

A Guide to Growth Area Street Tree Planting



CONTENTS

Streetscape Development	4
Introduction	4
Physical and Climatic Conditions	5
The Role Of Street Trees	5
Challenges to the Development of Effective Streetscapes	6
Streetscape Design	7
Layout	7
Character	8
Council Standards / Procedures	8
Planting Stock	10
Planting Preparation & Maintenance	11
Tree Species Selection	15
Biological Considerations	15
Climatic	15
Soils	16
Pests & Diseases	17
Pollution	17
Functional Considerations	17
Growth Habit	17
Root Growth	18
Horticultural Considerations	20
Longevity	20
Production	21
Structure	21
Debris	21
Aesthetic Considerations	21
Form	21
Colour	22
Scale	22
Foliage	22
Consistency	22
Environmental Considerations	23
Solar Access	23
Weed Potential	23
Allergens & Toxins	23
Planting List	23
Appendix 1 – Physical and Climatic Conditions	25
Topography	25
Water Catchments	25
Geology and Soil	25
Quaternary Basalt:	26
Quaternary Alluvium:	27
Palaeozoic Sediments:	27
Devonian Granite:	27
Climate	27

Appendix 2 – Typical Streetscape Designs	28
Formal Avenue.....	29
Residential Gateway	30
Residential Court.....	31
Park/Streetscape.....	32
Narrow Street.....	33
Winding Road.....	35
Industrial Area	37
 Appendix 3 – Entry Treatments	 40
Policy Basis.....	40
Objectives	40
Policy.....	40
Application Requirements	41
 Appendix 4 – Tree List.....	 42
Australian Native.....	43
Non-native	47

Streetscape Development

Introduction

This document is intended as a guide for developers with respect to the provision of high quality streetscapes throughout the growth areas of the municipality. It compliments the City of Whittlesea Street Tree Masterplan, published in September 2000, which primarily dealt with streetscape development and improvement within the established areas of the municipality.

The role of the street tree within new developments is now more important than it ever has been due to the emerging trend of reduced available space for the establishment of streetscape elements. These trends include:

- increased lot densities,
- reduced property set backs,
- on street parking demands,
- an array of underground services being accommodated within the road reservation,
- accommodating water sensitive urban design elements and
- the principles of sustainability

Reduced property setbacks and medium and high density housing design further compromises the traditional streetscape by reducing the contribution of private gardens and front yards to the general amenity as viewed from the street. This “borrowed landscape” within the new subdivision context is a thing of the past, as typical front yards within new areas are rarely large enough to accommodate trees.

The constraints listed above, coupled with particularly difficult local environmental conditions, places added importance in relation to street tree usage and species selection for growth areas within the City of Whittlesea. Consideration of the horticultural implications associated with these factors will need to be given priority if Council’s vision of the streetscapes within these areas defining local character and providing integration of potentially disjoint land parcels is to be achieved.

Council’s strategic planning for Growth Areas does not look at existing land ownership and property boundaries as its guide. Local character is rarely evident on such a micro scale and planning processes seek to ensure continuity and a seamlessness across these boundaries on a macro level. To this extent, the use of locally specific landscape themes and urban design initiatives to define and market an estate such that it is out of character with its surrounds, is discouraged. Council will only allow entry treatments such as feature walling and estate naming on the basis of them being temporary, to be removed after clearly defined marketing period. Refer **Appendix 3**

Over recent years, Council’s planning conditions have been continuously reviewed and refined to ensure that high quality streetscapes and open spaces are developed as part of the subdivision process. These changed conditions have generally been well supported by local developers who are encouraged to initiate discussions with Council officers on landscaping issues at the very first stages of development planning. The requirement of all developers to submit a landscape plan for approval, as well as detail the requirement to plant suitably advanced trees within all streets, has produced some stunningly successful outcomes, where the foundations of high quality, visually integrated and environmentally sustainable streetscapes have been established, with negligible plant failure rates.

Local experiences have demonstrated that three areas are crucial in determining the success of the establishment of high quality avenues within urban streetscapes. These are:

1. Proper planning and appropriate tree species selection.
2. The procurement of good quality planting material.

3. The undertaking of a high quality planting and maintenance regime, including a horticultural best practice approach to watering and the maintenance of the trees' watering well, as well as the expedient replacement of any dead or damaged trees within an avenue.

This document provides a guide to assist developers in the development of landscape concept plans for new subdivisions, with a particular focus on item 1 above.

Physical and Climatic Conditions

Understanding the physical characteristics of the land to be subdivided such as the soil types, geology, topography, and catchments as well as areas of significant vegetation, is essential to gaining an appreciation of the capability of the land to support various plant taxa and will influence the effectiveness of vegetation management decisions.

A detailed description of the physical and climatic conditions experienced within the municipality can be found in **Appendix 1** of this document. In summary, most of the soils throughout the municipality consist of relatively shallow, highly reactive, basaltic clays, overlaying basalt rock. In many places this rock is very close to the surface. The general physical characteristics of the soil are not conducive to the establishment of a wide variety of tree and shrub species. Coupled with this, exposure to winds on the open basalt plains further severely impacts on plant establishment.

In its natural state, the only tree that basaltic plains soils could support was the River Redgum (*Eucalyptus camaldulensis*) with occasional stands of Yellow Box (*Eucalyptus melliodora*), Blackwood (*Acacia melanoxylon*), Black Wattle (*Acacia mearnsii*) and Lightwood (*Acacia implexa*) on the more elevated rocky areas. Swamp Gum (*Eucalyptus ovata*) can occasionally be found in low lying swampy areas.

The Role Of Street Trees

There is a widely held view that street tree plantings bring broad community benefits. These are difficult to assess in purely financial terms but can be identified in general community values. Among the benefits of trees are:

- They modify the ambient climate to the benefit of residents and pedestrians by providing summer shade and shelter from the environment. Their foliage filters dust and other pollutants and they temporarily impede rainfall permitting slower release and improved percolation into the soil. The release of oxygen into the atmosphere and the associated removal of carbon dioxide have important implications for long-term environmental quality.
- They help to modify the visual scale of a place, reducing the impact of large-scale urban development and linking it to the human scale. This contributes to a sense of well-being and comfort in an environment that might otherwise be viewed as over-whelming and intimidating. The effective placement of street tree plantings can create a sense of a comfortably scaled pedestrian corridor as a contrast to the broad scale of major arterial and feeder roads.
- By the selection of indigenous trees especially, tree planting can provide a connection between the natural and the urban environments. This is particularly relevant in a city like Whittlesea where there are significant existing wildlife corridors and remnant vegetation zones that can be reinforced and extended into residential areas. The provision of habitat for wildlife into the urban environment brings colour, interest and life well beyond the values of trees themselves. Unfortunately, in a pure sense the use of indigenous trees within the City of Whittlesea is difficult, as most of the trees nominated above are quite unsuitable in an urban environment.

- They add economic value. Real estate values are generally higher in streets where appropriate tree planting has been implemented because treed streets offer attractive places to live and to work. Values increase as plantings mature and where effective design accompanies appropriate selections.
- They add beauty to a streetscape in many diverse ways. They possess intrinsic beauties in their foliage, flower, bark and fruit as well as providing subtle delights in such features as their shadow pattern and their response to wind movement. Most importantly trees offer a consistency that is frequently absent from the urban environment with its diverse architectural forms and materials.
- They provide a sense of place, offering road users, pedestrians and residents alike an orientation that assists their movement. Trees can reinforce particular urban messages providing city gateways, residential street character that helps slow traffic movement and signalling commercial zones where shopping and gathering can be important activities. Trees should be seen as integral components of the urban fabric fulfilling both aesthetic and functional roles. An additional value of street trees is that with appropriate use such as changes in species pattern at intersections or slow points, they can assist in traffic management.
- Cultural landscapes can be reinforced by appropriate tree selections which sustain the historic character of an area, supplementing the architectural fabric and helping to interpret the history of the City.

Challenges to the Development of Effective Streetscapes

Recent shifts in urban planning requirements offer specific challenges to the establishment of high quality streetscapes. These requirements include:

- The inclusion of medium and high density housing lots in response to the State Government's Good Urban Design guidelines, resulting in:
 - Reduced dwelling setbacks limiting the capacity to draw from the "borrowed landscape" in the establishment of streetscapes. In this case "borrowed" refers to the contribution that established trees and other vegetation located within house frontages adds to street trees in producing an aesthetic outcome as viewed from the street.
 - Reduced available space for the planting of street trees within the road reservation as a result of increased number of underground services, parking bays, narrower frontages (hence more crossovers), and the increasing propensity of claims against Council for damage to underground services by privatised utility service providers and damage/inconvenience to private land holdings.
 - The lack of grassed road verge areas or extremely reduced verge areas, limiting the soil and water catchment area for the sustainability of street trees.
 - Increased liability and risk associated with tree root intrusion and soil moisture loss impacts on structures. **The Australian Standard AS2870 for Residential Slabs & Footings for instance suggests that for Class H soils (highly reactive), trees should not be planted within one times their ultimate height of structural slabs or footings.** The impact of this is problematic in terms of amenity horticulture and urban design. With a typical property set back of 4 metres, a 1.5 metre wide footpath and a tree centrally located in a 2.5 metre wide naturestrip, the maximum height of a street tree complying with this standard is only 6.75 metres. For side boundaries, this could be as little as 3.95 metres.

- The impact of Water Sensitive Urban Design (WSUD) on the ability to produce consistent tree development, growth and performance in streets that may have for instance, a drainage swale and hence wet verge one side and a dry verge on the other where there is no swale.

The issues listed above can be overcome, in part, through an integrated approach to subdivision design, where the minimal physiological requirements for sustaining a street tree are stated and factored into the engineering and functional layout of any proposal. In many cases, this requires a change in the traditional process of subdivision development, where the provision of street and landscapes are considered only after all other technical and functional requirements have been determined.

Streetscape Design

Layout

In the past, the accepted requirement for the provision of street trees within new subdivisions has equated to one tree per residential frontage or approximately 15 metre spacings. Typically, this has resulted in a monoculture of trees for any given street. This monoculture is generally preferred as it is the resultant avenue that helps define the local area character and provides continuity in what, with a potential diversity of house styles, could otherwise be a very disjoint streetscape. The spacing of the trees will be very much dictated by the scale of the tree and the available planting space. An average 15 metre spacing will be considered adequate in most cases.

The use of a second species of tree in streets that contain a central median can help to provide precinct definition and act as an entry statement. It often allows the use of a tree of larger scale as the potential for impact on nearby residential properties is lessened by the separation from these properties.

The opportunity for an alternative, less formal, approach sometimes presents itself with curvilinear street alignments and where varying width verges have been developed as a result of external constraints (deviation around existing trees or the presence of abutting open space areas for example). Informal grouped plantings of trees can often be effectively incorporated into such situations.

Notwithstanding the above, there are a numerous circumstances where street trees can make a more effective contribution to a streetscape, not only by being aesthetically satisfying, but by fulfilling functional roles.

Often the best solutions to the use of trees result from a combination planting that utilises a long-lived, larger species with a short-lived quick growing or smaller species (nurse tree). Elsewhere trees may be located in a way that gives presence to a streetscape by providing a “gateway” effect to an avenue or cul-de-sac, or being an integral component of a traffic calming design.

Appendix 2 contains examples of planting plans from existing streetscape designs within the City of Whittlesea. The proposals address issues in real situations as opposed to the generic stylised designs typically developed by a landscape architect.

Though prepared for specific situations, principles are provided that allow these proposals to be utilised in the broader Whittlesea setting, though there will be a need for refinement to solutions to ensure they meet specific circumstances.

While tree groupings have been provided, these are offered only as a suggested planting. Specific treatments will be determined based on recommended plantings for different character areas.

Character

Growth areas in the City of Whittlesea are predominantly in areas that have been significantly altered from their natural state, primarily as a result of a long history of grazing, although this alteration has generally been restricted to ground story vegetation. The native grasses, herbs and forbs that dominated the ground flora of the predominantly Plains Grassy Woodland have been replaced with pasture grasses and unfortunately in some of the poorer managed areas, insidious weeds such as Paterson's Curse and Cape Weed. The generally rocky nature of the soils has limited the agricultural use of these areas to activities not requiring regular cultivation.

What hasn't changed is the dominance of the grand old redgums over the landscape. There is no doubt that these trees currently define the character of most of Whittlesea's growth areas and as such, the protection and retention of the trees is a guiding principle behind Council's Growth Area planning. Urbanisation of course is a major catalyst of change and there is no doubt that the introduction of the built form will impact on this currently well defined character. It is Council's belief that this character can be retained through urbanisation and its desire is that these changes, rather than contradicting the character of the redgum woodland, are complimentary to it.

Suitable street tree planting will be one of the prime tools in ensuring this character is complimented and enhanced.

Council Standards / Procedures

Council's requirement of developers is that all street trees are to be planted as semi-advanced, defined as a well established tree of the relevant species in a 45 litre container. As a condition of permit, developers are required to maintain newly planted trees for the first two summers. Suitably selected tree species of this size are generally big enough to provide early visual impact and with adequate watering and protection during the establishment period, are usually well enough established after the two summers to be able to flourish without supplementary watering, assuming average weather conditions. Smaller trees generally establish quicker but their initial impact is substantially lessened. Developers are discouraged from planting anything larger than a semi-advanced tree as, in terms of sustainability, there are substantially greater inputs required for successful establishment and the establishment period is longer.

There are situations where, for marketing purposes, the developer may wish to plant larger trees. This should not be encouraged or supported and in fact will be discouraged by requiring more intensive establishment and maintenance conditions of the developer. Developers who insist on planting "super advanced" trees incur penalties of additional site preparation and extended maintenance periods. If this is not undertaken, there will be a greater burden on Council at the end of the two summers maintenance period as the trees will undoubtedly not be adequately established.

There is no doubt that large "established" trees can have a significant visual impact in new housing estates. Generally though, only deciduous trees are readily available as super advanced trees and these are usually only available as field dug specimens, whilst dormant in winter. The marketing benefits of planting large leafless trees must be questioned, particularly when their advanced size is not enhanced with strong ongoing establishment. In the vast majority of situations where super advanced trees have been used, most trees either languish or in fact go backwards, as the following series of photos demonstrates.

If developers wish to plant species not supported by Council or larger super advanced trees, they may be required to provide an up front maintenance bond equivalent to at least five years maintenance (Council's realistic costs) or alternatively remove the trees at the end of an agreed period and replace them with the appropriate species and maintain them until completion of an additional two summers.



The very sparse and spindly plane trees on the left were planted as an avenue of super advanced 5 metre trees approximately 6 years before the image was taken. The one on the right was planted at the same time. It is one of the few trees that has actually shown any growth advancement since planting.



The Poplar on the right and those on the left were all planted at the same time as super advanced 5 metre trees, approximately 6 years before the image was taken. Those on the left and for the balance of this avenue are no bigger than when planted. The only reason the one on the right has advanced is because its root system is now into the drainage line emanating from the storm water pit on the right edge of the photo.

Council's current standard subdivision planning permit conditions require the submission and approval of a detailed landscape plans for each stage of a subdivision, including street tree planting and open space landscaping. The plans are required to be submitted in conjunction with engineering plans to ensure no conflicting proposals, such as street trees where street lights are proposed. The detailed landscape plan is based on the landscape concept plan for the entire subdivision, submitted as part of the more broadly scoped Development Plan. It is at this stage by stage submission that street tree selection is finally locked in place and typically, this might be between 6 and 12 months before the site is ready for landscaping, assuming a 6-9 month engineering construction phase. In most cases, this should a reasonable lead time to procure suitable street trees. All too often, developers leave plant procurement until the last minute and the lack of availability of the approved species leads to compromise.

The determination of suitable landscape themes forms part of the development planning approval process and good early planning is required to ensure availability of quality trees of the size stipulated at the time of subdivision landscape implementation. Depending on species, it may take up to three years to produce a semi-advanced tree. Because of the dynamic nature of the horticultural industry, being almost totally driven by seasonal constraints, unless street trees are pre-ordered, the chances of obtaining the approved species to size and in the quantities required, "off the shelf", are very limited. Council's forward planning and development approval processes are such that the forward thinking developer has the ability to ensure tree species can be locked in at Development Plan approval and hence pre-ordered for guaranteed availability at the completion of the subdivision construction phase, in readiness for the landscaping phase.

Planting Stock

One of the advantages of a planned program of tree planting is that material can be grown by nurseries to meet the exact specifications. It is important that the material selected should be assessed for its physiological condition, root system and canopy characteristics.

A number of methods are used to grow advanced stock designed to minimise transplanting stress and thus improve establishment. The three types of nursery stock that can generally be considered are:

Container Grown

Root safe container grown stock, such as those treated with Spin Out, a copper compound, are now widely available. Such compounds inhibit root extension when the root comes into contact with the container, ensuring girdling and spiralling does not occur. Strict hygiene can also be maintained with container grown stock grown in a soil-less growing medium. A problem with some container grown nursery stock is that the root to shoot ratio can be inappropriate to facilitate rapid establishment, that is, the mass of roots is insufficient to cater to the large mass of foliage.

Balled & Burlapped

Balled and burlapped stock is generally field grown and most species are generally available in substantially more advanced sizes than grown in containers. It is for this is reason that these trees are often used by the developer wishing to "make a statement". However at the time of harvesting, massive root loss occurs, resulting in poor recovery and establishment following planting out. This system is generally restricted to deciduous trees. More detailed site preparation and more intensive establishment maintenance programs are necessary for the successful establishment of such trees. For this reason, the use of field dug trees is generally discouraged for use as street trees within the City of Whittlesea.

Spring Ring

Spring Ring containers combat the problem of spiralling and girdling, unless the original stock potted into these containers is already spiralled. Stock is also available in semi-advanced sizes, with good root to shoot ratios. High quality stock can be grown in a non-soil medium, allowing for strict hygiene control in the nursery.

Whichever stock is chosen, it is important that the ratio of canopy to root size is such that the roots can support the canopy, that there is no evidence of atypical shoot extension and certainly no bifurcations or low branching that may lead to maintenance problems as trees mature in the street. Foliage should be typical of the species (it may in fact be larger than normal in young vigorous trees) and not small, sparse or atypically coloured. Stock should be pest free and some hardening off is beneficial. Stock grown under a luxury regime of high water and nutrients are likely to be sensitive to moisture stress and heat once they are planted out. Stock should be hardened off prior to delivery so that any potential for stresses are reduced prior to planting.

The canopy of nursery stock is also important and the following factors should be considered when stock is supplied:

Radial Symmetry

The canopy should be relatively even around the central stem. Asymmetrical canopies may never assume a symmetrical form and are aesthetically unacceptable. Asymmetry can lead to structural problems in later years.

Well Defined Leader

Where twin (or more) leaders are present in nursery stock, problems will be encountered in later years with included bark in the crotch of the branches, leading to splitting of the tree. This problem can be eliminated at an early stage by removal of one of the leaders.

It is advisable to retain a few trees from a planted batch within the nursery to allow supply of replacement trees should any planted stock be lost to vandalism.

Plants established with the Whittlesea streetscape should comply with the specifications in *Natspec Guide 2*.

Planting Preparation & Maintenance

Appropriate site preparation before planting will maximise the ability of nursery stock to rapidly establish once planted out. Removing competition from weeds, and providing friable soil in the localised area will reduce the stresses exerted on the young tree, aiding establishment. Timing of planting is critical in ensuring the success of the tree-planting program, and will ensure follow up management costs are kept to a minimum.

Planting site conditions pose different problems to the establishment of street trees, the most significant being compaction and degraded site soils often containing a high proportion of aggregates. Each site should be assessed on a case by case basis to assess what preparation and planting activities should be undertaken. Typically in new housing or industrial estates, roads and their verges (naturestrips) are constructed below natural ground level to provide for overland water flows in storm events, thus protecting the abutting lots from inundation. The net impact of this is that the soil profile in the naturestrip will consist of, at best, 100-150mm of top soil over laying compacted virgin subgrade material. In the better sites, this top soil might over lay re-compacted fill material. Neither of these soil horizons are conducive to strong plant establishment, so good site preparation prior to planting is critical.



Acer ‘Autumn Blaze’ two years after planting, planted as a street tree (left) into poorly prepared site conditions and provided with basic establishment maintenance whereas tree on the right, photographed on the same day, is the same species planted at the same time from the same stock but subjected to well prepared planting site and subjected to a regime of frequent automatic irrigation

Site preparation and planting measures should involve weed control, soil amelioration, timing, mulching and positioning.

Weed Control

Weeds should be removed before planting takes place, and controlled following establishment. Weeds compete aggressively for water and nutrients, inhibiting growth of newly planted stock. The most practical method of weed control is via application of Glyphosate based herbicides at the prescribed rate for the selected weed species one month before planting is scheduled to take place. Glyphosate is the most accepted knock down chemical herbicide currently in use in Australia. Dead weeds can be left in place until planting to prevent localised erosion of the planting area. The non-selective nature of the herbicide should ensure most weeds are controlled.

Pre-emergent herbicides applied after initial weed control are useful for ongoing weed management, and reduce the need for follow up spraying, reducing maintenance costs. However the residual nature of these chemicals, particularly in relation to high public exposure is of concern and may not be an acceptable management procedure in which case an annual application of Glyphosate during the early years of establishment should be adequate to ensure effective establishment.

Soil Amelioration.

Soil should be cultivated in a shallow broad hole, 2-3 times the diameter of the root ball and only marginally deeper than the root ball. The subsoil in general should not be pierced or broken but at the same time, the interface should not be “glazed”. Amelioration of backfill should be avoided where possible, as soil structure will be altered, resulting in a number of challenges to successful establishment, although the material should be friable and definitely not puggy. These challenges include moisture being actively removed by finer grade surrounding soils during the dry months, causing drought stress, a particular concern for newly planted trees. Additionally, with differing soil porosities, the ameliorated hole can act as a sump during the wetter months, causing water-logging.

Backfill should be broken up, resulting in a well-aerated, non-compacted ring, conducive to root growth.

A saucer of soil around the root ball is essential to hold available water, critical in a high stress situation such as street tree plantings, providing a location for watering during the establishment years. This method of watering allows the water to slowly percolate down through the root ball but it is essential that the saucer has the capacity to retain at least 45-50 litres of water. Perforated ag pipe coiled around the root ball and rising to the surface, in combination with the watering well, allows water to wet both the lower and upper parts of the root ball. A standard detail of Council's preferred planting measures is shown on the next page.

Notwithstanding the above amelioration issues, as stated above, in practice most road pavements and naturestrip are typically constructed below natural ground level, requiring the stripping of top soil and excavation into compacted underlying subsoils and in some cases, rock. The 100-150mm of topsoil placed back into the naturestrip for grassing, over the hard pan of the underlying subsoils is insufficient for successful tree establishment. Most of the hardier native tree species will quickly establish a strong root system in these sub-soils if adequately de-compacted but the less vigorous species and those less tolerant of local conditions will benefit from the placement of a good depth of local topsoil placed around the root ball for a distance of 1-2 metres from the trunk of the tree, as long as there is adequate drainage away from the base of the potential sump this creates. The adjacent road agricultural drain is usually sufficient for this purpose.

Timing

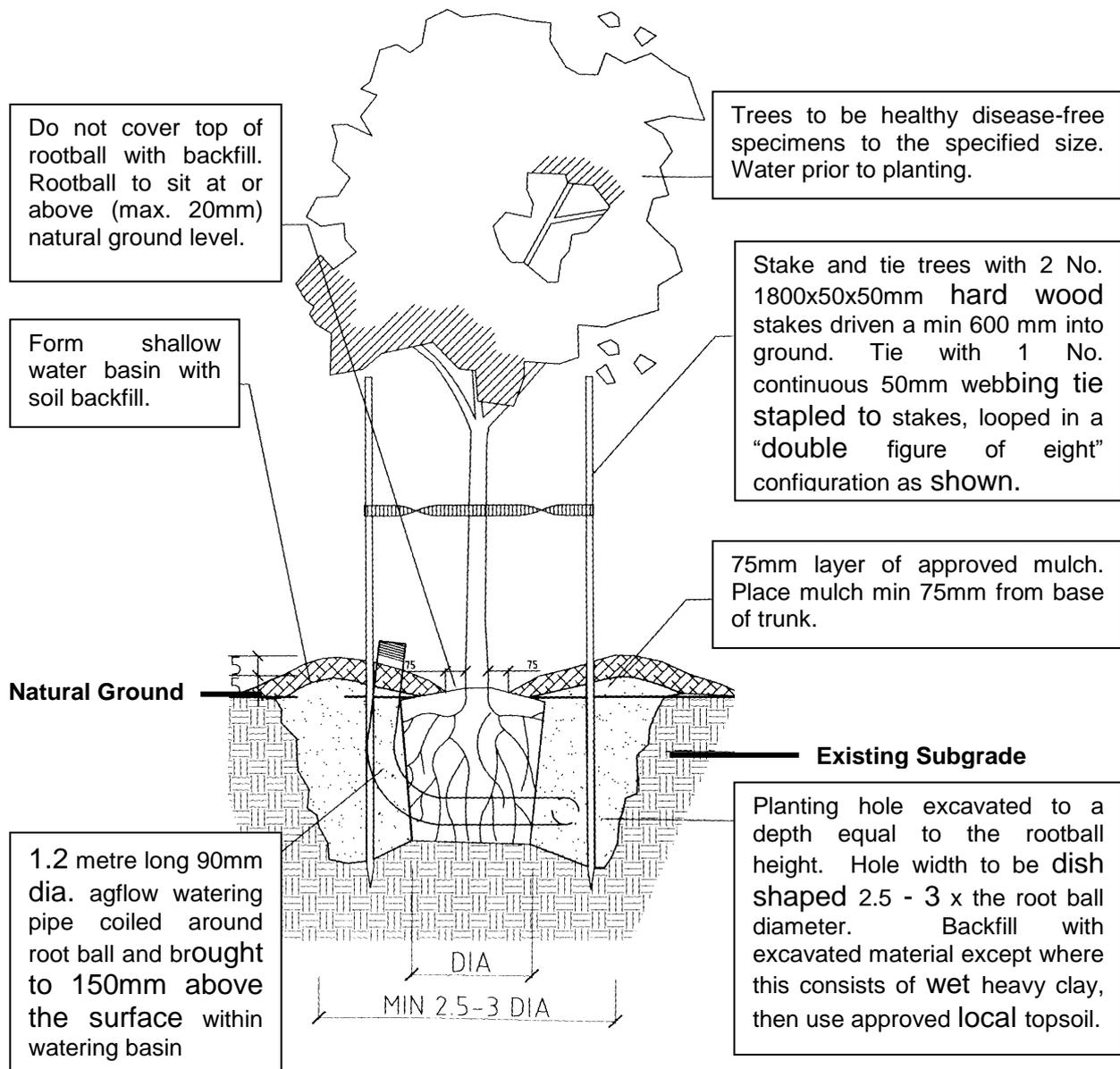
Planting should ideally be undertaken during autumn for optimal plant establishment. Overly wet conditions can lead to the smearing of the sides of the planting hole during excavation, and thus is difficult for root growth to penetrate, as well as forming a basin that tends to become waterlogged. Spiralling of roots within the hole can result, as well as a number of root rots and anoxic soil conditions.

Due to planting stock availability or subdivision construction timelines, it may not be possible to plant during autumn. Planting can be quite successfully undertaken at other times of the year, however it must be recognized that higher management input will be required to ensure successful establishment, especially if late plantings are undertaken, leading to an increased program of irrigation during early stages of establishment. Many of these problems can be overcome by contract growing of plant material, to ensure that robust specimens are available of suitable size and state of development for the project.

Mulching

Mulching is desirable for a number of reasons, not the least of which are moisture retention and weed control. Increased moisture has a flow on effect, including increasing the availability of nutrients to the tree. Furthermore, mulching helps to

dissipate traffic loadings laterally, reducing the effects of compaction. Mineral aggregates, such as granitic sand are useful in high wear areas, particularly adjacent to footpaths, where it is not easily displaced by pedestrians or washed away. Where a higher maintenance regime can be implemented, such as adjacent to parks, a fibrous mulch offers better protection from compaction but is more prone to displacement or being washed away. There may be a need for an annual replacement program and this should be factored into maintenance costs.



Typical Tree Planting Detail

Tree Species Selection

Topographical and landform conditions, vegetation patterns, soil types and climatic conditions are quite variable throughout the municipality and are significant influencing factors on street tree establishment. Variation in conditions, particularly soil type and structure, can commonly occur within individual subdivisions. Further to this, localised alteration to soil conditions associated with subdivision construction activities can further impact on the ability to successfully establish street and parkland trees. These alterations include the removal of topsoil, alterations to soil profiles, changed drainage patterns and general compaction of park and nature strip areas.

Gaining an appreciation and understanding of these variations within the subject site is an important step in determining appropriate plant species and establishment techniques to ensure the development of long lived, high performing avenues.

In general, Council will assess the suitability of tree selections for street tree planting within new subdivisions based on consideration of the following criteria.

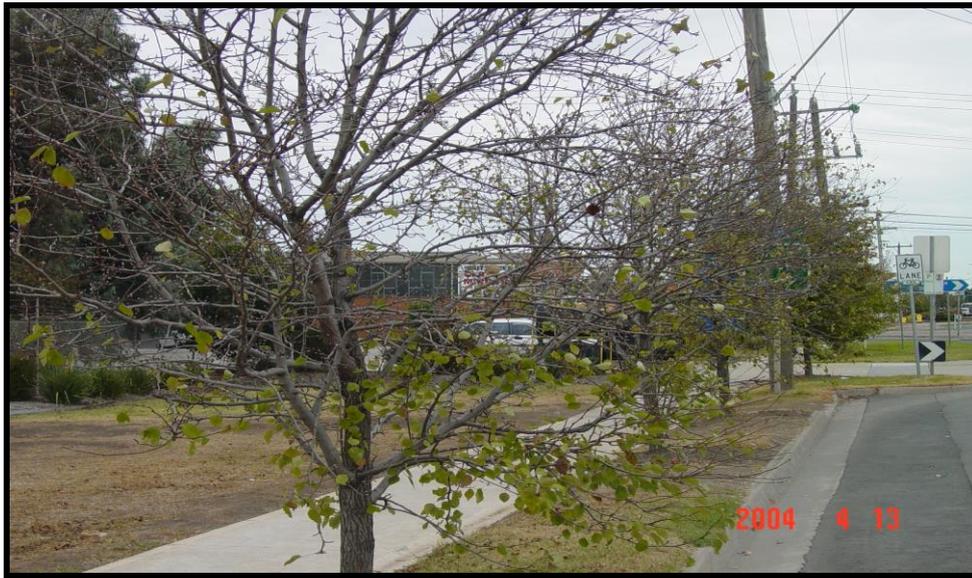
Biological Considerations

Climatic

Trees need to have the capacity to grow effectively in the temperature ranges provided by their planting site, to withstand exposure to winds and to thrive, watered only by the natural rainfall of the region. Street trees planted within the municipality should have the capacity to perform successfully without on going supplementary irrigation, post establishment (typically 2 years).

The harshness of the Whittlesea environment has a significant impact on many of the introduced taxa planted within the streetscape. The generally flat topographical nature of the municipality and its exposure to winds from the south west and more dramatically from the north, result in higher than Melbourne average evaporation rates. Extended dry summers and soils that crack open on drying, generally reduce trees' growth rates while leaf scorch is a frequent occurrence. Planes trees, for example, tend to burn around the leaf edge in hot weather so that by early February they may appear dishevelled and by early March they will generally be losing leaves because of moisture stress rather than the onset of cold weather. This is typical of most deciduous species grown within the plains areas of the municipality.

The traditional autumn display of changing leaf colours, a widely praised characteristic of deciduous trees, is in general terms not experienced within most parts of the municipality because of the loss of leaves through moisture stress in advance of dormancy. One of the major supporting reasons for planting many deciduous trees is thus lost. In contrast, some taxa such as *Robinia* spp. do retain their leaves late and, because of the relatively short winters experienced in Whittlesea, may grow more quickly. At the same time this rapid growth may shorten their life expectancy. Despite this phenomenon, suitably selected deciduous trees can contribute to a greater variety of vegetation form, foliage textures and canopy provision as well as creating a wider range of character types. Unfortunately, anecdotal evidence would suggest that there are few deciduous trees that are capable of withstanding the local extremes.



Example of drought induced defoliation of *Pyrus ussuriensis*, High Street, Epping. Note no autumn coloration in the leaves. The photo was taken in mid April when colours would normally be expected to show.



Drought induced defoliation of *Pyrus ussuriensis* (left) and unaffected tree (right). Regular bus shelter cleansing activities have most likely provided this tree with supplementary irrigation - High Street, Epping.

Soils

Soil oxygen is critical to successful tree growth yet many urban environments by their very nature – surrounded as they are by bitumen and concrete – provide little root oxygen. Compacted soils that result from road construction, are typically devoid of oxygen and provide a physical barrier to root development.

In soils that are generally de-oxygenated due to site constraints (poorly drained or low lying), conditions are unlikely to change through the life of the tree. Notwithstanding, compacted soils can be improved by the activity of soil organisms over time and may be improved at plant establishment by the application of suitable cultural practices that alleviate problems.

In either case there is much to be said for the selection of taxa with a notable capacity to tolerate low soil oxygen regimes. Direct observation of previous performance provides one of the best means of assessment though it is also important to note that biologically equivalent conditions occur when river valleys become inundated, the pore spaces within soils being filled with water so that trees lack access to soil oxygen. Trees originating from this habitat have an outstanding capacity to tolerate compaction and low soil oxygen levels, hence the predominance of river redgums over most of the basaltic plain soils of the region.

Pests & Diseases

Pests and diseases can significantly disfigure trees and may even lead to their death. Dutch Elm Disease, a fungal pathogen infecting elms has the potential to kill most elms in Australia. Though the disease is not yet in Australia it does offer a constant threat. The less serious Elm Leaf Beetle disfigures elm trees and has a high cost of even partial control. In these circumstances it would be unwise to select any elm taxa to provide the dominant component of a streetscape planting though it could be argued that their on-going use in specific locations, for example in a significant streetscape where they have been used historically, could be supported.

Native plants can also be susceptible to pests, for example the widely planted Mahogany gum (*Eucalyptus botryoides*) is frequently disfigured by lerp. By establishing a mixed tree canopy the chance of total loss from a disease outbreak is minimised. Planting diversity is beneficial. Indigenous plants may be exposed to their indigenous pests but they bring with them indigenous predators able to control these pests. Since many of these are native birds, the selection of indigenous planting stock may produce added environmental and amenity value to local communities.

Pollution

Exhaust fumes from cars that include low concentrations of ozone, nitrous and sulphur oxides can cause damage to stomatal opening in leaves. The net result of this is a slower growth rate, though at higher concentrations, damage can be more pronounced.

In general it is likely that significant damage is only likely to occur where traffic volumes are extremely high. Most Whittlesea locations should experience limited impact. Where this is viewed as a problem it may be desirable to use deciduous trees that loose their leaves annually rather than evergreen taxa where there can be a build-up of pollutant on leaves held longer on the plant.

Industrial emissions should not be a problem to tree growth except in the unlikely event of an emission that is outside EPA acceptable levels. It is not possible to plant with a view to tolerance of these extreme and unlikely circumstances. Note that trees do have the capacity to slow wind flow leading to the deposition of dust particles and absorb dusts so that their benefits can be direct. Evergreen trees perform best in these circumstances.

Functional Considerations

Growth Habit

Street trees need to have a form that allows traffic movement around them without impediment and without the need for major ongoing formative pruning. In the longer term, maintaining suitable sight lines and clearances above traffic and pedestrians is a critical component of Council's risk management initiatives. The trees' ability to be pruned to achieve these clearances without detriment to the form and character of the tree and the streetscape is critical.

The capacity to form a closed canopy is viewed as beneficial in street tree plantings especially on residential streets where the shade and enclosure created can be an important contributor to streetscape quality but it is very difficult to achieve with today's reduced dwelling setbacks, with out having some level of potentially negative impact on property owners. It must be born in mind that to achieve a closed canopy, the lateral spread of the tree is likely to be such that the impact of the

spread of the tree canopy and its accompanying overhang on adjacent residential properties may be unacceptable.

Root Growth

As the major conduit for the myriad of below ground infrastructure services including gas, telecommunications, water and electricity supply and the traditional location for street trees, the naturestrip is far more than a band of green separating road pavement from residential or industrial properties. The trenches in which service conduits are located generally provide a less compacted growing environment than the surrounding undisturbed sub-soils and hence as trees establish, their roots will quickly fill the space around these underground conduits. The risk of trees causing damage to below ground services is always present but as long as the infrastructure has been properly constructed and the joints well sealed, the chances of damage are minimal. Plastic conduits will generally deform sufficiently to withstand the pressures of an expanding root system. Generally, damage to services is directly related to the quality of the services in the first place. Cracked and damaged piping is more susceptible to root invasion.

On this basis, there appears to be little to guide tree selection other than larger and more vigorous trees generally proving to be a greater problem than smaller less vigorous taxa. In South Australia it was found that the frequency with which tree taxa caused blockage of services was directly related to their frequency of planting suggesting that there may be little difference between tree taxa when it comes to assessing their potential to cause damage.

The tendency for trees to lift pavements is closely related to the previous issue. Large trees displaying vigorous growth tend to cause greater damage as might be expected. Smaller less vigorous trees are less damaging. Research has shown that trees of similar size can cause different extent of damage depending upon their vigour. A large mulberry caused greater surface damage to paving than a less vigorous Zelkova of comparable size, for instance.

In part, the solution to root damage to paving lies in utilising flexible paving that permits repair more easily, in planting in larger nature strip areas and in providing larger cut areas in paths to allow space for development of major scaffold roots. In newer sub-divisions there is a tendency to provide off road parking and this decreases available areas for planting which may exacerbate this problem. Council's standard minimum naturestrip width is 2.5 metres which is generally considered a suitable width to ensure the potential for root deformation of abutting pavements for a centrally located tree of medium scale is minimised. For larger growing trees, greater widths should be provided.

Naturestrip Width

Whittlesea's planning scheme nominates minimum unencumbered naturestrip width requirements based on projected traffic volumes for use in all new developments within Table C1 –*Design of Road and Neighbourhood Streets* within the planning scheme guidelines.

Table 1 provides a guide for the provision of trees within given unencumbered naturestrip areas, based on the ultimate mature height of a tree growing within Whittlesea's local conditions. Two tree types are nominated within the table. Type 1 trees relate to standard upright trees (*Eucalypt spp* and similar). Type 2 trees relate to heavy stemmed tree varieties (typified by Fig Trees (*Ficus spp*) and similar).

Mature Tree Height (metres)	Minimum Naturestrip Width (metres)	
	Type 1 Tree	Type 2 Tree
5	2.50	2.50
6	2.50	2.50
7	2.50	2.50
8	2.50	2.50
9	2.50	2.50
10	2.50	2.75
11	2.50	3.00
12	2.50	3.25
13	2.70	3.50
14	2.90	3.75
15	3.10	4.00
16	3.30	4.25
17	3.50	4.50
18	3.70	4.75
19	3.90	5.00
20	4.10	5.25
21	4.30	5.50
22	4.50	5.75
23	4.70	6.00
24	4.90	6.25
25	5.10	6.50

Table 1 – Minimum requirements for the provision of unencumbered naturestrip, based on mature tree height (note, in accordance with Council's Streetscape Development Guidelines, the minimum naturestrip width for the planting of woody vegetation is 2.5 metres).

Based on the above discussion regarding below ground services, as long as services are located at suitable depths, lateral separation of the planted tree from the services is not required.

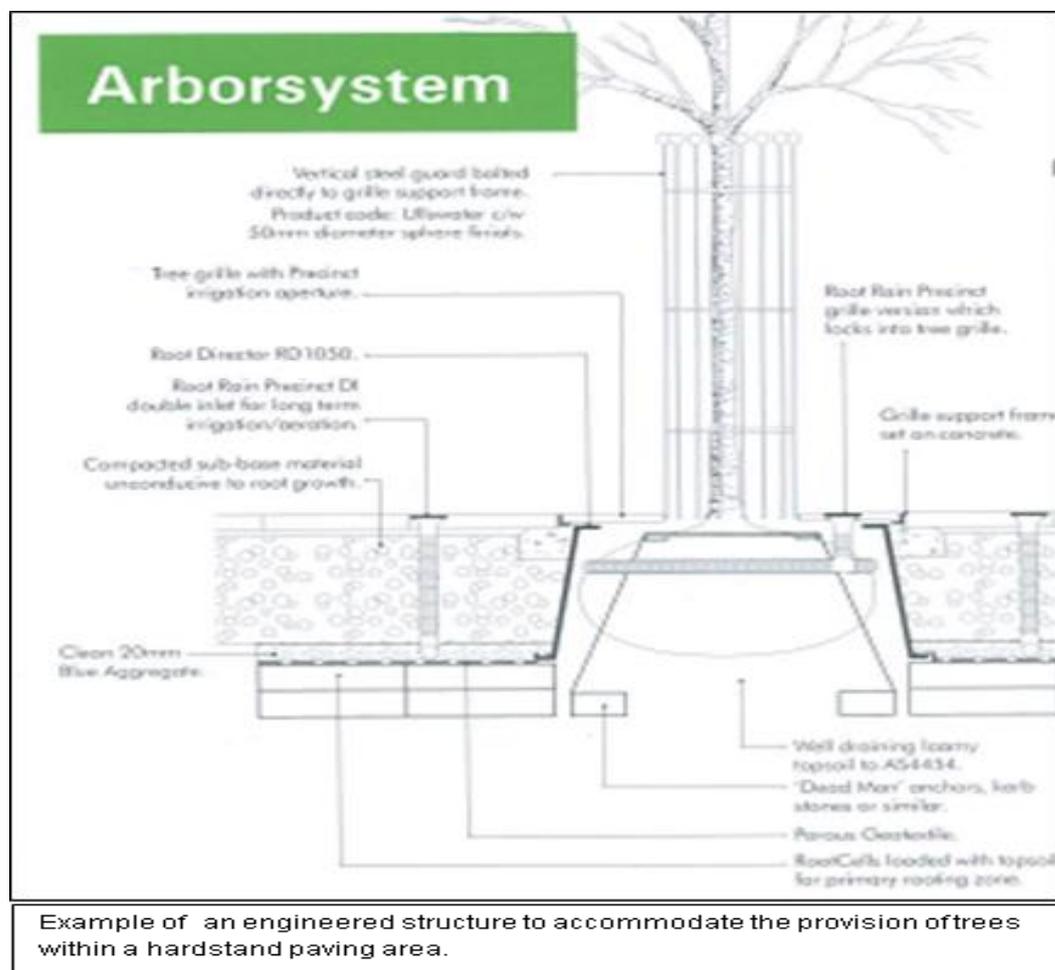
More modern technology involves the use of root barriers and deflectors designed to prevent penetration by roots into specific soil areas. Research is still being undertaken in this area and there are suggestions that stability may be affected in the long term because of the failure of a tree to develop a full root profile. Further to this, root barriers must have penetrations through the for the provision of services to each residential lot and it is these penetrations that can be quickly infiltrated by expanding root systems, defeating the purpose of the root barrier.

Root barriers come in three types – diversion barriers which form a wall, pervious barriers which allow only moisture to penetrate and chemical barriers which kill root hairs and prevent root development near a chemically treated fabric. Recent research suggests that each of these techniques has a limited life effectiveness. Further to this, the use of these techniques requires effective irrigation to be supplied to trees since their ability to explore large soil volumes for water is clearly limited.

For this reason, the use of root barriers in order to overcome potential problems associated with root development is not considered appropriate.

Trees Within Hardstand Areas

While the use of root barriers for asset protection is not considered as a solution per se, the growing trend to incorporate landscape embellishments within hardstand paving, typically located within strip shopping and main street areas, requires consideration.



In cases where developers wish to pursue landscape outcomes of this type, Council will seek engineered solutions that will ensure both adequate physical conditions to support the physiological needs of the tree, combined with appropriate asset protection measures.

In the case of physiological needs, the use of manufactured structural soils located within tree root growth areas, engineered with adequate soil moisture provision and drainage capacity will be viewed as acceptable.

The example detailed on this page also nominated the use of a specific root barrier structure for use in channelling developing roots within constructed root zone areas.

Horticultural Considerations

Longevity

Given the high costs associated with tree establishment and the early years of formative pruning it is important that street trees possess a reasonable life expectancy. In fact the issue is not the life expectancy of the taxa, rather its ability to provide a high level of amenity over an extended period at low on-going maintenance cost. This tends against the selection of short-lived pioneer species and in favour of medium to long-lived taxa with an effective form and appearance.

Production

Trees selected for street planting need to be available from nurseries in sizes suited to practical establishment in the landscape and an acceptable level of visual impact. This implies that the trees will tolerate transplanting as semi advanced nursery stock to ensure the optimum tolerance of vandalism etc. in the urban landscape. It also implies an ability to be transplanted as larger stock if there is a desire to replace lost trees as the planting matures.

Structure

The structural strength of the tree canopy is an essential facet of tree selection. There are taxa with intrinsic branch weaknesses that make them prone to limb loss in strong winds. *Robinia* spp., *Gleditsia* spp., and *Paulownia* spp. are all particularly prone to this type of damage. Other groups become prone to limb loss following pruning, for example *Cupressus macrocarpa* has a weak branch/trunk attachment making it especially prone to shear.

Poor branch and trunk attachment is common in a number of fastigate trees and is also a product of poor tree management where poorly attached epicormic growth formed after lopping has a marked propensity to shear. Post implementation practices have a considerable and on-going impact on the structural stability of trees.

However there are taxa that have a greater tendency to drop limbs as a result of soil moisture stress. Among these are *Aesculus hippocastanum* and, significantly for Whittlesea in the light of its dominance as a remnant, the River Red gum (*Eucalyptus camaldulensis*). Other taxa have a very low limb shear character and their use in public places is more desirable.

Debris

The production of leaves that form slippery masses in autumn when wet, or are especially slow to break down can be a nuisance for residents especially in heavily trafficked areas. Should their presence be deemed unacceptable then the costs of collecting and disposing of foliage places another burden on the public purse.

Leaves of some *Platanus* spp. especially are large and can take considerable time to break down. There can be considerable community resentment to their use. By contrast, leaves in the form of leaflets that are small and easily dispersed by wind e.g. *Robinia* spp. or evergreen taxa that are subject to a heavy single season leaf drop, avoid these conflicts.

Similar problems may be experienced with trees that produce heavy crops of especially succulent fruit or large woody fruit that are slow to break down. Fruit that has a particular appeal for gathering, for example that of *Olea* cultivars, may lead to branch breakage in the collecting process but at least there will be no fruit on the ground to contend with.

Aesthetic Considerations

Form

The appearance of street trees is a fundamental aspect of their perceived suitability in the public eye. While the appearance of a tree and its appeal may be subject to individual taste, there are trees that either through repeated use in a specific context or because of a specific character have locations to which they are especially suited. Palms for example are redolent of nineteenth century coastal development or pretentious place-making. *Platanus* spp. are redolent of urban streetscapes throughout the world and offer an especially urban tone.

Considered tree selection can enhance the character of an area and offer a very real sense of place and identity.

Colour

Colour of tree foliage is a critical element of street tree suitability. A consistent foliage colour provides a unifying element that is so often absent from the built environment. Yet there are foliages that can be dark and sombre (purple leafed plums), bright and garish (golden foliages against the soft grey foliages of the Australian bush) or over lush (fresh greens against the dry Australian landscape). Many of these associations reflect personal tastes though many are widely held attitudes.

Careful selection is especially important in the context of the interface between rural and semi-urban environments as is typified by the City of Whittlesea. In the words of Hitchmough, “trees with purple, yellow, yellow-green, white-green variegated foliage should only be considered in very specific situations involving specimen planting, and paying due regard to colour relationships with adjacent buildings and landscapes”.

Scale

Tree scale is the single most important factor in selecting street trees. Trees with large canopy spread and a significant ultimate height should be chosen only where possible. The use of inappropriately scaled trees does bring dangers. Where space is restricted, there can be a need for pruning to restrict the spread of canopies and this can involve high cost tree surgery, as well as detrimental impacts on the form and character of the tree

The selection of smaller growing trees fails to address the issue of urban scale and extends the philosophy of the home garden into the public domain. Unless the site specifically demands it, tree selection should reflect the scale of the broader environment. This has been one of the major problems with earlier street tree plantings in Whittlesea especially through sub-divisions of the 1970's and 1980's.

Foliage

Foliage and tree form are generally more important than the transient quality of floral display when selecting street trees. While flowers may have the added benefit of attracting wildlife, e.g. nectar seeking birds, it is the foliage and tree form that should dictate tree selection since they will meet the demands of the broader urban environment. The focus should be on the context of the tree planting not on the small-scale qualities of the individual plant.

Consistency

Apart from the use of a consistent species, consistent tree form has a major role to play where avenue effects are sought. Seed grown trees reveal variation that is common in any population of a species.

Cultivation of cloned trees where these are available ensures consistent form for avenue or boulevard effects. Given the state of plant breeding of Australian plants, this strategy would discriminate against their use. In fact the relaxed form of most eucalypts suggests they would be best utilised as informal masses rather than any formal avenue scheme. Exceptions to this are species which have a consistent upright form e.g. *Corymbia maculata* , *Grevillea robusta* etc. which allow successful formal avenue plantings.

Environmental Considerations

Solar Access

Much has been said about the environmental value and energy saving characteristics of deciduous trees in being able to provide shade in summer and light penetration in winter. These elements have often been cited as justification for planting of deciduous trees in east west aligned streets. There is no doubt that this is the case but the effectiveness of the trees in being able to provide these benefits is very much dependant on the location and scale of the tree.

In a street environment, for a tree to provide shade to a house such that the heating effects of the sun are diminished, the tree's canopy would have to spread well over the property line and probably over the house in part. Similarly, for an evergreen tree to shade a house from the solar heating effects of the sun in winter, although the sun is lower in the sky and the cast shadows longer than in summer, the tree would have to be very large for it to shadow the abutting house. Further to this, the tree would have to be particularly dense canopied which is certainly atypical of most Australian native trees.

In this regard, the use of deciduous trees specifically for their solar benefits is not supported in new subdivisions.

Weed Potential

The propensity of many taxa to seed into adjacent bushland has serious repercussions for the long term health of these habitats. While the chances of seed from inner-city areas invading nature reserves may be slight, the situation in urban fringe cities like Whittlesea is quite different. The risk of infestation of the Plenty Gorge and the associated bushland areas neighbouring the City make this issue a high priority for consideration in tree selection.

Allergens & Toxins

Several tree taxa produce pollen to which some residents could be allergic. Some trees produce poisonous fruit or foliage while others produce seeds that can be an irritant. In general trees selected for streetscape use should be free of such risk.

Planting List

There is no ideal street tree. Tree selection is inevitably a compromise with the selected tree meeting a number of the most important criteria. **Appendix 4** provides a list of trees considered for street tree plantings and assesses their performance against many of the criteria discussed in the preceding section of the report.

The selection of trees considered suitable for streetscape use in the City of Whittlesea has been based upon several criteria notably:

- Previous experience from the Council's Parks Management personnel relating to tree growth in similar environments.
- Observation of existing tree populations within the City of Whittlesea
- Advice from industry professionals about the performance of selected taxa as street trees.

An analysis of the qualities and limitations of each taxa has been included. One of the primary reasons for inclusion in the list is that many of the trees are considered to have the right characteristics for avenue type planting but it is not the prime reason as the form of many of the natives on the list is far from formal.

The City of Whittlesea encourages the use of a wide range of trees from this list and although the tried and true are included, developers are discouraged from preferencing their selections based on a more likely guarantee of availability because of established nursery growing lists. Nurseries will never grow a wider range of tree and plant species in general unless there is a demand for them – developers need to create that demand, particularly when it comes to Australian native trees for which almost no history of cultivation and selection of better forms has taken place, compared with European trees.

Appendix 1 – Physical and Climatic Conditions

Topography

Topographically, the waterways and prominent ranges within the municipality show a strong north-south structure. There is also a considerable range in elevation within the municipality as it falls (very steeply) from elevations of up to 792m above sea level in the north (Mt Disappointment) and to less than 40m in the southern areas of the municipality.

The flat land associated with basalt lava flows in the western areas of the municipality have a contour level of approximately 120m with gently undulating and dissecting hillsides with contour levels of between 200 m to 300m further to the north.

The northern reaches of the rural areas comprise the south western slopes of the Great Dividing Range, forming numerous spurs and valleys and providing the source of a number of streams, which flow into the Merri and Darebin Creeks to the west and the Plenty River to the east. The Great Dividing Range also forms the northern boundary of the municipality and is known along this length as the 'Hume Range'. Topographically, this range comprises prominent areas within the Mt Disappointment State Forest and adjacent water catchment areas.

A number of prominent spurs run south into the rural area from the Hume Range including the Sherwin Range which extends south-west from Kinglake West above Humevale. Further topographical features include the Whittlesea Hills which extend south (adjacent to Plenty Road) from the Plenty Range to She Oak Hill, separating the Plenty River from its major tributary, Barbers Creek. The Quarry Hills, north of South Morang and a number of volcanic cones and hills within Western Plains (including Mt Fraser, Green Hill, Hayes Hill and Summer Hill) add further diversity to the topographical features of the rural areas.

Water Catchments

The City of Whittlesea is located entirely within the Yarra Catchment and is one of 18 local-government areas that share the responsibility for the integrated management of the catchment.

A total of 19 sub-catchments have been identified in the Yarra Catchment. Four of these sub-catchments lie, to varying degrees, within the City of Whittlesea. They include:

- ❖ Approximately 80 percent of the ***Plenty River Catchment***. The upper northwest and lower south and southeast portions are located outside of the municipality.
- ❖ One-quarter of the ***Merri Creek Catchment***. These areas are located in the eastern middle and upper reaches of the catchment.
- ❖ Three-quarters of the ***Darebin Creek Catchment***. The municipality contains the entire middle and upper reaches of the catchment.
- ❖ A very small portion of the upper northwest catchment of the ***Diamond Creek Catchment***.

Geology and Soil

The non-urban areas show four distinct geological divisions (illustrated in figure 1), each supporting characteristic landform units, drainage patterns and vegetation types.

Land use patterns, both of the pre-settlement Aboriginal community and of more recent settlement, have been significantly shaped by the geological characteristics of the region.

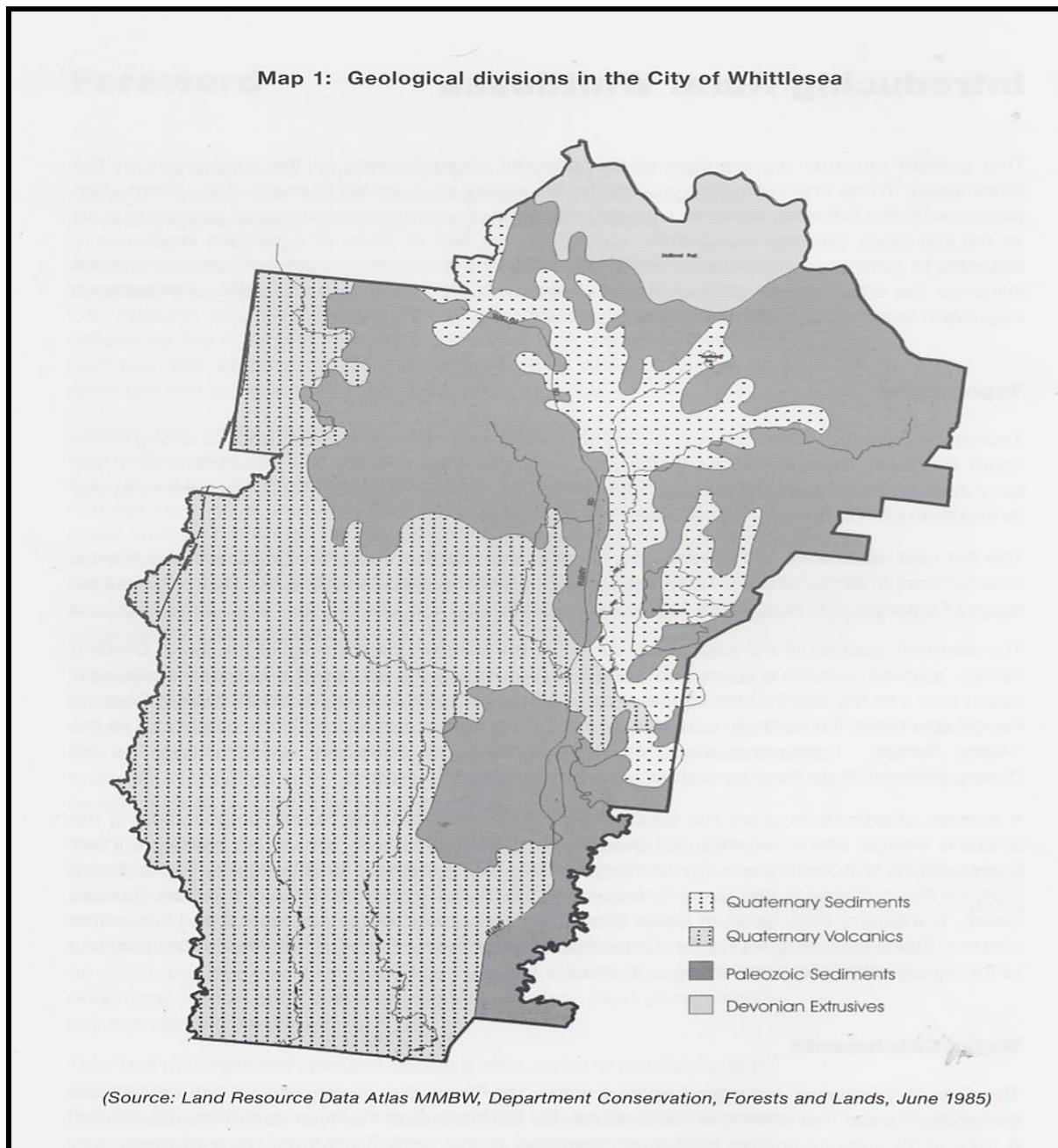


Figure 1 – Soil Types

Quaternary Basalt:

Forming extensive basalt plains extending west of Plenty River. They form two major soil types:

- ❖ black self-mulching cracking clay in the Epping-Donnybrook district. Rock incidence is high, particularly on the moderate undulating rises; and
- ❖ friable brown duplex soils, occurring from Yan Yean to Wallan, mainly as flat to undulating plains with low minor rises and occasional drainage depressions.

The indigenous vegetation types are predominantly River Red Gum Grassy Woodland and Basalt Plains Grasslands.

Quaternary Alluvium:

Where major alluvial deposits arise from the Plenty River and its tributaries, forming finger like projections leading to a central valley.

The alluvial soils are dark yellowish brown loams with bleaching and mottling occurring down the profile.

The indigenous vegetation communities that occur on this geological division include Swamp Scrub and Floodplain Riparian Woodland and Riparian Forest. Refer to Section 3 for further detail.

Palaeozoic Sediments:

Consisting of Silurian and Devonian siltstone and mudstone. The two main soil types which have arisen from this parent material are:

- ❖ a mottled yellow, brown sodic duplex soil; and
- ❖ shallow, stony brown gradational soils.

The duplex soils tend to be located on the more moderate slopes, giving way to the stony, gradational soils on the steeper slopes.

The vegetation associations are more complex in this geological division due to the variation in topography, aspect, soil type and elevation. Eucalypts such as narrow leaf peppermint, manna gum and messmate, are the dominant species with a shrub dominant understorey. Refer to section 3 for further information about local vegetation communities.

Devonian Granite:

Devonian granite occurs in the northern hills, forming a strongly undulating dissected terrain. Soils are generally red to brown, finely textured clay with some sand over decomposing granite. Major indigenous vegetation species are eucalypts and include mountain ash, broad leafed peppermint, yellow box, messmate and mountain grey gum.

Climate

The major climatic features of rainfall and temperature are locally modified by the topography

Average annual rainfall for Whittlesea varies from 630mm to 720mm throughout the municipality. Rainfall occurs over a relatively even monthly distribution pattern although the incidence is higher in spring. Summer rainfall is largely ineffective due to high evaporation rates from November to March.

The annual average temperature is 15° C but it exhibits a strong seasonal pattern, with the coldest months occurring over July-August and the hottest December-January. Plant growth patterns are constrained by the cold winter temperatures and the absence of effective soil moisture over the summer months. As a result of the interactions of rainfall and temperature, the growing season commences with the autumn break (late March-early April) and terminates late November-December, however topography and soil type modifies this pattern.

The Western Basalt Plains have a lower annual rainfall (630-650 mm) and are subject to winter water logging. Rainfall rises with increasing relief patterns to the northeast of the municipality

Appendix 2 – Typical Streetscape Designs

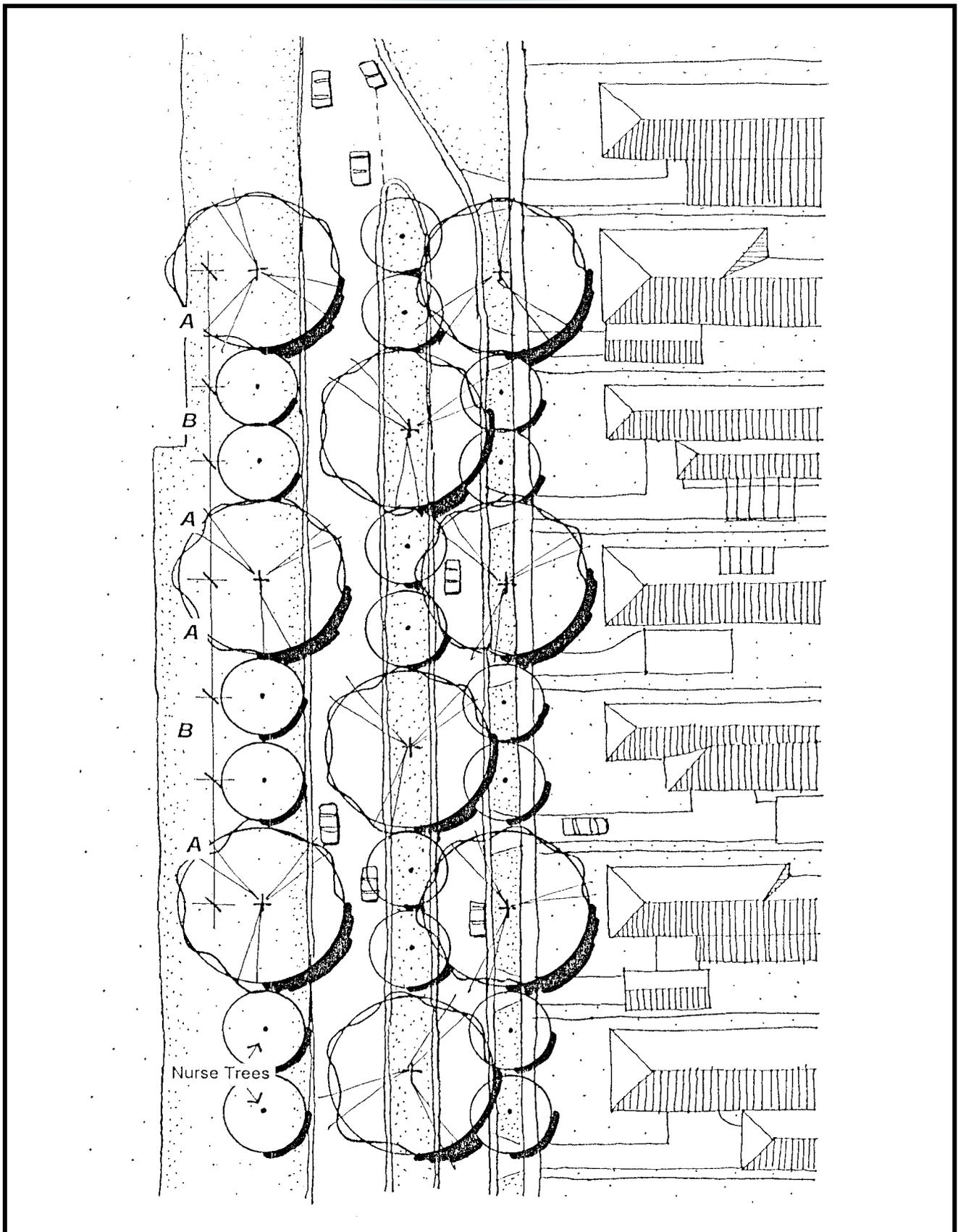
Planting plans will need to be developed for specific streets. This procedure will involve a number of stages including public participation, preparation of planting plans and the ordering of trees from plant nurseries (ensure that suitable quality material is available).

For many streets, the planting scheme will be quite straight forward, with trees planted at consistent spacings within nature strips along the street. However, there are a numerous circumstances where street trees can make a more effective contribution to a streetscape, not only by being aesthetically satisfying, but by fulfilling functional roles.

Often the best solutions to the use of trees result from a combination planting that utilises a long-lived, larger species with a short-lived quick growing or smaller species (nurse tree). Elsewhere trees may be located in a way that gives presence to a streetscape by providing a “gateway” effect to an avenue or cul-de-sac, or being an integral component of a traffic calming design.

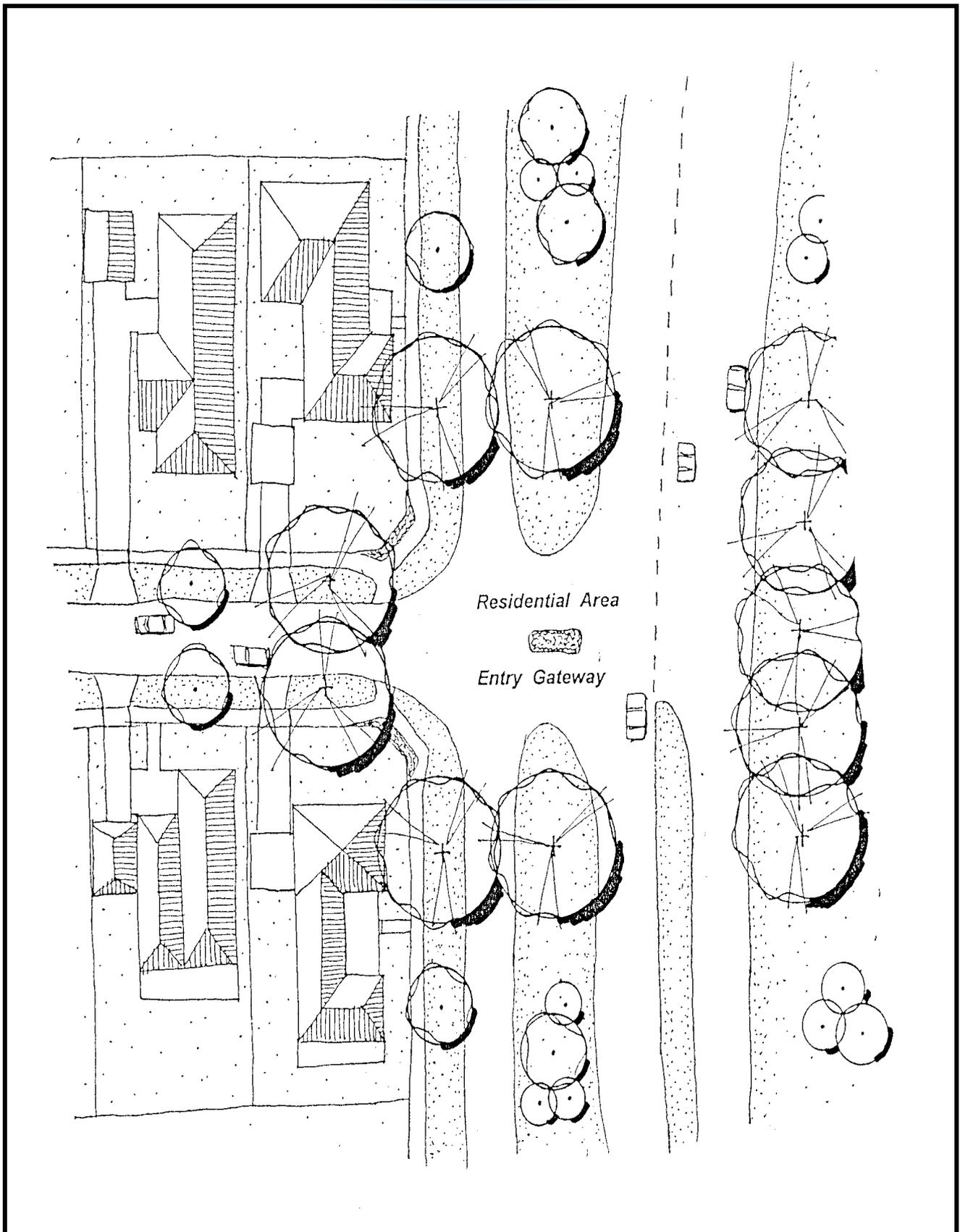
The following planting plans are developed from existing streetscape designs within the City of Whittlesea. None of the specific locations are identified, but the proposals address issues in real situations rather than being contrived schemes developed by a landscape architect.

Though prepared for specific situations, principles are provided that allow these proposals to be utilised in the broader Whittlesea setting, though there will be a need for refinement to solutions to ensure they meet specific circumstances.

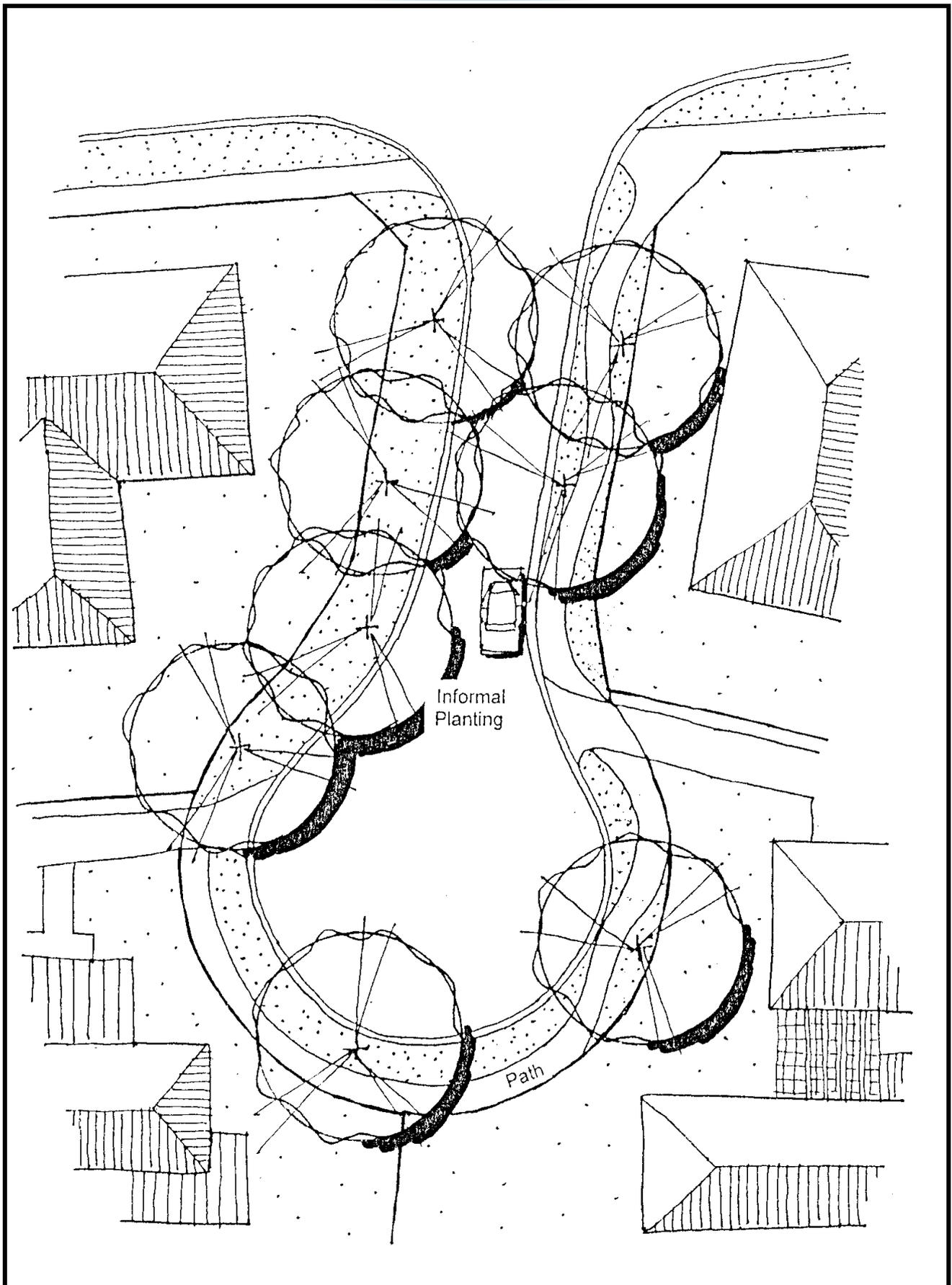


Formal Avenue - Mixed Large Tree/Small Nurse Tree

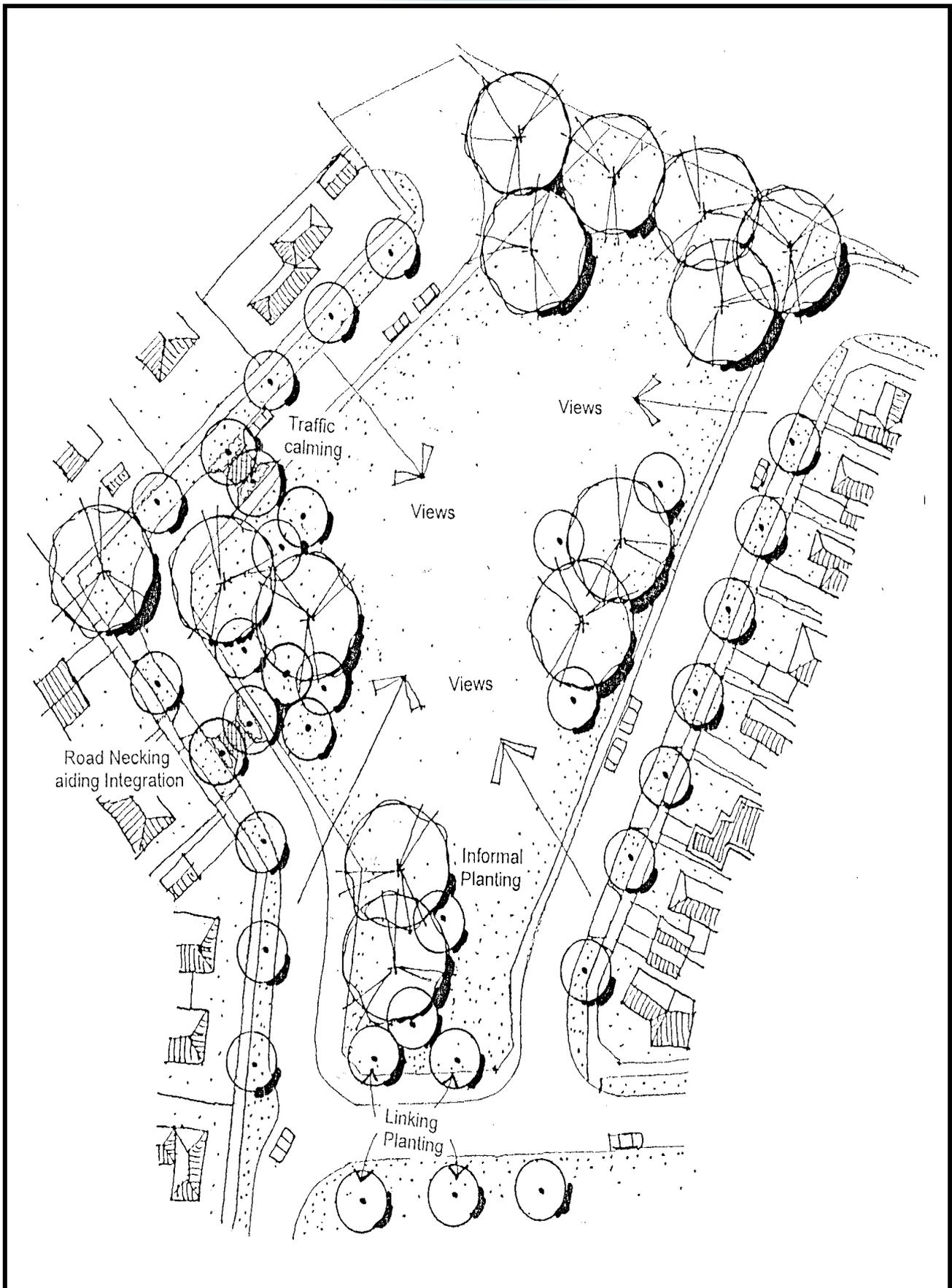
- Large Trees on 15m grid 8-10+ m canopy spread
- Medium Trees on 10 m grid 4-6m canopy spread



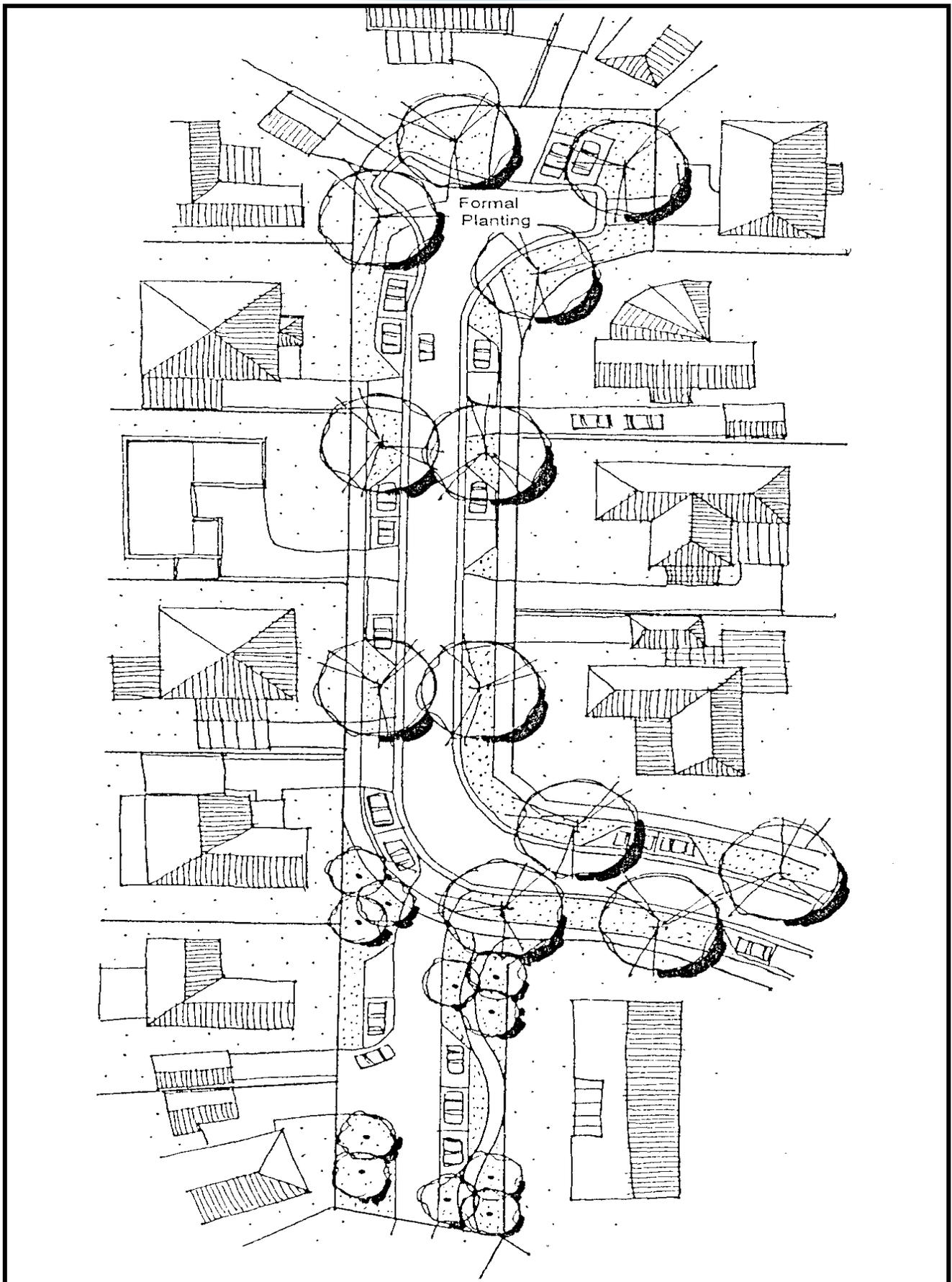
Residential Gateway - Defining Large Tree-Formal



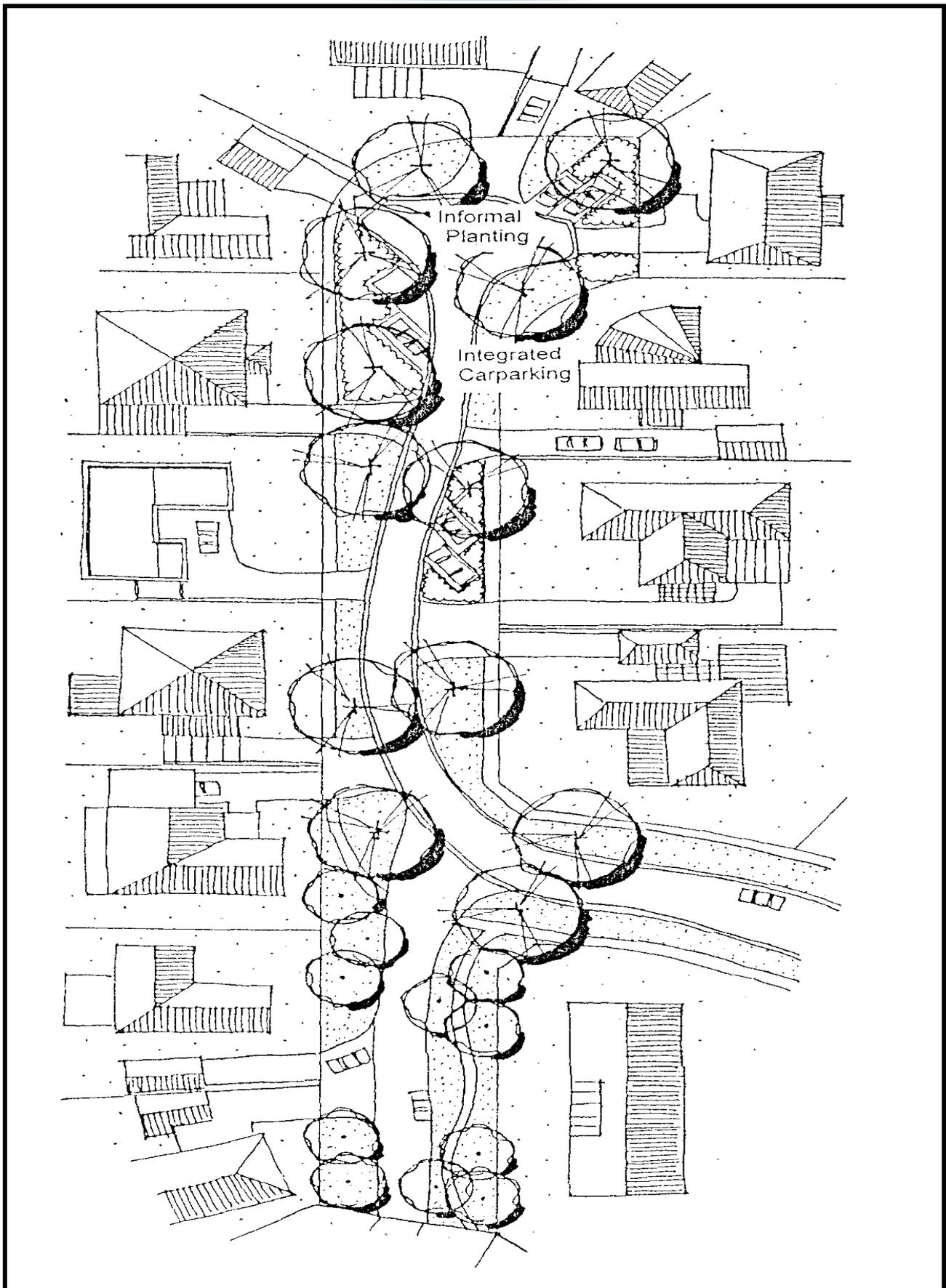
Residential Court — Realign footpath to vary tree positions



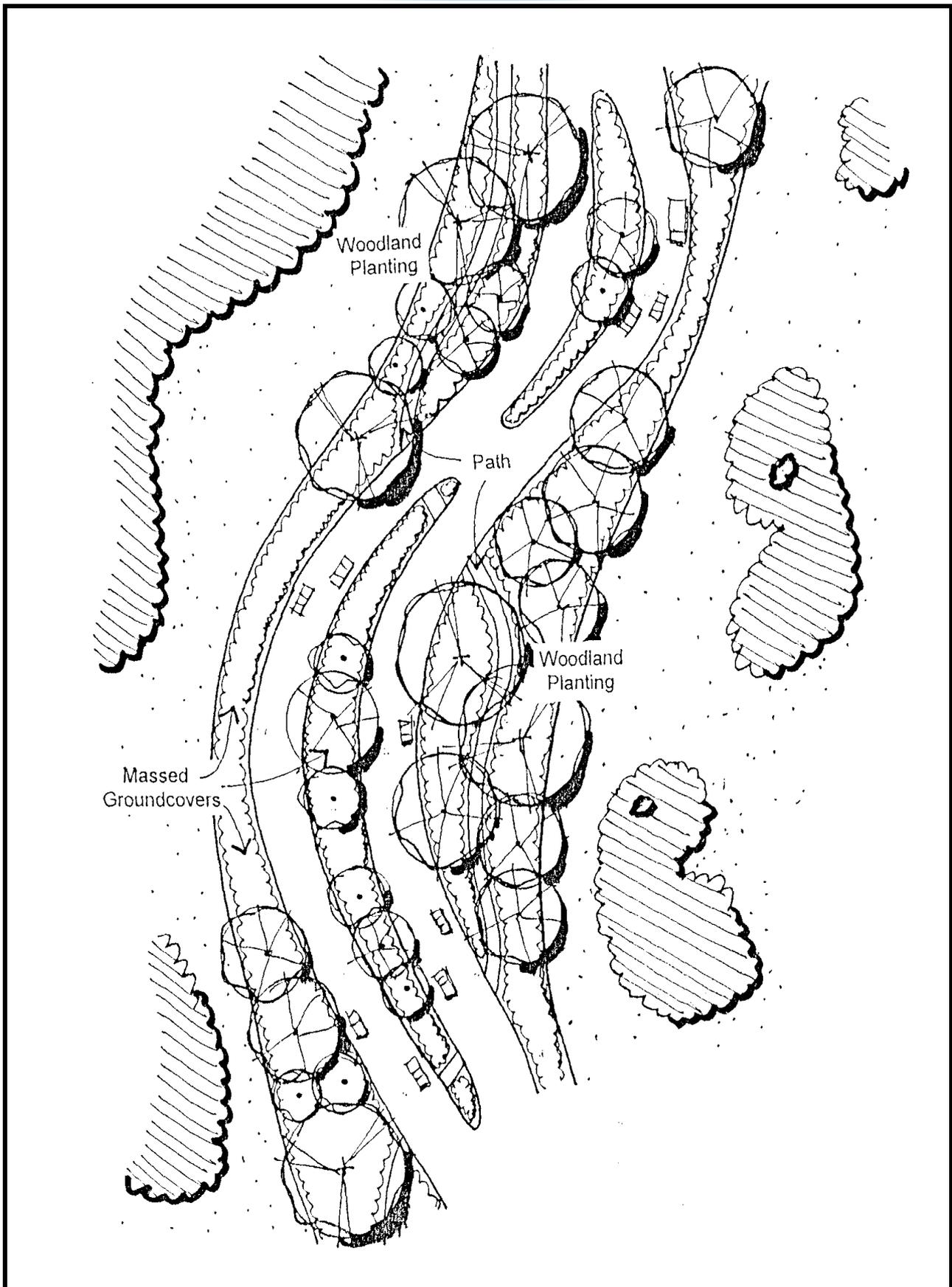
Park/Streetscape Interface — Shared street tree style



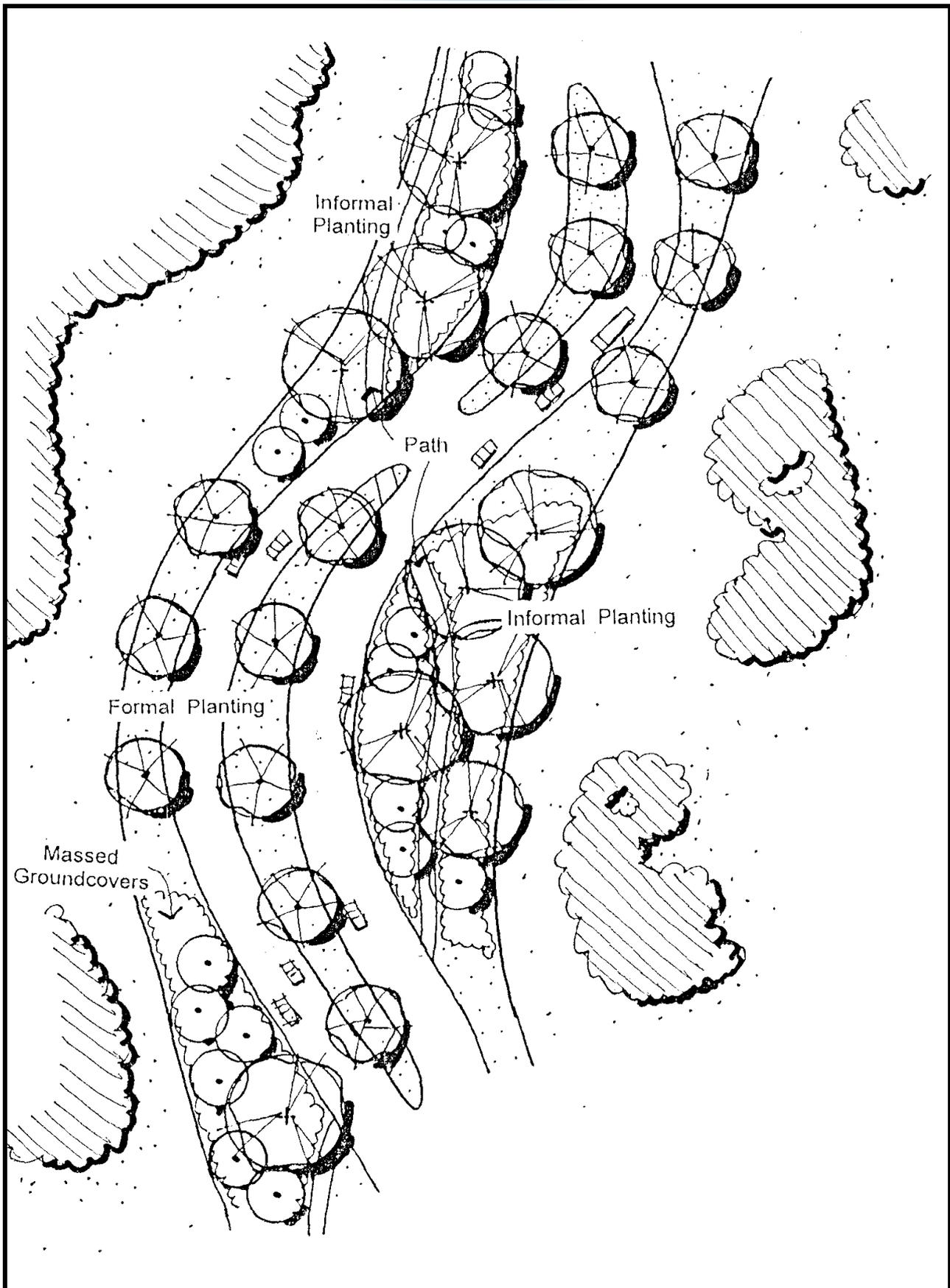
Narrow Street — Formal tree plantings



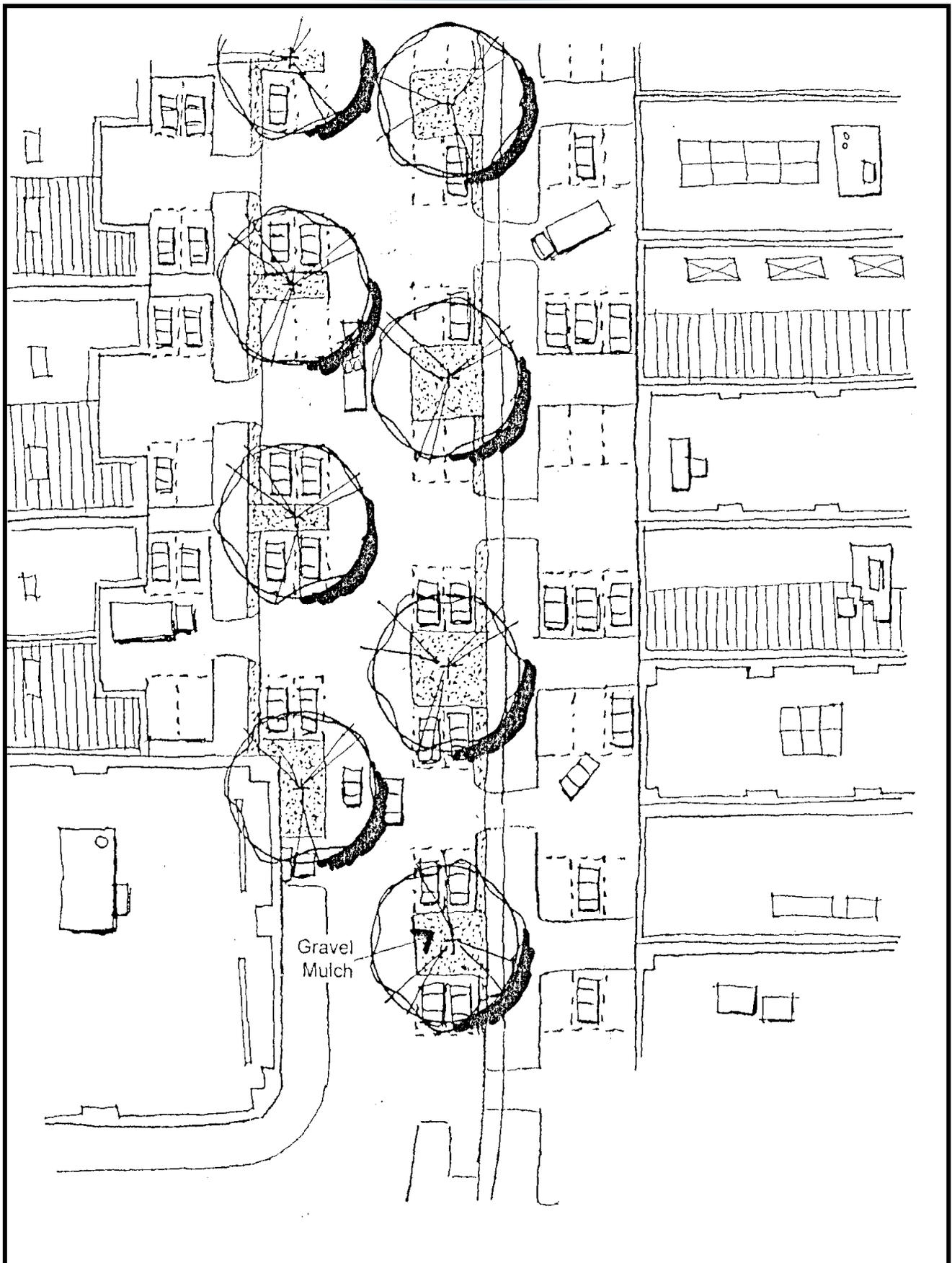
Narrow Street — normal tree planting



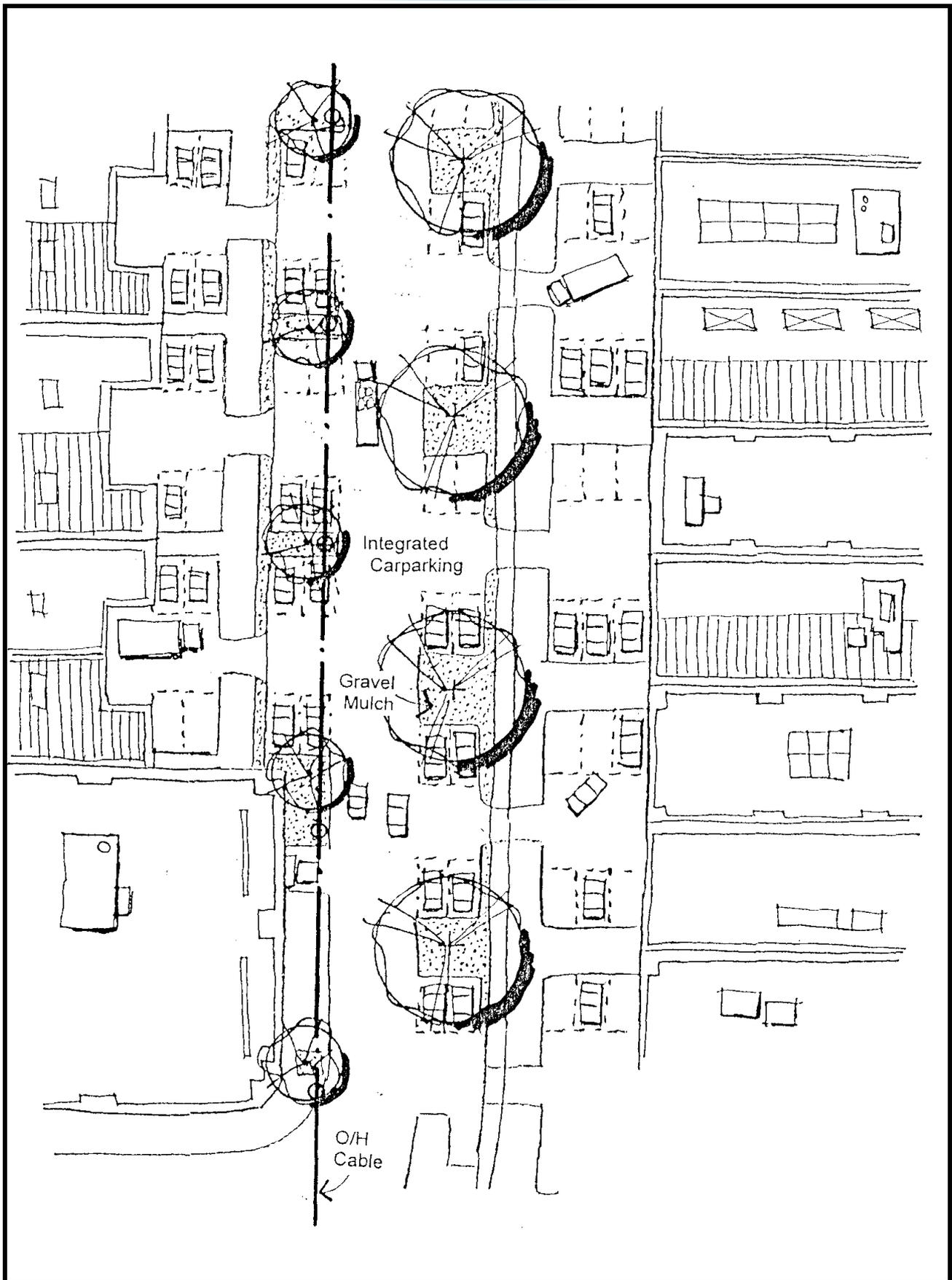
Winding Road – Blend of formal and informal for interest



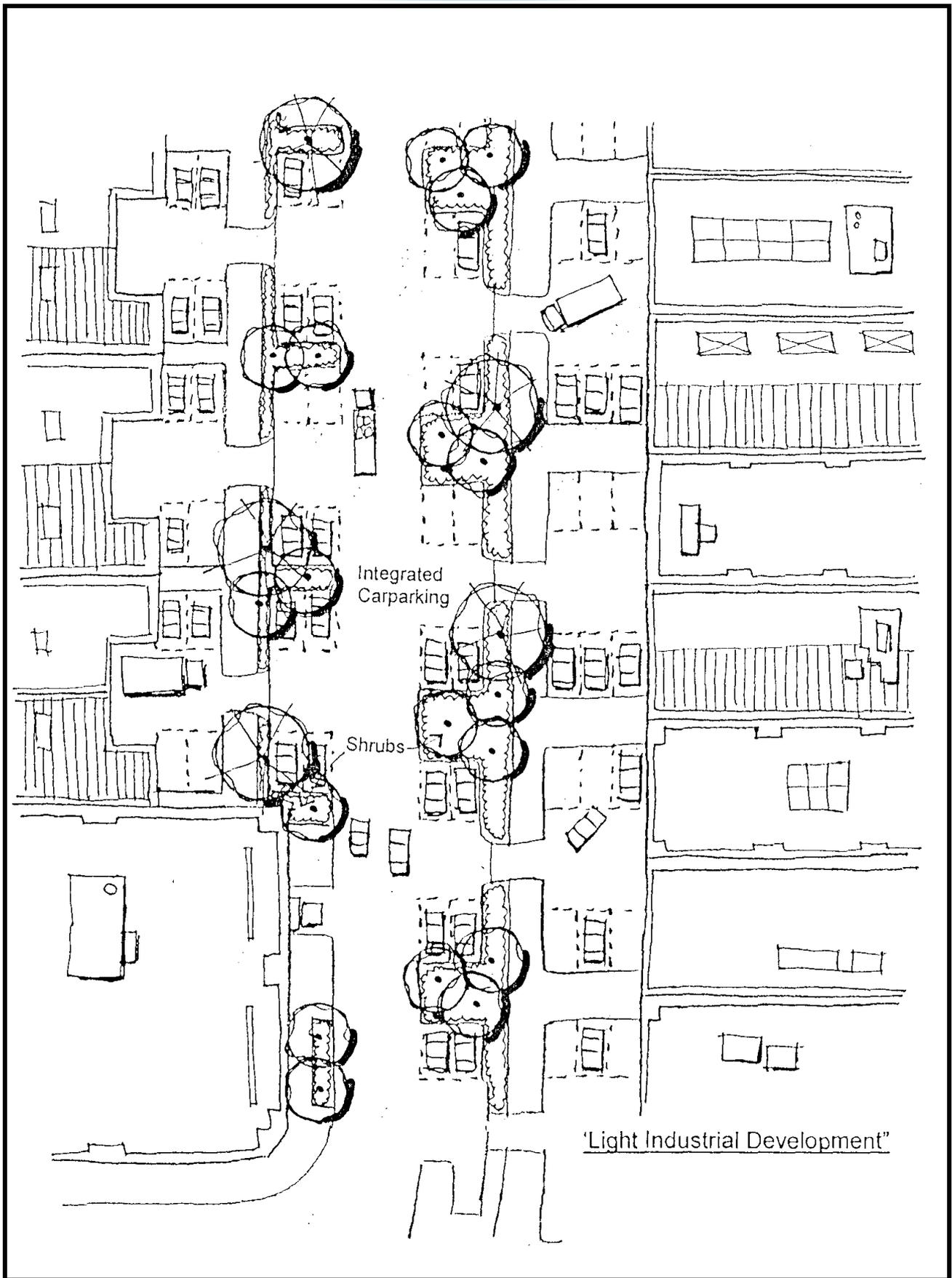
Winding Road — Vary road reserves and median strips — informal



Industrial Area — Formal large tree



Industrial Area Formal mix large and small/medium trees



Industrial Area— Informal small-medium trees

Appendix 3 – Entry Treatments

Entrance Treatments and Promotional Advertising for New Residential Subdivision – Policy and Guidelines

This Policy applies to all residential zones within the City of Whittlesea and in particular to development plans, multi lot residential subdivisions and larger medium density housing developments.

Policy Basis

The Municipal Strategic Statement recognises the need to progressively upgrade the image and appearance of the municipality's extensive residential areas – particularly through urban and landscape design improvements. Entrance areas to newly developing residential estates provide opportunities to further these objectives while at the same time providing estate developers with important landmarks for identification and marketing.

This Policy seeks to enhance the quality of entrance treatments for new residential estates and associated promotional advertising.

Objectives

1. To encourage a high standard of visual amenity and appearance at key entrance areas to new residential estates, subdivisions and integrated housing developments. Council is looking for an entrance statement, not an exclusion statement.
2. To ensure that entrance treatments to new residential areas are designed as permanent long term features which can be integrated and maintained as part of surrounding streetscape.
3. To provide appropriate opportunities for sensitively designed and sited temporary estate signage during the marketing phase of new residential developments.
4. To ensure that entrance treatments are designed to provide a sense of community inclusion, permeability and accessibility within the wider neighbourhood context.
5. To encourage unique and distinctive forms of landscape architecture in the design of new entrance treatments to residential areas.

Policy

It is local policy that:

1. Entrance treatments and associated works are designed as an integrated component at the initial development plan or subdivision stage. A comprehensive site analysis must form the basis for the consideration of height, scale and massing of any treatment and must take into account the natural, cultural and strategic context of its location.

2. Recognition should be given to the setting in which features are designed and the integrating role of landscape architecture.
3. All proposals must address the short and long term maintenance responsibilities for entrance treatments and associated works. Entrance features must be designed for long term retention, function and visual amenity.
4. Entrance treatments involving the following elements will be encouraged and supported where it can be demonstrated that they add to image and appearance of the area:
 - a) Distinctive landscape architecture, earth forming and mounding.
 - b) Street furniture, bollards, paving and lighting.
 - c) Architectural treatment and appropriate themes for building.
 - d) Good quality temporary signs.
5. Entrance treatments involving walls and gates will not be supported unless they provide:
 - a) An ancillary part of a predominant landscape orientated feature.
 - b) A minor or ancillary element along an entrance or frontage to the site.
 - c) Visual integration and permeability.
6. High walls and feature gates which restrict internal views into a development and portray a sense of exclusion and separation from any adjacent residential context will generally not be supported. However, the use of bluestone dry wall in a cultural or natural context and of an appropriate height may be considered as part of an entrance treatment feature.
7. Off-site promotional advertising be permitted only for those sites which do not have access to a Road Zone 1 under the Whittlesea Planning Scheme. Promotional Signage is to be limited to a temporary period specified by Council and not more than two signs at separate approaches to the land. All signage must be located at suitable locations to the satisfaction of VicRoads and Council.
8. The Council may require, as a condition of permit, part of the entrance treatment to be removed at the completion of the development.

Application Requirements

Any application or development proposal must be accompanied by three copies of all plans (to scale) showing:

1. The location of the proposed entrance treatment and/or promotional sign(s).
2. A site analysis and design response.
3. A photomontage showing the proposed sign or entrance treatment in its context from key viewing points and a context plan showing its impact on any adjacent land use and development.
4. The dimensions, colours, materials and height of any entrance feature and/or off site promotional signage.
5. Details of any forms of illumination.
6. A comprehensive landscape plan prepared by a qualified landscape architect (for entrance treatments and features).

Appendix 4 – Tree List

Trees Considered Suitable for Street Tree Usage in the City of Whittlesea

This list should not be construed as the definitive list of street trees that will be approved for planting within the City of Whittlesea. It is provided both as a guide and also to inform the developer of a wider range of particularly Australian native trees that are amenable for use in a street environment. There are many thousands of different tree species available world wide, the majority of which are rarely grown as amenity trees and very few that are suitable as street trees, particularly given the continuously tightening constraints placed on the street tree as the subdivision process continues to evolve. The City of Whittlesea supports and encourages plant breeders and growers willing to trial and introduce selected and better forms of any tree species for specific use in the street environment.

Australian Native

Botanical Name	Vernacular Name	Comments
Acacia implexa	Lightwood	Smaller tree suitable for individual or group planting.
Acacia melanoxylon	Blackwood	Use cautiously, can be very over powering. Dryland form only.
Acacia pendula	Weeping myall	Smaller tree suitable for individual or group planting, excellent form.
Agonis flexuosa	Willow Peppermint	Can be slow to establish but an excellent small to medium tree with fine foliage and massed white flowers.
Agonis flexuosa 'Burgundy'	Willow Peppermint	In all aspects, the same as the common form of Willow Peppermint but with dark burgundy new growth.
Agonis flexuosa 'After Dark'	Willow Peppermint	Very dark, almost black foliated form of A. flexuosa. Interesting small tree.
Agonis flexuosa 'Westland Burgundy'	Willow Peppermint	Fine foliage small tree form of A. flexuosa with burgundy new growth.
Allocasuarina littoralis	Black she oak	Smaller tree suitable for individual or group planting.
Allocasuarina torulosa	Rose she oak	Smaller tree suitable for individual or group planting but very variable.
Angophora costata	Smooth-barked apple	Larger tree for wider verges, medians, etc.
Angophora costata 'Little Gum Balls'		An excellent multi-trunked dwarf form of A. costata.
Angophora floribunda	Rough-barked apple	Larger tree for wider verges, medians, etc.
Angophora hispida	Dwarf Apple myrtle	Large shrub/small tree requiring formative pruning to single trunk for street tree usage. Good for group plantings.
Banksia integrifolia	Coastal banksia	Medium size tree suitable for individual or group planting.
Brachychiton acerifolius	Illawarra Flame tree	Recent plantings in Whittlesea performing well.
Brachychiton populneus	Kurrajong	Recent plantings in Whittlesea performing well.
Brachychiton rupestris	Bottle tree	A tree of unusual form. Its slow growth will render it suitable as a small street tree.
Callistemon 'Harkness'	Bottlebrush	Large shrub/small tree Callistemon hybrid requiring formative pruning to single trunk for street tree usage. Good for group plantings.
Callistemon 'King's Park Special'	Bottlebrush	Large shrub/small tree Callistemon hybrid requiring formative pruning to single trunk for street tree usage. Good for group plantings.
Callistemon 'Eureka'	Bottlebrush	One of the better small tree Callistemons but requires formative pruning early to a single trunk.
Callistemon salignus	Bottlebrush	Selected cultivars are available. The form with red tipped new growth is particularly attractive.

Australian Native

Botanical Name	Vernacular Name	Comments
Callistemon viminalis 'Dawson River'	Dawson River bottlebrush	One of the better small tree Callistemons but requires formative pruning early to a single trunk.
Callistemon viminalis 'White Wonder'	White Weeping Bottlebrush	White flowering form of the above.
Corymbia calophylla	Marri	Recent plantings performing well. More robust than the similar Corymbia ficifolia.
Corymbia citriodora	Lemon Scented Gum	Larger tree for wider verges, medians, etc.
Corymbia citriodora 'Marion'	Dwarf Lemon Scented Gum	Multi-trunked low growing form of the common Lemon Scented gum. Has the wonderful characteristics of the typical form but in a more compact manageable scale.
Eucalyptus cladocalyx 'Nana'	Bushy Sugar Gum	Smaller tree suitable for individual or group planting but very variable.
Eucalyptus coccifera	Tasmanian Snow Gum	Attractive blue grey foliage medium to large tree. Not suitable for the more exposed western growth corridor.
Eucalyptus crenulata	Silver Gum	Attractive blue grey foliage medium to large tree. Recent plantings performing well.
Eucalyptus dives 'Little Honey'		Small gum with plum new growth, blue grey foliage and masses of white flowers in winter/spring.
Corymbia eximia	Yellow Bloodwood	One of the most under rated small to medium sized Eucalypts. Excellent blue green foliage and masses of cream flowers. A dwarf form is available.
Corymbia ficifolia	Red Flowering Gum	Only grafted cultivars should be grown. A number of good forms are now readily available such as Wild Fire (Deep Red), Wild Delight (Orange), etc
Eucalyptus haemostoma	Scribbly Gum	Small to medium tree with cream flowers and interesting trunk.
Eucalyptus leucoxylon 'Eukie Dwarf'		Dwarf form of E. leucoxylon from the Murray Bridge area. Excellent small tree suitable for a wide range of conditions but particularly suited to dry conditions once established.
Eucalyptus leucoxylon 'Goolwa Gem'		Another recently introduced dwarf form of Eucalyptus leucoxylon.
Eucalyptus leucoxylon 'Rosea'	Yellow Gum	There is no such tree as Eucalyptus leucoxylon 'Rosea' - this plant is perpetuated only by suppliers of plant labels. Inbreeding is resulting in poor quality stock. Seek out the better forms from reliable sources.
Eucalyptus leucoxylon ssp. megalocarpa	Large Fruited Yellow Gum	Seek out the better forms from reliable sources. Inbreeding is resulting in poor quality stock. Metropolitan Trees grow a form of ssp megalocarpa called Mt Gambier Elite which is highly recommended.

Australian Native

Botanical Name	Vernacular Name	Comments
Eucalyptus luehmanniana	Yellow Top Mallee Ash	Smaller tree suitable for individual or group planting. Plum coloured new growth and smooth white bark. Note - do not confuse with E. lehmanni (now correctly named E. conferruminata)
Corymbia maculata	Spotted Gum	Larger tree only for wider verges, medians, etc.
Corymbia maculata 'Imagine'	Variegated Spotted Gum	Grafted form of E maculata with slight variegation on the leaves. Not commonly available but worth pre-ordering.
Eucalyptus mannifera ssp maculosa	Red Spotted Gum	Small to medium tree with lovely white trunk.
Eucalyptus mannifera ssp praecox	Brittle Gum	As above.
Eucalyptus mannifera 'Little Spotty'	Dwarf Red Spotted Gum	A good dwarf form is also now generally available of this species.
Eucalyptus melliodora	Yellow box	Larger tree only for wider verges, medians, etc. Seek out selected forms from reliable growers.
Eucalyptus 'Moon Lagoon'		Natural hybrid from the west with very attractive small blue grey foliage. Dwarf tree suitable for individual or group planting. Approved by SPI Powernet for planting on transmission easements.
Eucalyptus moorei	Narrow Leaved Sally	Smaller tree suitable for individual or group planting
Eucalyptus multicaulis	Whipstick Mallee Ash	Smaller tree suitable for individual or group planting
Eucalyptus pauciflora	Snow gum	Alpine forms must not be planted - only forms from the Melbourne area. The cultivar 'Little Snowman' is excellent.
Eucalyptus pauciflora 'Little Snowman'		As above.
Eucalyptus polyanthemus	Red box	Medium to large tree only for wider verges, medians, etc.
Eucalyptus pryoriana	Gippsland Manna Gum	The more amenable smaller form of the Manna Gum
Eucalyptus pulchella	White Peppermint	Attractive upright small to medium Eucalypt with fine foliage and smooth trunk.
Eucalyptus rupicola	Cliff Mallee Ash	Small tree with rounded crown. Suitable for group plantings.
Eucalyptus scoparia	Wallangarra White Gum	Graceful and hardy medium sized tree with smooth white bark and fine pendant foliage.
Eucalyptus sideroxyton	Red ironbark	The darker trunked, blue grey foliage forms are very attractive.
Corumbia Summer Beauty'		New hybrid flowering gum. Grafted plants only available. Pink/cream massed terminal flowers in spring and summer. Good small tree with dense rounded crown although not fully tested under cold and frost conditions.

Australian Native

Botanical Name	Vernacular Name	Comments
Corymbia 'Summer Cerise'		As above but with red/cerise flowers.
Corymbia 'Summer Red'		As above but with red/pink flowers.
Eucalyptus torquata	Coral Gum	Good small Eucalypt with dense rounded crown and masses of pink flowers.
Geijera parviflora	Wilga	Highly ornamental small tree tolerant of extreme dry conditions once established.
Grevillea robusta	Silky Oak	Performs well in the local environment.
Hakea bucculenta		This and the following Hakeas are excellent ornamental small trees. Grafted specimens are generally readily available, if pre-ordered.
Hakea coriacea		See above
Hakea francisiana		See above
Hakea laurina	Pin Cushion hakea	Good small tree but possibly short lived. Selected forms should be grown.
Hakea multilineata		As for H bucculenta, H. francisiana and H. coriacea
Lophostemon confertus	Brush box	Does not perform as well under local conditions as it does throughout Melbourne but with persistence is fine once established.
Melia azaderach	White cedar	Grows well in Whittlesea.
Tristanopsis laurina	Kanooka	Small to medium tree with yellow flowers, glossy dark green to reddish leaves and interesting trunk. Requires moister soils and formative pruning when young to create a single trunked tree. Not suited to the harsher western growth corridor of the municipality.

Non-native

Botanical Name	Vernacular Name	Comments
Schinus areira	Peppercorn	Suited to dry soils. Requires early formative pruning if to be used successfully as a street tree.
Olea europea	Olive	Suited to dry soils. Requires early formative pruning if to be used successfully as a street tree.
Pyrus calleryana 'Red Spire'		Most of the Pyrus cultivars have performed well in this municipality – one of the few groups of deciduous trees that have.
Pyrus calleryana 'Aristocrat'		
Pyrus calleryana 'Chanticleer'		
Pyrus calleryana 'Capital'		
Pyrus betulaefolia 'Southworth Dancer'		
Pyrus ussuriensis ssp ovoidea		
Gleditsia triacanthos 'Sunburst'		One of the other deciduous trees worthy of cultivation under local climatic extremes.
Platanus x acerifolia		Larger tree suitable only for wider verges, medians, etc. Does not perform as well as the tree typically does in older, inner areas of Melbourne. Broad spreading tree that will only be approved for usage in special circumstances.
Platanus orientalis 'Digitata'		Medium to large tree. Has performed well in better drained sites.
Ulmus parvifolia		Medium but broad spreading tree. Selected cultivars such as 'Todd' have performed well.
Lagerstroemia indica		Only use selected cultivars. Upright form such as Natchez suitable for street tree planting. Some of the other forms require wide naturestrips or medians to be grown and displayed to their best advantage.
Pistachia chinensis		Small tree with excellent autumn foliage. Slow to establish and not suited to the drier sites.
Magnolia grandiflora		Has performed surprisingly well on an amenable site. Not suited to exposed situations. A densely branched, uniform selection of <i>Magnolia grandiflora</i> with an upright habit, called 'Greenback' has showy summer flowers and good heat tolerance.