cultivated variety	0.5	0.5	Clumping, arching, strap leaf. Compact	Glossy slender dark green strappy leaves. Spikes of purple flowers.	Full sun, light to heavy shade. Tolerates heat and frost. Adaptable to most soils; sandy to clay soils. Little to no maintenance required. Rarely seeds.	Mass plantings, specimen plants, along paths and fences.
Lomandra confertifolia ssp. rubiginosa 'Mist'	Mist Mat Rush	Australian native. Cultivated variety	0.3-0.5	0.3-0.5	Tufted grass	Dark blue-grey leaves that weep gracefully back to the ground. small yellow flower spikes emerge from reddish-brown buds.	Grows in full sun to part shade and is adaptable to most well drained soils. Little to no maintenance required.	Mist can be used to create borders, as a specimen plant or in groups or for understorey planting. Excellent to use for contrast low level plantings where height restrictions are required in urban streetscapes.

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses
Lomandra longifolia x confertifolia ssp. pallida 'Lime Tuff'	Lomandra Lime Tuff	Australian native. Cultivated variety	0.3-0.5	0.3-0.5	Compact grass	Bright, light green to lime foliage is upright and remains neat all year round.	Can tolerate partial shade and dry conditions. Adaptable to most well drained soils. Not tolerant of waterlogged sites. Little to no maintenance required.	Good for understorey planting. One of the most adaptable Lomandra for urban landscapes available.
Nandina domestica 'Aka'	Blush™ Nandina. Variety of Sacred Bamboo	Exotic. Cultivated variety	0.6-0.7	0.6-0.7	Compact, small shrub	Rich burgundy, maroon new foliage in spring and autumn, brightening to red all over as the leaves mature.	Very drought, cold and humidity tolerant. Full sun to partial shade. Adapts to all soil types from sandy to heavy clay soil. Foliage may develop chlorosis in alkaline soils. Little to no maintenance required. Does not seed.	Mixed borders or groupings. Low hedge. Mass plantings. Foliage colour provides winter interest.
Nandina domestica 'Murasaki'	Flirt™ Nandina. Variety of Sacred Bamboo	Exotic. Cultivated variety	0.3-0.4	0.4-0.5	Small shrub, low growing, spreading habit	Characterized by its tight, dense mounding plant habit. The cultivar name 'MURASKI' means purple in Japanese due to the colour of new growth.	Very drought, cold and humidity tolerant. Full sun to moderate shade. Adapts to all soil types from sandy to heavy clay soil. Little to no maintenance required. Does not seed.	Ground cover, low hedge, understorey and mass plantings
Rhagodia spinescens 'SAB01'	Aussie Flat Bush™ Salt Bush	Australian native. Cultivated variety	0.3-0.5	1	Small shrub, low growing, spreading habit	Compact form with silver-grey foliage. Rarely flowers.	Very drought tolerant. Full sun to light shade. Adapts to all soil types from sandy to heavy clay soil. Little to no maintenance required. Does not seed.	Ground cover, mass plantings
Rhaphiolepis indica 'RAPH01'	Cosmic White™ Rhaphiolepis	Exotic. Cultivated variety	1.5-2.0	1.5	Medium shrub	Masses of larger white flowers when compared the species. It flowers heavily in spring with spot flowering the rest of the year.	Very drought, cold and humidity tolerant. Full sun to partial shade. Adapts to all soil types from sandy to heavy clay soil. Little to no maintenance required. Rarely produces seed.	Extremely adaptable plant that can handle difficult urban sites. Low maintenance evergreen shrub ideal for low dense hedging, containers and mass plantings. Contrasts well with Cosmic Pink.
Rhaphiolepis indica 'RAPH02'	Cosmic Pink™ Rhaphiolepis	Exotic. Cultivated variety	0.5-0.8	0.5-0.8	Small to medium compact shrub	Elliptic to lance-shaped, leathery, glossy, dark green leaves, olive-green beneath, and loose panicles of fragrant, pink flowers from mid-spring to early summer. Mounding habit has larger pink flowers than the species.	Very drought, cold and humidity tolerant. Full sun to partial shade. Adapts to all soil types from sandy to heavy clay soil. Little to no maintenance required. Does not seed.	Extremely adaptable plant that can handle difficult urban sites. Low maintenance evergreen shrub ideal for low dense hedging, containers and mass plantings.
Scaevola humilis 'PFS100'	Purple Fusion™ Scaevola	Australian native. Cultivated variety	0.2	1.5	Perennial herb. Spreading ground cover	Small fan shaped purple flowers in spikes to 15 cm long: bracts leaf-like but smaller from Spring to Summer. Dense mat-like cover of deep green foliage. Lovely fan-shaped	Adapts to most soil types. Sun to light shade. Tolerates drought and frost	More drought and heat tolerant than Scaevola aemula. Does not mound, a truer ground cover. Mass plantings

Botanical name	Common name	Origin	Height (m)	Width (m)	Form (crown shape)	Characteristics	Cultural requirements	Uses
Westringia fruticosa 'WES04'	Grey Box™ Westringia	Australian native. Cultivated variety	0.3-0.45	0.3-0.45	Compact small shrub with a naturally rounded habit	Attractive linear pale glaucous grey-green leaves and white flowers from September to May.	Full sun to part shade. Suited to most soil types including sandy and heavy clay soils. Can be left to grow naturally or given a light prune once or twice a year to shape and encourage more dense growth	Hedges, mass plantings, specimen. Containers
Westringia glabra 'Deep Purple'	Coastal Rosemary	Australian native. Cultivated variety	0.8-1.0	0.8-1.0	Compact small to medium shrub	Glossy green foliage and bright purple flowers that appear year-round	Full sun to part shade, clay, loam and well-drained soil types. Can be left to grow naturally or given a light prune once or twice a year to shape and encourage more dense growth.	Hedges, mass plantings, specimen. Containers