Newcastle City Council

Street Tree Selection Manual

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The City of Newcastle

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was prepared by Newcastle City Council Infrastructure Group

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Part 1 - Purpose

1.0 What does this Manual do?

The Street Tree Selection Manual (the Manual) defines the process for selecting tree species for planting in Newcastle's streets. The Manual applies to all streets within the Newcastle local government area (LGA). The principles and processes within this Manual are also applicable to tree planting in parks.

The purpose of the Manual is to ensure that the right tree is planted in the right place. Ensuring the right tree is planted in the right place means that the chosen tree species must be suitable for the space when fully grown. This requires a detailed analysis of site constraints, risks and opportunities prior to filtering through the Species Matrix to determine a short list of suitable species. In some instances increased space may be created to accommodate tree planting.

1.1 Planting our streets

Throughout 2008/2009 every street tree and vacant planting site in the Newcastle LGA was surveyed and the data was recorded in Council's Tree Asset Management System (TAMS database). During 2010 - 2011 Council developed a draft Tree Asset Management Plan (TAMP) which provides a range of measures to sustain the public urban forest (street tree component) and meet the Urban Forest Policy goals and objectives.

These measures are the product of an analysis of the data held in TAMS which has provided an age profile, useful life expectancy, tree size and species composition for the street tree population.

As of July 2015, Council has collected data on 140,000 street, park and bushland trees. Of the 82,000 street tree sites, 67% (54,940) have existing trees and 33% (27,060) are vacant planting sites.

The Urban Forest Policy goals and objectives and the Draft TAMP provide the framework in which to provide annual planting. The planting is integrated with road maintenance activity, infrastructure projects and areas of greatest tree vacancy rate. These are the key drivers that determine where annual planting will occur.

The two goals of the Urban Forest Policy relevant to this Manual are to:

1. Maximise the capacity of Newcastle's urban forest to provide ecological, economic, social and aesthetic benefits to both present and future generations
2. Sustain and expand Newcastle's urban forest on an inter-generational life cycle basis.

The Urban Forest Policy sets a number of objectives to achieve these goals, one of which is to improve the overall structure, health and condition of the urban forest. This is achieved through the draft TAMP which guides the prioritisation of planting to diversify tree species and age structure over time. Areas are prioritised subject to analysis of suburb vacancy rates and age distribution. Planting within any given year will be spread across a number of suburbs so as to avoid concentrating large numbers of same age trees in one suburb. Suburbs with high vacancy rates will require planting to be staggered over a number of years to provide age diversity.

This Street Tree Selection Manual provides the methodology for implement-ing planting programs and other activities involving the renewal of public trees.

1.2 Street tree planting categories

Council has identified three categories of street tree planting that are regularly undertaken within the LGA, and has developed individual tree species selection processes for each of these planting categories.

The tree species selection processes for each category are described in further detail in **Part 3**.

The three different categories of street tree planting are outlined below.

Residential streets

Residential street plantings are undertaken by Council for:

Council's annual street tree planting program: where Council undertakes predetermined plantings as part of the major asset preservation program (MAPP). This program includes community requests for street trees.

Council's maintenance or renewal works: where the works require tree removal and replacement.

Infill development: where a street tree requires replacement due to demolition or construction activity in an existing residential area.

Tree replacement in a subdivision: where a development application for the construction of a residence on a vacant block requires the replacement of a street tree that was previously planted during the development of the subdivision.

High profile and distinctive places

High profile and distinctive place plantings are undertaken by Council and include shopping precincts, arterial roads, the Newcastle city centre and neighbourhood centres.

Large scale development (subdivisions, commercial and industrial)

Large scale development plantings are undertaken by the proponent or Council on the proponent's behalf.

1.3 How do you use this Manual?

This Manual is presented in four parts:

Part 1 - this part outlines the purpose of the Manual.

Part 2 - provides the rationale for the Manual and describes Council's asset management approach for managing street trees.

Part 3 - contains the key considerations which must be read prior to application of the process under each category. Key considerations include the spatial elements, power lines, significant trees, and the species matrix.

To determine the appropriate tree species to plant **Parts 3** and **4** must be used in conjunction with one of the following categories:

Part 3.2.1 Residential streets

Part 3.2.2 High profile and distinctive places

Part 3.2.3 Large scale development (Subdivision, commercial and industrial).

Each category includes a community engagement component.

Part 4 - includes the Site Inspection Form, the Alternative Species Form and the species matrix.

1.4 Who should use this manual?

The street tree species selection process is designed to be used by professionals with an understanding of tree species and their characteristics.

Part 2 - Rationale

2.0 Value of Urban Forest

Street trees are a major public infrastructure asset and so it is essential to establish a clear and comprehensive approach to making decisions about what should be planted and where. Trees within the urban environment have a finite useful life and require removal. As the urban tree population is not self-renewing it needs to be planted, managed and renewed on a cyclical basis to ensure tree vacancy rates are reduced and canopy cover is retained.

The loss of trees on private land due to urban consolidation and other development diminishes canopy cover across the LGA. Given this loss, there is a need to place greater importance on securing space in the public domain to establish a sustainable tree canopy cover into the future. Maintaining a sustainable street tree canopy will help offset the loss of canopy cover on private land.

Establishing a resilient public urban forest is pivotal in addressing the emerging issues associated with climate change such as the urban heat island effect, increased frequency of intense storms, microclimate management, and creation of a water sensitive city. These factors greatly affect the livability of a city and appropriate canopy cover can reduce the negative effects.

2.1 Risk

This Street Tree Selection Manual has been developed to ensure that Council can manage the risk associated with maintaining a sustainable street tree canopy. Preparation of this Manual meets Council's obligations under its Statewide Insurance cover, to ensure that risk is considered as part of any tree planting. **Appendix 1** shows the Statewide Insurance audit criteria and the action taken by Council to meet these criteria.

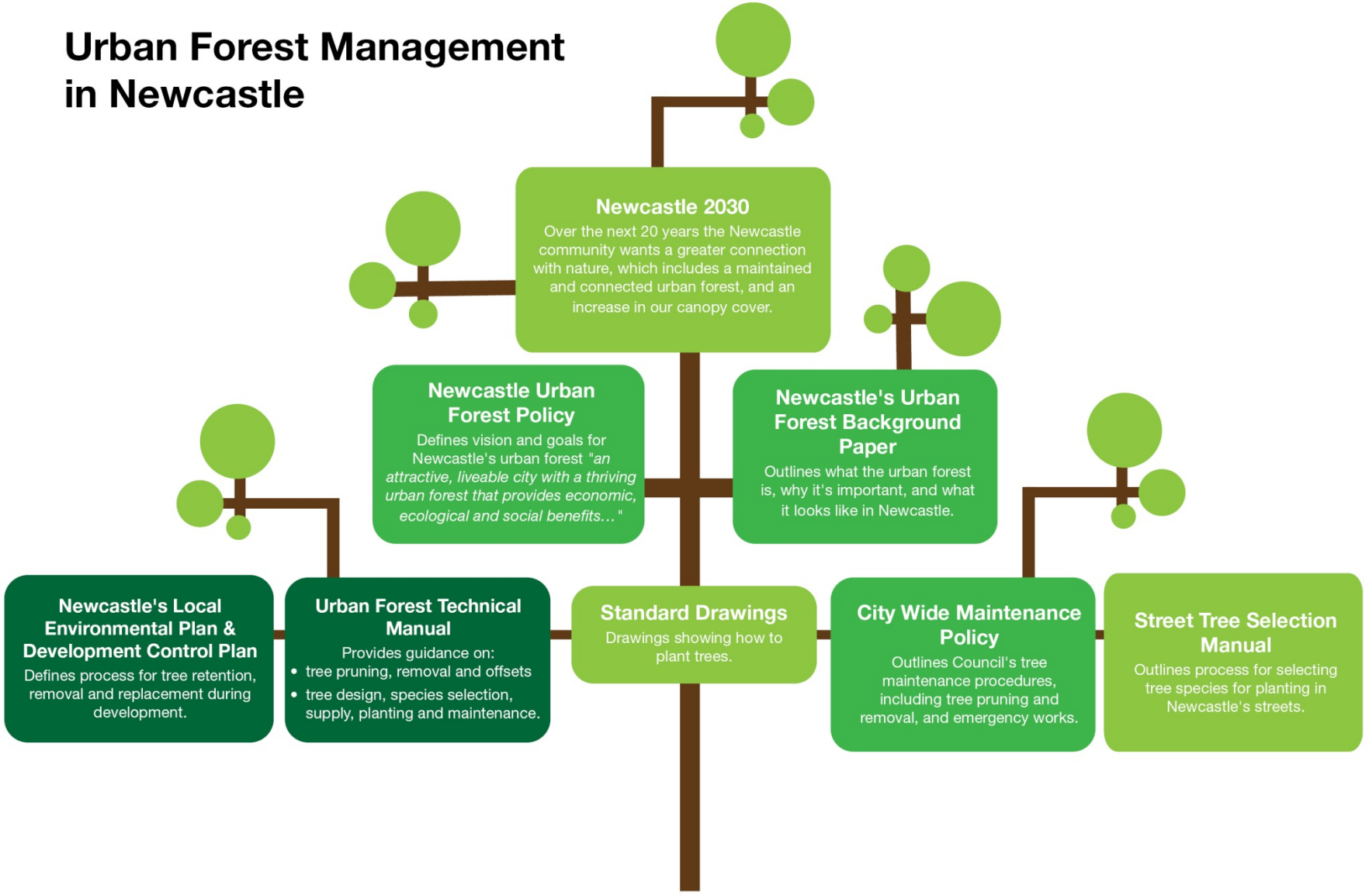
2.2 Policy

In May 2008 Council adopted the Newcastle Urban Forest Policy and Urban Forest Background Paper in recognising the importance of the importance of the Urban Forest. The goals of this policy include sustaining and maximising the Newcastle Urban Forest on an intergenerational basis. The Street Tree Selection Manual has been developed to achieve these goals.

In June 2013 Council adopted the Newcastle 2030 Community Strategic Plan which is the community's long term vision for the city. The document identifies that over the next 20 years the Newcastle community wants a greater connection with nature, with a greener more enriching environment where the Urban Forest is maintained and connected. Council's Street Tree Selection Manual will contribute to achieving this community vision.

Figure 1 *(over page)* shows Council's key documents for managing the urban forest in Newcastle.

Urban Forest Management in Newcastle



2.3 Street Tree Selection Manual approach

Street tree Master Plans commonly take a prescriptive approach to species selection. This Street Tree Selection Manual adopts a different approach that begins with analysis of site constraints, risks, design opportunities and species characteristics as key considerations prior to determining a short list of suitable species. This approach aids Council to meet its Best Practice commitments to address risk for street planting (Statewide Best Practice Manual - Trees and Tree Root Management v2 2013) see **Appendix 1** - Statewide obligations.

Street tree establishment and maintenance practices and processes are separately detailed in the Urban Forest Technical Manual DCP 2012.

2.4 Asset management principles

To ensure that the public tree population is effective, robust and sustainable Council manages these assets within an asset management framework (see **Figure 2**). This approach to whole of life tree management addresses Council's risk management obligations whilst ensuring that tree assets are healthy, sustainable and renewed across the LGA.

There are costs associated with maintaining trees over their life cycle. Planting with species appropriate to the site can significantly reduce the long term maintenance costs of both trees and nearby infrastructure. For example, historical avenue plantings of Plane trees in the CBD have provided shade in summer and sunlight in winter, making it a more enjoyable location at these times. However, this species has a very large leaf, which when shed in large numbers can contribute to stormwater blockages. This leaf shedding, along with this species fruit drop, has created some issues for business operators and users, which in turn has increased Council's maintenance costs. Whilst not all deciduous species pose such a problem, it is important to consider the location and species characteristics when making a tree selection.

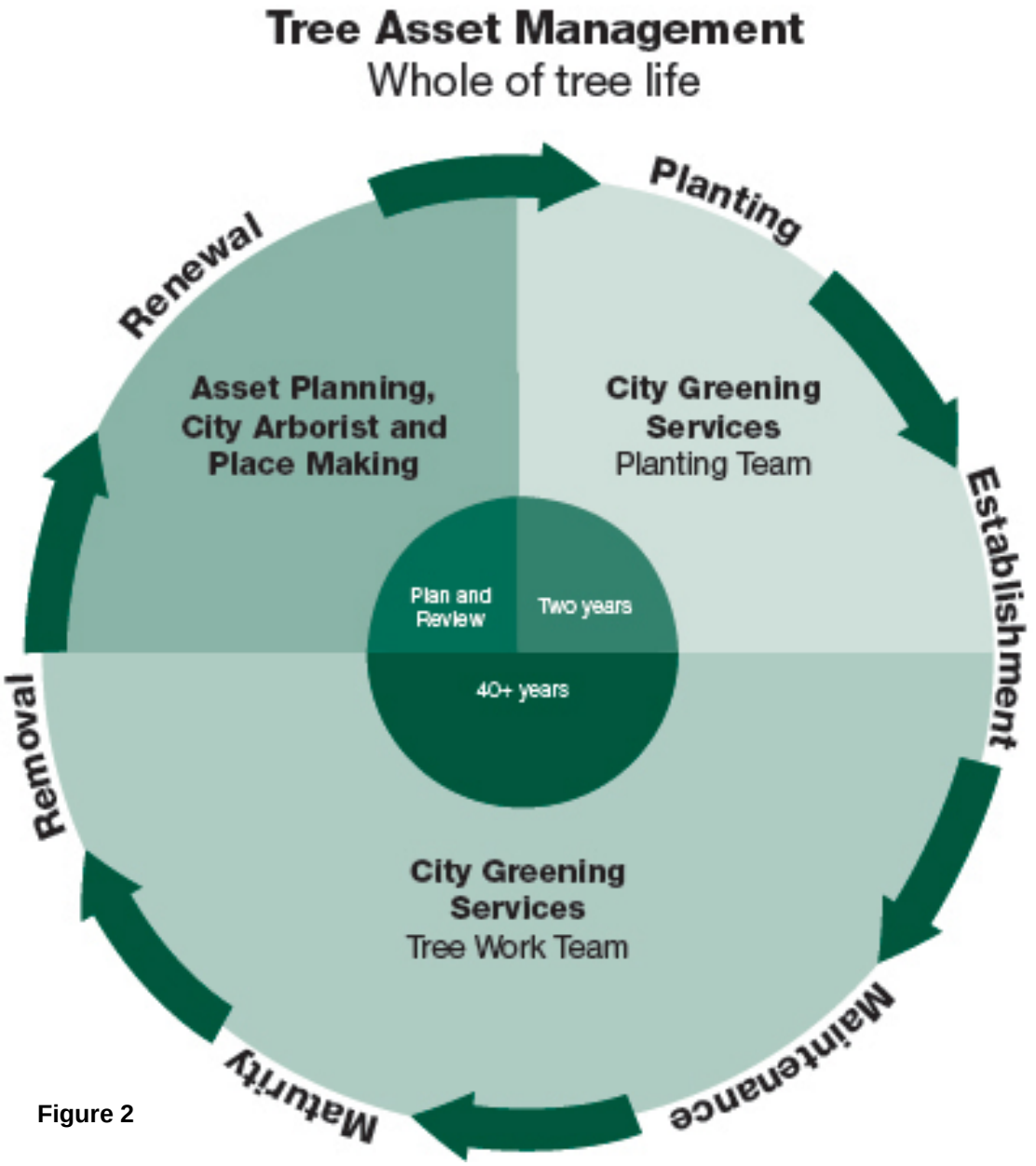


Figure 2

The following seven tree asset management principles are to be reviewed in implementing each of the decision processes in this Manual. These principles have been developed to ensure the overall health, biodiversity and sustainability of the urban forest.

1. Diversity of tree age and species established and maintained throughout the public urban forest.
2. Climate and site compatible tree species planted to ensure a long term fit for purpose tree asset that minimises risk of tree/infrastructure failure.
3. Whole of life impacts and costs considered during species selection
4. Largest, long-lived trees used in order to maximise tree biomass and to extend the period of accrued urban forest benefits.
5. Technology utilised to improve the success rate and the useful life span of the city's street tree investment
6. Historical, Visual and Environmental aspects of the urban form enhanced through tree planting.
7. Maximise the potential of the available spaces in each street to accommodate trees.

Part 3 - Street Tree Planting Process

3.0 Right Tree Right Place

The adage of planting the 'right tree in the right place' is often stated although it has not often been applied in past planting practice. Relatively few of Newcastle's streets were originally designed to accommodate street trees and subsequent planting periods have sought to fit popular and often quite large growing species into constrained spaces. This has often resulted in significant conflict between the tree and infrastructure, reducing the useful life of both and increasing the likelihood of failures in storm events.

'Right tree in the right place' means selecting the largest species that will reach maturity without significantly interacting with other assets and property in the immediate vicinity. This approach also reduces the likelihood of tree failure in storm events. Where the site conditions, footway configuration or other infrastructure constrains the planting of a candidate species, then street redesign may be an appropriate solution. For example planting beds may be incorporated to raise primary root systems, or the planting might be moved into the street pavement within blisters or vaults incorporating water sensitive design.

3.01 Risk management

Council has a responsibility to manage foreseeable risk in public areas (*Civil Liability Act 2002*). Council also has a responsibility to maintain appropriate insurance cover whilst managing risk (*Local Government Act 1993*). Inappropriate tree selection has resulted in significant conflict between tree roots and surrounding infrastructure and private property. The ability of trees to develop adequate supporting roots in streets is limited by road pavement construction methods and utilities. Past management practices have often resulted in significant damage to the trees root system, which further increases the potential for whole or partial tree failure in storm events.

Tree selection under this Street Tree Selection Manual will address the risk implication from planting, by ensuring that the space a tree is planted into can support the tree at maturity and reduce the risk of failure in storm events

3.1 Tree selection

As outlined in **Part 1**, Council has identified three categories of street tree planting that are regularly undertaken within the LGA, including:

- *Residential*
- *High Profile and Distinctive Places*
- *Large Scale Development.*

To ensure the right tree is planted in the right place, Council has identified processes for each of the three categories. The decision processes, which are provided as a series of steps, are outlined in **Parts 3.2.1, 3.2.2** and **3.2.3**. Before applying a decision process, the following section on space availability, power lines, significant trees, heritage, species matrix and the species must be read. These are relevant to all three categories of planting.

3.1.1 Space available

The space available within any given street often varies within an area and may vary within a single block. This can be challenging when trying to find a suitable species to plant within the available space, particularly where avenue plantings are planned in high profile or distinctive locations. This and other site factors such as above and below ground utilities, soil type, microclimate and building set backs are collected utilising the inspection form contained in **Part 4** and considered in the species selection process using the Species Matrix.

All planting must take into account the use of the footway including disability access (*Disability Services Act 1993*). The minimum footway width from property boundary to back of kerb that Council will consider planting a tree is 2.5 metres. The minimum planting width between constructed footpath and back of kerb is 1.0 metre (not applicable in full hard stand

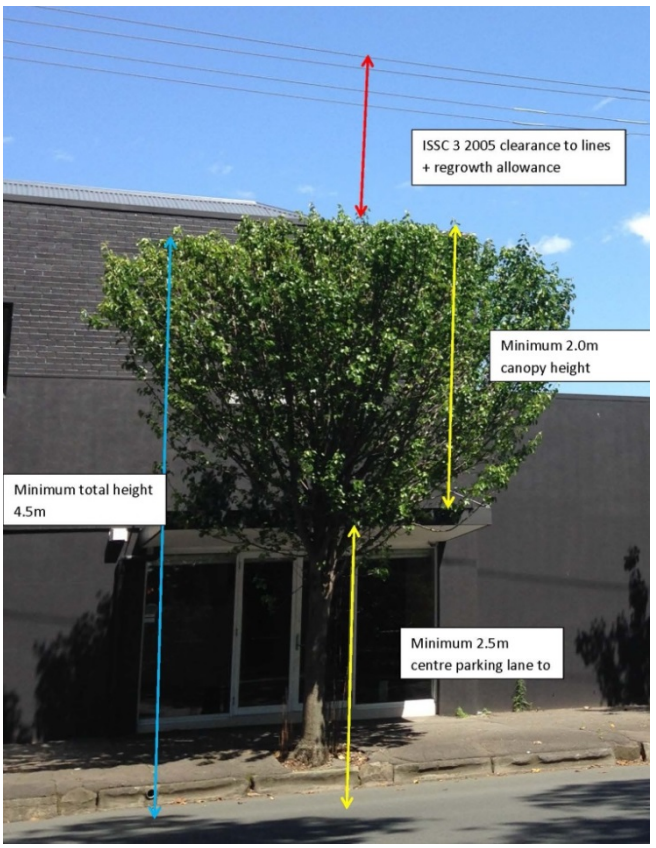
footways). Regardless of the footway width, the narrower the width between footpath and kerb, the smaller the species to be used, and/or the greater the need for footpath relocation and/or improved soil media under the path to allow root growth without lifting.

Where there is a lack of obvious tree space more innovative ways of achieving tree planting may be available to improve and enhance the streetscape. For instance there may be space within the building lot for trees and a borrowed landscape, or perhaps there are unique modifications that can be made to the street design such as planting within the street pavement or only using one side of the street for parking. Thorough investigation must be undertaken and discussed with relevant asset managers before committing to planting in the road pavement.

3.1.2 Power lines

Generally where overhead power lines occur, the size and type of trees listed as suitable in the Species Matrix are limited to smaller growing species with a suitable branching habit that tolerates pruning. Appropriate pruning methods will reduce the need for heavy cutting of these species. The current clearances from wires, and regrowth allowances used by utilities (see tables in ISSC 3 2005) can result in up to 8 metres of unusable space below the wires.

Planting will not be undertaken where there is insufficient clearance from wires to achieve a 4.5m tree that is below the current ISSC 3 2005 clearances, plus regrowth allowance. The tree must be able to achieve a 2.5m clearance above the middle of the parking lane and an additional 2.0m of canopy above this. This will occur generally where there is a parking lane or where footway widths offset trees from traffic lanes. Species selection is to consider the tendency for the canopy to spread or hang into traffic lanes.



3.1.3 Significant trees

Council considers all of the Newcastle urban forest to provide benefits across the local government area. However, there are some elements that are considered particularly significant, which are:

- Trees that are Heritage items listed in the Newcastle LEP or State Heritage Inventory
- Trees listed on Council's Habitat Register
- Trees planted as Commemorative plantings by heads of state. e.g. Tudor St Hamilton plant by Queen Elizabeth or the Lone Pine war memorial planting (this does not include general memorial plantings for residents).

When replacing a tree listed on the habitat register, a species of similar habitat value that is suitable to the site should be used. Where this is not possible then other species that provide fauna benefits must be used.

3.1.4 Heritage conservation areas

The historical layout of street trees and species planted are often the result of previous land uses, or an association with a particular period of landscape design.

A heritage conservation area is where building forms and landscape features have combined to create a consistently distinctive local character. Newcastle's six heritage conservation areas are Cooks Hill, The Hill, Newcastle East, Beaumont Street, Hamilton South Garden Suburb and Newcastle CBD. Each heritage conservation area has a rich heritage and streetscapes that contribute to a sense of place. They are protected and maintained through Council's Development Control Plan (DCP) 2012. Street tree planting will have regard for heritage in these areas, however this does not mean that like for like will be planted, as the other asset management principles will also apply. For further historical background refer to **Appendix 3**: *The Origins of Tree Planting in Newcastle*.

3.1.5 Species matrix

The street tree species matrix (see **Part 4**) is an excel based application that allows filtering of a range of site specific characteristics through seventeen columns to arrive at a short list of suitable species for any given street. Its application will eliminate inappropriate planting, minimise negative interactions with built infrastructure and will reduce the cost burden of increased maintenance and replacement costs. The matrix does not have specific application to park environments although many of the matrix species may also be suitable for park and open space planting.

The matrix is designed to filter relevant information collected on the Site Inspection Form (see **Part 4**). The first three columns are botanical, common and family names. The next four columns are fixed site characteristics which must be filtered, these are footway width, overhead utilities, soil drainage and salt exposure.

There are eleven other columns that are more flexible in their application. It is not necessary to use all of these eleven columns to select a short list of suitable species. The key drivers for each site will vary and therefore alter which of these columns in the matrix will take priority. For example in streets where buildings have no setback, the application of height, width and crown shape may result in a narrow canopy species being selected to ensure the mature tree has less interaction with the building. In other cases a deciduous species may be chosen to increase winter sun, or a low shedding species used in a hard paved area with high pedestrian use.

Once the above process is complete a short list of suitable species will be generated. This short list must be reviewed to consider if options other than the dominant Myrtaceae family (eg Eucalypts, Callistemon, Brushbox, Melalueca) are available. The availability of quality stock may also reduce the species short list and should be considered prior to engaging the community.

3.1.6 Species

The species listed in the matrix are known performers within the Newcastle LGA, or are trial species which have been researched in other local government areas with similar climate and demonstrated as suitable. The use of a species at any given location is subject to the plants individual requirements and site conditions. Procuring the specific species can be difficult either due to poor tree stock quality, or the plant is no longer available commercially, e.g. *Melaleuca quinquenervia* (Narrow-Leaved Paper Bark) which is no longer grown in most nurseries due to its susceptibility to Myrtle Rust.

The critical factor is that the chosen tree species is suitable for the space and capable of growing into a mature healthy tree in the site conditions. Given the difficulties with obtaining tree stock this Street Tree Selection Manual provides a process to substitute with a different species, e.g. *Pyrus calleryana* (Bradford Pear) is no longer available, but can be substituted with *Pyrus usseriensis* (Manchurian Pear) which will develop the same physical characteristics, scale and form, and will grow in the same site conditions and microclimate.

Where a substitute is proposed that is within the Species Matrix then the proponent only needs to demonstrate that the species is

suitable to the space and conditions. In some cases the species in the adjacent footway width classes may be suitable e.g. a smaller species in the wider F4 class footway width (>4.5m) may be suitable in the narrower F3 class (3.5 to 4.5m).

Where a species is not in the Species Matrix then the proponent must carry out investigation to demonstrate the species will be suitable to the Newcastle LGA and not result in negative environmental impacts. Environmental impacts can include species becoming a weed, or the introduction of pests or disease e.g. Fusarium Wilt. The proponent must provide a completed Alternative Species Form (**Part 4**) that includes consideration of key Species Matrix criteria and a completed Site Inspection Form. Council will review the information, provide a determination and consider whether to add the species to the Species Matrix.

3.1.7 Diversity of plant families

An analysis of the existing public tree population has revealed an imbalance at the plant family and species levels. An over-representation of one family or tree species increases the risk of significant loss as a consequence of pest and disease outbreaks. For example, the loss of 1,200 New Zealand Christmas Bush to borers, the threat to Plane Trees from Lace bug and infection of Canary Island Date Palms with Fusarium Wilt. In addition biosecurity issues like the recent introduction and spread of the exotic disease Myrtle Rust (Guava Rust) may threaten the Myrtle (Myrtaceae) plant family which comprises 52% of Newcastle's public tree population. As a result it is vital to select from a range of plant families to ensure a diverse and robust tree population.

3.2 Decision process

Council will apply the following three processes to determine a suitable species and carry out the planting.

3.2.1 Residential streets

This process is used by Council when selecting tree species as part of:

- Council's annual street tree planting program (including individual/whole street requests).
- Council's maintenance or renewal works.
- Infill residential development replacement planting.
- Tree replacement in new subdivisions.

Annual street tree planting program

Street trees are not self-renewing and require replacement for removals due to reduced useful life, works activities and storm losses. Each year hundreds of street trees are planted by Council to ensure a long term tree population thereby meeting the objectives of the Urban Forest Policy. An analysis of vacancy rates, age profile of existing trees within the Tree Asset Management System (TAMS), and integration with annual construction and rehabilitation projects drive the development of the annual planting program. Requests from individuals and whole of street requests for tree planting are also covered in this program.

Maintenance or renewal works

Council's maintenance or renewal works within the road reserve at times requires the removal and replacement of trees.

Infill residential development

Development under this process includes any activity associated with a residential development that results in public tree removal and replacement. This can include demolition or construction of dwelling, driveways or adjacent infrastructure e.g. paths kerb and gutter.

Tree replacement subdivision

This process is used where a DA approved dwelling is being constructed on a vacant block of land within a subdivision, which requires removal and replacement of an existing street tree.

Council will apply the following process to

determine a suitable species and carry out the planting. **Figure 3** provides an overview of the process.

Tree Species Selection Process Residential Streets,
Planting Program, Maintenance or Minor Renewal Works, Infill Development and Tree Replacement Subdivision

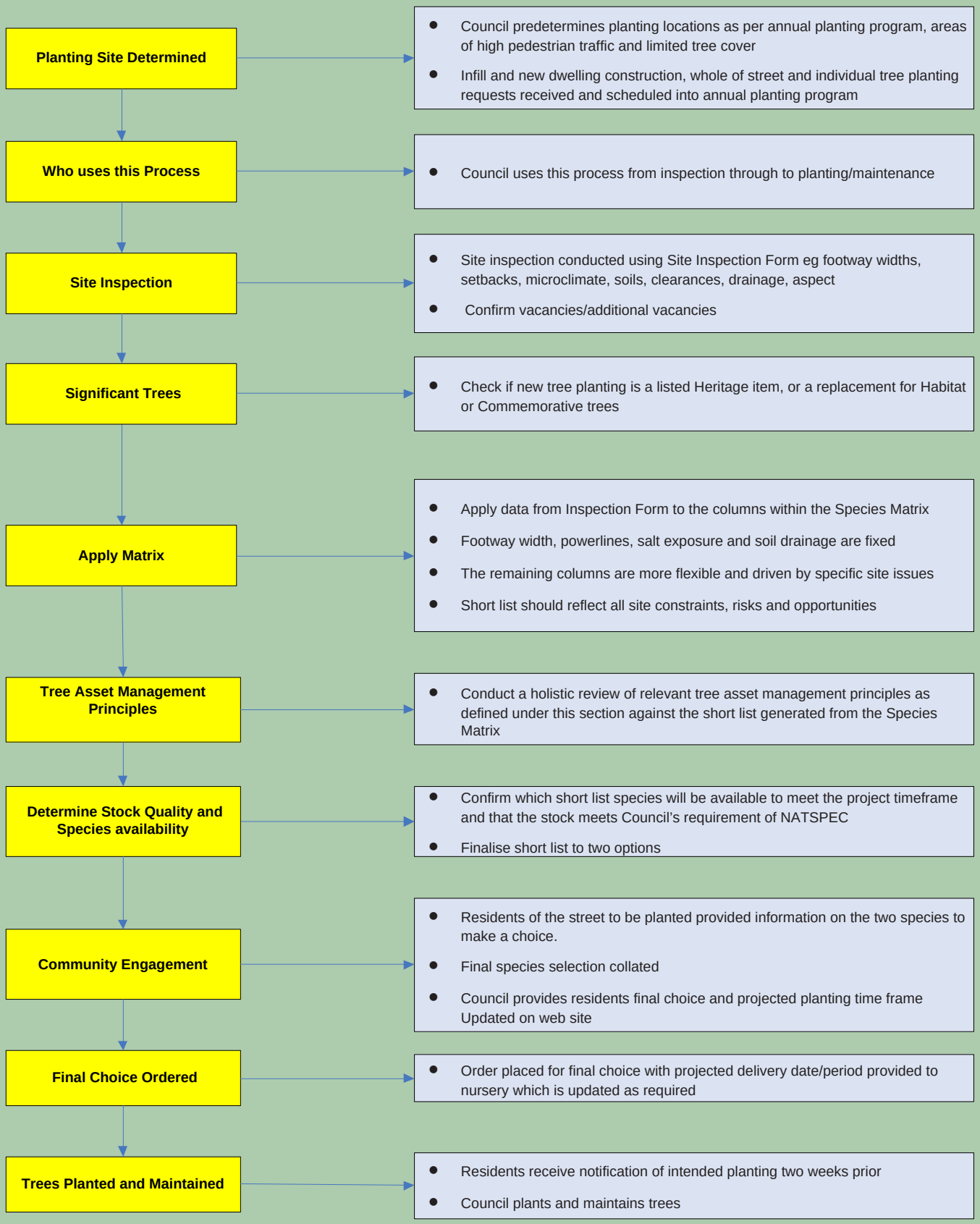


Figure 3

Residential streets

1. Who

Residential street tree plantings are undertaken by Council. Council will apply the process from inspection through to selection and planting/maintenance.

2. Site inspection

- Dial before U Dig plans are obtained.
- A site inspection is undertaken using the Site Inspection Form (Part 4) in this Manual to capture all on site data.
- Soil sample/s to be taken to determine soil type, compatibility for root growth and likely infiltration of water.
- Onsite assessment will include confirmation that vacancies meet the required offsets from infrastructure (see Urban Forest Technical Manual Design for trees in addition to STSM clearances). Vacancies that do not meet these offsets will not be planted.

3. Significant tree assessment

- □ Confirm if planting is replacing a heritage listed tree/s in Council's LEP or State Heritage Inventory.
- □ Confirm if the planting is replacing a tree on Council's habitat register.
- □ Confirm if the planting is replacing a tree that was commemorative planting. e.g. Tudor St Hamilton plant by Queen Elizabeth.
- □ When replacing a tree listed on the habitat register, a species of similar habitat value that is suitable to the site should be used. Where this is not possible then other species that provide fauna benefits must be used.

4. Use matrix

- □ Apply the site inspection data to the species matrix to determine a short list of species.
- □ Areas identified as Significant (3 above) will require consultation with Council's Landscape Architects to discuss matrix short list.

5. Consider relevant asset management principles

To further narrow the short list conduct a holistic review of the following asset management principles against the short list generated from the matrix in step 4:

Principle 1 - Diversity of species - Ensure species and families are across a broad range. Avoid monocultures or fad selections. Reduce Myrtaceae family across planting sites

Principle 2 - Site compatible species - must be capable of reaching projected mature size as a healthy tree with regard to site conditions and minimise future risk.

Principle 3 - Consider whole of life impacts and costs - ensure that the species will not generate a significant cost burden for Council over the life of the asset.

Principle 4 - Largest long lived species selected that meets other Asset Management Principle requirements.

Principle 5 - Technology - utilise Council's standard drawings to improve drainage where required.

6. Determine stock quality and species availability within timeframe

- □ Confirm which trees on the short list will be available when project is to be planted.

7. Confirm available tree stock will meet Council's quality requirements of NATSPEC.

- □ Finalise short list to two available options that best address the Asset Management Principles.

8. Community engagement

Annual street planting program

Under this program residents in the street to be planted will be provided a choice between two suitable species and will receive the one they choose.

Council will provide written information to the resident regarding the selection process, planting and the two species options of similar form, with a selection form to facilitate their choice. In some cases a community information session will be held e.g. a number of streets in one suburb are to be planted.

- Council receives and collates the resident choices and documents the outcome.
- Residents notified confirming species choice, any delays with supply and given estimated planting time frame.
- The projected planting period is made available on Council's website and updated as any changes occur.
- A date will be finalised closer to commencement of the project and will be updated on the website.
- Residents will be notified by letter box drop generally two weeks before works commence.

Council will provide residents the choice between two species. However, where it is not possible to offer two species due to unforeseen factors (e.g. only one of the short list available due to stock quality issues or damage by storm or pest) the residents will be notified and provided an appropriate species and planting time frame. The process of updating the website and notifying residents two weeks prior to planting remains the same as the last three points above.

Whole of street planting days

- Residents will be provided a choice between two suitable species that Council has available at the time, and will receive the one they choose.
- Whole of Street planting days where residents participate will include staff and resources to facilitate and supervise the planting.
- Council will provide written information to the resident regarding the selection process, planting and the two species options, with a selection form to facilitate their choice.
- During the street tree selection process residents in the selected street are asked if they wish to participate on the planting day and are offered a selection of weekday and weekend dates to choose from.
- Council receives and collates the resident choices and documents the outcome.
- The planting date is determined by when the majority of residents are available. Residents are notified of the planting date and the final species choice.
- A reminder is provided two weeks before the planting day.
- Council will provide residents the choice between two species. However, where it is not possible to offer two species due to unforeseen factors (e.g. only one of the short list available due to stock quality issues or damage by storm or pest) the residents will be notified and provided an appropriate species and planting time frame. The process of updating the website and notifying residents two weeks prior to planting remains the same as the points above.

Individual requests for a tree planting

Individual requests for tree planting will be provided a choice between two suitable species that Council has available at the time.

- The resident will make the final choice.
- Notification of planting date two weeks prior to planting wherever possible.
- Subject to when the planting is to occur and what stock Council holds at the time. It may not always be possible to provide two options. In this case Council will provide a single species.

Council's maintenance or renewal works

The resident/s immediately adjacent to the works will be provided a choice between two suitable species from Council's current tree stock to meet the timeframe between removal and replacement, and will receive the one they choose.

- Where this is not possible due to unforeseen factors or limited time frame the resident will be provided an appropriate species. The resident will be notified of species and estimated planting date.
- Where the works extend beyond a small section of road the planting will be incorporated into Council's Annual Street Tree Planting Program and consultation undertaken in accordance with that process.

Infill development

The resident will be provided a choice between two suitable species from Council's current tree stock to meet the timeframe between removal and replacement, and will receive the one they choose.

Where this is not possible due to unforeseen factors or limited time frame the resident will be provided an appropriate species. The resident will be notified of species and estimated planting date.

Tree Replacement Subdivisions

Species selection for first time residential construction in subdivisions will be in accordance with the approved subdivision landscape plan, or similar alternative where this is not possible. The resident will be notified of species and estimated planting date.

9. Final choice ordered

Species ordered to meet delivery date for each street.

10. Trees planted and maintained

Residents notified that planting is about to be undertaken. As outlined above this is normally two weeks prior however unforeseen circumstances may reduce this notification period.

Planting is undertaken by Council's tree planting teams in accordance with Council's standard drawings.

Site planting soil may be improved or replaced where appropriate.

Improved planting pit drainage to be incorporated in heavy soils as per Council's Standard drawings.

All maintenance activity is undertaken by Council staff to ensure a healthy, well-structured tree is achieved to maximize the benefits e.g. shade.

Frequent mulching, watering and weeding are undertaken for first two years. This may extend beyond this period subject to the location and seasonal fluctuations.

Only mulch that meets the Australian Standard (4454-2012) is used therefore grass clippings and other materials are not placed around trees.

Residents are encouraged to water trees during dry periods in summer to augment Council's watering program across the LGA.

Formative pruning is undertaken where required commencing at start of second year. This is generally undertaken at two year intervals up to year six but may be more frequent for some species. Advanced trees with a good canopy structure will generally not require formative pruning.

3.2.2 - High profile and distinctive places

This process is used by Council when selecting tree species for plantings in high profile locations and distinctive places. High profile locations include arterial roads, Newcastle City Centre and local centres (e.g. shopping/business centres). Distinctive places include locations such as Crown St Newcastle, Wheeler Place or Christchurch Cathedral. Council's annual delivery plan will determine where and when such planting will occur.

Examples of high profile and distinctive places and relevant considerations for integrating street trees into the design are provided below:

Arterial/sub arterial roads, avenues and major intersections

Road hierarchy and networks are important factors in selecting the type of street tree planting. Selection and positions of trees should relate to the scale and use of the road and can indicate changes in road direction or condition e.g. 'T' junctions, curves, distant landmarks. Subject to available space, a major arterial road will require large trees to balance multiple traffic lanes and provide shade where a narrow local road may only have room for small trees. Traditional approaches to avenue planting using regular rhythmical spacing and eventually creating interlocked canopies with leafy ceilings create a sense of place, are aesthetically pleasing and are amongst the most popular tree assemblages in cities around the world. However this cannot always be achieved due to a range of site constraints.

Where cycle ways or footpaths are to be upgraded or installed along these major transport corridors, consideration needs to be given to ensure that appropriate trees can be planted. These modes of transport are of increasing importance and popularity.

Each of these transport/movement corridors has unique design constraints within the street network. Effective design integration with street trees is essential to ensure the greatest benefits for those seeking alternative, low impact modes of travel.

Commercial zones, local and city centres

Due to the range and scale of individual public domain projects multi-disciplinary approaches to project design integrating street trees is necessary within the local and city centres. The key documents that must be reviewed for works in the City Centre are the Hunter Street Revitalisation Selection Manual 2010 and the City Centre Public Domain Technical Manual 2014.

The design results have long-term significance in daily life and in the presentation of the city to visitors. This Street Tree Selection Manual will be a valuable tool in achieving an appropriate design outcome.

Residential streets that connect to commercial zones, local or city centres will be planted under the residential street process. E.g. Council Street joins Darby St within the local centre however it is primarily residential; therefore it would be planted under the residential process.

Council will apply the following process to determine a suitable species and carry out the planting. **Figure 4** provides an overview of the process.

Tree Species Selection Process High Profile and Distinctive Places

Figure 4

High profile and distinctive places

1. Who

Street tree design and plantings are undertaken by Council. Council will apply the process from inspection through to selection and planting/maintenance.

2. Site Inspection

- Dial before U Dig plans are obtained.
- Multidiscipline design in conjunction with design and asset officers.
- A site inspection is undertaken using the Site Inspection Form (**Part 4**) in this Manual to capture all on site data.
- Soil profile investigations and sample/s taken to determine soil type, compatibility for root growth and likely infiltration of water.
- Onsite assessment will include a review of limitations and opportunities to place appropriate plantings (consider technology at this time).
- Below ground space is to be provided to minimize tree root and infrastructure interaction thus extending the life of all assets.
- Proposed planting locations are to meet the required offsets from infrastructure (see Urban Forest Tech Manual Design for trees in addition to STSM clearances). Tree locations that do not meet these offsets will not be planted.

3. Significant tree assessment

- Confirm if planting is replacing a heritage listed tree/s in Council's LEP or State Heritage Inventory.
- Confirm if the planting is replacing a tree on Council's habitat register.
- Confirm if the planting is replacing a tree that was commemorative planting. e.g. Tudor St Hamilton plant by Queen Elizabeth.
- When replacing a tree listed on the habitat

register, a species of similar habitat value that is suitable to the site should be used. Where this is not possible then other species that provide fauna benefits must be used.

4. Use Matrix

- Apply the inspection data to the species matrix to determine a short list of species (or refer to the species pallet within the applicable public domain plan or City Centre Technical Manual).
- Areas identified as Significant (3 above) will require consultation with Council's Landscape Architects to discuss matrix short list.

5. Consider relevant asset management principles

- To further narrow the short list conduct a holistic review of the following asset management principles against the short list generated from the matrix in step 4:

  - Principle 1 - Diversity of species - Ensure species and families are across a broad range. Avoid monocultures or fad selections. Reduce Myrtaceae family across planting sites.
  - Principle 2 - Site compatible species - must be capable of reaching projected mature size as a healthy tree with regard to site conditions and minimise future risk.
  - Principle 3 - Consider whole of life impacts and costs - ensure that the species will not generate a significant cost burden for Council over the life of the asset.
  - Principle 4 - Largest long lived species selected that meets other Asset Management Principle requirements.
  - Principle 5 - Technology - Utilise technology such as WSUD, tree vaults or improved soil zones to maximize tree planting outcomes.
  - Principle 6 - Historical, Visual and Environmental aspects of the Urban Forest enhanced - does the planting add to or detract from these aspects?
  - Principle 7 - Maximise the potential of the available space to accommodate trees - this may be through layout, increased planting space or layout of above and below ground infrastructure.

6. Determine stock quality and species availability within timeframe

- Confirm which trees on the short list will be available when project is to be planted.
- Confirm available tree stock will meet Council's quality requirements of NATSPEC.
- Finalise short list to two available options that best address the asset management principles.

7. Community engagement

  - Under this process the business community and residents in the street to be planted will be provided a choice between two suitable species.
  - Where the planting is in a business precinct Council staff will meet with the local business group.
  - Council will provide written information to the business community/residents regarding the planting and the two species options, with a selection form to facilitate their choice
- Council receives and collates the choices and documents the outcome.
- Given the high profile nature of these locations final species is chosen on a majority preference basis.
- Business/residents to be notified of final choice and estimated planting time frame in accordance with the project's communication plan.
- The projected planting period is made available on Council's website and updated as any changes occur.
- A date will be finalised closer to commencement of the project and will be updated on the website.
- Business/residents will be notified by letter box drop as part of the construction works notification and project communication plan.

Where it is not possible to offer two species due to unforeseen factors (e.g. only one of the short list available due to stock quality issues or damage by storm or pest) the business/ residents will be notified and provided an appropriate species and planting time frame. The process of updating the website and notifying business**/**residents prior to construction commencing remains the same as the points above.

8. Final choice ordered

Species ordered to meet delivery date for each street.

9. Trees planted and maintained

- Business/residents notified that planting is about to be undertaken. This is normally two weeks prior however unforeseen circumstances may reduce this notification period.
- Planting is undertaken by Council's tree planting teams in accordance with Council's standard drawings and the project design.
- All maintenance activity is undertaken by Council staff to ensure a canopy is achieved.
- Frequent mulching, watering and weeding are undertaken for first two years. This may extend beyond this period subject to the location and seasonal fluctuations.
- Only mulch that meets the Australian Standard (4454-2012) is used therefore grass clippings and other materials are not placed around trees.
- Business/residents are encouraged to water trees during dry periods in summer to augment Council's program across the LGA.
- Formative pruning is undertaken where required commencing at start of second year. This is generally undertaken at two year intervals up to year six but may be more frequent for some species.
- Advanced trees with a good canopy structure will generally not require formative pruning.

3.2.3 - Large scale development (subdivisions, commercial and industrial)

The selection of species is undertaken as part of a development approval. Tree planting is generally undertaken by the proponent with a set maintenance period and handed over to Council upon final inspection. There is the option for the proponent to fund the planting but have Council undertake sourcing of stock, planting and maintenance.

Species selection, tree stock quality, planting method and establishment maintenance are critical factors that influence the success of tree planting. Flexibility in species and tree size may be required to ensure quality stock is procured.

Subdivisions

Large Subdivisions often start with a clean slate to formulate a planting arrangement. These sites are often exposed to the elements with increased wind and heat. They are impacted by earth works and later activities associated with housing construction. It is important that the species chosen is suitable to the conditions and that establishment maintenance is carried out regularly as required.

Commercial

Commercial development may be undertaken across a range of locations that include Heritage items/conservation areas /archeological sites, City Centre or other local centres. The selection of species in commercial areas will need to take into account the relevant factors within conservations plans and technical manuals. For example planting in the Newcastle CBD will require investigation of site factors however the final species selection will be in accordance with the City Centre Technical Manual.

Industrial

Compared with residential zones, industrial zones have different spatial requirements and scales of development with wider than normal road reserve. Industrial design should take the opportunity to plant large canopy trees in these areas. In existing locations with no street planting, retrofitting may be possible and with design potential for larger trees to be used. As with subdivisions the species chosen and maintenance are critical to achieving a quality outcome.

External design teams will apply the following process to determine a suitable species and carry out the planting. **Figure 5** provides an overview of the process.

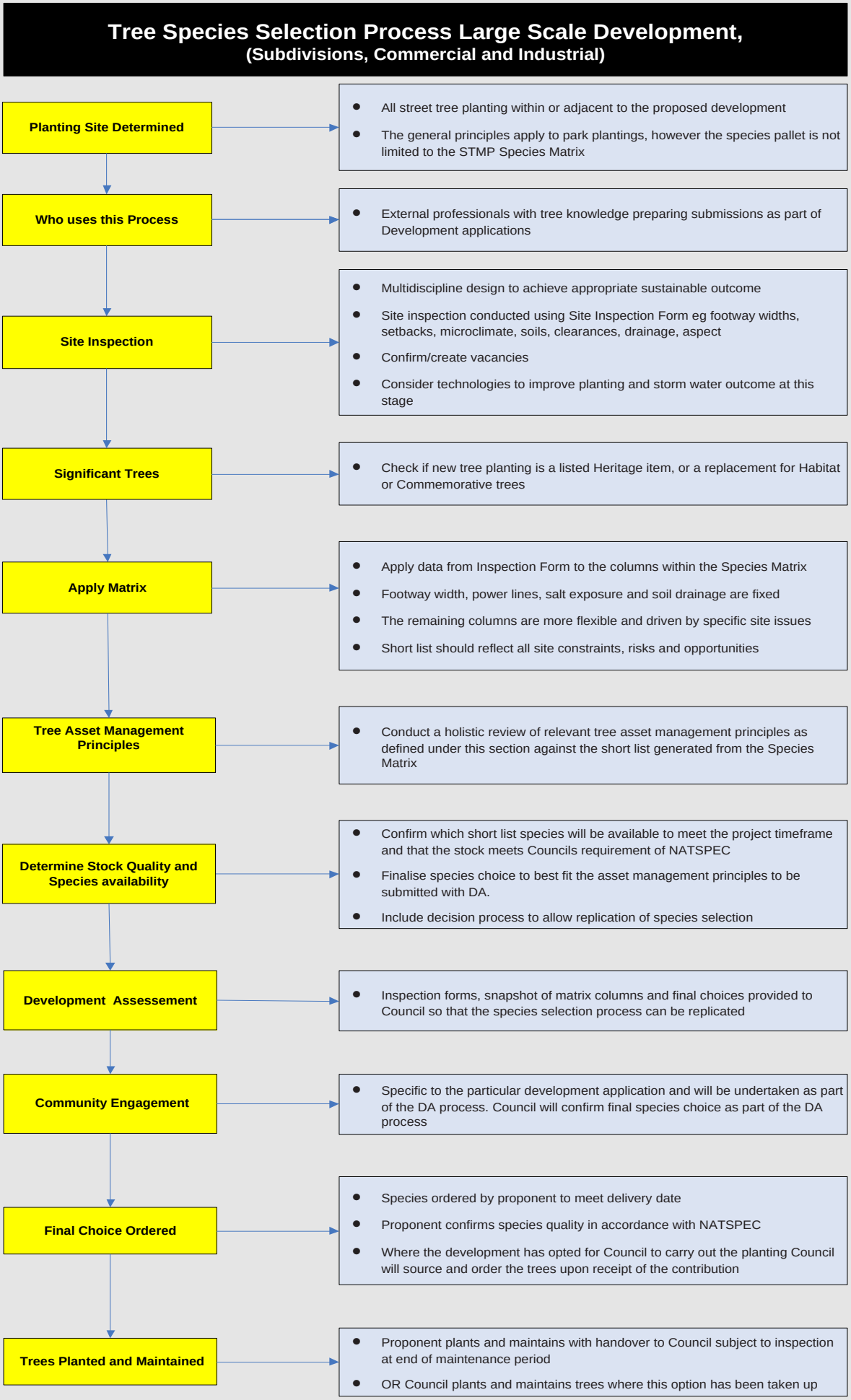

Tree Species Selection Process Large Scale Development,
(Subdivisions, Commercial and Industrial)
Planting Site Determined
All street tree planting within or adjacent to the proposed development
The general principles apply to park plantings, however the species pallet is not limited to the STMP Species Matrix
Who uses this Process
External professionals with tree knowledge preparing submissions as part of Development applications
Site Inspection
Multidiscipline design to achieve appropriate sustainable outcome
Site inspection conducted using Site Inspection Form eg footway widths, setbacks, microclimate, soils, clearances, drainage, aspect
Confirm/create vacancies
Consider technologies to improve planting and storm water outcome at this stage
Significant Trees
Check if new tree planting is a listed Heritage item, or a replacement for Habitat or Commemorative trees
Apply Matrix
Apply data from Inspection Form to the columns within the Species Matrix
Footway width, power lines, salt exposure and soil drainage are fixed
The remaining columns are more flexible and driven by specific site issues
Short list should reflect all site constraints, risks and opportunities
Tree Asset Management Principles
Conduct a holistic review of relevant tree asset management principles as defined under this section against the short list generated from the Species Matrix
Determine Stock Quality and Species availability
Confirm which short list species will be available to meet the project timeframe and that the stock meets Councils requirement of NATSPEC
Finalise species choice to best fit the asset management principles to be submitted with DA.
Include decision process to allow replication of species selection
Development Assessement
Inspection forms, snapshot of matrix columns and final choices provided to Council so that the species selection process can be replicated
Community Engagement
Specific to the particular development application and will be undertaken as part of the DA process. Council will confirm final species choice as part of the DA process
Final Choice Ordered
Species ordered by proponent to meet delivery date
Proponent confirms species quality in accordance with NATSPEC
Where the development has opted for Council to carry out the planting Council will source and order the trees upon receipt of the contribution
Trees Planted and Maintained
Proponent plants and maintains with handover to Council subject to inspection at end of maintenance period
OR Council plants and maintains trees where this option has been taken up

Figure 5

Large scale development (Subdivision, commercial and industrial)

1. Who

External professionals with appropriate design and tree knowledge such as landscape architects will apply the process from inspection through to selection.

These professionals may use other suitable professions to capture the site information required to inform the species matrix process.

2. Site Inspection

- Dial before U Dig plans are obtained.
- Multidiscipline design to achieve appropriate and sustainable outcome.
- A site inspection is undertaken using the Site Inspection Form (**Part 4**) in this Manual to capture all on site data (consider technology at this time).
- Soil sample/s to be taken to determine soil type, compatibility for root growth and likely infiltration of water.
- Onsite assessment will include confirmation that proposed plantings meet the required offsets from infrastructure (see Urban Forest Tech Manual Design for trees in addition to STSM clearances). Planting sites that do not meet these offsets shall not be planted.

3. Significant Tree Assessment

- Confirm if planting is replacing a heritage listed tree/s in Council's LEP or State Heritage Inventory.
- Confirm if the planting is replacing a tree on Council's habitat register.
- Confirm if the planting is replacing a tree that was commemorative planting. e.g. Tudor St Hamilton plant by Queen Elizabeth.
- When replacing a tree listed on the habitat register, a species of similar habitat value that is suitable to the site should be used. Where this is not possible then other species that provide fauna benefits must be used.

4. Use Matrix

- Apply the inspection data to the species matrix to determine a short list of species.
- Areas identified as Significant (3 above) will require consultation with Council's development and building team to discuss matrix short list.

5. Consider relevant asset management principles

To further narrow the short list conduct a holistic review of the following asset management principles against the short list generated from the matrix in step 4:

– *Principle 1* - Diversity of species - Ensure species and families are across a broad range. Avoid monocultures or fad selections. Reduce Myrtaceae family

across planting sites.

- *Principle 2* - Site compatible species - must be capable of reaching projected mature size as a healthy tree with regard to site conditions and minimise future risk.
- *Principle 3* - Consider whole of life impacts and costs - ensure that the species will not generate a significant cost burden for Council over the life of the asset.
- *Principle 4* - Largest long lived species selected that meets other Asset Management Principle requirements.
- *Principle 5* - Technology - Utilise technology such as WSUD, tree vaults or improved soils to maximize tree planting outcomes.
- *Principle 6* - Historical, Visual and Environmental aspects of the Urban Forest enhanced - Does the planting add to or detract from these aspects?
- *Principle 7* - Maximise the potential of the available space to accommodate trees - this may be through subdivision layout, locating of footpath closer to boundaries, increased planting space or layout of above and below ground infrastructure.

6. Determine stock quality and species availability within timeframe

- Confirm which trees on the short list will be available when project is to be planted.
- Confirm available tree stock will meet Council's quality requirements of NATSPEC as per Urban Forest Technical Manual.
- Finalise the species list to best address the asset management principles to be submitted with DA.

7. Development assessment

So that Council can replicate the process and determine if species are appropriate, the proponent must provide the following with the DA landscape plan:

- A copy of the final species matrix after filtering that shows columns and species shortlist.
- A list and explanation of the key drivers used to filter the species matrix.
- A rationale for using species from narrower or wider footway widths where applicable.
- The completed Site Inspection Form/s (see **Part 4**).
- The completed Alternative Species Form/s (see **Part 4**).

8. Community engagement

- This will be specific to the particular project and will be undertaken as part of the DA process.
- Council will confirm the final species selection as part of the DA approval.

9. Final choice ordered

- Species ordered by proponent to meet delivery date for each street.
- Where the proponent has opted for Council to carry out the planting all tree stock will be ordered by Council.

10. Trees planted and maintained.

- Tree planting is to be undertaken by proponent in accordance with Council's standard drawings and any DA requirements.
- Where the proponent has opted for Council to carry out the planting and maintenance activity, all works will be undertaken by Council staff in accordance with Council's set procedures and standard drawings.

Part 4 - Forms and Species Matrix

4.0 Important Considerations

Tree planting can be compromised at a number of stages from production through to establishment; therefore the following points need to be considered as part of the selection process.

4.1.1 Tree quality

Poor performance of street tree species is commonly attributable to one or a combination of the following: 'J' rooting at seedling stage of production; inappropriate root pruning program and methods during production; lack of proper formative pruning of the branching system during production; poor stock handling in transit and at planting time and inadequate establishment care especially watering.

Council has adopted the NATSPEC guide for tree quality (Ross Clark as published by Construction Information Systems) and continues to use this as the benchmark for assessing tree stock. In 2015 a national standard for tree stock quality was published (AS2303). Council is committed to using only the highest quality trees therefore the use of any species in this list assumes that the selected trees conform to the NATSPEC guide.

4.1.2 Tree establishment

Trees will only achieve their potential where establishment practices are routinely carried out. Formative pruning is most important. Crown lifting is commonly applied as a substitute for formative pruning, which it is not. Formative pruning has to be carried out over a number of growing seasons and requires considerable skill.

4.1.3 Tree maintenance

The cost of whole-of-life maintenance varies considerably between tree species. Costs rise significantly if maintenance requires the use of aerial towers and chippers, WHS requirements, utilities investigations and traffic planning. Even though some species require regular low level sucker pruning, the cost of this work is low due to small volume of material arising and less need for machinery, traffic interruptions and complex WHS considerations.

In addition, the ongoing infrastructure maintenance cost from poor tree selection should also be considered, e.g. excessive tree material blocking stormwater devices, or heaving of infrastructure from the base of the mature tree.

4.1 Species Matrix Key

The species matrix list must be read in conjunction with the key below. The data is specific to Newcastle streets and should not be seen as defining characteristics outside of this LGA.

Column	Explanation
D	Use In Footway Width. F1 = 2.5 - 3.0m F2 = >3.0m - 3.4m F3 = 3.5 - 4.5m F4 = > 4.5 M = suitable for median with internal width >7.9m and park planting along street-front.
E	Power lines.(PL) Suitable for growing under or near power lines. Not an indication that trimming will not be required in some circumstances however species will tolerate repeated and frequent crown reduction pruning (AS4373).
F	Drainage. The species tolerance for soil drainage. G = must be rapid draining eg sand; M = tolerates slower drainage eg loamy soil; P = tolerates slow drainage eg clays
G	Salt Air. Tolerance to salt laden winds typical of coastal Newcastle. Y = Yes, but not front line tolerance; YF = yes frontline tolerant; N = not tolerant
H	Height. The estimated range in metres for trees growing under typical street conditions. Soil factors and site environs commonly limit mature height.
I	Width. The estimated diameter (spread) of the mature crown in metres
J	Crown shape. BD = broad dome D = dome; ND = narrow dome; MD = medium dome; C = columnar
K	Shade. An indicator of shade density. L = low shade; M = medium shade; D = dense shade
L	Deciduous. (decid) N = Evergreen habit; Y = seasonal leaf colour and fall; Semi = short period of leaflessness
M	ULE. Estimated time that benefits will exceed costs. Short <25 yrs; Medium 25-50yrs; Long >50 yrs; * = timber is recyclable
N	Flower. Sp = spring; Su = summer; Au = autumn; W = winter; NA = not applicable
O	Recycle. Capacity to lock up some stored carbon after tree is removed. T = timber can be used eg furniture/ craftwork; M = primarily mulch value
P	Shedding. Propensity to shed fruit, twigs, bark, flowers. L = low (insignificant) M = moderate (some seasonal increase) H = high (sheds more or less continuously)
Q	Biodiversity. Contribution to local biodiversity through nectar, habitat, arthropods, insects etc; H =High; H* = high but should not be planted close to bushland; L = low
R	Origin. A = Australian non local; L = Locally Native; E = Exotic
S	Trial Species. Species that may be suited to street planting but that need to be trialled first. Y = yes; N = no

4.2 Species Matrix

The species matrix includes 35 plant families made up of 121 species. These are broken into three groups listed below.

- 38 Australian non-local species
- 29 Exotic species
- 54 Local native species

Note: Regardless of the footway width the narrower the width between footpath and kerb the smaller the species to be used e.g. Species under the F1 (2.5-3.0m) footway widths should fit in the minimum 1.0m distance between footpath and kerb (See **Part 3** Space Available).

Note: *Phoenix Canariensis* (Canary Island Date Palm) planted within the Newcastle LGA must have a minimum clean trunk height of 3.0m, and be certified that they are from a location that is not affected by Fusarium Wilt.

Scientific Name	Common Name	Family	Use In	PL	Drainage	Salt Air	Hght	Wdth	Crown shape	Shade	Decid	ULE	Flower	Recycle	Shedding	Biodiv	Origin	Trial Spp
Acacia maidenii	Maidens Wattle	Mimosaceae	F3	N	G	N	8-12	6-8	MD	M	N	M	Su Au	T	L	H*	L	Y
Acacia melanoxylon	Black Wattle	Mimosaceae	F4	N	M	N	12-15	6-8	MD	M	N	L	W	T	L	H*	L	N
Acer rubrum 'Fairview Flame'	Red Maple	Aceraceae	F4	N	G	N	12-15	6-8	D	M	Y	L	NA	M	L	L	E	Y
Acer rubrum (varieties)	Maple varieties	Aceraceae	F4	N	G	N	12-15	6-8	D	M	Y	L	NA	M	L	L	E	Y
Acronychia imperforata	Beach Acronychia	Rutaceae	F1	Y	M	Y	< 8	3-6	ND	M	N	S	Su	M	L	H	L	Y
Acronychia oblongifolia	White Aspen	Rutaceae	F1	Y	M	Y	< 8	3-6	ND	M	N	M	Su	M	L	H	L	Y
Acmena hemilampra	Broad-leaved Lillypilly	Myrtaceae	F3	N	M	Y	< 8	3-6	MD	D	N	M	Sp	M	H	H	A	Y
Acmena smithii	Lilly Pilly	Myrtaceae	F3	N	M	Y	8-12	6-8	D	D	N	M	Su	T	M	H	L	N
Agathis robusta	Kauri Pine	Araucariaceae	M	N	G	N	20+	6-8	ND	D	N	L	NA	T	L	L	A	N
Alectryon tomentosus	Woolly Rambutan	Sapindaceae	F3	Y	G	Y	< 8	3-6	ND	M	N	M	NA	M	L	H	L	Y
Alectryon coriaceus	Beach Birdseye	Sapindaceae	F1	Y	G	Y	< 8	3-6	ND	L	N	M	NA	M	L	H	L	Y
Alloxylon flammeum	Tree Waratah	Proteaceae	F3	N	G	N	12-15	6-8	ND	M	N	L	Sp	T	L	H	L	Y
Alphitonia excelsa	Red Ash	Rhamnaceae	F3	N	G	Y	8-12	6-8	ND	M	N	M	Su	T	L	H	L	N
Alphitonia petriei	Pink Almond	Rhamnaceae	F3	N	G	N	8-12	3-6	MD	M	N	M	Su	T	L	H	A	Y
Angophora costata	Smooth-barked Apple	Myrtaceae	F4	N	G	N	12-15	8-10	D	L	N	L	Su	M	M	H	L	N
Angophora hispida	Dwarf Apple	Myrtaceae	F1	Y	G	YF	< 8	3-6	ND	M	N	M	Su	M	L	H	L	N
Araucaria cunninghamii	Hoop Pine	Araucariaceae	M	N	M	N	20+	8-10	D	M	N	L	NA	T	L	H	A	N
Araucaria columnaris	Cook Pine	Araucariaceae	F4	N	M	Y	15-20	3-6	Col	M	N	L	NA	T	L	H	A	N
Araucauria heterophylla	Norfolk Pine	Araucariaceae	M	N	M	YF	20+	6-8	Col	M	N	L	NA	T	L	H	A	N
Archotophoenix cunninghamiana	Bangalow Palm	Arecaceae	F1	N	P	N	8-12	3-6	Col	L	N	M	Su	M	M	H	L	N
Argyrodendron actinophyllum	Black Booyong	Sterculiaceae	M	N	G	N	15-20	12-15	BD	D	N	L	NA	T	L	H	L	Y
Backhousia anisata (syn Anetholia)	Aniseed Tree	Myrtaceae	F3	Y	G	N	8-12	6-8	MD	M	N	L	Su	M	L	H	L	Y
Backhousia citriodora	Lemon Myrtle	Myrtaceae	F1	Y	G	N	< 8	3-6	ND	L	N	M	Su	T	L	H	L	N
Backhousia myrtifolia	Grey Myrtle	Myrtaceae	F1	Y	G	N	< 8	3-6	ND	M	N	M	Su	T	L	H	L	N
Banksia integrifolia	Coastal Banksia	Proteaceae	F2	Y	G	YF	< 8	3-6	D	M	N	S	Su	T	L	H	L	N
Brachychiton acerifolius	Illawarra Flame Tree	Sterculiaceae	F4	N	M	N	8-12	6-8	ND	M	Semi	L	Su	T	L	H	A	N
Brachychiton discolor	Lacebark	Sterculiaceae	F4	N	M	N	12-15	6-8	ND	M	N	L	Su	T	L	H	A	N
Brachychiton populneus	Kurrajong	Sterculiaceae	F4	N	M	N	12-15	6-8	D	M	N	L	Sp	T	M	H	A	N
Buckinghamia celsissima	Ivory Curl Flower	Proteaceae	F1	Y	G	N	< 8	3-6	ND	M	N	M	Su	T	L	H	A	N
Buckinghamia ferruginiflora	Noah's Oak	Proteaceae	F2	Y	G	N	< 8	3-6	D	M	N	M	Su Au	T	L	H	A	N
Caesalpinia ferrea	Leopard Tree	Ceasalpinaceae	F3	N	M	N	8-12	6-8	MD	L	Y	L	Su	T	L	L	E	N
Callistemon salignus	Willow Bottlebrush	Myrtaceae	F1	N	P	N	8-12	3-6	ND	M	N	M	Su	M	L	H	L	N
Calodendrum capense	Cape Chestnut	Rutaceae	F4	N	M	N	8-12	6-8	D	D	Semi	L	Su	T	L	L	E	N
Carya illinoiensis	Pecan	Juglandaceae	M	N	M	N	12-15	8-10	MD	M	Y	L	Su	T	L	L	E	N
Castanospermum australe	Blackbean	Fabaceae	M	N	M	N	15-20	10-12	D	D	N	L	Su	T	L	H	A	N
Corymbia maculata	Spotted Gum	Myrtaceae	F4	N	M	N	15-20	6-8	MD	L	N	L	Su	T	M	H	L	N
Corymbia eximia	Yellow Bloodwood	Myrtaceae	F3	N	G	Y	12-15	6-8	D	M	N	L	Su	M	M	H	L	N
Cupaniopsis anacardioides	Tuckeroo	Sapindaceae	F2	Y	M	Y	< 8	3-6	D	M	N	M	Su	M	L	H	L	N
Decaspermum humile	Silky Myrtle	Myrtaceae	F3	Y	M	N	< 8	3-6	D	M	N	M	Su	T	L	H	A	Y
Diploglottis cunninghamii	Native Tamarind	Sapindaceae	F4	N	M	N	8-12	3-6	ND	L	N	M	Su	M	L	H	A	Y
Doryphora sassafras	Sassafras	Antherosperataceae	F4	N	M	N	15-20	6-8	ND	D	N	L	Su	T	L	H	L	Y
Drypetes deplanchei	Yellow Tulipwood	Putranjivaceae	F3	N	M	N	8-12	3-6	ND	M	N	M	Su	T	L	H	A	Y
Elaeocarpus eumundii	Smooth-leaved Quandong	Eleocarpaceae	F3	N	M	N	8-12	3-6	ND	D	N	L	Su	T	L	H*	A	N
Elaeocarpus grandis	Blue Quandong	Eleocarpaceae	M	N	M	N	15-20	6-8	ND	D	N	L	NA	T	M	H	L	N
Elaeocarpus obovatus	Hard Quandong	Eleocarpaceae	F1	N	G	N	8-12	3-6	ND	M	N	L	Su	T	L	H	L	N
Eleaocarpus reticulatus	Blueberry Ash	Eleocarpaceae	F1	Y	G	N	< 8	3-6	ND	L	N	M	Su	T	L	H	L	N
Eucalyptus capitellata	Brown Stringybark	Myrtaceae	F4	N	M	N	8-12	6-8	D	M	N	L	Su	M	M	H	L	N
Eucalyptus curtisii	Plunket Mallee	Myrtaceae	F1	Y	M	N	< 8	3-6	ND	L	N	L	Su	M	L	H	A	N
Eucalyptus microcorys	Tallowwood	Myrtaceae	F4	N	M	N	15-20	6-8	D	M	N	L	Su	T	L	H	L	N
Eucalyptus punctata	Grey Gum	Myrtaceae	F4	N	M	N	15-20	6-8	D	L	N	L	Su	T	M	H	L	N
Eucalyptus sideroxylon 'Rosea'	Ironbark	Myrtaceae	F3	N	M	N	12-15	6-8	MD	L	N	L	Su	M	L	H*	A	N
Ficus macrophylla	Moreton Bay Fig	Moraceae	M	N	M	Y	20+	15-20	BD	D	N	L	NA	M	H	H	A	N

Ficus microcarpa var. 'Hillii'	Hills Weeping Fig	Moraceae	M	N	M	Y	15-20	15-20	BD	D	N	L	Su	M	H	H	A	N
Ficus rubiginosa	Port Jackson Fig	Moraceae	M	N	M	YF	12-15	10-12	D	D	N	L	NA	M	H	H	L	N
Ficus superba var Henneana	Deciduous Fig	Moraceae	M	N	M	N	12-15	10-12	D	D	Y	L	NA	M	M	H	L	N
Flindersia australis	Crows Ash	Rutaceae	F4	N	M	N	12-15	8-10	D	M	Semi	L	Su	T	M	H	A	N
Flindersia xanthoxyla	Yellowood	Rutaceae	F3	N	M	N	15-20	6-8	ND	M	N	L	Su	T	L	H	A	Y
Fraxinus griffithii	Himalayan Ash	Oleaceae	F2	Y	M	N	< 8	3-6	D	M	N	M	Sp	T	L	L	E	N
Fraxinus pennsylvanica 'Urbanite'	'Urbanite' Green Ash	Oleaceae	F4	N	M	N	12-15	6-8	D	M	Y	M	NA	T	L	N	E	Y
Geijera parviflora	Wilga Wilga	Rutaceae	F1	Y	M	N	< 8	3-6	ND	M	N	M	Su	T	L	H	A	Y
Glochidion ferdinandi	Cheese Tree	Phyllanthaceae	F3	Y	P	N	8-12	3-6	MD	M	N	L	NA	T	L	H	L	N
Gmelina leichhardtii	White Beech	Verbenaceae	M	N	M	N	8-12	6-8	D	M	Semi	L	Su	T	L	H	L	Y
Gordonia axillaris	Gordonia	Theaceae	F2	Y	M	N	<8	3-6	MD	M	N	L	Su	M	L	L	E	N
Grevillea baileyana	White Oak	Proteaceae	F3	N	M	N	8-12	6-8	D	M	N	L	Sp	T	L	H	A	Y
Grevillea hilliana	White Silky Oak	Proteaceae	F4	N	M	N	12-15	6-8	ND	M	N	L	Su	T	L	H	A	Y
Grevillea robusta	Silky Oak	Proteaceae	M	N	M	N	12-15	6-8	ND	L	Semi	L	Su	T	M	H	A	N
Harpullia pendula	Tulipwood	Sapindaceae	F3	Y	M	N	< 8	6-8	D	M	N	L	Su	T	L	H	A	N
Hibiscus tiliaceus	Beach Hibiscus	Malvaceae	F2	Y	G	YF	6-8	3-6	BD	M	N	S	Su	M	L	H	L	N
Hibiscus tiliaceus 'Rubra'	Red Beach Hibiscus	Malvaceae	F2	Y	G	Y	6-8	3-6	MD	D	N	M	Su	M	L	H	L	Y
Jacaranda mimosifolia	Jacaranda	Mimosaceae	F3	N	M	N	8-12	6-8	MD	L	Y	L	Sp	M	L	L	E	N
Koelreuteria paniculata	Golden Rain	Sapindaceae	F2	Y	M	N	< 8	3-6	D	M	Y	L	NA	M	L	L	E	N
Lagerstroemia indica 'Biloxi	Crepe Myrtle	Lythraceae	F1	Y	M	N	< 8	3-6	ND	L	Y	M	Su	M	L	L	E	N
Liquidambar formosana	Formosan Sweetgum	Altingiaceae	F4	N	M	N	12-15	6-8	MD	M	N	L	NA	M	L	N	E	N
Liquidambar styraciflua	Liquidamber	Altingiaceae	M	N	M	N	15-20	10-12	D	M	Y	L	NA	T	L	N	E	N
Lagunaria patersonii	Norfolk Island Hibiscus	Myrtaceae	M	N	P	YF	8-12	6-8	ND	M	N	L	Su	M	M	L	A	N
Lepiderema pulchella	Fine Leaved Tuckeroo	Sapindaceae	F1	N	M	N	< 8	3-6	ND	M	N	M	Su	M	L	H	A	Y
Leptospermum petersonii	Lemon Scented Tea Tree	Myrtaceae	F2	Y	M	N	< 8	3-6	MD	L	N	S	Su	M	L	H	A	N
Livistona australis	Cabbage Palm	Arecaceae	F3	N	P	Y	8-12	3-6	Col	L	N	M	Su	M	L	H	L	N
Lophostemon confertus	Brushbox	Myrtaceae	F3	N	M	N	12-15	6-8	MD	D	N	L	Su	T	M	H	A	N
Macadamia integrifolia	Queensland Nut	Proteaceae	M	N	G	N	15-20	12-15	BD	D	N	L	Su	T	L	H	A	N
Magnolia grandiflora 'Exmouth'	Evergreen Magnolia	Magnoliaceae	F4	N	M	Y	12-15	6-8	D	M	N	L	Su	M	L	L	E	N
Magnolia grandiflora 'Little Gem'	Little Gem Magnolia	Magnoliaceae	F2	Y	M	Y	8-12	3-6	MD	M	N	L	Su	M	L	L	E	N
Melaleuca quinquenervia	Swamp Paperbark	Myrtaceae	M	N	P	Y	12-15	6-8	MD	M	N	L	Su	M	M	H	L	N
Melaleuca styphelioidies	Prickly Paperbark	Myrtaceae	F3	N	P	Y	3-6	3-6	MD	M	N	M	Su	M	L	L	A	Y
Melia azederach 'Elite'	Low fruiting White Cedar	Meliaceae	F3	Y	M	N	< 8	3-6	MD	M	Y	L	Su	T	L	H	A	N
Melicope elleryana	Pink Euodia	Rutaceae	F1	Y	G	N	< 8	3-6	ND	M	N	M	Su	M	L	H	L	Y
Nyssa sylvatica	Blackgum	Cornaceae	F3	N	P	N	8-12	3-6	ND	L	Y	L	Sp	T	L	L	E	N
Olea europea	Green Olive	Oleaceae	F3	Y	M	Y	8-12	3-6	D	M	N	L	Su	T	L	L	E	N
Pararchidendron pruinosum	Snowwood	Fabaceae	F1	Y	M	N	< 8	3-6	ND	L	N	M	Su	T	L	H	L	Y
Phoenix canariensis	Canary Island Date Palm	Arecaceae	M	N	M	YF	8-12	3-6	MD	L	N	L	NA	M	M	L	E	N
Pistacia chinensis	Chinese Pistachio	Anarcardiaceae	F2	Y	G	N	< 8	3-6	BD	M	Y	M	NA	M	L	L	E	N
Platanus orientalis 'Autumn Glory	Autumn Glory' Plane	Platanaceae	F4	N	M	N	12-15	6-8	D	L	Y	L	NA	T	L	L	E	N
Platanus x Hybrida	London Plane	Platanaceae	F4	N	M	N	15-20	10-12	D	M	Y	L	Sp	T	M	L	E	N
Podocarpus elatus	Plum Pine	Podocarpaceae	F4	N	M	Y	8-12	6-8	MD	D	N	L	Su	T	M	H	L	N
Polyscias murrayi	Pencil Cedar	Araliaceae	F3	N	G	Y	8-12	3-6	ND	M	N	M	Au	M	L	H	L	Y
Auranticarpa rhombifolia prev.Pittosporum rhombifolium	Diamond-Leaf Laurel	Pittosporaceae	F1	N	M	N	8-12	3-6	ND	M	N	M	Sp	M	L	H	L	N
Pyrus calleryana 'Capital'	Callery selection	Rosaceae	F2	N	M	N	8-12	2-4	ND	M	Y	M	Sp	T	L	L	E	N
Pyrus calleryana 'Chanticleer'	'Chanticleer' Callery Pear	Rosaceae	F3	N	M	N	8-12	3-6	ND	M	Y	M	Sp	T	L	L	E	N
Pyrus ussuriensis	Manchurian Pear	Rosaceae	F3	N	M	N	8-12	6-8	MD	M	Y	M	Sp	M	L	L	E	N
Quercus ilex	Holm Oak	Fagaceae	M	N	M	N	15-20	10-12	BD	H	N	L	NA	T	L	L	E	N
Rapanea variabilis	Muttonwood	Myrsinaceae	F3	Y	P	Y	8-12	3-6	ND	M	N	M	Su	M	L	H	L	Y
Rhodosphaera rhodanthema	Tulip Satinwood	Anarcardiaceae	F1	N	M	N	8-12	6-8	ND	H	N	L	Su	T	L	H	L	Y
Scolopia braunii	Flintwood	Flacourtiaceae	F1	N	M	N	< 8	3-6	ND	D	N	L	NA	T	L	H	L	Y
Stenocarpus sinuatus	Firewheel Tree	Proteaceae	F3	N	G	N	8-12	3-6	ND	L	N	L	Su	T	L	H	A	N
Streblus brunonianus	Whalebone Tree	Moraceae	F1	N	M	N	8-12	3-6	ND	M	N	M	Su	T	L	H	A	Y

Syncarpia glomulifera	Turpentine	Myrtaceae	F4	N	P	N	12-15	6-8	MD	D	N	L	Su	T	L	H	L	N
Synoum glandulosum	Scentless Rosewood	Meliaceae	F3	N	M	N	8-12	3-6	ND	M	N	L	Su	T	L	H	L	N
Syzygium australe	Brush Cherry	Myrtaceae	F3	N	M	N	8-12	6-8	ND	M	N	L	Sp	M	L	H	L	N
Syzygium jambos	Rose Apple	Myrtaceae	F3	N	M	N	8-12	6-8	D	M	N	L	Su	M	L	H	E	N
Syzygium luehmannii	Small-leaved Lilly Pilly	Myrtaceae	F4	N	M	N	8-12	6-8	ND	M	N	L	Su	M	M	H	L	N
Syzygium moorei	Rose Apple	Myrtaceae	F3	N	M	N	8-12	6-8	MD	M	N	L	Su	M	L	H	L	N
Syzygium oleosum	Blue Lilly Pilly	Myrtaceae	F3	N	M	N	8-12	6-8	D	M	N	L	Su	M	L	H	L	N
Syzygium paniculatum	Magenta Cherry	Myrtaceae	F3	N	G	Y	8-12	6-8	D	M	N	L	Su	M	M	H	L	N
Toona ciliata	Red Cedar	Meliaceae	F4	N	M	N	8-12	6-8	MD	L	Y	L	W	T	L	H	L	N
Tristaniopsis laurina	Watergum	Myrtaceae	F2	Y	M	N	< 8	3-6	MD	M	N	L	Su	T	L	H	L	N
Tristaniopsis laurina 'Luscious'	Luscious Watergum	Myrtaceae	F2	Y	M	N	< 8	3-6	MD	M	N	L	Su	T	L	H	A	N
Taxodium distichum	Swamp Cyprus	Cupressaceae	M	N	P	N	15-20	6-8	ND	M	Y	L	NA	T	L	L	E	N
Ulmus parvifolia 'Burnley Select'	Chinese Elm	Ulmaceae	F3	N	M	N	8-12	6-8	MD	L	Y	L	NA	M	L	L	E	N
Waterhousea floribunda	Weeping Lilly Pilly	Myrtaceae	F4	N	M	N	12-15	8-10	MD	M	N	L	Su	T	L	H	L	N
Xanthostemon chrysanthus	Golden Penda	Myrtaceae	F3	N	M	N	8-12	6-8	ND	M	N	M	Su Au	T	L	H	A	Y
Zelkova serrata 'Green Vase'	Japanese Zelkova	Ulmaceae	F4	N	M	N	12-15	8-10	ND	D	Y	M	Sp	M	H	L	E	Y

Street Tree Selection Manual
Alternative Species Form

The City of Newcastle

This form is to be used where species options within the matrix have been exhausted. The street is a harsh environment with limited resources to grow trees resulting in a much smaller tree. The projected heights and canopy width should reflect this. The following information is to be provided to Council for consideration. (see matrix key for definitions).

Botanical name:

Common name:

Family:

Origin and habitat:

Identifying features:

Maintenance issues:

Planting footway or median plus width:	☐ F1 ☐ F2 ☐ F3 ☐ F4 M(width):
Use under powerlines:	☐ Yes ☐ No
Drainage soil:	☐ Good ☐ Moderate ☐ Poor
Salt tolerance:	☐ Good ☐ Moderate ☐ Poor
Projected height (m):	☐ <8 ☐ 8-12 ☐ 12-15 ☐ 15-20 ☐ 20+
Canopy width (m):	☐ 3-6 ☐ 6-8 ☐ 8-10 ☐ 10-12 ☐ 12-15 ☐ 15-20
Shading:	☐ Low ☐ Moderate ☐ High
Deciduous:	☐ Yes ☐ No ☐ Semi
ULE:	☐ Short ☐ Moderate ☐ Long
Flower:	☐ NA ☐ Summer ☐ Spring ☐ Autumn
Recyclable:	☐ Timber ☐ Mulch only ☐ No
Shredding:	☐ Low ☐ Moderate ☐ High
Biodiversity value:	☐ No ☐ Low ☐ High ☐ High*

Where currently planted in a street: include exact address, age, height, health, vitality, soil type, microclimate and photo/s.

NB: Tree/s should be in a location accessible for Council to inspect and similar climate range to Newcastle LGA

Planting Site Inspection Form

The City of Newcastle

Replacing significant trees: ☐ Heritage listed ☐ Habitat ☐ Commemorative

Site Category (private): ☐ Residential ☐ High Profile/Distinctive ☐ Large Scale Development

Footway width: Even_____m Odd_____m

Footpath: **Even** ☐ Yes ☐ No **Odd** ☐ Yes ☐ No

Off street parking: **Even** ☐ Yes ☐ No **Odd** ☐ Yes ☐ No

Road width: _____m

Parking lane: ☐ Yes ☐ No

Potential for planting in road: ☐ Yes (consider previous four points)

Use under tree: ☐ Parking ☐ Traffic ☐ Pedestrian ☐ Recreation ☐ Landscape

Powerlines: ☐ Yes ☐ No Odd # ☐ HV ☐ LV ☐ Service ☐ ABC
Even # ☐ HV ☐ LV ☐ Service ☐ ABC

Building setback: ☐ <1 ☐ 1 – < 2. 5 ☐ 2.5 ☐ > 2.5 - < 3.5 ☐ 3.5 ☐ > 3.5 - < 4.5
☐ 4.5 ☐ > 4.5 - < 6 ☐ > 6

Solar consideration - side of building to be planted: **Odd** ☐ N ☐ S ☐ E ☐ W **Even** ☐ N ☐ S ☐ E ☐ W

Vacany clearances: ☐ Driveways 3m ☐ Power poles 4m ☐ Intersections 10m (kerb)
☐ Storm water inlet 2m ☐ Bus stop 18m approach/3m depart
☐ Traffic lights 10m ☐ Major underground junction box 3m

Clear of underground services to property: ☐ Gas ☐ Water ☐ Telecommunications

Soil type: ☐ Sand ☐ Loam ☐ Silt ☐ Clay ☐ Fill

pH: ☐ Neutral ☐ Alkaline ☐ Acidic **Remediate:** ☐ Yes ☐ No
☐ Phosphonate ☐ Lime ☐ Gypsum

Drainage: ☐ Good ☐ Moderate ☐ Poor **Hydrophobic:** ☐ Yes ☐ No

Slope: ☐ Flat ☐ Moderate ☐ Steep

Planting site: ☐ Concrete ☐ Asphalt ☐ Cutting required

Heritage Conservation Area: ☐

Aspect: ☐ N ☐ S ☐ E ☐ W

Prevailing wind: ☐ N ☐ S ☐ E ☐ W

Exposure to wind: ☐ exposed ☐ protected ☐ ridgeline ☐ gully

Salt Exposure: ☐ salt frontline ☐ salt other ☐ Nil

Frost Potential: ☐ No ☐ Mild ☐ Severe

House no.	Vacancy no.	Building set back	Footway width	Kerb to footpath min 1.0M	Vacancy Clearances met (y/n)	Height to wires	Comments Services- PP= power pole, SW= storm water pit. Tel= Telstra pit, NBN= NBN pit, W= water hydrant, DW= driveway, SD= electricity service drop, JB= Major underground junction box, Int= intersection

Matrix Choices - Option 1 = largest canopy

Odd

1. # _____

2. # _____

Even

1. # _____

2. # _____

Notes:

5.0 Appendices

Appendix 1: Compliance with Statewide Insurance Obligations

Audit Requirement	How met
Council is encouraged to adopt a responsible planting procedure for new trees to ensure that the problems faced today from past plantings are not repeated into the future	STSM species selection process
The characteristics of the tree, within the environment or intended location, should be known prior to being planted. Only trees that have been reviewed for their characteristics should appear on the preferred species list	STSM Species Matrix
Council needs to implement a systematic identification and evaluation process that will ensure that new tree plantings will not impact on services or structures	STSM site inspection and matrix process
In some instances, a case can be made to plant trees within the minimum distances for damage control. These circumstances may include trees of significant value or trees to compliment an existing street scene. If the situation warrants deviation from the procedure then risk control strategies must be initiated.	Newcastle DCP 2012 - Urban Forest Technical Manual – Risk Control Strategies
Council should develop policies to support its decisions	Urban Forest Policy 2008; City Wide Maintenance Policy – Tree Amendment 2008

Appendix 2: Snapshot of Newcastle's trees 2015

Our trees

- 103,541 established trees.
- Of the 82,000 street tree sites, 67% (54,940) have existing trees and 33% (27,060) are vacant planting sites.
- 38% (31,160) of the public street tree population and vacancies is affected by aerial power lines.
- 9,572 new trees planted as part of 2008 -2015 MAPPs (street tree replacement and strategic planting).
- 680 trees per annum is the average removal rate over eight years to 2015.
- Significant storms have resulted in the loss of a further 4258 trees over eight years to 2015.
- 9698 total number of removals 2008 to 2015 inclusive.
- The Myrtle plant family contributes 52% of the total street tree population including Paperbark, Turpentine, Eucalyptus, Angophora, Bottlebrush, Lilly Pilly and Brushbox.

Asset values

Public tree asset replacement cost estimated on 31December 2015 at $111,448,314.

Estimated value of net annual benefits from existing tree resource $22,800,000 – based on benefit value estimates by Adelaide University 2006.

Condition of public street tree

The overall health of the street tree resource is fair to good with 55% of trees in reasonable health and adequate canopy density for the species. However 22% of the population is in poor structural condition.

Useful life profile

About 30% of the public tree resource has an estimated 15-25 year useful life expectancy with only 11% estimated to have a useful life expectancy of 25-50 years. The implication of this imbalance in life expectancy distribution is that a large proportion of the existing public tree population will require replacement within a relatively short time. This equates to an 80% loss of existing street trees within 30 years and 66% within 20 years.

Plant diversity

With 74 plant families, 178 genera and 468 different species, the public tree resource appears to be very diverse. However, there is a severe imbalance due to 55% of the population being represented by just 10 genera which includes Eucalyptus, Corymbia, Bottlebrush, Casuarina, Brushbox, Paperbark, Fig, Wattle, Lilly Pilly, Crepe Myrtle and Robinia. A number of plant families are represented only by single individual.

Management Issues

Although the public tree population is reasonably healthy, it is ageing and in relatively poor structural condition.

Many of the city's mature trees have outgrown their street locations.

Annual tree planting is required and should seek to diversify plant families where ever possible.

Drought periods will reduce planting in some years to ensure previous plantings watered so that they do not fail.

Appendix 3: The origins of tree planting In Newcastle

Background

As the second oldest city in Australia the built form of Newcastle dates from the early 1800s and provides a distinct layer of heritage and cultural significance.

The Newcastle local government area covers approximately 214 square kilometres with a population of 142,000 (2006 census). Newcastle is the sixth largest urban area in Australia and is the cultural and economic heart of the Hunter region. The city is located on the coast 160 kilometres north of Sydney in the Lower Hunter region which embraces the local government areas (LGAs) of Cessnock, Lake Macquarie, Maitland, Port Stephens and Newcastle.

Newcastle's natural assets are diverse, including coastal headlands, beaches, estuarine wetlands, mangrove forests, steep ridges, rainforest gullies and dry wooded inland slopes. Since the first European settlement at Port Hunter in 1804 this environment has been altered significantly.

In 2006 the NSW State Government identified the Hunter as one of six key regional areas for growth. Through employment and housing opportunities and by becoming a more liveable city Newcastle is to underpin economic growth in the Hunter region. The State Government's vision identified the value of trees and vegetation as part of the urban environment.

In response Newcastle City Council adopted an Urban Forest Policy (2008) to improve management of the city's urban forest. The Street Tree Selection Manual provides the tool for maintaining and extending canopy coverage across Newcastle and provides a framework for consistent and sustainable provision of street trees.

Historical context

Pre European settlement

The Awabakal and Worimi are the local Aboriginal people, the first people of the land in Newcastles LGA. Prior to European settlement the physical environment in which the locals lived was lush and heavily forested, in stark contrast to present day Newcastle.

The Hunter River was known as 'Coquun' by the local people. Prior to European settlement, the environs was one of a mangrove fringed river with dense brush and large trees lining the banks.

Joseph Lycett, a well renowned convict artist commented on the landscape of Newcastle (1815 - 1819) "There are immense quantities of the finest timber of the different sorts of the Eucalyptus, grown in the vicinity of Newcastle, and the Casuarinas' grown to considerable size". This image supported by H.W.H Huntington in his History of Newcastle (1897-78) where he describes the area around Newcastle as having "Magnificent forests of lofty Eucalyptus and Casuarinas as well as Swamp Oak, Tea Tree and Mangrove in abundance stretching far and wide along the branches of the river".

Post European settlement

Five elements interwoven into Newcastle's history have shaped urban development and help explain the settlement pattern of modern Newcastle. These elements are the penal settlement 1804-1822, coal, the harbour, port, railways and heavy industry.

The first penal settlement was formed in 1804. The convicts were a source of labour for the exploitation of coal, timber, salt and lime. Newcastle ceased to be a penal colony in 1822 when the convicts were relocated to Port Macquarie. At this time the government surveyor Henry Dangar was directed to prepare a town plan on the site of the penal settlement. Dangar overlaid the irregular arrangement of the penal settlement with a rigid grid pattern that still exists today as central Newcastle.

The entry of the Australian Agricultural Company into coal mining during the 1830's had a dramatic effect. The company received a grant of 2,000 acres to the west of Newcastle and proceeded to extract coal via two steam engines. By the mid 1850's Newcastle was still small but the impact of coal mining on the environment was apparent with the township being described as "these shores of sand and coal dust".

The second phase in Newcastle's expansion was brought about by the advent of the railway system. Construction of The Great Northern Railway Line commenced in 1857 with a connection between the port of Newcastle and Maitland. Private rail systems developed simultaneously with the public system resulting in a network of private colliery steam trains servicing the coal mines and linking the villages. The port facilities in Newcastle Harbour expanded in response to the growth of the rail network greatly accelerating the export of coal to ports in Asia and America.

By the 1860's Newcastle was a major shipping and commercial centre, with a settlement pattern characterised by a series of small villages centred on coal mines and linked by a private rail system. Townships developed close to the mines to accommodate miners and their families. When mining ceased the colliery land was then further subdivided and sold off for commercial and residential development. With their supply of affordable residential land and convenient rail connections to Newcastle CBD the fledgling townships expanded to become the suburbs we know today.

Newcastle became a centre for heavy industry with the advent of the steel works in 1917. Significant industrial expansion has continued, particularly with open cut coal mining, aluminium smelters and ongoing development of port facilities.

Although modern Newcastle is still an industrial centre the closure of BHP in 1999 brought an end to the city's reliance on heavy industry. The BHP closure resulted in massive job losses and depopulation which Newcastle is only beginning to recover from now. The release of former industrial lands particularly along the foreshore has initiated a period of economic and environmental renewal for the core of the city. With new public open spaces and commercial and residential developments that incorporate modern built forms Newcastle is beginning to become the post industrial 'liveable' city envisaged by State Government.

The history of tree planting

Street trees form an important part of the cultural and historic landscape of Newcastle. The type of trees chosen, their location and grouping provide an insight into the past. Tree planting was undertaken to mark events, to celebrate and remember people and as a functional response to land use. Collectively the street tree population in Newcastle exhibits distinctive characteristics of a culture, a way of life and signifies a

particular response of people to a place over time.

By the 1930's it was evident that industrialisation had created a landscape that was devoid of vegetation, with Newcastle often referred to as 'Coaly Town' and as being 'drab' in appearance. In 1931 Alderman Parker, the Lord Mayor commented in response to this industrialised landscape, 'It is on all sides admitted that the city streets sadly lack the beauty and picturesque appearance which well ordered and suitably planted avenues of trees would afford'. In response an extensive policy of tree planting and five year city beautification program was initiated. Alderman Shedden spoke of an intention to create a 'tree sense' in the public, the best way to nurture this being to provide trees for private citizens to plant and attend.

Newcastle's intent to overcome its bleak industrial character has been closely aligned with tree planting programs implemented over time. The twelve individual councils, which were amalgamated to form the Greater Newcastle Council in 1938, had been active in beautifying their areas. The Newcastle Herald on the 5th of August 1937 reported that 'the suburban councils have planted hundreds of trees…. and it is expected that in a short time the suburbs will do much to explode the belief that Newcastle is a treeless city'.

The historically significant stand of Moreton Bay Fig trees along Islington Park's boundary with the Pacific Highway was first planted in 1880 by Wickham Municipal Council.

A group of protesters gathered in 1935 to protect the Figs in Islington Park when they were under threat.

The original planting was supplemented circa 1937 to commemorate the golden jubilee of Islington School. In 1941 E.G.Waterhouse, a prominent professor from Sydney University was invited by the Newcastle Tree Planting and Preservation League to inspect the trees in Islington Park. He commented that the grove of Figs is 'one mass of greenery, the one landmark on which the eye dwells with pleasure in the otherwise uninspiring city landscape'.

A dense planting of Hills Fig trees along Port Waratah's boundary with Industrial Drive is a prime example of tree planting in response to the industrial environment. When steel was being produced at BHP these Figs assisted in absorbing airborne particulates and providing an effective visual screen to the vast industrial complex. As these Fig canopies have matured they have merged to form a massive hedge that has outlived BHP and still enhances Industrial Drive today.

Inspired by a trip abroad Alderman Armstrong, President of Newcastle Rotary Club, stated 'trees planted on main traffic routes into overseas cities gave one a tremendous first impression'. An Avenue of Remembrance first planned in 1961 in association with the Rotary Club was implemented along the Pacific Highway from Hexham Bridge to the abattoir at Mayfield.

The avenue had a dual objective to beautify the northern approach to the city and commemorate the early pioneers of Newcastle. In addition Council commenced planting of Hills Figs along the Pacific Highway west of Mayfield. Tree planting along these routes was instrumental in improving Newcastle's presentation to visitors.

Over the years Newcastle's citizens have been divided on the importance of trees in Newcastle. A negative attitude to trees was expressed in an article from the Newcastle Herald March 1941 from a ratepayer in Wickham complaining about the Fig trees that lined Albert Street in Wickham Park, 'They are dirty, and make our homes look like rubbish tips. We are always cleaning up the mess they make.' Council's Park Superintendent Mr Richard H Patterson countered, stating the importance of trees for four reasons first their 'beauty', second for their 'sanitary and hygienic value', then for the 'convenience in keeping the city cool'; and lastly for 'their architectural value in creating harmony where non uniform buildings exist'. Patterson continues, recognising key environmental benefits identified in today's urban forest, 'Who would believe that trees absorbed the surplus carbon dioxide in the air and that they prevented much dust from flying over the city'.

The benefits of trees recognised by Patterson back in 1941 are still relevant today. Council's Urban Forest Policy recognises that quality tree canopy cover across the city provides aesthetic, health, environmental and monetary benefits, helping to offset the negative effects of increasing urbanisation, the heat island effect and climate change.

Newcastle currently benefits from the canopy of trees planted from the 1930s onward, however this canopy has a limited lifespan and there are many parts of the city that still lack trees. The Urban Forest Policy requires that the current canopy is properly managed so residents of Newcastle can continue to enjoy the benefits of trees.

Appendix 4: References

A Pictorial History of Newcastle; John Turner, 2001

Burden, Dan; 22 Benefits of Urban Trees, May 2006

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