MUSWELLBROOK SHIRE COUNCIL

TREE MANAGEMENT PLAN

November 2006

CONTENTS

1 INTRODUCTION

1.1 BACKGROUND

For Council, the management of trees is a complex, multi-faceted issue. The proper management of trees draws on horticulture, arboriculture, risk management, human and social sciences, engineering design, financial management and asset management, plus consideration of the environment and community heritage. All this is being brought together into the concept of the Urban Forest which is being championed in North America, where many US and Canadian organisations work as cooperative groups to facilitate research, to develop management practices and to promote the benefits of trees in communities.

Such work is very applicable to the issues that Muswellbrook Shire Council faces. Because community members take a proprietory interest in trees, (more so than say, a section of concrete footpath) the decision making and enacting of decisions demands a significant level of community consultation and public relations. While trees generally present as passive, inert, ordinary objects, they are an important part of the community and their behaviour directly affects us individually and collectively. Therefore the management of them is an emotive issue.

In the past, the trees on Council-controlled land (street verges, parks, reserves, etc) only received occasional, often inexpert, treatment and there was no onus of responsibility for them on any party. This was largely because of a common acceptance by the community and society that trees were a natural thing, that their benefits and disadvantages were a part of life as well as there being a different attitude to suing for damages.

However, it is now recognised that;

- Council has the responsibility for many effects of trees, regardless of the tree's origin,
- the practices of the past were misguided and have created problems that need to be addressed in light of the responsibility Council now bears,
- new technologies and new management techniques are available and new ways have to be learnt,

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- there are limits to the resources Council can provide in the management of trees, whereas the demand upon Council for services is increasing.

Council is being driven by forces from the environment it is part of, to find a way to provide the 'urban forest', with all its benefits while minimising the total cost and disadvantage of doing so. This is best done through thorough and holistic consideration of all significant factors, internal and external, that affect the trees that Council has responsibility for.

1.2 SCOPE

This management plan sets out to define the broader management approach and the specific operational procedures to be applied in the management of trees on all lands under Council's care and control. The scope is to include;

- all trees, regardless of age, origin and ownership,
- consideration of all functions (for the community) of a tree; amenity, environment, aesthetics and so on,
- consideration of all costs and risks in maintaining amenity trees
- all practices, from selection and placement, maintenance, to removal and disposal

Stakeholders to be consulted in the development of this plan and its attachments include;

- residents of Muswellbrook Shire
- Council's insurers
- Council's operational staff and management

The framework of this document is to consider firstly, the tree in its complex array of aspects, secondly, to consider Risk Management concepts and then to describe the application of Risk Management to the management of trees in Muswellbrook Shire.

2 ASPECTS OF A TREE

Muswellbrook Council recognises the wide range of benefits that trees provide to its residents. The urban forest contributes greatly to the aesthetics and amenity of any urban area and to the well being of the residents and visitors. These benefits are better described in Table 1 from the Statewide Best Practice Manual (BPM). Because of these benefits, that part of the urban forest under Council's care and control is managed as a public infrastructure system, along with roads, footpaths, stormwater drainage and utilities. Having the responsibility for maintaining a large portion of the trees in the shire, to maximise the benefits and minimise the undesirable aspects, Council seeks to manage the trees as best it can within the resources available.

However, the management of trees is a particular science, different to other infrastructure types because of the tree's place in nature, its growth dynamics, its impact upon its environment and the public. The most relevant of these are considered in defining the management of trees. The following pages in this section are drawn from the Statewide BPM to assist in understanding the living tree.

Trees planted in street verges and recreational turf areas are usually growing under conditions that are sub-optimal and as a consequence they require appropriate, and often sophisticated management if they are to establish and achieve their full potential as amenity trees. They have to be properly managed, especially if their contribution to the landscape is to continue for future generations.

Given the advances that have been made in the knowledge of branch attachment and canopy structure, and the improved technologies that are available for pruning and tree surgery in general, many of the issues associated with poor canopy management have been resolved. There has been great progress in the past decade not only in pruning practices, but also in the quality of the arborists who undertake these operations. It is intended that the benefits of such work be reflected in the procedures and practices Council works to in its management of its trees.

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TABLE 1 THE BENEFITS AND CONTRIBUTIONS OF URBAN TREES

ECONOMIC	• The urban forest is a source of economic revenue attracting recreational users and tourists • The production of by-products from tree maintenance such as firewood, craft-wood, and woodchip • Urban forests provide infrastructure services without which development opportunities decline i.e. tree roots stabilise stream flow, reduce storm water run-off, protect land and earth structures such as embankments, dunes, roads and canals. Trees reduce urban heat island effects, conserve energy and absorb air pollutants responsible for numerous breathing ailments • Annual CO_2 reductions achieved through tree planting programs can offset from 0.2% - 2% of annual emissions with flow-on benefits to public utilities • Strategically located tree planting contributes to retail sales, and to shopper attitudes
SOCIAL	• Urban forests contribute to social cohesion thereby enhancing the success of productive enterprises. • Forest groves, as in Parks and other urban spaces provide a focus for community life • Urban forests contribute to the value of real estate and tourism potential • Trees and people are psychologically linked by culture, socialisation, and co-adaptive history
ENVIRONMENT	• Air temperature reductions up to 8^{o}C can be achieved in the presence of appropriate tree cover • Trees shading building and road surfaces reduce a major source of heat gain and hence reduce community reliance on air conditioning cooling loads. • Gaseous air pollution is absorbed and airborne particles are captured by tree canopies. For example in New York City trees removed an estimated 1,821 tonnes of air pollution at an estimated value to the city of $9.5 million in 1994. • The larger the tree the greater the benefits – for example the average annual net benefits from a large tree such as London Plane, can be as much as 6 times greater than from small trees such as Crepe Myrtle. • Increasing development densities lead to increased impervious surfaces reducing soil permeability and the overall area of permeable surface. Trees can mitigate such negative impacts
ECOLOGICAL	• Appropriate urban trees enhance biodiversity by providing wildlife habitat • Bird life diversity is least in mown grasslands and greatest where trees grow in groves or stands – typically in a park or open space system • The average ecological contribution of a typical community tree has been estimated at $270 • Studies show that on average, for every dollar spent on the urban forest, it returns two dollars in benefits.

Source: Stringer

2.1 UNDERSTANDING THE LIVING TREE

2.1.1 GENERAL

A tree is a dynamic living organism as well as a potentially large structure. Every species is genetically determined to achieve certain proportions within the limits imposed by its environment. A tree gets bigger as it grows and so its mature size has to be accounted for when planning new planting or when designing new structures near existing trees.

In order to grow, a tree must take carbon dioxide from the air, and water, nutrients and oxygen from the soil. It must have enough light, the right temperature range, and enough depth and volume of soil in which to support itself. The leaves of trees produce sugars and oxygen by the process of photosynthesis. These sugars are the source of energy for all living cells within the tree and as such are essential for its normal functioning and survival. Branches and trunks are composed of many tissues with specialised functions. These tissues include bark for protection, transport systems for water, nutrients and sugars, wood for strength and support and areas for storage. The main functions of roots are the uptake of water and nutrients, support (anchorage) and sugar (energy) storage.

In order for trees to provide the benefits that we expect from them (Table 1) the needs of the tree must be met. Most limiting is the need for oxygen and water from the soil, and this is where most of the interactions and potential conflicts arise between trees and structures. A comprehensive list of references and resources on tree biology is provided in the Statewide BPM.

Trees are complex biomechanical structures that adapt and change mechanically as a result of interactions with their environment. For example, a tree will add extra wood in places where it needs extra support, such as when it is growing towards a light source.

2.1.2 HOW ROOTS GROW

Whilst trees do not ‘think’ - they do react. Despite popular opinion, roots do not have intentions and so they cannot ‘seek’ out resources as is commonly believed. Roots are opportunistic but they do not act ‘aggressively’. Root growth occurs at the very end of the root tip and it can only occur when there is sufficient soil oxygen and moisture.

Roots will not grow if there is too much water, not enough oxygen, or if the spaces in the soil are too small. Knowledge of root growth characteristics can be used in the design of infrastructure in proximity to trees. Equally important is the provision of sufficient space for the growth of healthy trees.
Tree roots are also storage organs and so they do have the potential to generate new roots after being cut. In most cases, a tree will generate new roots when

roots are cut cleanly, but if roots are torn then they are most likely to decay and die leading to a potential loss of tree stability.

2.1.3 A SUMMARY OF CONTEMPORARY KNOWLEDGE ON ROOTS

One of the most influential studies is that by Perry (1982) who proposed the following revised view on tree root systems:

- The diameter of tree root spread is commonly (but not universally) 2-3 times the height of the tree, or 3-7 times the diameter of the canopy, and are well beyond the periphery of the canopy (*drip line*),
- The bulk of root growth is predominantly lateral in soils, parallel with the surface,
- On medium textured soils the bulk of the root system is in the top 1.0 metre of soil with most of this in the top 300mm. Deeper roots represent only a small fraction of the total root mass,
- Root systems consist of three main parts – the primary or first order woody roots for support and storage, the secondary or second order woody roots for transport and non-woody roots for water and nutrient absorption. It is these non-woody roots that are the most extensive,
- Tap roots do not persist in transplanted trees and are less common than generally imagined in trees that have established *in situ.* The most important roots are the lateral roots described above,
- The trees environment (and the soil environment) is probably more important than genotype (the genetic constitution of an individual) in determining tree rooting patterns and depth of rooting,
- Tree roots do not grow towards anything in particular, but are opportunistic, concentrating wherever conditions are favourable. (favourable conditions can be defined as soil penetrative resistance of less than 0.2 - 0.3 MPa; soil oxygen levels greater than 13.0% of soil pore atmosphere, and adequate soil moisture),
- The ratio of root mass to aerial parts of the tree is determined by a combination of genotype and site conditions (in particular seasonal moisture stress) and varies from 0.15:1 to greater than 1:1,
- The actual behaviour and architecture of the root systems of most species can only be determined by excavation; this is not practical. However the data generated by several scientific studies plus observations, supports the model proposed by Perry, and
- There are very few scientific reviews of the distribution of the root systems of Australian trees to confirm anecdotal views long held that Australian native trees are inherently deep rooted.

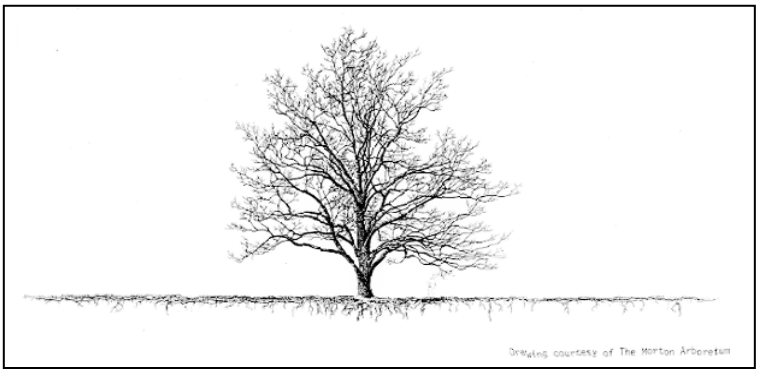

FIGURE 1
TYPICAL ROOT SYSTEM

(Source:
International Society of
Arboriculture)

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2.1.4 INTERACTIONS BETWEEN TREES AND STRUCTURES

The difficulties with trees arise at the points of interaction between the tree and its surroundings, including the built environment and people. The interactions between trees and the built environment are complex and not well understood, and so these potential interactions must be given proper consideration when designing for new trees and when developing strategies to manage and maintain existing trees.

Typical interactions leading to conflict involve trees and powerlines (eg causing fires and loss of power) trees and poles, trees and footpaths (eg tripping points), trees and pipes, repair of footpaths and trees, installation of underground services near trees and so on. TABLE 2 COMMON INTERACTIONS AND IMPACTS BETWEEN TREES AND STRUCTURES lists some of the more common interactions.

Factors that commonly contribute to negative interactions between trees and structures include:

- The soil type; its structure and depth;
- The tree species and its genetic 'disposition';
- The design of the structure;
- The construction materials and methods adopted;
- The age of the structure (as with trees, structures have a ‘useful life span’ and have to be maintained and then replaced within a set timeframe); and
- The type of previous land use eg industrial sites where soil contamination and/or layers of fill can impede normal biological processes.

Notwithstanding the above, interactions between trees and structures are complex and there are likely to be other factors contributing to any given situation. It is therefore not beneficial to focus concern entirely onto a particular tree or tree species when developing a tree risk management strategy.

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TABLE 2 COMMON INTERACTIONS AND IMPACTS BETWEEN TREES AND STRUCTURES

STRUCTURE	Typical Causes **OF** conflict with trees	Impact **BY** trees	Impact **ON** trees
Footpaths Concrete, Pavers & Bitumen	Pathways located too close to trees, bitumen laid over tree roots.	Lifting, heaving, cracking, leading to trip hazards & increased risk	Root pruning and root scalping leads to root decay & a potential loss of stability; reduced water and nutrient uptake; reduction of soil oxygen; loss of natural nutrient recycling; and elevated tree stress.
Kerb and Gutter Concrete	Pathway cross overs located too close to trees.	Lifting, heaving, cracking & displacement. Drainage interruptions	Restricted root distribution effects tree stability and the critical availability of water and elements
Underground services Power; fibre optic, water, gas	Improperly laid eg poorly jointed, inadequately compacted backfill; inappropriate backfill materials, pipes retained past their useful life and requiring renewal, use of technology that does not account for the dynamics tree root development	Blockages, crushing, displacement & heaving	Root loss during installation; incipient decay following excavation. Changes in water table fluctuations; gas leaks; soil saturation.
Overhead Services Power lines, Phone and cable TV	Inappropriately located poles, poles shorter than prescribed heights, wires lower than prescribed height, uninsulated wires where insulated cables would be less restrictive on tree planting and safer near people, above ground transformers	Branch & whole tree failures; wind whipping. Electrical outages, blackouts, fire, restricted access to poles	Reduced amenity and environmental contributions ie shade and shelter, aesthetics, PM 10 absorption; incipient decay. Poor public image for street trees
Buildings & other load bearing structures	Minimum distances not observed, reactive soils.	Lifting and cracking of foundations; subsidence; branch & fruit shedding; reactive soils drying and wetting cycles	Damage during site preparations and construction, reduced sunlight, wind tunnelling,
Traffic & pedestrians	Compaction.	Vehicle hitting trees Blocked vision of road signs and access places Trip points in footpaths	Trees damaged/killed in vehicle accidents; Heavy and repeated pruning for visibility; Decay of roots and loss of stability from root grinding for footpaths.

3 RISK MANAGEMENT

3.1 LEGAL ISSUES

3.1.1 SCOPE

A fuller explanation of the legal issues relevant to Council's management of trees can be found in Council's document "Public Liability Risk Management of Public Infrastructure" as well as in the Statewide BPM. A summary of the legal issues is provided herein for context.

3.1.2 LIABILITY

Council can be liable for damage to third party property damage and personal injury caused by Council's trees There are a number of situations wherein Council may be found liable for damage and/or loss involving trees;

- An 'action in nuisance'; is where a party's right to the enjoyment of their land is affected by the actions of another party/owner of land. The typical situation of this type is where roots from a tree on the verge interfere with the property (or service conduits) of a rate payer on adjoining land. Council may be found liable in nuisance for tree root damage in circumstances where it has actual knowledge of the cause of the damage and the damage being sustained but fails to take any reasonable steps within its budget to abate the nuisance.
- An 'action in negligence' is where a tree under the care and control of council is implicated in property damage and/or personal injury. Typically, this would be branches or trees falling onto property owned by a third party or tree roots lifting a footpath causing a trip.

In order to be able to defend a claim arising from a fallen branch or tree etc., Council is required to have taken reasonable steps to ensure the trees under its care and control are properly maintained and managed. It is absolutely vital that the processes and actions done to achieve this be documented so that they can be relied upon, if necessary, as evidence for Council's defence in the event of litigation.

3.1.3 FACTORS

ORIGIN

The origin of the tree is not a large factor in determining liability. Whether a tree on land of which Council has the care and control is;

- council sown, including those planted by developers in residential subdivisions,
- sown by others, primarily by adjoining residents, or
- self sown, including those of unknown origin,

Council is very likely to be held responsible for any injury or damage it causes.

While management practices for each of these types may differ at times, it is important to note that Council's responsibility cannot be assumed to fall to another party. For example, a business house in the CBD may take a proprietory interest in a particular tree and form some agreement over its maintenance with Council. The responsibility for that tree cannot be delegated; it remains with Council

EXISTING VS NEW

Similarly, while a Council is able to exercise discretion in the selection and placement of new trees and has no influence over the trees it inherits, the Council still has the responsibility for those trees. However a tree comes to belong to Council, Council is obliged to exercise prudent management of the tree for its life.

NATURAL VS ARTIFICIAL

The courts have determined that a tree is an artificial structure. In the urban forest, a tree's selection, placement and cultivation, directly or indirectly, is at the hand of man. Therefore some person or party is responsible for any damage or injury the tree may cause.

DILIGENCE

Diligence, as the opposite of negligence, starts with recognising that council has a duty of care in the management of its trees and the trees on land under its care and control and having that shape Council's work. It entails taking reasonable precautions to protect the public from injury or damage.

Diligence needs to be able to be demonstrated. The decisions, policies, standards and procedures that comprise this diligent management, which will minimise the risk of injury and damage and will protect Council from litigation, must be documented.

Having documented the risk management systems as above, the ongoing application of those systems must also be carried out and recorded. A council or council employee that fails to comply with its own management system is not in a good position to prove its diligence

3.2 OTHER ISSUES

RISK MANAGEMENT

Risk Management is the process of ensuring a service or a product of Council serves its purpose as intended without adverse effect. A footpath is intended to help the pedestrians, not trip them up; a playground is built for fun and exercise, not to cause injury to children. For this management plan, this means any and all trees are to be managed so that the benefits are realised and, as far as can be achieved within Council's resources, no problems, damage or injury are allowed to arise.

MAINTENANCE

Maintenance of trees is to be planned, scheduled resourced and carried out to promote the health, vigour and structure of the tree for its life. Much of the tree problem for councils stems from inappropriate pruning in the past, where the cheapest methods have caused an administrative and financial burden in the present time. As an example, heavy pruning of strong branches has often resulted in epicormic shoots taking their place, but without the inherent strength of the original branch

Efficiency in its operations will always be a goal for Council but a short-term view has shown to be ineffective.

DOCUMENTATION

It would be difficult for Council to claim it relied on a management system where there is no corroborative evidence of the system being adhered to. A decision made outside of a management system belongs solely to the maker of the decision. Documentation, whether on paper or electronically, is how the management system protects Council and the employee.

HERITAGE

Heritage is a very subjective concept, and may be cited in arguments or discussion over trees, with varying levels of appropriateness. Apart from the heritage assets as determined by Council and state and local bodies, heritage values may also be placed upon trees by individuals. They are no less real for not having official corroboration, only less widespread. Council's liabilities and obligations are no less an imperative regarding trees of heritage significance but more thought must be put into remedial works.

Any tree in the Heritage Conservation Areas of Muswellbrook and Denman, as shown in APPENDIX 8 may be subject to heritage constraints. Input from the Environmental Services division is required before any work is carried out on these trees. Similarly, a stand of bottle trees in Ford Street are ascribed heritage value and any proposed work upon them should be checked with the Environmental Services division.

SAFETY

The actual work of pruning, lopping or felling trees can be very dangerous, for the workers and for members of the public in the vicinity. Little is gained in lopping a dangerous branch if its felling injures a passer-by. An essential part of risk management of the tree is the risk management of the maintenance activity, per Council's OH&S procedures.

TREE PRESERVATION ORDERS

Council does not have any tree preservation order in place relating to trees on private property. Its influence in this area is limited to conditions placed upon the approval of subdivision development and is managed by that process.

Despite not having a blanket protection of all trees within the township, Council is sensitive to trees of significance because of the places they hold in the collective heart of the community. Consideration of this will be made in the management of its trees. Nonetheless, a dangerous tree still requires attention to reduce the risk to acceptable levels. It is intended that this risk control procedure will provide a moderate, sensible approach to the management of such trees.

COMPETING/OPPOSING DEMANDS

Separate to the question of nuisance, damage and injury that the risk control of this management plan seeks to eliminate, Council's trees will be the subject of conflict with the interests of individuals. In urban environments, where most such conflict will occur, street trees and trees in reserves will interrupt access to property, views, light.

In such cases, it is important that any question of risk be addressed per the methodology in this management plan. Safety issues should not be clouded by other arguments raised.

Secondly, any landholder is entitled to access their property from the road frontage. Therefore, permission may be given for the removal of street trees to allow vehicular access to properties.

Beyond these priorities, decisions to remove, or to permit the removal of, can be made on the merits of the individual case while pursuing the objectives of the Tree Policy (shown in Appendix 5). Currently, such matters are referred to the Street Tree Planting Committee. A methodology to the decision-making is defined in Appendix 4.

3.3 RISK MANAGEMENT CONCEPTS

3.3.1 SCOPE

Council's document "Public Liability Risk Management of Public Infrastructure" contains details of how Risk Management is applied in the management of Council-owned infrastructure at Muswellbrook Shire and may be referred to for further reference. The basic concepts are explained below to establish a minimum understanding as a basis to the implementation of the defined procedures following.

3.3.2 RISK MANAGEMENT

Risk Management is recognised as an integral part of good management practice. It is an iterative process consisting of steps, which, when undertaken in sequence, enable continual improvement in decision-making (AS 4360:1999). It is as much about identifying opportunities as it is about avoiding or mitigating losses. AS 4360:1999 lists the main elements of the risk management process as:

a) Establishing the context
b) Identifying the risks
c) Analysing the risks
d) Evaluating the risks
e) Treating the risks
f) Monitoring and reviewing the process
g) Communicating and consulting about the process

The interrelationship of these elements is shown in FIGURE 2 **IMPLEMENTING A RISK MANAGEMENT STRATEGY FOR EXISTING TREES**.

Establishing the context

It is necessary to establish the strategic, organisational and risk management context in which the remainder of the process is to occur. Criteria against which risk will be evaluated should be established and the structure of the analysis defined.

Risk Identification

The process of identifying the risks to be managed needs to be comprehensive and systematic to ensure that all probable risks are identified – if neglected they are not included in further analysis. All risks should be considered, even those not under the control of the organisation [or department]. The particular approach will depend on the nature of the activity or project under review and the types of risk. In this context, the approach is defined in the form shown in APPENDIX 2 .

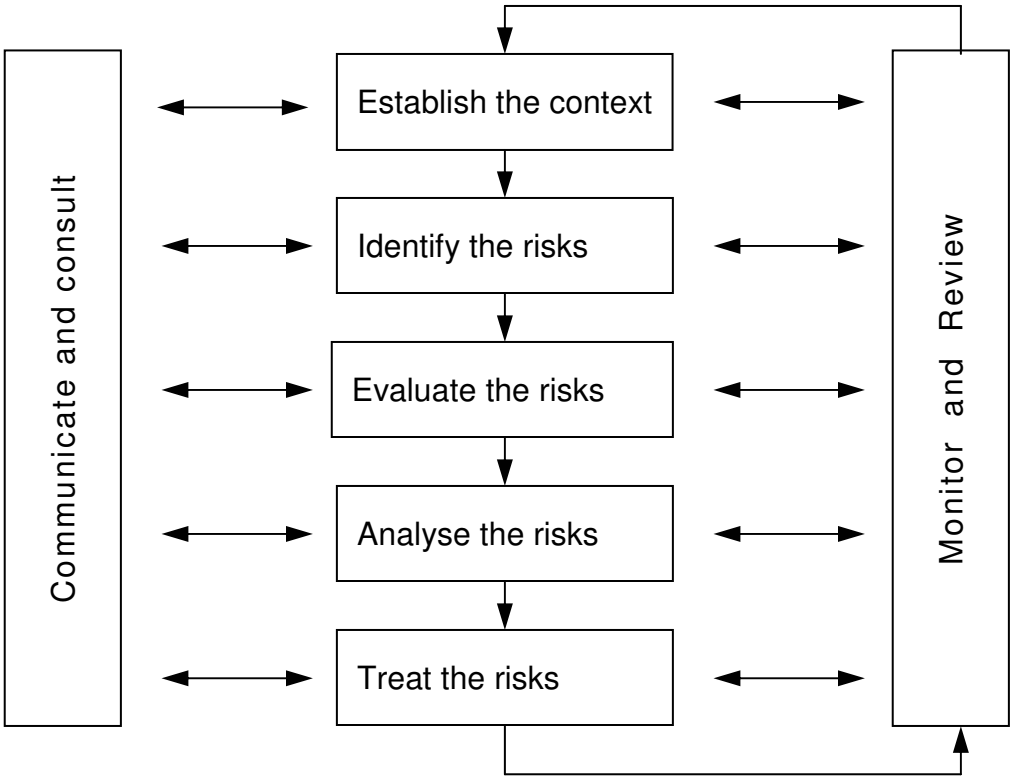


Figure 2: Risk Management overview flow diagram (AS 4360:1999)

Risk Analysis

Risk Analysis outlines the possible future events and their likelihood of occurrence. The objectives of risk analysis are to separate the minor acceptable risks from the major unacceptable risks and to provide information to assist in the evaluation and treatment of risks. Risk analysis involves consideration of the sources of risk, their consequences and the likelihood that these consequences may occur. Factors also offsetting consequences and likelihood should also be identified. Risk in turn is analysed by combining estimates of consequences and likelihood in the context of existing control measures.

Risk analysis starts by ascribing the identified potential hazards two factors; likelihood and consequences. These are combined to produce a level of risk. These may be assessed quantitatively (using numerical values) or qualitatively, using descriptors such as “very likely”, “likely”, “unlikely”, or “never”. These are based on judgement, experience and team/peer review and it is the quickest, easiest and most common means of assessment, used;

- as a preliminary study to determine further action,
- when quick results are required,
- for coarse ranking or filtering of results,
- to justify further action, or
- in low risk areas that do not justify detailed risk assessment.

Risk Evaluation

Risk evaluation involves comparing the level of risk found during the analysis process with previously established risk criteria. The result is a priority list of risks for further action. If the resulting risks fall into the low or acceptable risk categories they may be accepted with minimal further treatment, but should still be monitored in an ongoing manner to ensure they still remain low or acceptable. If risks are not evaluated as low or acceptable, they should be treated using one or more of the options considered under risk treatment.

Risk Treatment

Risk Treatment involves identifying the range of options for treating risk, assessing such options, preparing risk management plans and implementing them. Options for risk treatment include;

- Avoidance – choosing not to proceed with an activity likely to produce a risk
- Risk reduction – limiting risk to a minimum, usually by close control of the activity
- Risk transfer – by contract or agreement or by insurance

It is essential also to assess the expense, difficulty, inconvenience and implications of taking alleviating action. Council's resources are limited, some works are less feasible than others and some actions may have adverse effects.

Monitoring and reviewing the process

It is just as important to subsequently monitor the effectiveness of the risk management plan and the system set up to control implementation as it was to prepare the original risk analysis – one without the other is totally ineffective. As well it is important to monitor ongoing effectiveness of the plan for it to remain relevant – few risks remain static.

Communicating and consulting about the process

Communication and consultation are also important considerations at each step of the risk management process (refer again to FIGURE 2 **IMPLEMENTING A RISK MANAGEMENT STRATEGY FOR EXISTING TREES**). Effective internal and external communications are important to ensure that all relevant parties understand the basis of decisions and actions.

4 RISK CONTROL – EXISTING TREES

Knowing council's approach to managing the urban forest, the legal issues, some concepts of tree behaviour and of risk management, the operator is in a position to implement risk control strategies. The aims are to

- Identify and prioritise the work required to maintain the urban forest
- Achieve the work within Council's ability to resource
- Provide for OH&S
- Document works done for a history

Council staff have had the delegated authority to remove obviously dangerous trees (standing dead or nearly dead trees or branches) as a top priority but have had no process for addressing lesser hazards. The method and resources to systematically detect, assess, prioritise and correct the less obvious or extreme structural defects in trees in a timely and cost-effective manner, provides the opportunity to prevent or correct many of the defects before the trees become hazardous to public safety.

However, just as nothing in life is risk-free, every landscape and tree situation involves risk. The goal of a tree risk control program should not be to strive for zero risk, as this would be unattainable. Rather, the goal should be to reduce the hazard a tree presents to a level that meets professional standards and demonstrates reasonable care.

4.1.1 TREE INVENTORY AND DOCUMENTATION

Starting with high use areas and known problems areas, an inventory of trees should be drawn up containing all relevant information including at least the location, species, size, approximate age, health and condition. This information can be gathered for individual trees or for stands of trees of the same species and age.

This information should also be gathered for all trees the subject of complaints and reports from the public. This should include any remedial action, maintenance and other work carried out, to compile a history of the tree's management.

4.1.2 IMPLEMENTING A RISK MANAGEMENT STRATEGY FOR EXISTING TREES

It is necessary to systematically assess each tree under Council control in order to determine an appropriate risk management strategy. **FIGURE 2 IMPLEMENTING A RISK MANAGEMENT STRATEGY FOR EXISTING TREES** sets out a method for making such assessment.

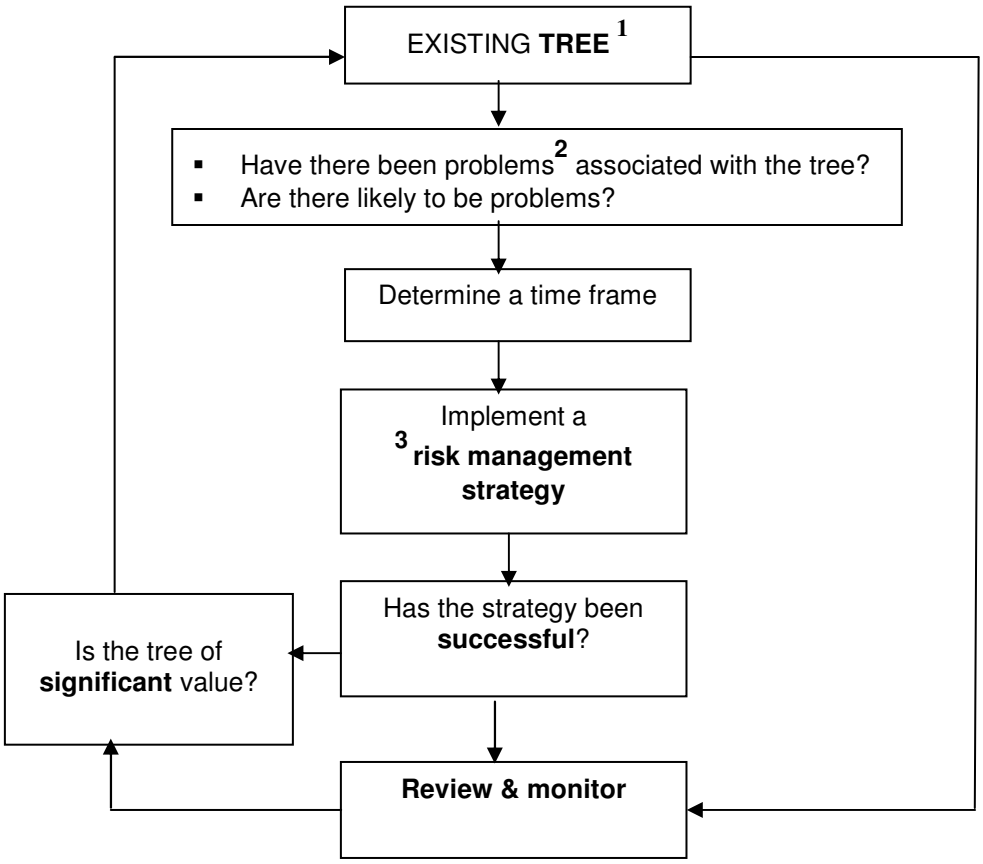


FIGURE 2 IMPLEMENTING A RISK MANAGEMENT STRATEGY FOR EXISTING TREES

NOTES TO FIGURE 3

1. A ruling by the Courts has defined a tree planted by Council or under Council's control to be an artificial structure and therefore it (council) must take all steps necessary to eliminate exposures caused by the tree. An inventory of trees is the first step to this.
2. Council should adopt a systematic method for determining this question, particularly in the absence of specialist arboriculture knowledge. A tree inspection form, structured as per that in Appendix 2 is part of that system.
3. The risk management strategies are those that appear in Table 3. These strategies have been generally adopted by the Australian amenity tree industry as remedies for risk reduction whilst preserving appropriate trees.

4.1.3 STAFF PREPARATION

Training

Proper training is essential for ensuring accurate, salient and consistent management decisions. New operators using the assessment form need thorough training and proper supervision, in the classroom and in the field. This way they can learn from the more experienced staff, gaining familiarity with the form and the local conditions and practices. Periodic refreshers and re-calibration between operators should also be done as a quality control measure.

Equipment

The personnel carrying out the inspection and assessment of trees are entitled to be properly equipped for the task. Transport, pen-paper-and-clipboard or electronic device for recording, measuring tools, reference documents, camera, clothing, PPE and food and water as required are basic necessities of the work.

RA & SWMS

All OH&S requirements must be attended to in carrying out this work, including induction, risk assessments, safe work methods and the wearing of PPE.

4.1.4 TREE INSPECTION

Given an appropriately trained and experienced person, with the correct equipment and all the preparatory measures taken, a tree can be inspected. A record shall be kept of the inspection. The method and form for tree inspection and accompanying notes are included as Appendix 2

Any checklist should be used as a guide only; additional information may be required to make a reasonable assessment and any opinion from higher qualified source must be respected. Any inspection should include walking around the tree and it may be necessary for a close inspection of the higher branches to be performed. Accessing the tree must comply with the New South Wales WorkCover Code of Practice for the Amenity Tree Industry.

In order to achieve the most effective and efficient inspection of council's trees, the shire shall be categorised in terms of;

1) Developed public reserves
2) Urban Street trees
3) Undeveloped public reserves
4) Restricted reserves
5) Rural roads

Initial inspection will be carried out in the order of priority given above. When enough of the first level is inspected, resources can be allocated to address the hazards identified so far, while the first level inspection continues.

4.1.5 HAZARD ASSESSMENT

Hazard tree assessment is a systematic process for determining the potential for a tree or one of its parts, to fail and in so doing, injure people or damage property. Since trees are living, dynamic organisms (ie constantly growing), they do have the potential to cause damage or injury if a structural failure occurs.

The degree of hazard will vary with the size of the tree, type and location of defect, tree species, and the nature of the target. Tree hazard assessment involves three components:

- A tree with the potential to fail,
- An environment that may contribute to that failure, and
- A person or object that would be injured or damaged (ie. the target).

Each of these components and their interactions must be considered.

4.1.6 HAZARD ABATEMENT

Once a visual assessment, and if required, a hazard assessment have been performed, the appropriate risk management strategy should be determined. Table 3 lists risk management options for existing trees.

TABLE 3 RISK MANAGEMENT AND HAZARD ABATEMENT STRATEGIES FOR EXISTING TREES

STRATEGY	DESCRIPTION
Monitor trip points	Where no other prevention method is practical, the trip hazard shall be referred to the Footpath Inspection Program.
Flexible pathways	Use of flexible material such as bitumen, paving, or rubber compounds for footpaths and tree surrounds can be considered instead of concrete.
Re-direct pathways	Where space allows, pathways may be re-directed away from trees and their roots.
Bridging Footpaths	Elevated footways may be considered to avoid roots, where the cost can be justified
Root pruning	Non-structural roots could be pruned on a predetermined basis under the guidance of a qualified arborist. This practice could be combined with installation of root barriers where appropriate.
Root barriers	Where future problems are perceived, barriers could be installed to deflect roots away from pavement or services.
Tunnelling for services	Directional boring, rather than open trenching for underground services, will greatly reduce public risk as well as reducing injury to tree roots
PVC welded piping	Replacing of old porous clay or concrete pipe with PVC or polyurethane pipes will significantly reduce the potential for tree root entry.
Preventative tree maintenance	Trees in public areas shall be regularly inspected and maintenance, such as dead-wooding and developmental pruning carried out as prescribed. Pruning should be undertaken as per AS 4373-1996.
Raising pathways	Where appropriate, pathways could be raised to reduce direct root pressure on the pavement. Care must be taken not to cause soil build-up or ponding against the trunk of a tree.
Insulated (ABC) cabling	Replacing uninsulated overhead powerlines with insulated & bundled cables reduces the clearance needed, the pruning costs and severity.
Underground power & cables	The initially high cost of installing power underground may be balanced by eliminating on-going costs, risks, and impacts of repeated pruning.
Diverting services	Services could be diverted along roadways, rather than in the nature strip where a valuable stand of trees is present.
Diverting kerb/gutter	When possible, kerb/gutter could be diverted around tree roots or further away from the trunk, creating an island around the tree.
Enlarging root zone	Where space allows, an area (of garden bed or grate) above the root zone of the tree may be provided to deter foot traffic on surface roots.
Formative pruning	Early pruning will reduce the development of structural weaknesses in older trees. Refer to AS4373 *Pruning of Amenity Trees.*
Remove target	In some situations it is preferable to remove a potential target, such as a seat rather then to remove a tree in order to abate a hazard.
Remove the defect	This could include pruning of live or dead branches or the removal of co-dominant stems.
Tree engineering	In some cases cabling may be used to support tree structure or to control the direction of a possible failure. This is highly specialised work.
Tree removal	In some situations it may be preferable to remove a tree and replace with a more suitable species, perhaps in an alternative location.

5 RISK CONTROL - NEW TREES

5.1 INTRODUCTION

Most of any council's tree related problems are caused by inadequate tree selection and placement, with current tree managers inheriting problems caused many years before. The wrong tree in the wrong place can cause major problems including;

- roots blocking and cracking sewer and storm water pipes,
- lifting and cracking pavements and roads,
- damaging building foundations,
- poor traffic visibility,
- pedestrian access problems,
- stoppages to power supply, and
- death or injury to persons.

The long term success of urban tree plantings is the end result of careful and enlightened consideration of the factors affecting a tree throughout its life. It involves an analysis of the tree's characteristics, the site conditions, the intended benefits of the tree and potential conflicts and problems. The only practical time for such consideration is in preparation for planting. Measures taken after planting are typically limited, less effective and more expensive. Figure 3 sets out the method for pre-planting check.

This risk control must be applied to all trees for which Council will have the care and control. This includes trees planted in parks and reserves, on road and street verges and on any land under Council's care and control.

5.2 Pre-Planting Check

The pre-planting check is the cheapest, quickest opportunity to ensure the tree suits the location. Using the following tables as reference, the potential for future problems is minimised. This should always be applied for every planting event, whether for individual trees or stands of the same species.

FIGURE 3 SPECIES SELECTION FLOW CHART

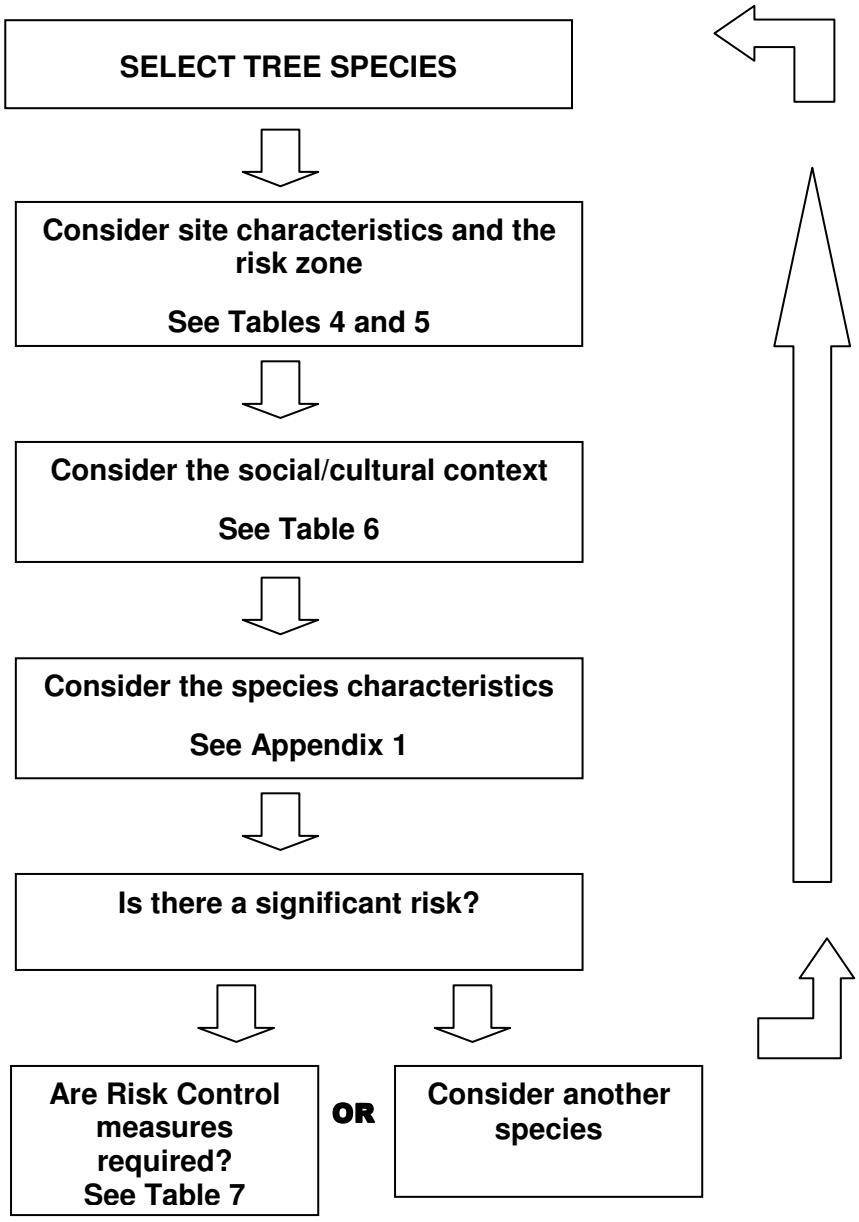


TABLE 4 TREE PLANTING RISK ZONES IN STREETS

	Most Constraints (Greatest Risk)	Moderate Constraints (Moderate Risk)	Fewest Constraints (Minimum Risk)
Electrical & telecommunications	▪ uninsulated low and high voltage wires ▪ bushfires area	▪ bundled cables (ABC) ▪ insulated cables	▪ no powerlines
Below ground services typical layouts	▪ fibre optic cables ▪ high voltage power	▪ water mains ▪ gas mains ▪ stormwater	▪ no underground services
Slope	▪ steep slope	▪ moderate slope	▪ generally flat land
Paved areas	▪ area wholly paved ▪ surface wholly sealed ▪ brick pavers laid on sand bedding	▪ partially paved areas ▪ non reinforced concrete	▪ grass up to 6m
Verge width	▪ less than 3.0m	▪ from 3m to 4m	▪ 4m or wider
Building set back	▪ none	▪ less than 6m	▪ 6m or greater
Street lighting	▪ over pedestrian crossings ▪ traffic intersections	▪ street lighting other than crossings and intersections	▪ no street lighting
Safety signage ie traffic signs	▪ dual carriageways ▪ arterial roads ▪ high density residential streets	▪ medium density residential streets ▪ arterial roads in rural zones	▪ low density rural/residential streets
Traffic	▪ heavy vehicles ▪ public transport in heavy volumes	▪ public transport in moderate volume ▪ heavy vehicles in moderate volumes	▪ public transport in low volume ▪ residential traffic in low volume ▪ cul-de-sacs.
Soils	▪ severely compacted ▪ shallow ▪ reactive clay ▪ acid sulphate ▪ poor drainage	▪ moderately compacted ▪ urban fill ▪ moderate drainage	▪ undisturbed soil ▪ deep profile ▪ medium texture ▪ good natural drainage
Water table	• high	• moderate depth	• deep water table

From Statewide 2003

NOTES:
Areas in **column A** with **most constraints** represent the **highest potential risk and therefore require greater emphasis on risk management**. These areas are typical of CBD, high-density sites, tourist precincts and the like where trees are highly desirable and often critical components of the landscape. In these areas the objective should be to minimise risk associated with trees by selecting trees that will have minimal impact on and have minimal impact by their new environment.

TABLE 5 TREE PLANTING SITE CHARACTERISTICS

	A Most Constraint	B Moderate Constraint	C Least Restraint
Climate	▪ Frontline salt wind exposure ▪ Prevailing wind exposure ▪ Rain shadow ▪ Extensive sealed ground surface	▪ Second line coastal salt influence ▪ Moderate wind exposure ▪ Partial rain shadow ▪ Partial ground surface sealed	▪ Minimum salt influence ▪ Minimal wind exposure ▪ No rain shadow ▪ Minimal ground surface sealed
Slope	▪ Steep slope	▪ Moderate slope	▪ Minor slope to flat land
Aspect	▪ Southern & Western exposure	▪ Either southern or western exposure	▪ Northern & eastern exposure
Street – Width & Usage	▪ Narrow; CBD residential & commercial; ▪ Arterial –high traffic volume	▪ Non CBD; narrow residential & commercial; ▪ Suburban collector roads – medium volume traffic	▪ Average to wide residential/ commercial ▪ Wide residential
Soil – Type and Drainage	▪ Reactive clay ▪ Poor drainage ▪ Salinity	▪ Non reactive clay ▪ Average drainage	▪ Free draining open textured soil
Services	▪ Above ground and below ground utilities	▪ Above or below ground utility services	▪ No utility services

TABLE 6 SOCIAL AND CULTURAL CONTEXT

CONTEXT	IMPORTANCE			COMMENT
Heritage				
Architectural style				
Community values				
Wildlife habitat				
Street character				
Landscape character				

TABLE 7 RISK MANAGEMENT CONTROL STRATEGIES

Root barriers	Installation of root barriers to manufacturers' specification at the time of planting will assist tree roots to develop away from services, pavements and other structures. NOTE OF CAUTION Tree root barriers do require periodic monitoring as roots deflected downwards will return to the surface if soil oxygen levels are not sufficient to support growth at depth. Roots can also grow over the barrier in some situations
Soil compaction	Proper compaction of the soil when back filling trenches or around utility easements and house footings will direct tree roots away from these areas. By achieving and maintaining compaction to 95% root growth can be inhibited through the depravation of oxygen.
Pseudo street trees	Residents could be encouraged to plant trees within their boundaries in preference to street tree planting. This might allow larger species to be used, and reduce pressure on pavements and services.
Design of new roads and pathways	The design of new roads and footpaths should be undertaken with consideration for tree planting on the nature strip or in the road pavement to ensure appropriate allocation of space.
Provision of aeration and irrigation	Where there is to be continuos paving around a tree, the installation of an aeration and irrigation system should be considered. Where irrigation is installed and properly operating, a tree root system will be proportionally smaller than without irrigation.
Pavement Openings	Pavement openings at the base of the tree should be as large as possible to reduce the future impact of buttressing roots on pavements. Position of the tree should be a good distance (eg 1 m) from the kerb line to reduce the likelihood of future cracking.

5.2.1 TREE SPECIES CHARACTERISTICS

There are many sources of information regarding the characteristics of particular tree species and varieties, not all of them have the viewpoint of risk management in Muswellbrook Shire.

The recommended source is TreeList, extracts of which are included in the appendix TREE SPECIES CHARACTERISTICS for the reference of staff. The information provided herein may be added to, from the experience of staff, members of the Street Tree Committee, the public, colleagues in other councils and professionals.

APPENDIX 1 TREE SPECIES CHARACTERISTICS

APPENDIX 2 TREE INSPECTION FORM #1

Location _____

Inspected By _____ Date of Inspection _____

To use this inspection criteria: Bold highlight denotes code, where there is no bold, check the accompanying notes and use the appropriate code or insert the necessary information.

Information Category	**No 1**	**No 2**	**No 3**	**No 4**	**No 5**
Species					
Identifier					
Remnant/**P**lanted/**S**elf sown					
Special Significance					
Age class **Y**/**S**/**M**/**O**					
Tree height **(m)**					
Ave. crown diameter **(m)**					
Crown condition					
Root zone					
Defects					
Services/adjacent structures					
Failure potential **1 - 4**					
Size of defective part **1 - 4**					
Target rating **1 - 4**					
Hazard Rating **(-/12)**					
Recommendations					
Full assessment					
Reinspect ½yr - 1yr – 2yr					
Remove tree					
Pruning					
Repair/replace surface					
Root pruning/root barrier					
Replanting required					
Other					
Comments					

NOTES ON TREE INSPECTION SCHEDULE

Key	Criteria				Comments
Identifier	May be; adjoining address, # on a site diagram, etc.				
Special Significance	A Ha M U	Aboriginal Habitat Memorial Unique form	C Hi R O	Commemorative Historic Rare Other	This may require specialist knowledge.
Age class	Y S M O	Young = recently planted Semi-mature (< 20% of life expectancy) Mature (20-80% of life expectancy) Over-mature (> 80% of life expectancy)			
Crown Condition (overall vigour and vitality)	0 1 2 3 4	Dead Severe decline (<20% canopy; major dead wood) Declining (20-60% canopy density; twig and branch dieback) Average/low vigour (60-90% canopy density; twig dieback) Good (90-100% crown cover; little or no dieback or other problems)			This may require knowledge of species.
Root zone	C D E Ga Gi Gr K	Compaction Damaged roots Exposed roots In garden bed Girdled roots Grass kerb close to tree	L+ L- M Pa Pr O	Raised soil level Lowered soil level Mulched Paving/concrete /bitumen Roots pruned Other	More than one of these may apply.
Defects	B C D F I	Borers Cavity Decay Previous failures Inclusions	L M S T O	Lopped Parasites Splits/cracks Termites Other	More than one of these may apply.
Services/ adjacent structures	Bs Bu HVo HVb LVo LVb Na Nb Si Sl T U O	Bus stop Building within 3m High voltage open-wire construction High Voltage bundled (ABC) Low Voltage open-wire construction Low Voltage bundled (ABC) No services above No services below ground Signage Street light Transmission lines (>33KV) Underground services Other			More than one of these may apply.

Failure Potential	Identifies the most likely failure and rates the likelihood that the structural defect(s) will result in failure within the inspection period. 1. Low – defects are minor (eg dieback of twigs, small wounds with good wound wood development) 2. Medium – defects are present and obvious (eg cavity encompassing 10-25% of the circumference of the trunk) 3. High – numerous and or significant defects present (eg cavity encompassing 30-50% of the circumference of the trunk, major bark inclusions) 4. Severe – defects are very severe (eg heart rot fruiting bodies, cavity encompassing more than 50% of the trunk)	This requires specialist knowledge
Size of defective part	Rates the size of the part most likely to fail; 1. most likely failure less than 150mm Ø 2. Most likely failure 150-450mm Ø 3. Most likely failure 450-750mm Ø 4. Most likely failure more than 750mm Ø	
Target Rating*	Rates the use and occupancy of the area that would be struck by the defective part 1. Occasional use (eg jogging/cycle track) 2. Intermittent use (eg picnic area, day parking) 3. Frequent use, secondary structure (eg seasonal camping area, storage facilities) 4. Constant use, structures (eg year-round use for a number of hours each day, residences)	
Hazard rating*	Failure potential + size of part + target rating Add each of the above values for a number up to 12	

Recommendations	
Full assessment	of tree characteristics and hazards by arborist or #2 form
Reinspect	Nominate reinspection period ½ yr, 1 yr, 2 yr, etc
Remove tree	Full assessment is normally appropriate before removal
Pruning	Use the table from AS 4373 – 1996 and insert the appropriate code
Repair/ Replace surface	✔ or -
Root pruning/ barrier	Rb Root barrier Rp Root prune - do nothing
Replanting	✔ or -
Remove target	
Other	Modify target, modify tree
Modify tree	

APPENDIX 3 REPORT FORM - FOR APPLICATION FOR TREE REMOVAL

Applicant's Details _____
Name

_____ _____
Phone *Address*

Tree Details _____
Species Location

Reason given for removal _____

_____

_____

Staff comment _____

_____

_____

Hazard Rating _____/12
Blocking primary access _____/10
Blocking secondary access _____/5
Blocking view / sunlight _____/1
Nuisances _____/1
- inherent nuisance – leaf/twig/nut drop, fruit drop
- associated nuisance – fauna (inc termites)

Alternatives to removal _____

_____

_____

Is replacement a better option? _____

_____

_____

Recommendation _____

_____

_____

.

APPENDIX 4 PREFERRED SPECIES

LIST A TREES UNDER POWER LINES

Botanical Name	Common Name	Mature Height
a) Trees and shrubs able to be planted no closer than two (2) metres from sewers or drains.		
Evergreen		
Tristania Conferta	Brush Box	
Callistemon viminalis	Weeping Bottle Brush	6
Callistemon viminalis Hannah ray		5
Callistemon kings park special		5
Geijera parviflora	Wilga	8
Photinia robusta		5
Fraxinus griffithii	Himalayan Ash	5
Deciduous		
Faxinus ornus	Manna Ash	8
Pistacia Chinensis	Chinese pistacia	6
b) Trees and shrubs able to be planted no closer than four (4) metres from sewers or drains.		
Evergreen		
Eucalyptus platypus	Round-Leaved Moort	5
Pittosporum rhombifolium	Queensland Pittosporum	8
Pittosporum undulatum	Native Daphne	6
Deciduous		
Sapium sebiferum	Chinese Tallowwood	8

LIST B ADDITIONAL TREES TO LIST "A" WHERE THERE IS NO HEIGHT RESTRICTION

Botanical Name	Common Name	Mature Height
a) Trees and shrubs able to be planted no closer than two (2) metres from sewers or drains.		
Evergreen		
Calodendrum capense	Cape Chestnut	12
Eucalyptus nicholii	Small leaved peppermint	12
Deciduous		
Jacaranda mimosifolia	Jacaranda	15
b) Trees and shrubs able to be planted no closer that four (4) metres from sewers or drains.		
Evergreen		
Brachychiton popuheus	Kurrajong	12
Lophostemon confertus	Brush Box	15
Deciduous		
Acer negundo	Box Elder Maple	10
Fraxinus velutina *	Velvet Ash	10
Fraxinus oxycarpa *	Desert Ash	12
Fraxinus Raywoodii (grafted to Ash wood stock)	Claret Ash	12

* Providing sewer, drains and water mains are no closer than eight (8) metres.

PLANTING YOUR STREET TREE

ENTITLEMENT

- Council supports the planting of street trees by residents and offers residents up to two (2) trees for planting on the verge outside their property, on the basis that the resident plants and maintains the trees.

PLACEMENT

- Trees should be planted one (1) metre from the kerb alignment.
- On corner allotments, trees should not be placed within 10 metres of the projection of the kerb of the intersecting road.
- Trees should not be placed near street lights so that they cast shadows upon footpaths

PLANTING

- Locate the hole one metre back from kerb, clearing grass from within 500mm from the plant.
- Dig a 300mm minimum diameter hole with sides and base pitted with mattock or garden fork
- Form a raised ring of soil 100mm high 500mm diameter around the hole to act as a basin to store water
- Carefully remove plant from container avoiding disturbance to roots. Try to keep as much of root ball intact as possible.
- Position plant in hole centrally, upright and at a level where the base of the stem is at final ground level.
- Progressively replace soil and firm the soil around the roots to make sure air pockets are removed.
- Use straw or bark mulch or old dried grass clippings to form a 100mm thick 'blanket' around trees but make sure this does not touch the stem of the plant
- Fill the watering basin with water immediately after planting.

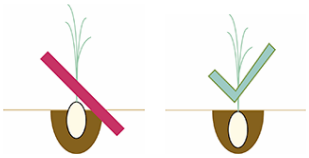
MAINTENANCE:

- The amount of water required to make your trees grow well will depend on the weather but generally a watering basin or bucket full per summer week.
- Fertilisers: Avoid high phosphate and nitrogen fertilisers for native plants. Consult you garden supplier or plant nursery if in doubt about the use of fertiliser.
- Keep grass and weeds clear of approximately 500mm from tree trunk.

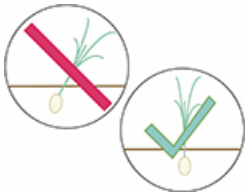
Planting Tips

Planting is fun, but it is no good planting today if the plant dies later!

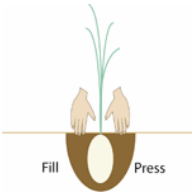
1. Make sure the root system is not above the soil surface.



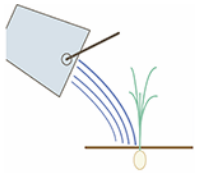
2. Make sure the plant is standing straight.



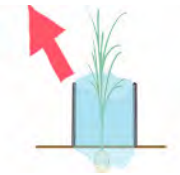
3. Fill around the plant with soil, to remove air pockets.



4. It would help to water the plant again,



5. If you have used a tree guard:
When your plant grows a short distance above the top of the tree guard remove the tree guard. The guard can then be reused.



Trees provide shade, shelter, screening and a more pleasant environment in which to live. Live in a street with trees and experience the difference.

APPENDIX 5 GOVERNING POLICY

S29/1

POLICY REGISTER

Subject: POLICY FOR THE MANAGEMENT OF TREES ON ROADS AND PUBLIC RESERVES IN MUSWELLBROOK SHIRE

	Current	*Previous*	*Prior*	*Prior*
Minute No:	**189**	**268**	**90**	**511**
Meeting Date:	**08/03/04**	**16/06/97**	**12/02/96**	**1989**

POLICY

As the "owner" of trees on all lands under Council's care and control, including road reserves and public reserves, Council will manage these trees, including tree roots, to minimise any injury or damage and/or loss they may cause, while striving to maximise the benefits of the trees and their contribution to the "urban forest". The desirable level of service for this activity of Council can only be maintained where resources are allocated for the purpose. Risk Management techniques will be applied to prioritise the work to achieve best effect from available funds.

1.0 BACKGROUND

Tree management is an important issue for Council. While Council has a responsibility to manage its valuable tree assets for the substantial benefits they provide to the community and the environment, Council can be liable for damage and/or loss caused by trees/tree roots.

Most tree related problems are caused by inadequate tree selection and placement and Council has inherited many problems from past years. The selection and placement of new trees will directly impact on the potential for liability within the Shire.

Council is required to take reasonable steps to manage its existing tree assets to preclude damage to a third party/property and minimise risk of injury. This shall be done by documented method to ensure due diligence is applied and to demonstrate its application.

2.0 OBJECTIVES

To manage the valuable tree assets throughout the Shire in order to:

(a) Provide and maintain attractive "leafy" urban streetscapes and public reserves.

(b) Preserve the trees within Council road reserves and public reserves where they provide numerous tangible benefits, including clean air, shade, erosion protection, noise dampening, protection from winds, screening of unsightly features, privacy, definition of boundaries and a habitat for birds and other wildlife.

(c) Reduce the potential for injury, damage and/or loss caused by the trees, within Council's ability to resource, by the application of Risk Management concepts and techniques

3.0 STRATEGIES

An Operational Procedures Manual will be produced and maintained that defines the tree management practices to be used by staff in the care and maintenance of Council's trees. This shall include guidelines, standing orders and written procedures governing;

- Selection and placement of new trees
- Adopted arboricultural practices
- Safety for workers and public
- Authority of staff
- Risk Management procedures

Manage the emergence of hazards presented by trees by;

- Maintaining a tree inventory for the purpose of monitoring those trees which may present a hazard to public health, safety and property.
- Delegate authority to staff to act to mitigate or remove trees that are assessed as a high and immediate risk to public safety. Assessment may be by staff using the method defined in the Manual or on professional advice.

Develop the value of the urban forest by promoting tree species which are;

- aesthetically appropriate;
- appropriate for the adjacent land use;
- appropriate for the climate;
- not likely to expose members of the public to unreasonable or avoidable risk;
- not likely to interfere with underground or overhead services.

Promote planting by:

- Encouraging Community involvement in tree planting through the Citizen Tree Planting Programme and other programmes
- Requiring a Section 94 Contribution from subdividers for the provision of street trees in new subdivisions.
- Allocating suitable proportion of public revenue to tree planting.
- Maintaining all trees in public areas, ensuring that public safety is at all times upheld, within the resources available.
- Participate wherever appropriate in unemployment schemes for tree planting.

4.0 PROCEDURES

4.1 TREE PLANTING STANDARDS

Selection
Trees planted in urban areas will normally be in accordance with the Street Tree Master Plan for Muswellbrook and Denman.

Areas not identified in the Street Tree Master Plan with trees in accordance with the approved list of street trees listed in Appendix A and B.

Size of Tree Stock
Resident Planting
Street Trees shall usually be advanced stock healthy, vigorous and of reasonable size, planted in 200mm containers not less than five (5) litres. Smaller stock shall be used where appropriate.

Council Planting
Street trees planted by Council staff shall usually be tube stock when available. Otherwise, advanced stock of reasonable size will be planted.

Placement
Trees will be placed in locations as set out in the Operations Procedures Manual. Trees on main roads shall be planted clear of shoulders and table drains on all rural roads in accordance with RTA guidelines.

Established Urban Areas
The Citizen Tree Planting Programme will be encouraged by Council. Under this programme, residents in established urban areas will be able to request up to two (2) trees to be planted on the footpath outside their properties on the basis that the resident plants and maintains the trees.

Trees provided under this programme will be in accordance with the Street Tree master Plan and Appendix C.

New Urban Areas
In new subdivision areas, where a payment per lot for trees has been received by Council, a total of five (5) trees will be made available to the resident by Council. Up to two (2) of these trees are to be planted on the footpath outside the residence.

The remaining trees will be made available on the basis that these trees are planted in the front yard. Residents taking up this offer will be required to plant, water and maintain all the trees supplied to them in line with the street tree planting guide and in accordance with the approved list of street trees listed in Appendix A and B.

4.2 MAINTENANCE PROCEDURES

Maintenance of trees, including tree roots, on Road Reserves and Public Reserves will be directed to those locations where there is a high hazard rating and resources are available to undertake the work. The priority for maintenance will be according to the severity of the hazard rating subject to the following conditions:

(i) Council will organise all work regarding the maintenance or removal of trees on public roads and reserves, unless specifically authorised by the Recreation Manager or Manager Community Infrastructure.

(i) Any work not carried out by Council staff will be carried out by a suitably qualified or experienced person holding a current Public Liability Insurance Policy with a minimum $10m cover for any one event.

(ii) All pruning/tree removal is to be carried out in accordance with Council's Draft Operational Procedures Manual and AS 4373 (1966) Australian Standard, 'Pruning of Amenity Trees'.

(iii) The suitably qualified or experienced person shall, where necessary, implement traffic control measures in accordance with AS 1742.3 (1996) 'Manual of Uniform Traffic Control Devices – Traffic Control Devices for Works on Roads', for the protection of motorists and pedestrians during the course of the work. When required a Traffic Control Plan is to be lodged with Council prior to work commencing.

(iv) All pruning/tree removal refuse is to be disposed of responsibly.

(v) When the work requires removal of tree roots and/or stump grinding the affected area is to be filled and compacted to natural surface level and revegetated.

4.3 RISK MANAGEMENT

A Risk Management Strategy shall be developed for each tree that becomes some sort of hazard or potential hazard. The Operations Procedures Manual shall define a program and method for inspection and re-inspection of trees under Council control. A system of documentation and processes to facilitate and record the application of Risk Management shall be established to provide for the following;

IDENTIFICATION A Tree Inventory shall be established and maintained as the base dataset for tree management. It shall include the tree's location and identifier, and the tree species, size, age, health and condition as description. The inventory shall provide access to the associated documentation that makes up the Risk Management history for each tree.

ASSESSMENT OF RISK Risk assessment shall be carried out as per the Operational Procedures Manual and documented.

PRIORITISATION Each Risk Assessment shall provide a ranking system that allows grading and prioritisation of hazard reduction works required so that the available resources can be allocated most effectively.

ACTION Each hazard identified shall have standard remedial works nominated as well as intervention levels, to allow prompt, appropriate response from the relevant officers. These shall be documented in the Operational Procedures Manual and will be reviewed periodically to follow best practice.

REVIEW Every tree identified on the tree inventory shall be reviewed at suitable periods to monitor the effect of the Risk Management decisions made.

APPENDIX 6 SUMMARY OF AS4373

APPENDIX 7 WORK METHOD STATEMENTS

APPENDIX 8 HERITAGE CONSERVATION AREAS

Denman Conservation Area