Hepburn

SHIRE COUNCIL

Street Tree Planting Plan

2021/2022

Contents

Table 1: Table of Revisions

Rev No.	Report Date	Description	Author	Internal Review Date	Reviewed by
2.0	01.10.2020	Amended based on Council feedback	CB	-	-
1.0	15.10.2020	Draft submission to Council for review	CB	14.10.2020	MNB
0	Prepared by Homewood Consulting Unit 10, 350 Settlement Road Thomastown VIC 3074 Ph: 1300 404 558 Prepared For Sean Ludeke Coordinator Parks and Open Spaces PO Box 21 Daylesford, VIC 3460				

1. Introduction

Homewood Consulting has been engaged to develop a five-year street tree planting plan for Hepburn Shire Council.

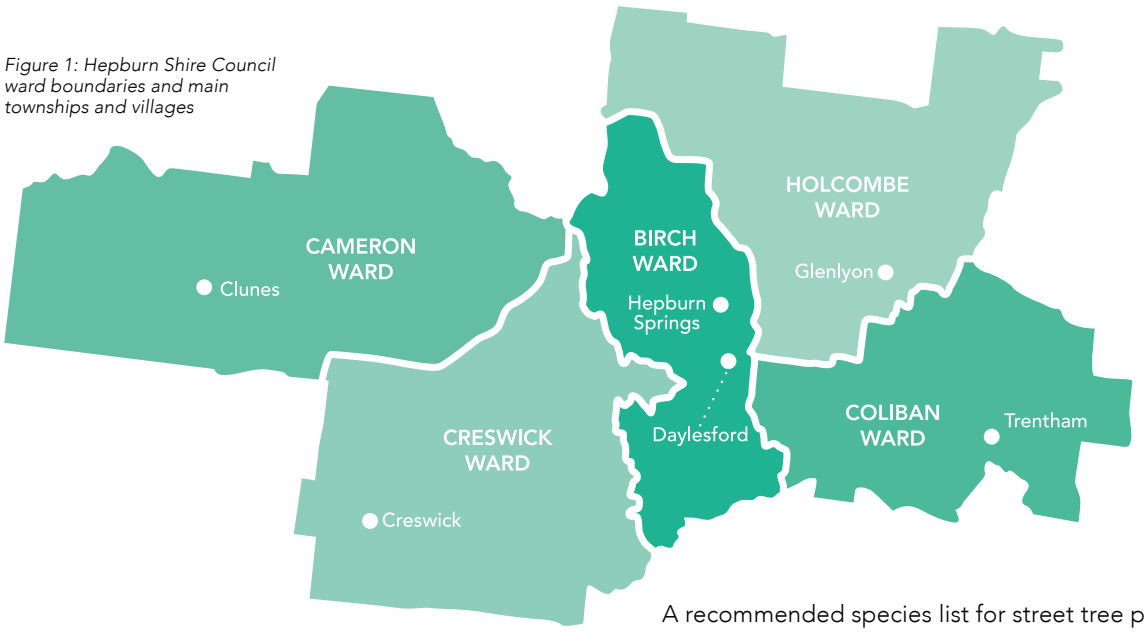
A popular tourist destination, Hepburn Shire is known as the 'Spa Capital of Australia', attracting over 70,000 visitors a year. Hepburn's landscapes are enhanced through its parks, reserves, tree lined avenues, and native and planted exotic forests. In addition, mature exotic specimen trees and remnant native trees add to the character of the Shire.

Many of Hepburn's parks and reserves have a clear delineation between historical European landscapes and indigenous landscapes, such as Hepburn Springs Mineral Reserve, Wombat Hill. Located in Daylesford is an excellent example of a 19th century Botanic Garden and has over 1,000 trees on site.

Trees are pivotal in contributing to the unique character of Hepburn, and Council recognises the importance of trees and the diversity of benefits provided, from shade, amenity and promoting well-being to capturing carbon and providing wildlife habitat. The creation and maintenance of sustainable urban forests is 'essential to the current and future health of cities and their inhabitants' (Clark et al, 1997).

This plan has been developed in line with the five management wards, Birch, Cameron, Coliban, Creswick and Holcombe (Figure 1) and will focus on townships and villages within each ward.

Figure 1: Hepburn Shire Council ward boundaries and main townships and villages



A recommended species list for street tree planting is provided and includes species recommendations based on individual aesthetic appeal and existing landscape character, as well as hardiness, longevity, maintenance requirements and performance in current and future climates.

1.1 Key Considerations

The Street Tree Planting Plan links closely to the Hepburn Tree Management Plan which was developed to provide guidance for the management of public trees to ensure a consistent management approach and provide a safe environment for the community. The key considerations of the Plan include:

- Whilst the characteristics of Hepburn's existing street tree population is unknown, it is estimated that Council has over 8,000 existing street trees within its urban and suburban road reserves.
- The proactive management of trees will allow Council to:

> Increase knowledge of the street tree population and further refine tree planting priorities and goals into the future.

> Staging large-scale tree removal and replacement planting projects, to maintain overall tree coverage and reduce any impacts to amenity and habitat values.

- An active tree planting program combined with appropriate tree removal will maintain the tree population age distribution (mix of young and mature), both within townships and across the shire.

1.2 Objectives

The overall objective of this Plan is to provide a framework that allows Council to maintain a sustainable and diverse tree population that is adaptable to climate change.

Clark et al (1997) define a sustainable street tree population is one which 'maintains a maximum level of net environmental, ecological, social and economic benefits over time'.

In the next five year's Council aims to:

- Increase tree canopy cover on public land by establishing a minimum of 'one tree per frontage' policy for road reserves within Zones 1 and 3.
- Work towards an age diverse and species diverse (no more than 10% of any one species (Clark et al, 1997) within the Shire tree population.
- Plant environmentally appropriate species.
- Support and enhance local biodiversity through prioritising native and indigenous species where appropriate.
- Educate the community and foster community wide support for street tree planting.

2. Consultation

This Plan was developed in consultation with Hepburn Shire Council's Parks and Open Space, Works, Engineering and Planning (Biodiversity) Teams. Working group meetings were used to review the draft plan with feedback incorporated into a final draft plan which was used in subsequent consultations.

3. Existing Conditions

3.1 Climate and Soils

Hepburn has a temperate climate characterised by mild to warm summers and cold winters. Across the municipality average rainfall ranges from 600mm to 800mm per year, with more precise rainfall and temperature data from relevant weather stations shown in Table 2.

Table 2: Overview of average rainfall and temperatures

Weather Stations	Average annual rainfall (1991- 2020)	Average maximum temperatures °C
Creswick	698mm	17.9
Clunes	543mm	19.6
Macedon Forestry (26km from Lyonville)	769mm	15.6

3.1.1 Climate Predictions

Climate change predictions must be considered when recommending species for future planting as the changing climate can have a marked effect on species performance and longevity. Using annual average rainfall and maximum temperature the CSIRO climate analogues tool has been used to determine the proposed future climate of Hepburn (CSIRO, 2016). The city of Ballarat was used in this tool (being the closest available reference point) to represent the current climate.

This tool indicates that by 2050 based on a pre-set mid-range scenario[1], Hepburn's climate will mirror the likes of Cranbourne, Millicent, Goulburn, Mount Gambier, Launceston, Ararat, Colac and Traralgon. This pre-set scenario represents an annual 1.1°C increase in temperature and no change in rainfall (based on the 1986 – 2005 average). To ensure longevity of trees in the future climate, consideration has been given to species Indigenous to or with demonstrated success at these locations.

3.2 Bioregions and Vegetation

Bioregions offer a 'landscape-scale approach to classifying the environment using a range of attributes such as climate, geomorphology, geology, soils and vegetation' (DELWP, 2020).

Hepburn Shire spans across three bioregions (Figure 2) and as such has a variety of ecosystems.

Bioregions are further divided into Ecological Vegetation Class (EVC) benchmarks, which provide indicative vegetation types and typical species which occur in these areas and are useful to consider when planning urban tree populations.

[1] *RCP (Representative Concentration Pathway) of 4.5 and 'Maximum consensus' (deals with spread of data and model uncertainty) were used as inputs into the model to achieve a mid-range scenario rather than a best or worst-case scenario.*

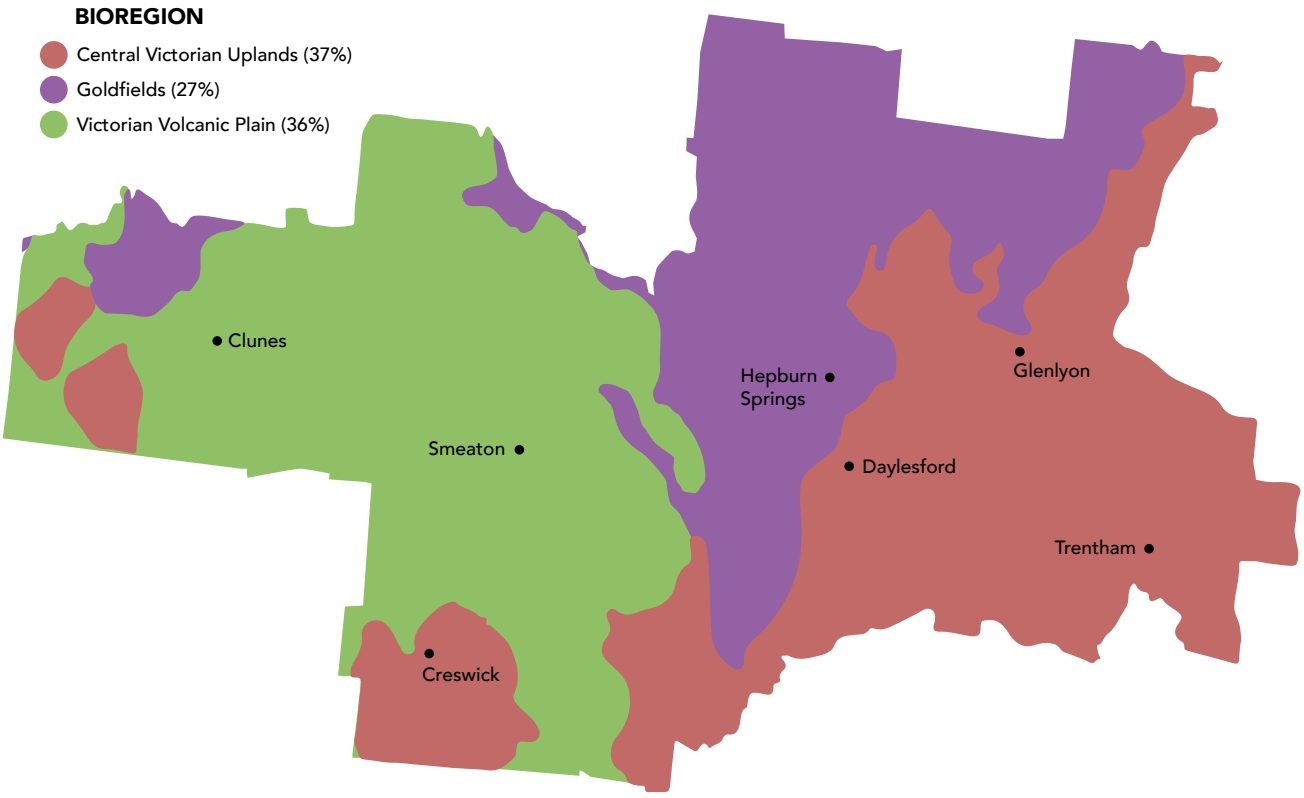


Figure 2: Main townships and distribution of bioregions across Hepburn

- Whilst the Central Victorian Uplands bioregion only accounts for 37% of the Hepburn landscape, half of the town centres are located within this bioregion. The Herb-rich Foothill Forest EVC dominates (Daylesford, Lyonville, Trentham, Bullarto, Bullarto South, Newbury and Coomoora) the more fertile slopes, Heathy Dry Forest (Creswick) the less fertile hills and Plains Grassy Woodland (Glenlyon) the low-lying valleys and plains.
- The Goldfields bioregion accounts for 27% of the Hepburn landscape, including the north west of Daylesford and all of Hepburn Springs. Rainfall in this bioregion is uncertain varying from 400 – 700mm per year and relatively poor soils are associated with Heathy Dry Forest EVC (Daylesford, Hepburn Springs) and Grassy Dry Forest (Hepburn Springs).
- Rainfall in the Victorian Volcanic Plains bioregion is relatively consistent across the year, and soils are generally 'shallow, fertile and high in available phosphorous'. Townships within these areas are characterised by the Plains Grassy Woodland EVC (Clunes, Smeaton, Creswick and Glenlyon).

3.2.1 Soils

Hepburn Shire is located in the Southern slopes of Central Victoria. Friable earths and red friable earths are common throughout the main townships of Clunes, Creswick, Daylesford, Glenlyon, Newlyn, Smeaton and Trentham. These are generally fertile soils and do not present any significant limitations for planting.

In line with changes to geology and vegetation, areas likely to be associated with areas of lower nutrient status soils include Hepburn Springs, Franklinford, Allendale, Clunes and Yandoit as well as parts of Daylesford.

4. Methodology & Limitations

The development of Council planting plans often uses existing street tree inventories to identify gaps in public canopy cover and priorities planting opportunities. As there is no existing street tree data inventory for Hepburn Shire Council, a desktop analysis of satellite imagery was undertaken for all the road reserves within each township boundary.

This Plan focuses on townships and villages within the Hepburn municipality. Of the 24 settlements, there are four townships (Clunes, Creswick, Daylesford and Trentham) and ten villages. For further details regarding classifications see Appendix 2.

Settlements have been categorised based on population size, with this plan focusing on those areas with the highest populations. In general, Hamlets are not included in this plan. For a list of townships, villages and hamlets refer to Appendix 2.

- Townships – more than 1,000 people
- Villages – 100 to 1,000 people
- Hamlet – less than 100 people

Satellite images taken between 2017 and 2020, and to a lesser extent Google street view, were used to estimate existing street tree numbers and potential planting sites (vacants):

- Existing infrastructure was considered in this process (e.g. overhead and underground services)
- Limitations of this data analysis include - misinterpreting ground cover for trees, inappropriate identification of potential planting sites

A summary of this data at a township level is shown in Table 3 (over).

At a street level, vacant site and existing tree numbers were used to rank each street from '1' – highest proportion of vacants, to '10' – lowest proportion of vacants.

Where a street has been ranked '10', this generally means the desktop analysis has identified limited opportunities for planting. There may, however be future opportunities for planting as a result of the removal of existing trees, changing priorities and/or the development of planting spaces in built environments (e.g. planting pits, trenches).

Vacant and tree data is recorded for 435 of the 559 total streets/roads within Hepburn Shire's urban boundary.

Whilst the limitations of this data are recognised, it does provide a basis for the prioritisation of street tree planting within each ward over the next five years.

5. Township Profiles

Table 3: Township and village vacancy profiles

Ward	Location	Category	Population (ABS, 2016)	Estimated Vacants (#)	Estimated Trees (#)	Total (trees + vacants)	Estimated vacancies (%)
Birch	Daylesford	Township	2,548	869	3,417	4,286	20%
	Hepburn & Hepburn Springs	Village	928	278	554	832	33%
	Yandoit	Village	154	19	25	44	43%
		Subtotal	**3,630**	**1,166**	**3,996**	**5,162**	**32%**
Cameron	Clunes	Township	1,728	497	797	1,294	38%
	Smeaton	Village	231	83	179	262	32%
		Subtotal	**1,657**	**580**	**976**	**1,556**	**35%**
Coliban	Lyonville	Village	175	69	181	250	28%
	Trentham	Township	1,180	241	1,015	1,256	19%
		Subtotal	**1,461**	**310**	**1,196**	**1,506**	**23%**
Creswick	Allendale	Village	166	63	147	210	30%
	Broomfield	Village	228	32	138	170	19%
	Creswick	Township	3,170	768	1,547	2,315	33%
	Newlyn	Village	128	72	66	138	52%
		Subtotal	**3,692**	**935**	**1,898**	**2,833**	**34%**
Holcombe	Glenlyon	Village	389	158	344	502	31%
	Coomoora	Village	252	66	67	133	50%
		Subtotal		**224**	**344**	**502**	**31%**
		Total	**11,081**	**3,215**	**8,477**	**11,692**	**33%**

6. Planting Plan

6.1 Site Conditions

When selecting a species for a particular site, the existing conditions and characteristics should be considered:

- Existing character of the site – planting patterns, deciduous vs. evergreen, native vs. exotic
- Site limitations (e.g. available planting space, proximity to infrastructure)
- Environmental limitations (e.g. soil type, rainfall, temperature)
- Habitat and biodiversity values
- Cultural and heritage values – of both the land and existing plantings
- Future site plans and adjacent land use
- Planning Overlays (e.g. Significant Landscape Overlays, Vegetation Protection Overlays, Environmental Significance Overlays)
- Relevant Master Plans and Management Plans (Appendix 1)

With existing character of sites, the following planting patterns are often observed in urban environments:

- Rows of a single species along one or both sides of the street
- Alternating plantings of two or three different species along a street
- Mixed species and age class plantings with little or no theme

Where one of these common themes is observed the existing theme should be emulated. Where one or more of the species is difficult to replace or no longer considered appropriate, this should be replaced with a similar species (e.g. size, form, foliage) from the recommended planting list.

6.2 Recommended Species

Species and age diversity are both critical components of any urban forest. Species diversity contributes towards the sustainability of urban forests through buffering uncertain impacts of changing climates, as well as ensuring large percentages of trees are not wiped out by pests which are often 'species-specific'.

The following have been considered when developing the recommended planting list:

- Longevity – Investment into Council trees should be associated with an asset life span of at least 30-50 years. Short-lived species should be avoided.
- Robustness – The ability of a tree to tolerate challenging urban conditions, such as root compaction and root damage (Matheny & Clark 1998) varies between species.
- Tolerances – Species tolerant to stresses such as pests, disease, heat and drought.
- Propensity to develop structural defects – Some species are prone to forming structural defects and weak branch attachments (Lonsdale 1999), whilst other species may be more susceptible to advanced decay (Shigo & Marx 1977).
- Tree planting history – Local experience regarding species that perform well in the local area.
- Environmental weeds – Species with weedy or invasive tendencies. Weeds can have environmental, social and economic impacts, threatening biodiversity as well as agriculture.
- Nuisance – All species drop some debris (e.g. leaves, small branches) as a natural part of their life cycle, however where possible, non or low fruiting varieties are preferred.
- Health and wellbeing – Species which are not known to trigger significant adverse health impacts.

6.2.1 Recommended Planting List

Planting site restrictions are one of the major influences for species selection, particularly in more urban environments.

Planting the right tree in the right location is not only a long-term community and environmental investment, it also ensures maintenance costs are kept to a minimum. For example, planting large trees in narrow nature strips or under powerlines creates ongoing maintenance commitments/costs and can significantly reduce the expected life of the tree.

To assist with species selection for each site a recommend planting list has been compiled.

All listed species have been categorised based on their mature size and habit.

- **Small** trees up to 8 metres high
- **Medium** trees between 8m to 12m high
- **Large** trees between 12m to 20m high
- **X-Large** trees generally 20m or higher, or with a wide canopy spread

Key characteristics for each species are detailed, such as expected mature height vs. width, evergreen vs. deciduous, or whether they are suitable for planting under powerlines.

Nature strip width is a key driver for efficient street tree management.

Recommended nature strip widths have been guided by recent research (Hilbert et al, 2020). As with previous studies, this research indicates a large proportion (up to 39%) of trees planted in areas confined by right of ways (e.g. between roads and footpaths) may be causing damage to adjacent infrastructure.

Whilst larger trees are generally associated with greater benefits, the trunk flare of larger trees in narrow planting spaces is most often associated with infrastructure damage (Hilbert et al, 2020).

Ensuring mature trees have appropriate planting space improves tree longevity outcomes and reduces the ongoing costs associated with tree management and infrastructure damage.

This research has developed a method for guiding appropriate planting spaces based on the mature size of the tree, including species specific maximum DBH and trunk flare diameter. Further details can be found in Appendix 4.

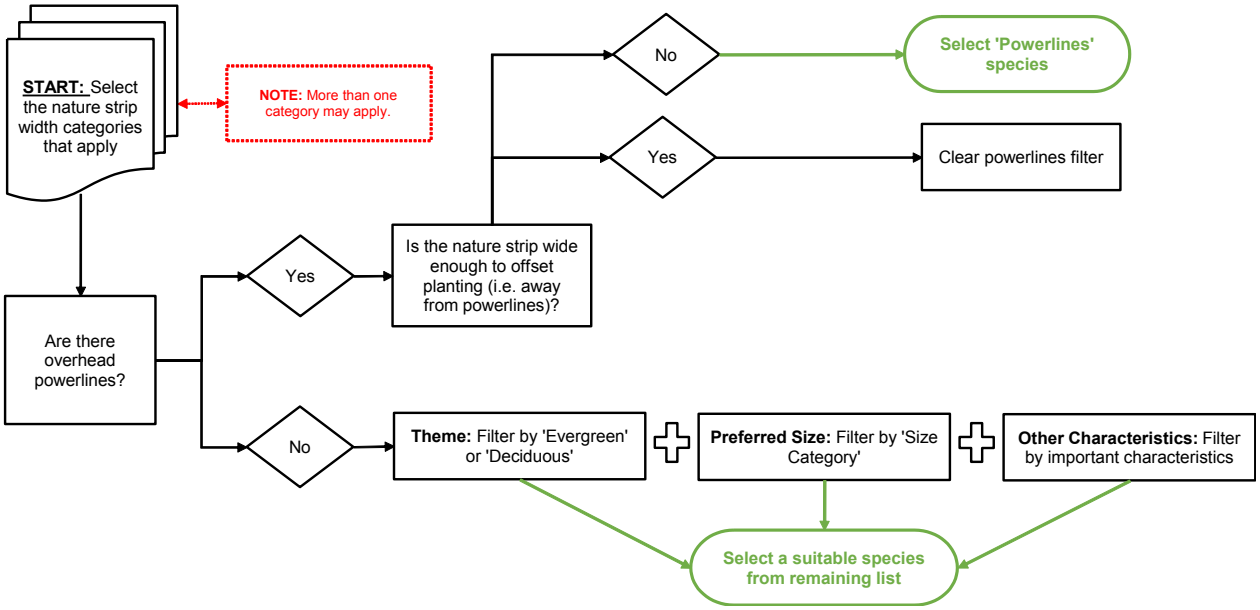
6.2.2 Implementation

The recommended species list is not intended to be a conclusive list and there may be situations where alternative species may be planted or approved for planting by Council.

The species list is supported by six tabs:

- Flowchart (Figure 3) – how to use the species list
- Species List – species and associated characteristics
- 5 Year Planting Priorities – pivot table summarising streets to be planted
- Individual Street Data – tree and vacant data estimates per street
- Ranking categories – background information only

Figure 3: Recommended planting list process chart



In addition:

- The recommended planting list will not encompass all the different species currently planted in streets and reserves across Hepburn.

> This may be due to a variety of reasons – trees that are no longer considered appropriate by Council, or trees that have been planted by residents, or self-seeded species.

> This may be the case for high-profile avenues across Hepburn, where existing species are not included on the recommended list. Unless alternatives have been identified, where appropriate these species will continue to be planted.

> While species may not be on the recommended planting list, existing public trees will continue to be managed in line with the Hepburn Tree Management Plan until they reach the end of their useful life.

- Council approval must be sought for any significant tree planting on Council managed land.

6.3 Priorities

Planting sites have been prioritised based on the highest estimated proportion of vacant planting sites on an individual street level.

Table 4 provides a summary of the estimated vacancies for each Ward.

Table 4: Summary of estimated vacancies by Ward

Ward	Estimated vacancies (%)
Cameron	35
Creswick	34
Birch	32
Holcombe	31
Coliban	23

Ranking of individual streets has also considered:

- High profile areas, such as main roads, high streets and schools
- Spread of planting across locations (e.g. townships and villages).

Figure 4 shows an example of the planting priorities and associated budgets for the Ward of Birch.

Figure 4: Excerpt from Planting Plan for the Birch Ward

Ward	Sum of Estimated Vacant Sites (#)	Sum of Budget ($)
Birch	230	34500
Daylesford	144	21600
Bridport St	13	1950
Central Springs Rd	20	3000
Elsbeth Ct	8	1200
Hospital St	17	2550
Morris St	6	900
Orford St	11	1650
Smith St	34	5100
Vincent S	13	1950
Vincent St North	22	3300
Hepburn	67	10050
Church Av	11	1650
Heath Av	11	1650
Main Rd	24	3600
McKinnon Rd	10	1500
Sixth St	1	150
Wynvale Rise	10	1500
Yandoit	19	2850
High St	19	2850

6.4 Budget

The Hepburn Planting Plan will invest $35,000 annually into planting new street trees. This allows for the planting of approximately 233 trees per year.

This is based on an estimated cost for purchasing and installing each tree of $150.00. This includes 45lt container stock, two stakes and hessian ties, as well as site preparation and contractor costs (Appendix 5).

This includes the initial cost of establishment but does not consider ongoing maintenance which is supported through a different budget.

The planting schedule contains a prioritised list of streets to be planted per ward. It is a live document managed by the Parks and Open Space Team and will be updated regularly to reflect any changes to budgets and priorities.

7. Planting Guidelines & Specifications

The quality of nursery stock and planting techniques have significant consequences to tree establishment, stability and longevity.

Stock should be sourced from reputable nurseries with all planting of new stock sourced and planted in line relevant Australian Standards (AS 2303-2015 Tree Stock for Landscape Use).

To avoid ongoing management and maintenance costs new plantings should be installed using the setback distances outlined in Table 5. In addition:

- Plantings should be positioned in the centre of the nature strip.
- Plantings should be aligned as close as possible to the centre of the property frontage.
- Plantings should be at least 3 metres from the edge of the road where the road is not sealed and/or has no kerb.
- Only 'Powerline' trees should be planted underneath powerlines or within proximity to streetlights.
- No tree should be planted over an existing underground service or conduit.

Table 5: Minimum setback distances for new plantings

Minimum Distance	Infrastructure or Asset Description
1.5 metres	Kerb (where practical), Pedestrian gate pathway
2.0 metres	Underground services
3.0 metres	Driveways, Crossovers, Power poles, Streetlights, Fences
4.0 metres	Fire hydrant
5.0 metres	Intersections (Local or Collector Roads)
15.0 metres	Intersections (Major or Minor arterial roads, Link Roads)

7.1 Maintenance

To ensure maximum tree establishment, street tree planting will generally be undertaken in the cooler months, between May and September. On occasion, trees may be planted by Council outside of this period provided adequate water can be supplied over hotter drier periods.

New plantings will be:

- Staked – to protect young stock from damage e.g. vehicles, mowers
- Mulched – to help retain soil moisture improve growing conditions
- Guarded – where required, to protect young stock from grazing animals

New plantings will be maintained for two years subsequent to planting, with watering occurring weekly in the hotter drier months. Tree stakes (and guards) will be removed after approximately 1-2 years.

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Appendix 1. Existing Plans

1.1 Master Plans

- Major Facilities Master Plans 2016/17
  - > Hepburn Recreation Reserve
  - > Newlyn Recreation Reserve
  - > Trentham Sports Recreation Reserve
  - > Creswick Doug Lindsay Recreation Reserve
- Hammon Park Master Plan 2018
- Trentham Recreation Reserve: Master Plan
  - > Identifies Pines and Cypress in need of replacement planting
- Bath Street Reserve: Draft Master Plan

1.2 Management Plans

- Jubilee Lake Reserve: Management Plan
  - > Passive recreation reserve in a bushland setting
- Calabeen Park: Management Plan, Lake Daylesford Reserve: Management Plan and Hepburn Springs Mineral Reserve: Management Plan
  - > All these reserves have a clear delineation between European landscape and indigenous landscape
  - > Indigenous species for planting recommended in plan

Appendix 2. Location Categories

Table 7 below describes the hierarchy of settlements, with Table 7 allocating a category for each settlement within Hepburn Shire.

Table 6: Types of settlements by population

Type of settlement	Description	No. of residents
Town	Large town	10,000 - 100,000
Township	A medium sized town	1,000 - 10,000
Village	Small settlement	100 - 1,000
Hamlet	Very small population and a few buildings	<100

Table 7: Hepburn Shire settlements categorised by population

Type of settlement	Description	No. of residents
Clunes	Township	1,728
Creswick	Township	3,170
Daylesford	Township	2,548
Trentham	Township	1,180
Allendale	Village	166
Broomfield	Village	228
Glenlyon	Village	389
Hepburn	Village	599
Hepburn Springs	Village	329
Lyonville	Village	175
Newlyn	Village	128
Smeaton	Village	231
Yandoit	Village	154
Coomoora	Village	252
Bullarto	Hamlet	73
Bullarto South	Hamlet	33
Campbelltown	Hamlet	55
Dry Diggings	Hamlet	25
Franklinford	Hamlet	66
Glengower	Hamlet	13
Hollinwood	Hamlet	No statistics
Lawrence	Hamlet	17
Leonards Hill	Hamlet	45
Newbury	Hamlet	71

Appendix 3. Desktop Observations

Table 3: Township and village vacancy profiles

Ward	Township	Desktop Observations
Birch	Daylesford	Increased level of plantings closer to the CBD, with avenues of Elms, Planes, Ash, Ornamental Pear.
	Franklinford	New plantings of Crepe Mrytle.
	Hepburn	Other common species observed: Birch, Eucalypts spp. (including Ironbark).
	Leonards Hill	Dispersed residential areas.
	Yandoit	Main Street (main thoroughfare from Daylesford to Mineral Reserve) has limited trees.
Cameron	Campbelltown	Zone 4 only.
	Clunes	No trees along Fraser Street (main thoroughfare and home to Booktown Festival). Avenues of large aging deciduous trees within central areas (e.g. Elms, Planes) High number of vacant sites within Zone 3 road reserves. Semi-mature Eucalypt plantings
	Glengower	Zone 4 only.
	Lawrence	Zone 4 only.
	Smeaton	Large Elms (?) and row of Cherry Plums (Prunus cerasifera 'nigra') at town hub. Other common species, Melaleuca, Elms (Ulmus parviflora) and various Eucalypts.
Coliban	Bullarto & Bullarto South	Zone 3 and 4 – rural nature.
	Lyonville	Zone 3 and 4 - rural nature. Google street view not available.
	Newbury	Zone 4 only.
	Trentham	No trees along High Street (main thoroughfare). Significant avenues of mature Elms, some Plane trees. New plantings of Elms (Ulmus parviflora?). Other common species: Birch, Eucalyptus nicholii.
Creswick	Allendale	Mature plantings of Popular and Elms.
	Broomfield	Zone 3 and 4 – rural nature.
	Creswick	Avenues of mature exotic trees (Plane trees dominant, with some Elms). Infill planting of young semi-mature trees undertaken. Wide road reserves, with in-road plantings common. Other common species: Cherry Plum (Prunus cerasifera 'nigra').
	Hollingwood	Zone 4 only.
	Newlyn	Zone 3 and 4 – rural nature. Limited roadside vegetation in residential areas (Zone 3).
Holcombe	Glenlyon	Main thoroughfare dominated by Avenue of Honour (Elms). Mostly mature, some semi-mature plantings at southern end. Some significant Eucalypts at southern end also. Remaining areas Zone 3 – rural in nature.
	Coomoora	Zone 3 and 4 – rural nature. Scattered roadside vegetation – mostly native.
	Dry Diggings	Zone 4 only.

Appendix 4.
Planting Space Recommendations

Recent research undertaken by the University of Florida (Hilbert et al, 2020) developed a method for recommended planting spaces for trees planted in confined right of ways (e.g. between roads and footpaths).

This research studied the interaction between trees and infrastructure, supporting the findings of previous research and indicating that a high proportion (up to 39%) of trees in right of ways may be causing infrastructure damage.

The recommended planting space refers to the distance width required for a mature tree to develop without causing damage to adjacent infrastructure. This method considers mature tree size based on the estimated maximum DBH to give a Trunk Flare Diameter (TFD), buffer zone and allow for the zone of rapid taper.

Providing trees with adequate planting space in which to mature will support overall efficiencies in tree management, through minimising infrastructure damage and improving tree longevity outcomes.

Whilst this research is species specific, to allow for broadscale application predictive equations for habitat groups have been developed (Table 8).

Table 8: Generalised habitat group equations (Hilbert et al, 2020)

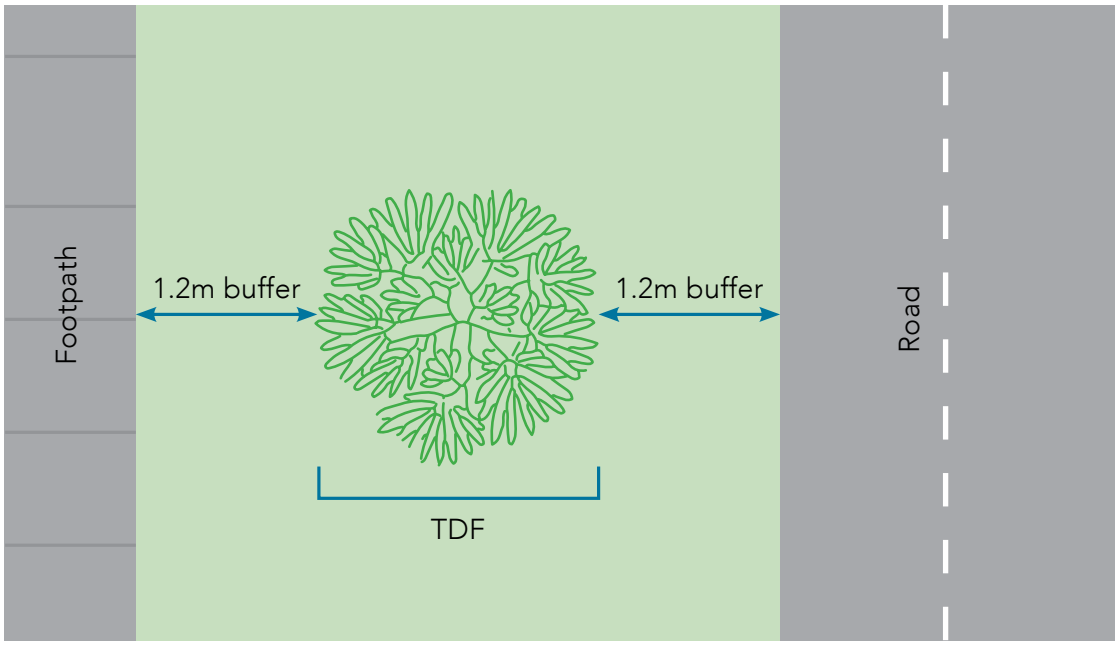
Habitat Group	Predictive Equations
Upland	TFD = 1.3 x DBH
Wetland	TFD = 1.7 x DBH
Variable	TFD = 1.6 x DBH

As there is currently no street tree inventory data for Hepburn, the estimated maximum DBH for each species has been based on tree inventory data collected from nearby areas (e.g. Mount Alexander Shire).

Minimum nature strip widths for each species has been calculated based on the planting space width formula:

PLANTING SPACE WIDTH = TFD + 2.4 M

Figure 5: Planting space recommendations based on 'TFD plus 1.2m buffer additional growing space' (Hilbert et al 2020)



Where:

- In general, the Upland equation has been used to calculate TFD.
- A buffer of 1.2m is added the TFD to account for the zone of rapid taper ()
- Species with large buttress roots should have a larger buffer space applied (at least 4m

Appendix 5. Costings

The cost for purchasing and installing each tree is based on the following cost estimate (Table 9). Note this does not included ongoing maintenance.

Table 9: Cost estimate per tree

Item	Cost ($)
Tree (45Lt container)	98.00
Miscellaneous (site preparation, installation, stakes, hessian ties, staples)	52.00
Total	**$150.00**

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