ABOUT TREES

URBAN TREE & BUSHLAND MANAGEMENT

PRELIMINARY

TREE SURVEY & REPORT

AT

40-46 EVAN ST & 96-98 LETHBRIDGE ST

PENRITH

FOR

MATTHEW FREEBURN

TABLE OF CONTENT

ABOUT TREES
URBAN TREE AND BUSHLAND MANAGEMENT

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1.0 INTRODUCTION

A Development Application (DA) is to be lodged with Penrith City Council for consent for a new development at 40-46 Evan St & 96-98 Lethbridge St Penrith

1.1 Scope

This report has been commissioned by Mr. Matthew Freeburn and its purpose is to assess the health and condition of the subject trees, and provide an estimate of their safe life expectancies

1.2 Summary of Report

This preliminary tree survey and summary report has been prepared in accordance with Clause 5.9 of Penrith LEP 2010 to allow the siting and layout of the proposed development to consider, at the initial concept stage, the location of trees and other vegetation and favour their retention.

This has been achieved by

- A summary of the Retention Values of the trees that is provided in Section 4.5
- An estimate of their Safe Live Expectancies is provided in Section 4.6
- The provision of their recommended Tree Protection Zones and Structural Root Zones , in accordance with AS 4970, are provided in the Tree Survey Sheets in Section 10

In my opinion, the Retention Value Assessment in Section 4.5 doesn't give adequate considerations to the negative attributes that an individual tree may have, or of its suitability for the location. For example. Tree No. 62 in this report is in good health, but poor structural condition, and is suitable for short term retention. Due to the large size of the defective part, I would recommended that a tree in this condition be removed as soon as practically possible

For this reason, I prefer and recommended the TreeA/Z Assessment, provided in Section 4.6 as it considers more structural issues that should be considered on a proposed development site.

1.2.1 Trees considered unsuitable for retention

Exempt Species (invasive or noxious species)

The following trees are exempt from Clause 5.9 of Penrith LEP 2010

- Tree No's 2 – 7, 10 & 11, 41 – 46, 65, 69, 106, 107 & 109 – 114 are listed as exempt species, and Clause 5.9 of Penrith LEP 2010 does not apply

- Tree No. 108 (within 2m of a dwelling) and Clause 5.9 of Penrith LEP 2010 does not apply

Hazardous Trees:

The following tree were identified as being potentially hazardous

- **Tree No. 60 (*Corymbia citriodora*)** has significant dieback in its canopy and fruiting bodies of root decaying fungus on its root crown. The type of fungus was not identified, but another tree in close proximity (No. 18) has typical symptoms associated with Armillaria Root Decay (see additional information in Appendices 9.8)

- **Tree No. 61 (*Corymbia citriodora*)** has a two equal sized, codominant ascending branches at about 15m high on the main trunk. Staining along the trunk beneath this junction is a symptom of an internal crack, and it has a possible to imminent potential of failure (see Appendices 9.10 & 9.11)

- **Tree No. 62 (*Corymbia citriodora*)** has been heavily suppressed by the more dominant forms of No's 60 & 61. This has resulted in the formation of a significant asymmetrical canopy towards the northwest, and it will have a probable to imminent potential of failure if the more dominant trees are removed.

  'Trees that develop naturally with a lean may be as strong and stable as an upright tree due to the development of reaction wood and compensating root growth. Natural leans can develop in trees along the edge of a stand. Such trees are not prone to failure unless the adjacent trees are removed, exposing the leaning tree to unaccustomed wind stress' (Matheny & Clarke 1991)

  'A sudden increase in exposure to wind is another factor that can lead to the failure of trunks and branches whose support has been provided partly by reaction wood. This problem often arises when neighbouring trees are felled, or when tall buildings are erected or demolished. In some cases, the neighbouring trees may have also provided direct physical support' (Lonsdale 1999).

- **Tree No's 71 and 72 (*Corymbia citriodora*)** both have significant asymmetrical canopies, and their retention will be dependent on the retention of Tree No. 72. The removal of No. 72 will expose the edge type canopies of the remaining trees to uncustomed wind loading, and this will increase their failure potentials.

- **Tree No. 72 (*Corymbia citriodora*)** has formed a significant asymmetrical canopy towards the east, and most of its tall canopy overhangs a unit on No. Derby Street. The potential for a whole tree failure is considered unlikely at this stage, but the species is prone to Summer Branch Drop (Appendices 9.12)

- **Tree No's 80 & 81 (*Melaleuca quinquenervia*)** are semi-mature trees with 25° leans towards the east. They are being supported by the change rooms within their driplines, and the proposed demolition of this building will result in probable to imminent failures

- **Tree No. 85 (*Liquidamber styraciflua*)** is a mature tree with a wide spreading canopy. Some of these branches are receiving mechanical support from the dwelling in its dripline, and the proposed demolition of this building will result in probable to imminent failures

- **Tree No. 92 (*Jacarandar mimosifolia*)** is an over-mature tree with two equal sized diameter, codominant ascending branches and a partially failed weak junction. This has a probable to imminent failure potential.

Dead and declining trees

The following tree were identified as being dead or in decline

- **Tree No. 9 (Cupressus *sempervirens*)** is an over-mature hedgerow. They have typical symptoms associated with Cypress Canker, of which there is no effective control (see Appendices 9.7)

- **Tree No. 18 (*Eucalyptus moluccana*)** is in advanced stages of decline and has typical symptoms of Armillaria Root Decay (see Appendices 9.8)

- **Tree No's 21 (*Melaleuca quinquenervia*)** This tree is dead and is exempt from Clause 5.9 of Penrith LEP 2010

- **Tree No. 22 & 23 (*Melaleuca quinquenervia*)** have sparse foliage, and appear to be in declining health and vitality (see Appendices 9.9)

- **Tree No. 64 & 67 (*Grevillia robusta*)** are in advanced stages of decline, and treatment and or tree surgery techniques are unlikely to increase their safe life expectancies (see Appendices 9.9)

Trees with poor structural forms and are unlikely to improve

- **Tree No's 19 & 20 (*Melaleuca quinquenervia*)** – these trees have suppressed asymmetrical forms that will become recently exposed edge-type trees after No's 18, 20 & 23 are removed
- **Tree No's 48, 51 & 52 (*Casuarina cunninghamiana*) –** these trees have very tall thin canopies, with canopies that lean out of the stand
- **Tree No's 66 & 68 (*Lophostemon conferta*)** – these trees have suppressed asymmetrical forms that will become recently exposed edge-type trees after No's 67, 69 & 70 are removed
- **Tree No's 100 & 101 –** these trees have heavily suppressed, edge type canopies towards the north
- **Tree No's 102 – 104 (*Cinamomum camphora*) –** these are a codominant stand of trees that have originated from suckers on an old stump. They are unsuitable for long term retention

1.2.2 Tree considered suitable for retention

This assessment determined that Tree No's 1, 8, 13, 15 – 17, 24 – 40, 47, 49, 50, 53 – 59, 63, 73 – 79, 82 – 84, 87, 88 – 91, 93 – 97, & 117 – 121 have SULE Ratings of A1 – No significant defects and could be retained with minimal remedial care.

- **Low Amenity & Ecological Values:** Tree No's 1, 8, 13, 58, 87, 95, 98, 114 and 115 are suitable for long term retention, but have limited ecological and amenity values. Their proposed removals may be considered to be justified for design layout purposes.
- **Tree No. 16 (*Eucalyptus moluccana*)** has been heavily colonised by mistletoe, and this is often associated with an irreversible decline spiral of this species in the local area. Careful consideration should be given to the practicality of trying to retain this tree in the long term.
- **Boundary Screening:** Tree No's 15 (hedgerow), 53 – 57 (hedgerow) 76, 77, 96 & 97 provide screening along property boundaries. Tree No's 87 – 90 are located on No. Derby Street, and also provide boundary screening. A priority should be made to retain these trees.
- **Tree No's 117 – 121 (*Lophostemon conferta*) –** these are council owned street trees, and their safe life expectancies are unlikely to compromised by the proposed development, if appropriate tree protection methods are utilised

1.3 Conclusions

- Tree No's 1, 8, 13, 15 – 17, 24 – 40, 47, 49, 50, 53 – 59, 63, 73 – 79, 82 – 84, 87, 88 – 91, 93 – 97, & 117 – 121 have SULE Ratings of A1 – No significant defects and could be retained with minimal remedial care.
- Tree No's 2, 9 – 12, 18 – 23 41 – 46, 48, 51, 52, 60 – 62, 64, 67, 69 – 72, 80 & 81, 85, 86, 92 & 98 - 114 are not considered suitable for retention.

1.4 Recommendations

- This preconstruction survey should be used as a basis to select trees to be retained within the proposed development.
- Trees scheduled to be retained should be shown on the proposed site plan, and their Tree Protection Zones and Structural Root Zones of each tree should be included
- This will assist in the preparation of any required Arboricultural Impact Assessment.

If you require any further information, please feel free to contact me on 0439 758 658.

Lawrie Smith,
Arboricultural Consultant

2.0 METHODOLOGY AND OTHER INFORMATION

This report has been presented in an accepted industry format and should easily be understood by any person with a reasonable understanding of arboriculture.

2.1 Methodology & Assessment Criteria

- A visual assessment of this tree was undertaken from ground level between March and July 2019 in accordance with the Visual Tree Assessment (VTA method of Mattheck and Breloer (1994).
- The assessment took into account the biological state of the trees, as indicated by the health of their foliage, their structural form and their growing environment.
- The terminology used in the assessment is defined in Section 8, with more detailed information provided in the Appendices, which are referenced to recent industry research.
- Unless otherwise stated, no underground sections were examined and no aerial inspection (climbing) was undertaken.
- Tree heights were obtained with a clinometer and canopy spreads were measured.
- Retention Values are based upon the Sustainable Retention Index Value (SRIV) – Refer to the SRIV Matrix in Appendices 9.2
- Safe Life Expectancies are based on Barrell (2006) – Refer to TreeA/Z Categories in Appendices 9.3
- Significance Values are based on numerous concepts used within the Arboricultural Industry – Refer to the Significance Values in Appendices 9.4
- A copy of the tree assessment is include in Section 10
- A Tree Location Plan is included in Section 11, and shows the location of the subject tree/s.

2.2 Curriculum Vitae of Author

The authors Curriculum Vitae is attached as Appendices 9.1 of this report which provides the qualifications, experience and additional training on which any stated opinions and conclusions are based.

2.3 Limitation of Liability

Trees are living organisms and do not remain static over time. Conditions are often hidden within trees and below ground. Unless it has been otherwise stated, observations have been made by eye and from ground level. Tree can be managed, but they cannot be controlled, and to live near a tree is to accept some degree of risk. The only way to eliminate all risks is to remove all trees.

Arborists cannot detect every condition that could possibly lead to the failure of a tree. They cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period of time. Likewise remedial treatments, like any medicine, cannot be guaranteed.

Site changes, storms and ongoing growth can alter a tree over time; therefore, tree assessments must occur on a regular basis. Unless stated otherwise, this assessment cycle is based on an annual inspection. This is consistent with and the Land & Environment Courts definition of a tree that is ‘likely to cause damage or injury in the near future’ as ‘likely to cause damage or injury within the next 12 months’.

It should also be noted that any opinions given by the Arborist in relation to the health, condition, desirability or significance of any tree will not necessarily coincide with the opinions of the relevant Council authority or their Tree Management Officers.

The author shall not be required to provide additional information, give testimony or attend Court by reason of this report unless subsequent contractual arrangements are made, including an additional fee for such services.

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2.5 Uniform Civil Procedures Rules (2005)

In order to ensure the reliability of evidence provided by experts, the Courts have provided the Uniform Civil Procedures Rules 2005 (UCPR) and Land & Environment Court Rules 2007 (LECR).

The author of this report has read and understands the Expert Witness Code of Conduct in Schedule 7 to UCPR, and agrees to be bound by it in accordance with UCPR 31.23.

An expert is permitted to provide evidence before a Court in order to assist the Court draw inferences. The primary overriding duty of an expert is to assist the Court impartially on matters relevant to the expert witness's expertise. Any opinions expressed must be based on the persons training, study or expertise.

2.6 Copyright

Payment for a report permits a client to use it on the provision that all contractual arrangements are complied with. Its unauthorised use in any form is prohibited. The report is only to be used for its stated purpose and by the person for whom it was commissioned. It cannot be transferred to any third party without written consent from the author. About Trees accepts no liability or responsibility in respect of the use or reliance upon this report by a third party.

3.0 TREE LEGISLATION

3.1 Penrith DCP 2014 – Vegetation Management

This section of the DCP seeks to address vegetation management in a holistic manner by considering the requirements for vegetation preservation and enhancement in terms of a number of different and sometimes competing objectives.

This includes protecting threatened species and their habitats, protecting other significant native vegetation and bushland, preserving significant non-native or introduced vegetation; and considering the impact of bushfires on life and property where buildings and vegetation interface.

Any proposed development or activity should address the objectives and controls in this section in a holistic manner

3.2 General Objectives

a. To adopt the principles of ecologically sustainable development (ESD) in protecting and enhancing Penrith's native vegetation;
b. To preserve existing trees and vegetation for the benefits they provide;
c. To preserve existing trees and vegetation, where possible, during the design, development and construction process and justify any tree or vegetation removal to Council;
d. To protect and enhance native vegetation and biodiversity in the Penrith Local Government Area, including habitat for threatened species, populations and ecological communities and corridors for flora and fauna;
e. To retain native vegetation in parcels of a size and configuration which will enable existing plant and animal communities to survive in the long term;
f. To protect and enhance the landscape character and scenic qualities of the Penrith Local Government Area; and
g. To manage the conflict between protecting and removing vegetation to address natural hazards such as bushfires.

3.3 Preservation of Trees and Vegetation

There is a need to retain and protect trees and vegetation on both public and private land. However, conflicts between trees/vegetation and land uses/activities need to be managed. For this reason, this Plan provides controls for the preservation of trees and vegetation.

This section of the DCP seeks to reinforce and supplement the controls set out in Clause 5.9 Preservation of trees or vegetation of Penrith LEP 2010, which apply to the preservation of trees and vegetation in all areas of the City.

Note: The 'Development on natural resources sensitive land' clause in Penrith LEP 2010 and Section 2.2 Biodiversity Corridors and Areas of Remnant Indigenous Vegetation in Non-Urban Areas below contain additional provisions to protect and enhance biodiversity corridors and areas of remnant indigenous vegetation.

Objectives

a. To prescribe which species or kinds of trees or other vegetation are protected by Clause 5.9 Preservation of trees or vegetation of Penrith LEP 2010 and this section of the Plan;
b. To promote the benefits of trees and other vegetation;
c. To protect and enhance native vegetation, habitat for native fauna and biodiversity;
d. To protect and enhance native vegetation for its scenic values and to retain the unique visual identity of the landscape;
e. To manage non-native vegetation in accordance with its cultural and landscape significance;
f. To ensure that any new development takes into account existing vegetation in the site planning, design, development, construction and operation of the development; and
g. To ensure there are mechanisms for the long term protection, management and maintenance of trees and vegetation.

3.4 Development Consent

a. In accordance with Clause 5.9 of Penrith LEP 2010, a person must not ringbark, cut down, top, lop, remove, injure or wilfully destroy any tree or other vegetation which is prescribed by this Plan without development consent, or a permit granted by Council.

3.5 Prescribed Vegetation

a. The prescribed trees or other vegetation that are protected by Clause 5.9 of Penrith LEP 2010 and this section of the Plan include:
   (i) Any indigenous tree (both living and dead) or other vegetation that is on land zoned E2 Environmental Conservation in the Penrith LEP 2010 Land Zoning Map or natural resources sensitive land identified in the Penrith LEP 2010 Natural Resources Sensitivity Land Map.
   (ii) In residential areas, any tree or other vegetation having a height of 3m or more or a trunk diameter exceeding 100mm at 1400m above ground level.
   (iii) In business and industrial areas:
   - Any tree or other vegetation having a height of 3m or more or a trunk diameter exceeding 100mm at 1400mm above ground level.

   (iv) In rural areas:
   - Any tree or other vegetation, within 20m of a dwelling house, having a height of 3m or more or a trunk diameter exceeding 100mm at 1400mm above ground level.
   - Any indigenous tree or vegetation, not within 20m of a dwelling house. Note: clearing of vegetation will only be considered where it is proposed in conjunction with a use permissible on that land.
   - Any introduction vegetation, not within 20m of a dwelling house, having a height of 3m or more or a trunk diameter exceeding 100mm at 1400mm above ground level.

   (v) Any tree or other vegetation that is, or forms part of, a heritage item or is within a heritage conservation area.

b. Clause 5.9 of Penrith LEP 2010 and this section of the Plan do not apply to:
   (i) A tree or other vegetation that the Council is satisfied is dying or dead and is not required as the habitat for native fauna;
   (ii) Tree or other vegetation that the Council is satisfied is a risk or imminent threat to human life or property;
   (iii) A tree or other vegetation where the trunk is located within 2m of an existing dwelling, as measured from the main trunk of the tree or other vegetation to an external enclosing wall of the existing dwelling;
   (iv) Remove or prune any exempt species

Ailanthus altissima (Tree of Heaven)	*Cotoneaster spp.* (Cotoneaster
Celtis sinensis (Hackberry)	*Ficus elastica* (Rubber Tree)
Lagunaria patersonia (Norfolk Island Hibiscus)	*Ligustrum spp* (Privet)
Nerium oleander (Oleander)	*Olea* africana (African Olive)
Schefflera actinophylla (Umbrella Tree)	*Senna pendula* (Cassia)
Syagrus romanzoffianum (Cocos Palm)	

   (v) A tree that is an edible fruit tree requiring annual pruning or is a tree within a timber plantation;
   (vi) the pruning or removal of trees and other vegetation on Council owned or managed land provided the work is undertaken by persons authorised by Council, and is in accordance with Council approved works, a Council policy or a Plan of Management, AS 4373-2007 (Australian Standard – Pruning of Amenity Trees) and statutory approvals;
   (vii) Action required or authorised to be done by or under the *Electricity Supply Act 1995*, the *Roads Act 1993* or the *Surveying and Spatial Information Act 2002*;
   (viii) Controlled weeds under the NSW Biosecurity Act 2015 and identified in the Greater Sydney Regional Strategic Weed Management Plan 2017 – 2022
   (ix) The removal of trees and other vegetation to control declared pests under the *Local Land Services Act 2013*. (Species currently declared pests in NSW are wild rabbits, wild dogs, feral pigs and a number of locust species); and
   (x) The removal of trees and other vegetation to maintain approved dams or asset protection zones.

c. Where vegetation works (including tree removal) are proposed as part of other works on the site for which consent is required, the works then must be assessed as part of the Development Application.

3.6 Submission Requirements

a. An application for development consent may require different levels of information, depending on:
   (i) The location and extent of the proposed works;
   (ii) Whether the site contains any threatened species, population, ecological community or its habitat.

   The level of information required to be submitted with the application will also depend on these factors.

b. Applicants should consult with Council's Development Services Department or Tree Management Officer for advice

   A species impact statement will be required if Council determines that the works are likely to have a significant effect on any threatened species, population or ecological community or its habitat. For some works, Council may require a report from a suitably qualified arborist.

   Note: A Flora and Fauna Assessment report will be required for any Development Application for works to any indigenous trees and vegetation comprising 5 or more native trees with understorey or when there is the potential for Threatened Species or Endangered Ecological Communities to be present.

c. A tree survey and assessment report should address the following matters:
   (i) The location and type of tree(s) or vegetation;
   (ii) Details of the proposed works and the reasons for the works;
   (iii) The health and condition of the tree(s) or vegetation, including its structural soundness and the condition of the root zone;
   (iv) The aesthetic, scientific and/or historic importance of the tree(s) or vegetation;
   (v) The impact of the proposed work on the appearance, health or stability of the tree(s) or vegetation and the general amenity of the surrounding area, including any effect on the streetscape;
   (vi) In the case of an application to remove a tree(s) or vegetation, whether pruning would be a more practicable and desirable alternative;
   (vii) The risk of personal injury;
   (viii) The risk of damage to buildings, structures or services;
   (ix) The extent of other trees and vegetation on the property;
   (x) Whether the tree(s) or vegetation is habitat, a source of food or shelter, or used by fauna; and
   (xi) Whether all alternatives to removing or pruning the tree or vegetation have been considered.

d. In most cases, where works are proposed to any indigenous vegetation and require a development application, a flora and fauna assessment will be required. The report must be undertaken by a suitably qualified and experienced and must be prepared in accordance with the Threatened Species Assessment Guidelines – The Assessment of Significance for the Threatened Species Conservation Act (DECCW (OEH) 2007), the Threatened Species Survey and Assessment: Guidelines for developments and activities (working draft) (DEC, 2004), and the Significant Impact Guidelines – Matters of National Environmental Significance for the EPBC Act (prepared by the Commonwealth Department of Environment, Water, Heritage and the Arts, 2013). This report must include the following as a minimum:
   (i) A written and mapped description of the plant and animal species present and their habitats;

   (ii) A clear site plan showing, as a minimum, the proposed development and any associated Asset Protection Zone and Effluent Management Area, location of all vegetation, important site features and location of any vegetation to be removed.

(iii) A statement of whether any of the plant and animal species or their habitats are listed as threatened, endangered or vulnerable species or communities under the Threatened Species Conservation Act 1995 or the Fisheries Management Act 1994.

(iv) A description of the proposed vegetation works and, if the works are to be undertaken as part of the proposed development, a description of the proposed development, including measures to mitigate adverse impacts;

(v) An objective assessment to determine whether the proposed works and development are likely to significantly affect any threatened species, populations or ecological communities or their habitats. This assessment is required under Section 5A significant effect on threatened species, populations or ecological communities or their habitats, of *Environmental Planning and Assessment Act 1979*. Section 5A lists the factors that must be taken into account in making such a determination; and

(vi) Consideration of the likely impacts the proposed works or development may have on any potential use of the vegetation as a fauna movement corridor. Where relevant, consideration of the importance of any rural dams for fauna habitats. The location of any APZ or Effluent Management Area should also be considered by the assessment.

(vii) If Council determines that the proposed works and/or proposed development are likely to have a significant effect, then a *Species Impact Statement* will be required. The *Species Impact Statement* must be prepared in accordance with the requirements of the *Threatened Species Conservation Act 1995.* Before preparing a *Species Impact Statement*, the requirements of the Office of Environment and Heritage and Council must be sought. Similarly, a *Species Impact Statement* must be prepared if there is likely to be a significant impact on threatened fish or marine vegetation protected under the *Fisheries Management Act 1994*.

(viii) Where vegetation works are proposed on land that is a heritage item or within a heritage conservation area, a heritage impact statement may be required in accordance with Clause 5.10 Heritage conservation of Penrith LEP 2010. In this regard, applicants should consult with Council's Development Services Department.

3.7 Trees that are dying or dead

(a) Clause 5.9(5) of Penrith LEP 2010 states that it does not apply to a tree or other vegetation that the Council is satisfied is dying or dead and is not required as the habitat of native fauna. The terms 'dead', 'dying' and 'Council's satisfaction' are defined in Appendix F1 – Definitions.

(b) If the proposed works involve removing dead or dying trees or vegetation, Council's Development Services Department or Tree Management Officer must first be consulted.

3.8 Trees that are causing a Risk to Life or Property

(a) Clause 5.9(6) of Penrith LEP 2010 states that Clause 5.9 does not apply to a tree or other vegetation that the Council is satisfied is a risk to human life or property.

(b) If the proposed works involve undertaking work to a tree or other vegetation that is a risk or imminent threat to human life or property, Council's Development Services Department or Tree Management Officer must first be consulted.

(c) In relation to trees causing property damage, it must be demonstrated (e.g. by a report from a practising qualified structural engineer) that the tree, its trunk, or its root system is causing damage to a structure and the damage cannot be controlled by measures such as the installation of a root barricade.

3.9 Site Planning and Design

The following controls apply where the removal of trees and other vegetation is proposed as part of a development application for a proposed use permissible under the relevant zone of Penrith LEP 2010:

(a) The siting and layout of a development should consider, at the initial concept stage, the location of trees and other vegetation and favour their retention.

(b) Buildings, Asset Protection Zones and Effluent Management Areas are to be sited on existing cleared land, where possible.

(c) Where a stand of trees is to be retained, any associated native understorey should also be retained.

(d) Trees and vegetation should be retained on steeply sloping sites (slopes greater than 20%) or where there is unstable soil to minimise erosion or geo-technical instability. (See also the controls in the Land Management section of this Plan relating to Geotechnical Stability).

(e) Trees and vegetation must be retained along watercourses (See also the controls in the Water Management section of this Plan, relating to Riparian Corridors).

(f) An application is required to address the effect of the proposed development on existing vegetation, the landscape character and the scenic quality of the locality.

(g) Trees and vegetation must be retained where they shield existing or proposed buildings from views from public areas.

(h) Trees and vegetation must be retained where they form part of the landscape character of an area, including on or near ridgelines.

(i) Any proposed building should be setback a minimum of 3m from the trunk of any retained tree. Council may consider a variation to this setback depending on the type and size of the tree.

(j) Hard (or impervious) surfaces are not permitted under the drip line of any tree.

(k) Services (and particularly pipes carrying water/moisture) must not be located in the drip line of an existing tree.

(l) Wherever trees or vegetation are removed (with consent) as a consequence of the development, an equal or greater number of replacement trees that grow to a similar or greater height or canopy should, where practical, be incorporated into the landscaping design of the new development.

(m) The siting and layout of a development should also consider, at the initial concept stage, bushfire risk.

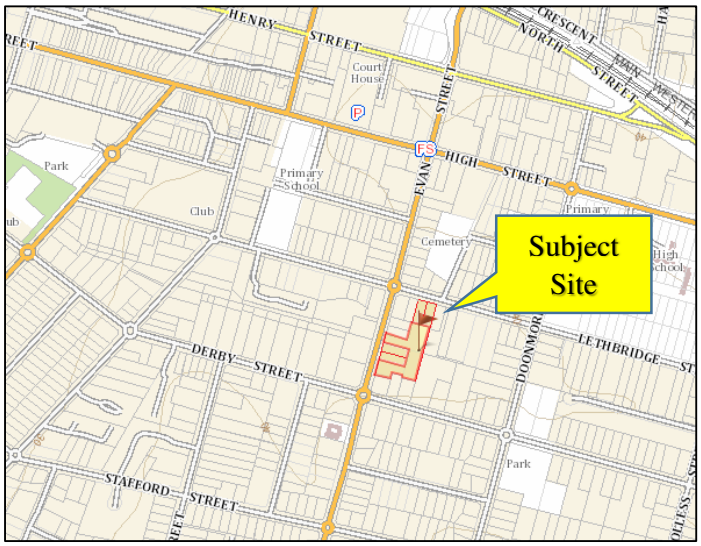
3.10 Protection of Trees during Construction

(a) During construction, an adequate fence or similar structure must be constructed around any trees or vegetation to be retained, at a distance at least equal to the drip line. This area must not be used by machinery, for stockpiling wastes or for storage of any building materials. This will help protect the tree or vegetation from soil compaction and contamination; root, trunk and limb damage; and changes in surface levels that affect the health of the tree or vegetation. (See the Landscape Design section of this Plan for further details).

(b) Tree protection must be in accordance with Australian Standard AS 4970-2009 Protection of trees on development sites.

4.0 OBSERVATIONS

4.1 The sites is known as 40 – 46 Evan Street & 96 – 98 Lethbridge Street Penrith and the surrounding areas are mainly comprised of urban residential development



Map 1 – showing location of subject site (Dept Lands 2019)

Map 2 – showing subject trees (Dept Lands 2019)

4.2 The soil of the general area has been described by Bannerman & Hazelton (1990), as 'Luddenham Soil Landscape'. The top soil is usually 10cm of friable brownish dark brown loam which becomes hard setting when dry or compacted (lu1), and overlies 40cm of hardsetting brown clay loam, especially when exposed at the surface (lu2).

Where subsoil exits, >50cm of medium to heavy clay (lu3) over overlies <90cm of grey mottled clay (lu4). Soil is generally shallow on crests (<100cm), moderately deep on upper slopes (70 – 150cm) and moderately deep on lower slopes and drainage lines (<150cm). Subsoils have high clay content and are moderately reactive.

Reactive soils can cause surface movement as they shrink or swell in response to changes of their soil moisture content. This can cause extensive damage to pathways, paving, underground services and buildings with inappropriately designed footings.

4.3 Current Condition of the Tree/s

Tree 1 is a mature *Lagerstroemia indica*; 'Crepe Myrtle; a deciduous small tree to 6 – 8m tall, the trunk dividing 1 – 2m from the ground unless pruned otherwise, the main branches forming a vase-shaped crown growing to 5 – 6m wide at maturity.' Rowell, R. 1980)

a. **Health & Vitality:** Average **–** this is a deciduous species and was dormant at the time of the inspection. However, an examination of the previous seasons of extension growth indicates that it's generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 4).
b. **Tree Form: –** it has formed multiple stems from the rootcrown and these combine to form a codominant canopy that is 7m in height, with a crown spread of 10x10m.
c. **Structural Condition:** Average, retainable in the long term

Tree No's 2– 7 are a mature hedgerow of *Ligustrum lucidum*; 'Large Leaf Privet is an evergreen small-tree to 6 – 10m tall, a large bush when young, but unless restricted by pruning, eventually tree-like with a distinct single trunk and conical, leafy crown; in old age, the head becomes broad-domed and umbrella-like to 8 – 10m wide. It has been used extensively in Australian gardens for hedging and screening, but escapees from cultivation have become one of the most serious threats to bushland in the Sydney Region (Rowell 1980)' (Rowell, R. 1980)

a. This species is a 'weed of National Concern in the Sydney Region – harmful to human health and the environment, and is listed as an exempt in Penrith DCP 2014 (see Plate 1).
b. These trees should be removed

Tree 8 is a mature *Archontophoenix alexandrae*: 'Alexander palm is an attractive plant native to the rainforests of northern Queensland A large palm tree with a single trunk growing up to 30 m tall, and with a crown that contains a cluster of about 10-12 very large leaves. The grey trunk is up to 30 cm or more thick and ringed with noticeable leaf scars. The leaves are 3.5-4.5 m long on mature trees and have 60-80 narrow leaflets on each side http://www.technigro.com.au/documents/WW%20Alexander%20palm.pdf

a. **Health & Vitality:** Average – the foliage of this palm appears to be generally healthy and growing vigorously, with no visible symptoms of decline.
b. **Tree Form: –** they have formed a single stems with DBH of 200mm and form codominant canopy that is 8m in height, with a crown spread of 8x8m.
c. **Structural Condition:** Average, retainable in the long term

Tree 9 is an over – mature hedgerow comprised of twenty (20) *Cupressus sempervirens:* 'Italian Cyprus is an evergreen tree with a narrow columnar habit of growth, and forms a tall, symmetrical, dark green column 6-9m in height. Trees are normally no more than 1-3m wide. This species has a very special form and is therefore only suited for certain landscapes. It is often used for framing, as a strong accent around large buildings or in a formal landscape, but does not lend itself well to many home gardens. It grows much too tall for most residential landscapes looking much like a green telegraph pole' (Gilman, E. 1997)

a. **Health & Vitality:** Low **–** these trees are showing typical symptoms of Cypress Canker, and are in irreversible decline (sees Plate 2 & 3).
b. **Tree Form:** these trees combine to form a hedgerow with an east/west axis that is 18m in height, and a crown spread of 25x6m
c. **Structural Condition:** Poor, retainable for 0 – 5 years

Tree No's 10 & 11 are mature *Syagrus romanzoffiana*: 'Cocos Palm is a native of Brazil. It has a single grey trunk that can grow to 15m in height and forms a thick crown of deep-green, plume-like fronds which can spread to 8m. Individual fronds can grow to 4.5m long, bearing leaves with a green upper surface and greyish undersides. These palms are easily relocated (Cundall 2004).

a. This species is a 'weed of National Concern in the Sydney Region – harmful to human health and the environment, and is listed as an exempt in Penrith DCP 2014 (see Plate 2).

Tree No. 12 is a semi mature hedgerow of *Ehretia acuminata*: 'Koda is a semi-deciduous tree found in throughout Australasia. It is a common tree found from near Bega in south east New South Wales to Cape York in far north eastern Australia is a medium to large size tree, occasionally reaching 30 metres in height and a 90 cm in trunk diameter. The Australian habitat are different forms of rainforest, particularly near the margins or in disturbed areas.

Tree 13 is a semi-mature *Melia azedarach*: 'White Cedar NSW South Coast to North Coast to North Qld, usually confined to the fringes of the forests within 100 km or so of the sea, but now cultivated in almost all parts of Australia, thriving at Alice Springs, Marree and other dry climate places. It is a shapely tree to 10 m tall and nearly as wide when grown in the open, with a broad crown and slightly drooping branches on a straight, sturdy main trunk: taller in its native habitat to 25 m or more and with only a small, tufted crown' (Rowel 1980)

a. **Health & Vitality:** Low **–** this tree has been heavily suppressed by the more dominant canopies of the Privet on its north-western side.
b. **Tree Form:** This tree has a suppressed canopy that is 4m in height, with a crown spread of 7x4m.
c. **Structural Condition:** Poor**,** retainable for 0 – 5 years

Tree 14 is an over- mature *Albizia julibrissin:* 'Silk Tree originates from Japan to Western Asia and forms a deciduous tree to 6m in height, on a single trunk with a broad, umbellate canopy that is 7 – 8m in width. Flowers cover the top of the tree' (Rowell, R. 1980)

a. **Health & Vitality:** Poor **–** the foliage of this tree is very sparse, and is a typical symptom of decvline in this short lived species.
b. **Tree Form: This tree** has formed a single stem with DBH of 150mm and a codominant canopy that is 6m in height, with a crown spread of 6x10m.
d. **Structural Condition:** Poor**,** retainable for 0 – 5 years

Tree 15 is a mature hedgerow of sixteen (16) *Cupressocyparis leylandii:* 'Leyland Cypress is a hybrid between *Cupressus macrocarpa* and *Chamaecyparis nootkatensis* having an outstanding growth rate of up to

4m in six years, while the average growth for a thirty year plant is 20m, with a possibility of 30m under ideal conditions. It has inherited the extreme hardiness of its Alaska Cedar parent and is most like that tree in leaf and habit, resembling *Cupressus macrocarpa* only in cone and seed detail. It appears to be free of diseases, will grow in almost any soil type, will tolerate 'wet feet' and has good promise as a timber tree.' (Grace, J. 1983)

a. **Health & Vitality: –** the foliage of these trees appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 5).
b. **Tree Form: –** these trees combine to form a hedgerow with a north/south axis that is 22m in height, and a crown spread of 22x5m
c. **Structural Condition:** Average

Tree 16 is a mature *Eucalyptus moluccana:* Grey Box has a straight trunk, to half the height of the tree and the canopy is usually 'V' shaped. It is the most common of the boxes in the Sydney district, and is associated with *Eucalyptus tereticornis, Eucalyptus maculata* and the Ironbarks on clay soils in Western Sydney. It occurs in Open Forest and Woodland in moist, but well drained, moderately fertile undulating country with a clay soil or subsoil, and is common on the Cumberland Plain west of Parramatta (Leonard, G. 1993. Fairley, A. Moore, P. 1989)

a. **Health & Vitality: –** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline. However, it has been heavily colonised by mistletoe (see Plate 6).
b. **Tree Form:** This tree has formed a single stem with DBH of 1100mm and a codominant, asymmetrical canopy towards the north that is 26m in height, with a crown spread of 33x29m.
c. **Structural Condition:** Average to fair, this tree may be in the beginning of a decline spiral.

Tree 17 is a mature *Eucalyptus moluccana:* See description of tree 16

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 7).
b. **Tree Form:** it has formed a single stem with DBH of 900mm and a codominant, asymmetrical canopy towards the north that is 29m in height, with a crown spread of 18x21m.
c. **Structural Condition:** Average, retainable in the long term

Tree 18 is an over- mature *Eucalyptus moluccana:* See description of tree 16

a. **Health & Vitality:** Poor **–** this tree is in advanced stages of decline, and is considered to be unsuitable for retention (see Plate 8).
b. **Tree Form:** This tree has formed a single stem with DBH of 750mm and a codominant canopy with a significant bias towards north that is 26m in height, with a crown spread of 13x17m.
c. **Structural Condition:** Poor **–** A large canker wound originating from the root crown has killed a significant amount of cambium (sapwood). The symptoms are consistent with Armillaria Root Decay, and is highly probable that its root system is also compromised (see Plate 9 and Appendices 9.)

Tree 19 is a semi-mature *Melaleuca quinquenervia*: 'Broad-leaved Paper-bark is from eastern Australia, between Cape York and the Shoalhaven River, mainly on moist coastal heathland, occasionally standing in swamps. It usually forms an erect, evergreen tree to 8 – 10m tall (Rowell, R. 1980) but can reach heights of 20m with crown spreads of 10m' (Gilman 1997). It usually develops a single trunk with thick layers of paperbark and a densely foliaged crown with abundant white flowers in spring and summer.

a. **Health & Vitality:** Low **–** the foliage of this tree has been heavily suppressed by a climbing plants throughout is canopy (see Plate 8).
b. **Tree Form:** This tree has formed two codominant stems with DBH's of 300mm and a suppressed canopy with a bias towards the southwest that is 9m in height, with a crown spread of 8x5m.
a. **Structural Condition:** Fair, retainable for 0 – 5 years

Tree No's 20 – 23 form a stand of over-mature *Melaleuca quinquenervia*: (see description of tree 19)

b. **Health & Vitality:** Low **–** the dominant tree within the stand (No's 22 & 23) have very sparse foliage, while No. 21 is dead, and No. 20 has a significant asymmetrical canopy towards the east (see Plate 10).
c. **Tree Form:** These trees have formed a codominant stand and No's 22 – 23 are considered to be unsuitable for retention.
d. **Structural Condition:** Poor **–** The removal of No' 21 – 23 will leave the recently exposed asymmetrical canopy of No. 20 to unaccustomed wind loading, and this will increase its failure potential. Retainable for 0 – 5 years

Tree No's 24 & 25 are semi-mature *Liquidambar styraciflua:* 'Sweet Gum is a large deciduous tree and can grow to about 30m tall; conical at first but broadening with age. The trunk forms a dominant central axis, the lower branches more or less horizontal, but ascending towards the apex; young branches and twigs prominently are ridged with a distinctive corky bark' (Rowell, R.1980)

a. **Health & Vitality:** Average **–** the foliage of these trees appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 15).
b. **Tree Form:** These trees have formed single stems with DBH's of 300 & 400mm and codominant canopies that are approximately 12m in height, with a crown spreads of 10x10m.
c. **Structural Condition:** Average, retainable in the long term

Tree No's 26 & 27 are codominant *Melaleuca quinquenervia*: (see description of tree 19)

a. **Health & Vitality:** Average **–** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 13).
b. **Tree Form:** These trees formed single stems with DBH's of 300 & 450mm and a codominant, asymmetrical canopy that is 17m in height, with a crown spread of 9x8m.
c. **Structural Condition:** Average, retainable in the long term

Tree No. 28 is a mature *Melaleuca quinquenervia*: (see description of tree 19)

a. **Health & Vitality:** Average **–** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 14).
b. **Tree Form**: This tree has formed four codominant stems with DBH's 400 and a codominant canopy that is 15.5m in height, with a crown spread of 11x9m.
c. **Structural Condition:** Average, retainable in the long term

Tree No's 29 & 31 are semi-mature *Liquidambar styraciflua:* (see description of tree 24)

a. **Health & Vitality:** Average **–** the foliage of these trees appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plates 15 & 16).
b. **Tree Form:** These trees have formed a single stem with DBH of 300mm and codominant canopies that are 15m in height, with a crown spreads of 10x10m.
c. **Structural Condition:** Average, retainable in the long term

No's 33 – 34 are a codominant stand of mature *Melaleuca quinquenervia*: (see description of tree 19)

a. **Health & Vitality: Average –** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 16).
b. **Tree Form:** They have has formed stems with DBH's of 300 & 400mm and a codominant canopy that is 19m in height, with a crown spread of 10x12m.
c. **Structural Condition:** Average, retainable in the long term

No's 32, 35 & 36 are a codominant stand of mature *Melaleuca quinquenervia*: (see description of tree 19)

a. **Health & Vitality:** Average **–** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 17).
b. **Tree Form:** They have formed a single stem with DBH's of 350, 400 & 450mm and a codominant canopy that is 14m in height, with a crown spread of 8x9m.
c. **Structural Condition:** Average, retainable in the long term

No's 37 – 40 are a codominant stand of mature *Melaleuca quinquenervia*: (see description of tree 19)

a. **Health & Vitality:** Average**–** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 18).
b. **Tree Form:** They have formed stems with DBH.s of 220 - 550mm and a codominant, asymmetrical canopy towards the north that is 19m in height, with a crown spread of 11x17m.
c. **Structural Condition:** Average, retainable in the long term

No's 41 – 46 is a mature *Ligustrum lucidum* (see description of tree 2)

a. This species is a 'weed of National Concern in the Sydney Region – harmful to human health and the environment, and is listed as an exempt in Penrith DCP 2014

b. These trees should be removed

Tree 47 is a mature *Casuarina cunninghamiana*: 'River She-oak or River Oak occurs in NSW & Qld, mainly along the freshwater rivers of the coastal strip, the Tablelands, and closer Western Slopes. It forms a tall evergreen tree to 20 – 30m, with a single pronounced trunk and slender, conical crown with fine, pendulous branches (Rowell, R.1980).

a. **Health & Vitality: Average –** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 18).
b. **Tree Form:** This tree has formed a single stem with DBH of 400mm and a codominant canopy that is 22m in height, with a crown spread of 15x11m.
c. **Structural Condition:** Average, retainable in the long term

Tree 48 is a mature ***Casuarina cunninghamiana*** (see description of tree 47)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 18).
b. **Tree Form:** This tree has formed a single stem with DBH of 250mm and a codominant canopy that is 21m in height, with a crown spread of 9x8m.
c. **Structural Condition:** Poor **–** tall thin form with a very high trunk diameter to tree height ration

Tree 49 is a mature ***Melaleuca quinquenervia***

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 18).
b. **Tree Form:** This tree has formed two codominant stems with DBH's of 200mm and a codominant canopy with a bias towards the east that is 14m in height with a crown spread of 9x7m.
c. **Structural Condition:** Average, retainable in the long term

Tree 50 is a mature *Casuarina cunninghamiana* (see description of tree 47)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 20).
b. **Tree Form: This tree** has formed a single stem with DBH of 450mm and a dominant, a canopy that is 22m in height, with a crown spread of 12x16m.
c. **Structural Condition:** Average, retainable in the long term

Tree No's 51 & 52 are suppressed *Casuarina cunninghamiana* (see description of tree 47)

a. **Health & Vitality: –** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 20).
b. **Tree Form:** These trees have formed a single stems with DBH's of 120mm & 200mm and significantly asymmetrical canopies that are 13 - 18m
c. **Structural Condition:** Fair, retainable for 0 – 5 years

Tree No's 53 – 57 is a hedgerow of five (5) *Syzygium luehmannii:* 'Small-leafed Lillypilly is native to North Coast of NSW to North Qld, mostly in coastal gullies and on sandy flats. It can grow to 15m or more in its native habitat, with a small tufted crown. As a garden specimen, it forms an erect tree to 6m or so, with an irregular, medium-domed crown based on a single trunk which usually branches within 1 – 2m above the ground (Rowell 1980)

a. **Health & Vitality: –** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 21).
b. **Tree Form:** they combine to form a hedgerow with a north/south axis with a height of 16m and a crown spread of 16x10
c. **Structural Condition:** Average, retainable in the long term

Tree 58 is a mature *Jacaranda mimosifolia*: *'A deciduous tree from South America which grows to about 12-15m tall and as wide, with a single main trunk and a broad-domed twiggy head, forming a shapely shade tree and recognised as one of the world's most beautiful trees.'* (Rowel R.1980) *'Jacarandas make an ideal street tree and create a spectacular sight when in full bloom, but are rarely pruned correctly. They can develop large-diameter surface roots or numerous smaller diameter surface roots, especially in compacted, clay soil (Gilman 1997a) The 25 to 30cm diameter wounds left on the lower trunks after the pruning of large branches are very damaging to the tree, and usually lead to internal decay.'* (Gilman 1997b).

a. **Health & Vitality: Average –** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 21).
b. **Tree Form:** This tree has formed a single stem with DBH of 350mm and a codominant canopy with a bias towards the east that is 17m in height, with a crown spread of 13x15m.
c. **Structural Condition:** Average, retainable in the long term. Located on 155 – 157 Derby Street.

Tree 59 is a semi-mature *Acer palmatum*: 'Japanese Maple is a small deciduous tree to 4 – 8m tall, with a short trunk of 1m or so and a broad domed crown of irregular shape; a widely diversified species, with many fine cultivars with varying growth habit, shape, size and colour of leaves and colour of twigs' (Rowell, R.1980)

a. **Health & Vitality: –** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 21).
b. **Tree Form: –** it has formed here codominant stems; two with DBH's of 100mm and one with a DBH of 150mm. These combine to form an understory canopy that is 8m in height, with a crown spread of 11x10m.
c. **Structural Condition:** Average, retainable in the long term

Tree 60 is an over-mature *Corymbia citriodora*: 'Lemon Scented Gum can be expected to grow to 20-30m in height and is recommended for use in parks but not small gardens' (Rowell, R. 1980). 'An attractive tree with smooth bark and lemon scented leaves; can be a danger close to homes.'(Hadlington 1988) 'These are very beautiful trees, but may lose big limbs. They are not suitable for planting near houses or play areas, but are superb in large gardens' (Australian Plant Study Group 1984).

a. **Health & Vitality:** Poor **–** this canopy of this tree contains a significant amount of dieback of its 3rd and 4th order branches, and appears to be in advanced decline (see Plate 22).
b. **Tree Form:** This tree has formed a single stem with DBH of 550mm and combines with No's 61 & 62 to form a large, wide spreading canopy. It has a natural trunk lean of 25° towards the north and a significant asymmetrical canopy with a bias towards the north that is 32m in height, with a crown spread of 15x16m.
c. **Structural Condition:** Poor – die back within its canopy and mushrooms on its root crown are consistent with symptoms associated with root decay, and this may increase its failure potential (see Plates 23 & 24) Retainable for 0 – 5 years

Tree 61 is a mature *Corymbia citriodora*:

a. **Health & Vitality:** Average – the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 25).
b. **Tree Form:** This tree has formed a single stem with DBH of 700mm and combines with No's 60 & 61 to form a large, wide spreading canopy. it has formed a single stem with DBH of 700mm and a codominant canopy with a bias towards the south that is 24m in height, with a crown spread of 20x21m.
d. **Structural Condition: Poor –** Retainable for 0 – 5 years

Tree 62 is a mature *Corymbia citriodora*:

e. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline.
f. **Tree Form:** This tree has formed a single stem with DBH of 700mm and combines with No's 60 & 62 to form a large, wide spreading codominant canopy. It has formed a significant asymmetrical canopy with a bias towards the northwest that is 25m in height, with a crown spread of 18x20m.
g. **Structural Condition:** Poor **–** Tree No's 60 & 61 do not appear to be retainable, and their removal will expose the significantly asymmetrical canopy of this tree to unaccustomed wind loading, and this will increase its failure potential. Retainable for 0 – 5 years

Tree 63 is a mature *Macadamia integrifolia*: 'Queensland Nut occurs naturally on the coastal plains of southern Queensland. It is mostly seen in gardens as a small tree from 8 – 10 m tall, with a medium-domed leafy crown' (Rowell 1980)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline.
b. **Tree Form:** This tree has formed four (4) codominant stems with DBH's of 150mm and a codominant, canopy that is 13m in height, with a crown spread of 10x12m.

c. **Structural Condition:** Average, retainable in the long term

Tree 64 is an over- mature *Grevillea robusta*: 'Silky Oak is endemic to coastal gullies and forests from the mid North Coast of NSW to the Atherton Tablelands, Qld. It forms a tall, slender evergreen tree to 30m in its native habitat, but much shorter elsewhere (Rowell 1980). Due to its potential size and its susceptibility to limb breakage, especially as the wood becomes brittle with age, it should not be located close to houses. (Gilman 1997) It grows into a tall slender tree to 30m in its native habitat, but much shorter elsewhere. It occurs natively in coastal forests of Qld and northern NSW, mostly in deep fertile soils near permanent streams, although it adapts to drier, poorer soils elsewhere when grown as an ornamental.' (Rowell.1980). Due to the clay derived soils and low average rainfall of Western Sydney, *Grevillea robusta* is generally a short lived ornamental tree with a life span of about 25 years.

a. **Health & Vitality:** Poor **–** the foliage of this tree is very sparse and it appears to be in advanced decline (see Plate 26).
b. **Tree Form:** This tree has formed a single stem with DBH of 350mm and a canopy that is 22m in height, with a crown spread of 12x9m.
c. **Structural Condition:** Poor – Retainable for 0 – 5 years

Tree 65 is a semi-mature is a mature *Ligustrum lucidum* (see description of tree 2)

a. This species is a 'weed of National Concern in the Sydney Region – harmful to human health and the environment, and is listed as an exempt in Penrith DCP 2014
b. This tree should be removed

Tree 66 is a mature *Lophostemon conferta*: 'Brush-box occurs naturally in the coastal forests of NSW and Qld, between Port Stevens and the Tropic of Capricorn and on the eastern slopes of the Atherton Tablelands. In its native forest habitat it forms a tall, slender tree to 35-50m or more, with a pronounced straight trunk and a lofty crown of tufted foliage, but in the open, it forms a smaller, dense headed tree with a short trunk and a medium-domed crown to 15m or so. It requires deep, fertile, moist soil, often along or near a water course in the higher rainfall areas. When planted elsewhere, they are tolerant of a wide variety of soils but with a preference for the fertile loams or sandy soils with free drainage and a dependable water supply in summer.' (Rowell 1980)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate).
b. **Tree Form:** This tree has formed a single stem with DBH of 250mm and a suppressed, asymmetrical canopy with a bias towards the north that is 13m in height, with a crown spread of 8x8m.
c. **Structural Condition:** Fair – Retainable for 0 – 5 years

Tree 67 is an over- mature *Grevillea robusta*: (see description on tree 64)

a. **Health & Vitality:** Poor **–** the foliage of this tree is very sparse and it appears to be in advanced decline (see Plate 26).
b. **Tree Form:** This tree has formed a single stem with DBH of 250mm and a codominant canopy that is 14m in height, with a crown spread of 8x8m.
c. **Structural Condition:** Poor **–** Retainable for 0 – 5 years

Tree 68 is a mature *Lophostemon conferta*: (see description on tree 66)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 26)
b. **Tree Form:** This tree has formed a single stem with DBH of 200mm and a suppressed, asymmetrical canopy with a bias towards the northwest that is 14m in height, with a crown spread of 8x7m
c. **Structural Condition:** Fair – Retainable for 0 – 5 years

Tree 69 is a semi-mature is a mature *Ligustrum lucidum* (see description of tree 2)

a. This species is a 'weed of National Concern in the Sydney Region – harmful to human health and the environment, and is listed as an exempt in Penrith DCP 2014
b. This tree should be removed

Tree 70 is a mature *Corymbia citriodora*:

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 28).
b. **Tree Form:** This tree has formed a single stem with DBH of 700mm and combines with No's 71 & 72 to form a large, wide spreading codominant canopy. It has formed a single stem with DBH of 350mm and a heavily supresses, asymmetrical canopy with a bias towards the northeast that is 15m in height, with a crown spread of 12x6m.
c. **Structural Condition:** Average – the significant asymmetrical canopy of this tree is dependent on the retention of tree No. 71 & 72

Tree 71 is a mature *Corymbia citriodora*:

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 28).
b. **Tree Form:** This tree has formed a single stem with DBH of 700mm and combines with No's 70 & 72 to form a large, wide spreading codominant canopy. It has formed a single stem with DBH of 500mm and a heavily supresses, asymmetrical canopy with a bias towards the southwest that is 28m in height, with a crown spread of 18x10m.
c. **Structural Condition:** Average – the significant asymmetrical canopy of this tree is dependent on the retention of tree No. 70 & 72

Tree 72 is a mature *Corymbia citriodora*:

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plates 27 & 28).
b. **Tree Form:** This tree has formed a single stem with DBH of 700mm and combines with No's 70 & 71 to form a large, wide spreading codominant canopy. It has formed a single stem with DBH of 700mm and has a natural lean of 20° with a significant asymmetrical canopy towards the east. It is 26m in height, with a crown spread of 12x20m.
c. **Structural Condition:** Fair – The tall asymmetrical canopy of this tree overhangs a unit on 155 – 157 Derby Street, and a potential failure would most likely have catastrophic results

Tree 73 is a mature *Gleditsia triacanthos*: 'Honey Locust', a deciduous tree from eastern and southern USA which can grow to 30m tall, with ascending branches and an open, vase-shaped canopy, the trunk and branches are heavily armed with spines' (Rowell 1980)

a. **Health & Vitality:** Average **–** this is a deciduous species and it was dormant at the time of the inspection. However, an examination of the previous seasons of extension growth indicates that it's generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 29).
b. **Tree Form:** This tree has formed a single stem with DBH of 250mm and a codominant canopy that is 10m in height, with a crown spread of 10x12m.
c. **Structural Condition:** Average, retainable in the long term

Tree 74 is a mature *Gleditsia triacanthos*

a. **Health & Vitality:** Average **–** this is a deciduous species and it was dormant at the time of the inspection. However, an examination of the previous seasons of extension growth indicates that it's generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 29).
b. **Tree Form:** This tree has formed a single stem with DBH of 450mm and a codominant, asymmetrical canopy towards the north that is 24m in height, with a crown spread of 14x18m.
c. **Structural Condition:** Average, retainable in the long term

Tree 75 is a mature *Eucalyptus sideroxylon*: 'Mugga Mugga Ironbark: Small to medium sized woodland or forest tree widespread on the western slopes and plains of NSW, and west of Sydney towards the Blue Mountains' (Brooker & Kleinig 1993). 'It is a typical Ironbark, of erect form to 25m or so high when grown on better class soils, but shorter and denser to 10-12 m on dry ridges and poor, gravel soils, the branches and twigs pendulous. It is an attractive and useful species for parks, large gardens and roadside planting. (Rowell, R. 1980)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 30).

b. **Tree Form: –** it has formed a single stem with DBH of 550mm and a codominant, asymmetrical canopy with a bias towards the southeast that is 23m in height, with a crown spread of 14x14m.
c. **Structural Condition:** Average, retainable in the long term

Tree No's 76 & 77 are codominant *Casuarina cunninghamiana* (see description of tree 47)

a. **Health & Vitality:** Average **–** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 30).
b. **Tree Form:** These trees have formed a single stems with DBH's of 150mm and they combine to form a codominant canopy that is 16m in height, with a crown spread of 12x10m.
c. Structural Condition: Average, retainable in the long term

Tree No's 78 & 79 are codominant *Jacaranda mimosifolia*: (see description of tree 58)

a. **Health & Vitality:** Average **–** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 30).
b. **Tree Form:** These trees have formed a single stems with DBH's of 200 & 300mm and they combine to form a significant asymmetrical canopy towards the east that is 15m in height, with a crown spread of 14x14m.
c. **Structural Condition:** Fair **–** these trees is located on No. 159 Derby Street

Tree No's 80 & 81 are semi- mature *Melaleuca quinquenervia* (see description of tree 19)

a. **Health & Vitality:** Average **–** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 31).
b. **Tree Form:** They have both formed single stems with DBH of 250mm and natural trunk leans of 25° with significant asymmetrical canopies towards the east. They are 16m in height, with a combined crown spread of 10x5m.
c. **Structural Condition:** Poor – these trees are using the change rooms as support, and are likely to collapse when it is demolished. Retainable for 0 – 5 years

Tree 82 is a mature *Acmena smithii:* *'Lillypilly: occurs from Cape Howe to Cape York, growing on the margins of coastal streams and deep protected gullies. It forms an evergreen tree to 20m tall in its native habitat but smaller in the open, usually seen as a small tree to 8 – 10m tall with a single trunk and a medium domed crown of handsome appearance, especially when in fruit'* (Rowell, R. 1980).

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 33).
b. **Tree Form:** This tree has formed a single stem with DBH of 750mm and a codominant, asymmetrical canopy with a bias towards the north that is 20m in height, with a crown spread of 17x15m.
c. **Structural Condition:** Average – a large Camphor Laurel that was on 161 Derby Street combined with this tree to form a codominant canopy. Its subsequent removal has left this tree with an asymmetrical canopy towards the north. Retainable in the long term

Tree 83 is a mature *Acer saccharum*: '*Sugar Maple originates from Canada and north-eastern USA, and is a deciduous tree to 15m in height in Australia, but twice the size in its native habitat*' (Rowell 1980)

a. **Health & Vitality: –** Average **–** this is a deciduous species and was dormant at the time of the inspection. However, an examination of the previous seasons of extension growth indicates that it's generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 34).
b. **Tree Form:** This tree has formed five codominant ascending branches; two with DBH's of 300mm and three with DBH's of 150mm. These combine to form a codominant, asymmetrical canopy with a bias towards the east that is 15m in height, with a crown spread of 15x10m.
c. **Structural Condition:** Average, retainable in the long term

Tree 84 is a mature *Acer saccharum*: (see description of tree 83)

a. **Health & Vitality:** Low **–** this is a deciduous species and was dormant at the time of the inspection. However, its canopy is heavily suppressed by the more dominant form of tree No. 85 (*Liquidambar*) and it appears to be in declining health and vitality (see Plates 35 & 36).
b. **Tree Form:** This tree has formed six codominant ascending branches; three with DBH's of 300mm and three with DBH's of 150mm. These combine to form a codominant, asymmetrical canopy with a bias

towards the east that is 12m in height, with a crown spread of 14x10m.
c. **Structural Condition:** Fair, retainable in the medium term

Tree 85 is an over- mature *Liquidambar styraciflua* (see description of tree No. 24
a. **Health & Vitality:** Average **–** this is a deciduous species and was dormant at the time of the inspection. However, an examination of the previous seasons of extension growth indicates that it's generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 35).
b. **Tree Form:** This tree has formed a single stem with DBH of 900mm and a large dominant canopy that is 22m in height, with a crown spread of 28x32m.
c. **Structural Condition:** Poor – some of the wide spreading branches of this tree are receiving mechanical support from the dwelling within its dripline. The proposed demolition of the dwelling will remove this support, and will expose them and others to unaccustomed wing loading. This wil significantly increase their failure potentials. Retainable for 0 – 5 years

Tree 86 is a mature *Arbutus unedo*: 'Strawberry Tree is from southern Europe, Mediterranean region and Eire. A small evergreen tree to 6-8m, typically with a main trunk to 2-3m tall, and a broad-domed crown to 6-7m wide, the larger branches and trunk with colourful, red stringy bark, often spirally arranged.' (Rowell, R. 1980)
a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 37).
b. **Tree Form:** This tree has formed a single stem with DBH of 350mm and a codominant, asymmetrical canopy with a bias towards the south that is 8m in height, with a crown spread of 8x4m.
c. **Structural Condition:** Poor, this tree is receiving mechanical support from the brick boundary fence. It is likely to damage the fence, and has a high potential of failure if the fence is removed. Retainable for 0 – 5 years

Tree 87 is a semi-mature *Archontophoenix alexandrae*: Alexander palm is an attractive plant native to the rainforests of northern Queensland A large palm tree with a single trunk growing up to 30 m tall, and with a crown that contains a cluster of about 10-12 very large leaves. The grey trunk is up to 30 cm or more thick and ringed with noticeable leaf scars. The leaves are 3.5-4.5 m long on mature trees and have 60-80 narrow leaflets on each side. http://www.technigro.com.au/documents/WW%20Alexander%20palm.pdf
a. **Health & Vitality: –** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 38).
b. **Tree Form:** This tree is comprised of two stem with DBH's of 150mm, with a canopy that is 8m in height, with a crown spread of 4x4m.
c. **Structural Condition:** Average, retainable in the long term

Tree No's 88 - 90 is a mature hedgerow of *Cupressus sempervirens* (see description of tree 9)
a. **Health & Vitality:** Average – the foliage of these trees appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 39).
b. **Tree Form:** These trees form a hedgerow with a north/south axis that is 10 - 12m in height, with a crown spread of 6x3m.
c. **Structural Condition:** Fair, retainable in the medium term

Tree 91 is a mature *Lagerstroemia indica* (see description of tree No. 1)
a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline.
b. **Tree Form:** This tree has formed a multi-stemmed habit and a codominant, asymmetrical canopy towards the south that is 12m in height, with a crown spread of 7x12m.
c. **Structural Condition:** Average, retainable in the long term

Tree 92 is a mature *Jacarandar mimosifolia* (see description of tree No. 58)
a. **Health & Vitality:** Low – Twig and branch dieback in the outer canopy of this tree is indicative of declining health and vitality (see Plate 40).
b. **Tree Form: –** it has formed a single stem with DBH of 500mm and a dominant canopy that is 14m in height, with a crown spread of 15x13m.

c. **Structural Condition:** Poor **–** Two codominant first order branches at about 2m high on the main trunk have a weak junction with a high failure potential **(**see Plate 41**)** Retainable for 0 – 5 years

Tree 93 & 94 are mature *Photinia x fraseri* 'Robusta': A large evergreen shrub, 4 – 5m tall, with many stems from the short trunk forming a top-shaped bush, but frequently seen as a single-stemmed tree as a result of pruning.' (Rowell, R. 1980 Shrubs)

a. **Health & Vitality:** Average – the foliage of these trees appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 40).
b. **Tree Form:** They have formed multi-stemmed habits and combine to form codominant canopy that is 10m in height, with a crown spread of 13x10m.
c. **Structural Condition:** Average – retainable in the long term

Tree 95 is a semi-mature *Magnolia grandiflora*: 'Bull Bay Magnolia originates from the southern states of USA, around the Gulf of Mexico and north to Virginia. It forms an evergreen tree (usually less than 20m in height in Australia,) with a broad domed crown on a single trunk' (Rowell 1980)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline.
b. **Tree Form:** This tree has a multi-stemmed habit and a codominant canopy that is 9m in height, with a crown spread of 10x10m.
c. **Structural Condition:** Average – retainable in the long term

Tree 96 & 97 are mature *Camellia sasanqua*: 'A small evergreen tree to 6 – 8m tall in its native state, with a single trunk and elevated, conical crown 4 – 5m wide, but much modified in the modern cultivars to be tree-like, shrubby, drooping or pendulous. (Rowell 1980)

a. **Health & Vitality: –** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline.
b. **Tree Form: They have multi-stemmed habits and their** codominant canopies are 5m in height, with a crown spread of 10x8m.
c. **Structural Condition:** Average – retainable in the long term

Tree 98 is a mature *Bauhinia variegata:* 'Butterfly Bush' is an evergreen tree to 5 – 8m tall, with a short single trunk which divides into several large, erect branches to form a vase-shaped crown. It is well furnished with bilobed leaves when properly managed but often sparsely foliaged in cool climates, becoming almost deciduous in mid-winter, thus minimising the risk of frost injury' (Rowell, 1980)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 42).
b. **Tree Form:** This tree has formed three codominant stems with DBH's of 150mm and a codominant, asymmetrical canopy with a bias towards the east that is 14m in height, with a crown spread of 11x9m.
c. **Structural Condition:** Fair – retainable in the long term

Tree 99 is a *Hedera helix*: English Ivy

a. This is a climbing plant and is not relevant to this tree survey

Tree 100 is a mature *Melaleuca decora*: 'This Paperbark grows to about 8 metres tall and is common on the Cumberland Plain, especially on swampy ground or heavy clay soils that are subject to occasional flooding. (Fairley & Moore 1989)

a. **Health & Vitality:** Average – the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 43).
b. **Tree Form:** This tree has formed a single stem with DBH of 300mm and a heavily suppressed, asymmetrical canopy with a bias towards the north that is 14m in height, with a crown spread of 8x9m.
c. **Structural Condition:** Poor – retainable for 0 – 5 years

Tree 101 is a mature *Morus nigra*: 'Black Mulberry' is a native to southwestern Asia and forms a medium to large deciduous tree to 15m in height, usually based on a stout single trunk and low-placed branches supporting a medium-domed, leafy crown' (Rowell 1980).

a. Average **–** this is a deciduous species and was dormant at the time of the inspection. However, an

examination of the previous seasons of extension growth indicates that it's generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 43).

b. **Tree Form: –** it has formed a single stem with DBH of 150mm and has been heavily suppressed by the more dominant trees on its southern side. This has resulted in a natural lean of 25° with a significantly suppressed, asymmetrical canopy towards the north that is 8m in height, with a crown spread of 5x7m.
c. **Structural Condition:** Poor – retainable for 0 – 5 years

Tree No's 102 - 104 is a codominant stand of semi-mature *Cinnamomum camphora:* 'Camphor Laurel originates from China, Japan, Taiwan and neighbouring islands. It forms an evergreen tree to 15 – 20m in height, slender domed at first, becoming broad-headed to 15m in width at maturity, the trunk short and massive, the canopy with a closed but somewhat billowing surface' (Rowell 1980)

a. **Health & Vitality:** Average **–** the foliage of these trees appear to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plates 43 & 45).
b. **Tree Form:** They have formed a multiple stems with DBH's of 100 - 200mm and a large codominant, canopy that is 19m in height, with a crown spread of 22x14m.
c. **Structural Condition:** Fair – retainable in the medium term

Tree 105 is a mature *Lagerstroemia indica* (see description of tree No. 1)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plate 44).
b. **Tree Form:** This tree has been heavily suppressed by a more dominant Broad-leaved Privet growing beside its rootcrown. It has formed a multi-stemmed habit stem with a significant asymmetrical canopy towards the south that is 10m in height, with a crown spread of 6x10m.
c. **Structural Condition:** Poor – retainable for 0 – 5 years

Tree 106 is a mature *Ligustrum lucidum* (see description of tree 2)

a. This species is a 'weed of National Concern in the Sydney Region – harmful to human health and the environment, and is listed as an exempt in Penrith DCP 2014
b. This tree should be removed

Tree 107 is a mature *Lagunaria patersonia*: 'Norfolk Island Hibiscus is an evergreen tree from the South Pacific which grows to 15m or so tall, with an erect main trunk and a shapely conical crown 6 – 8m wide, with abundant foliage' (Rowell 1980) 'Throughout the warmer months, it produces rose-pink to white flowers that look like small hibiscuses, to which it is closely related. These are followed by rough, inedible fruit about the size of a ping-pong ball, which are lined with barbed hairs that can be irritating to both man and beast. Early colonists called it the cow-itch tree' (Macaboy1979)

a. This species is a 'weed of National Concern in the Sydney Region – harmful to human health and the environment, and is listed as an exempt in Penrith DCP 2014
b. This tree should be removed

Tree 109 – 114 is a hedgerow of *Ligustrum lucidum* (see description of tree 2)

a. This species is a 'weed of National Concern in the Sydney Region – harmful to human health and the environment, and is listed as an exempt in Penrith DCP 2014.
b. This tree should be removed

Tree 115 is a mature *Magnolia x soulangiana*: 'The collective name for the interspecific hybrid progeny of *M. dendata* and *M. liliiflora.* It is an erect, deciduous tree to about 5 – 8m tall and 4-5m wide, usually growing on a single trunk but with low lateral branches' (Rowell 1980)

a. **Health & Vitality:** Average **–** this is a deciduous species and was dormant at the time of the inspection. However, an examination of the previous seasons of extension growth indicates that it's generally healthy and growing vigorously, with no visible symptoms of decline
b. **Tree Form:** This tree has formed a multi-stemmed habit and an understory canopy that is 8m in height, with a crown spread of 8x8m.
c. **Structural Condition:** Average – retainable in the long term

Tree 116 is a mature *Camellia sasanqua*: (see description of tree No. 96)

a. **Health & Vitality:** Average **–** the foliage of this tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline.
b. **Tree Form:** This tree has formed a multi-stemmed habit and an understory canopy that is 7m in height, with a crown spread of 8x8m
c. **Structural Condition:** Average – retainable in the long term

Tree 117 – 121 form a codominant row of mature *Lophostemon conferta*: (see description on tree 64)

a. **Health & Vitality:** Average **–** the foliage of these tree appears to be generally healthy and growing vigorously, with no visible symptoms of decline (see Plates 46 & 47).
b. **Tree Form:** They form a codominant row of street trees that is 13m in height, with average crown spread of 6x6m.
c. **Structural Condition:** Average – retainable in the long term

4.4 Site Photographs

Plate 1 – showing tree No's 2 – 6 (Privets)

Plate 2 – showing tree No's 9 – 11

Plate 3 – showing tree No. 9 (over-mature hedgerow)

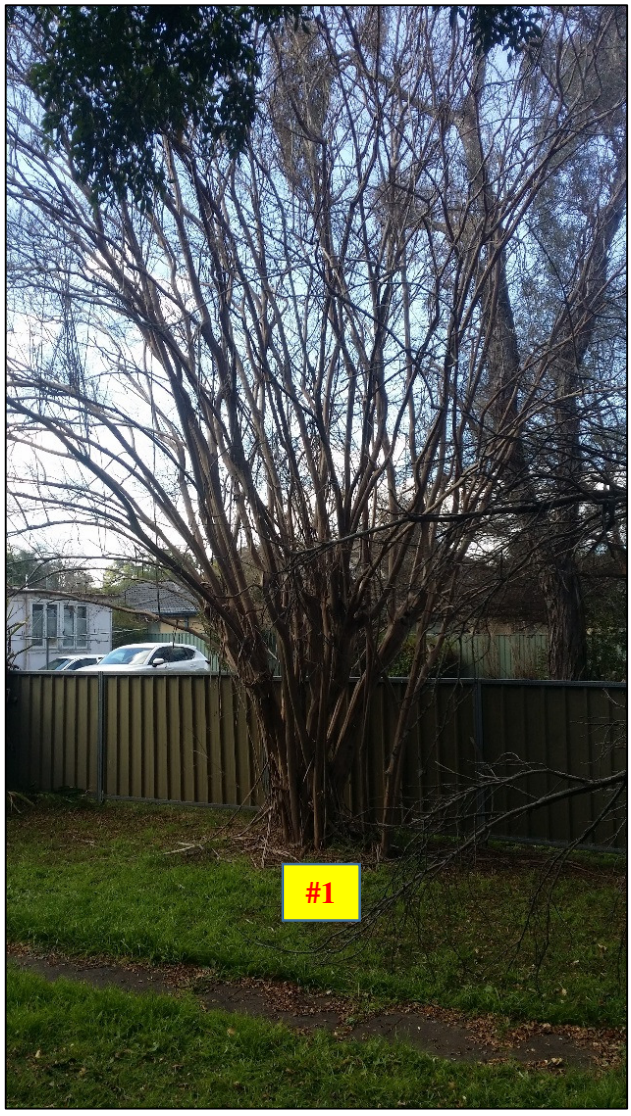


Plate 4 – showing tree No. 1

Plate 5 – showing tree No. 15 (mature hedgerow)

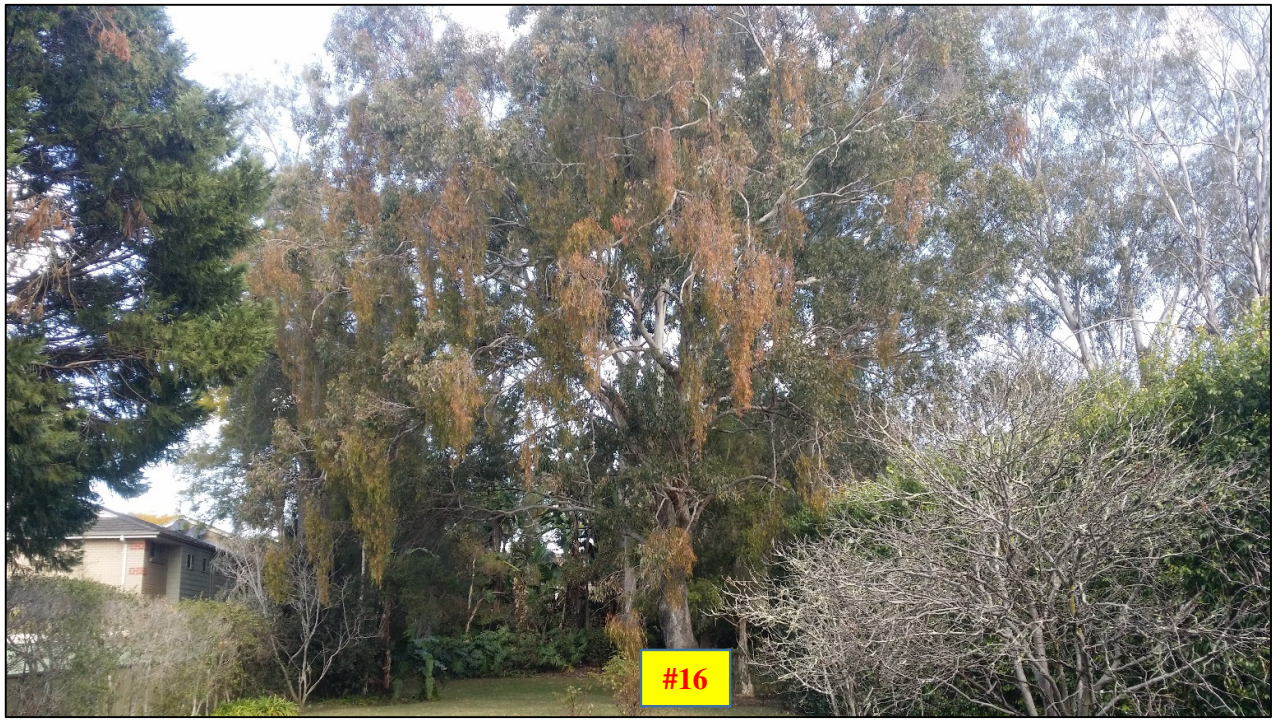


Plate 6 – showing tree 16 with a significant colonisation of mistletoe

Plate 7 – showing tree No. 17

Plate 8 – showing tree No. 18, in advanced stages of decline

Plate 9 – Armillaria Root Decay on trunk of tree 18

Plate 10 – codominant stand of tree No's 20 - 23

Plates 11 & 12 – showing dieback and decline of tree No's 21 - 23

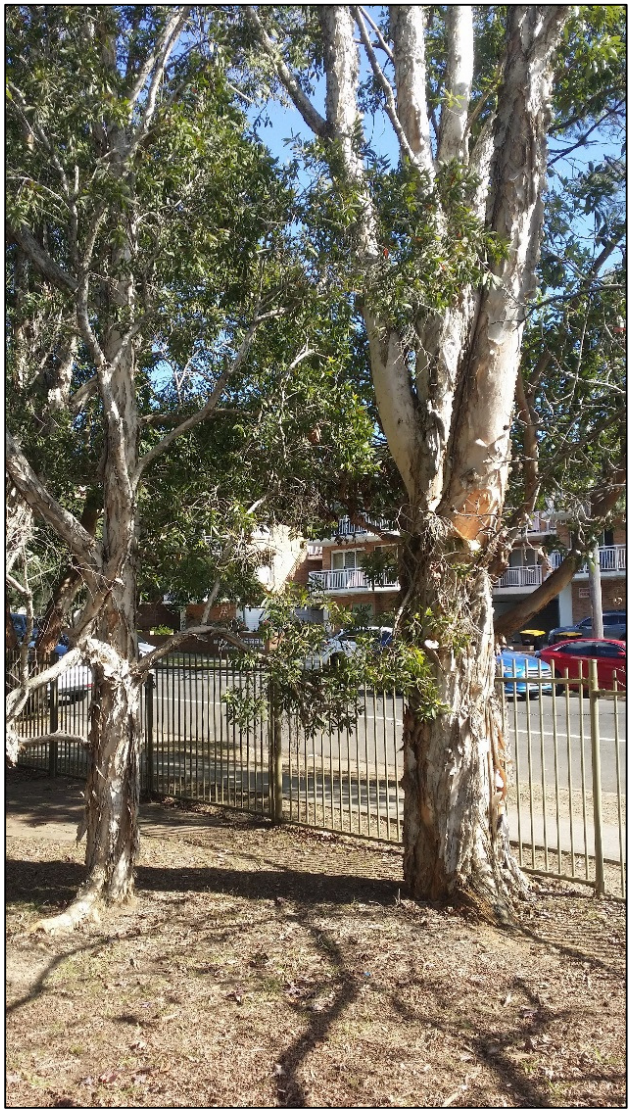
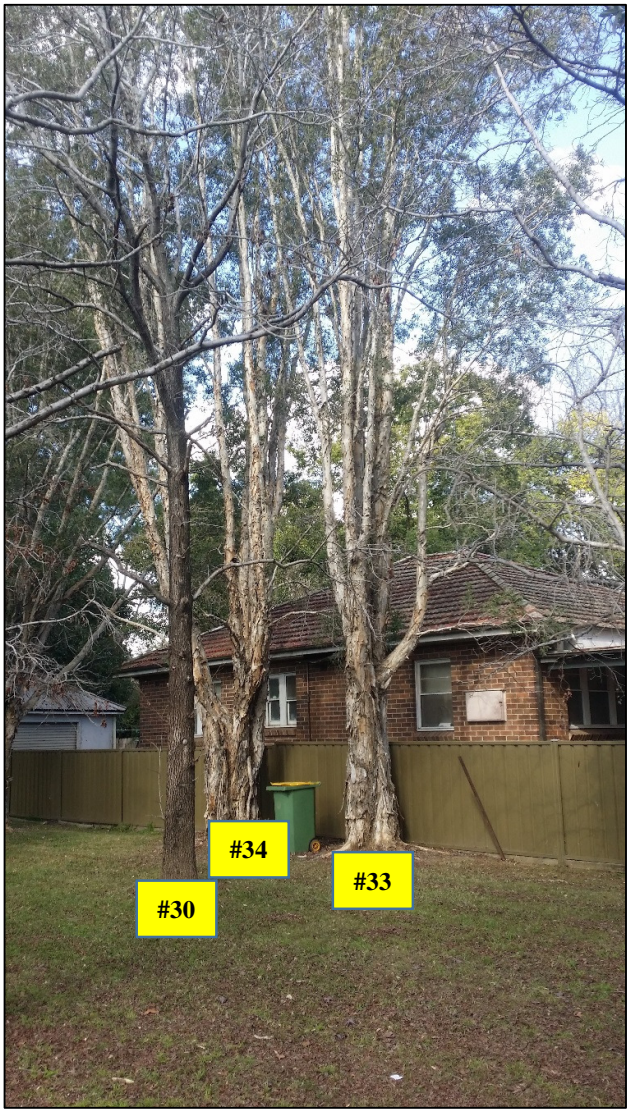


Plate 13 – showing tree No's 26 & 27

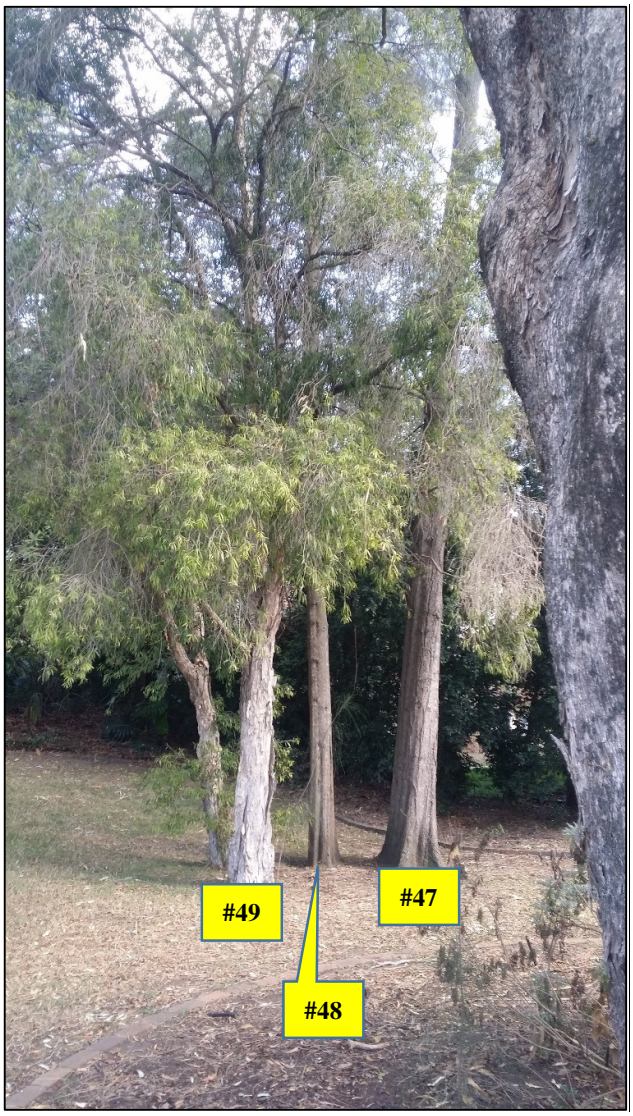
Plate 14 – showing tree No. 28

Plate 15 – showing tree No's 24, 28, 29 & 30



Plates 16 & 17 – showing the codominant stands of tree (No's 33 & 34) and tree (No's 32, 35 & 36)

Plate 18 – showing codominant stand of tree No's 37 - 40



Plates 19 & 20 – showing tree No's 47 – 52

Plate 21 – showing tree No's 52 – 57 (hedgerow)

Plate 22 – showing canopy of tree 60, in advanced stages of decline, with a natural trunk lean of 30° towards the north

Plates 23 & 24 – showing fruiting bodies of *Meripilus* on rootcrown

Plate 25 – sap weeping from junction in of tree 61

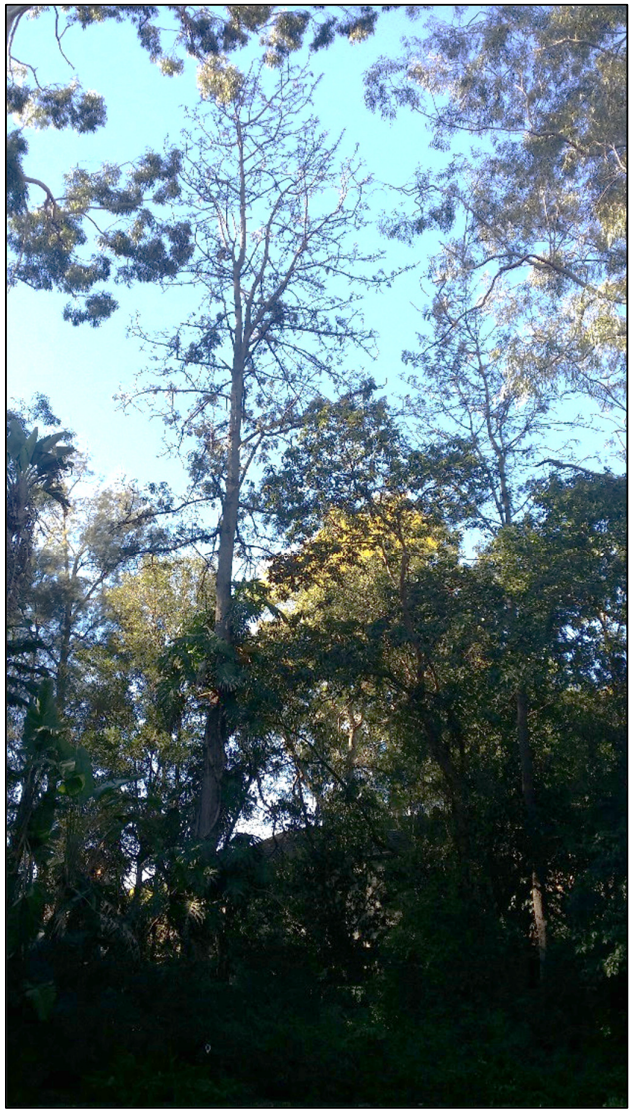


Plate 26 – showing dieback in canopy of tree No's 64 & 68

Plate 27 – showing significant asymmetrical canopy of tree No. 72

Plate 28 – showing codominant stand of tree No's 70 – 72

Plate 29 – showing codominant canopies of tree No's 73 & 74

Plate 30 – showing tree No's 75 – 79


Plates 31 & 32 – showing tree No's 80 & 81, with a sigificant lean towards the east

Plate 33 – showing tree 82

Plate 34 – showing tree 83

Plate 35 – showing tree No's 84 & 85

Plate 36 – showing tree 84

Plate 37 – showing tree 86

Plate 38 – showing tree 87

Plate 39 – showing tree No's 88 - 90

Plate 40 – showing trees 91 - 93

Plate 41 – showing tree 91

Plate 42 – showing tree 98

Plate 43 – showing tree No's 100 - 104

Plate 44 – showing tree No's 105 & 106

Plate 45 – showing tree No's 102 – 104

Plate 46 – showing tree No. 107

Plate 47 – showing tree No. 108

Plate 48 – showing tree No's

Plate 49 – showing tree No's

4.5 Retention Values

Sustainable Retention Index Value (SRIV©) considers its age class, condition class, vigour class and its sustainable retention with regard to the safety of people or damage to property. The ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement is also considered (See Matrix in Appendices 9.2).

Unfortunately, like all methodologies used to assess trees, not all trees fit neatly into a category. For example, SRIV doesn't give consider the negative attributes that an individual tree may have, or of its suitability for the location.

Long term retention: Retainable for more than 40 years or more

- Tree No's 1, 8, 13, 15 – 17, 24 – 40, 47 – 49, 53 – 59, 63, 73 – 79, 82 – 84, 87, 88 – 91, 93 – 97, 102 – 104, 108, & 117 – 121 have retention value of MGVG (10); Mature tree with Good Vitality and in Condition with a retention value index of 10 – suitable for long term retention

Medium Term Retention: Retainable for 15 – 40 years or more

- Tree No's 19, 20,48, 51 & 52, 66, 68, 98, have retention values of MGVF(9); Mature tree with Good Vitality and in Fair Condition with a retention value index of 9 – suitable for medium term retention

Short Term Retention: Retainable for less than 15 years

- Tree No's 61, 62, 68, 70 – 72, 80 & 81, 85, 86 100, 101, 105, have retention values of MGVP(5); Mature tree with Good Vitality and in Poor Condition with a retention value index of 5 – suitable for short term retention

- Tree No's 9 & 19 have retention values of MLVF(4); Mature tree with Low Vitality and in Fair Condition with a retention value index of 4 – suitable for short term retention

Unsuitable for Retention: likely to be removed immediately or within 5 years

- Tree No's 60, 61, 64, 67& 92 have retention values of MLVP(0); Mature tree with Low Vitality and in Poor Condition with a retention value index of 0 – likely to be removed immediately or within 5 years

- Tree No. 21 have retention values of MPVP(0); Mature tree with Poor Vitality and in Poor Condition with a retention value index of 0 – likely to be removed immediately or within 5 years

Exempt Species:
The retention Values of these trees have not been calculated, and it is assumed that they will be removed. This category includes tree No's 2 – 7, 10 –12, 41 – 45, 65, 69, 106, 107, 108 (within 2m of a dwelling) & 109 – 114

4.6 Safe Life Expectancy of the Tree (TreeA/Z)

'TreeAZ' is a systematic method of assessing whether individual trees are important, and how much consideration should be given to them in management decisions. It views each tree as being worthy of 'consideration' in the planning process, not automatically as a 'constraint' on development. Each tree is considered against a standard list of thirteen (13) negative attributes. If a tree fails any of these tests, it is categorised as 'Z' and further analysis stops. If it passes all attributes, it is categorised as 'A', and is then viewed as a constraint on the development (See Tree A/Z Categories in Appendices 9.3).

Tree No's 2 – 7, 10 & 11, 41 – 46, 65, 69, 106, 107, 108 (within 2m of a dwelling) & 109 – 114 have SULE Rating of Z1 – Exempt Species (invasive or noxious species)

Tree No. 9 (Cypress hedgerow), 14, 18, 21, 22, 64, 67 & 92 have SULE Rating of Z4 – Dead, dying, diseased or declining

- **Explanation: '***Trees that should be removed despite statutory protection because they are in poor health, poor structural condition or otherwise unstable. The condition must be terminal with no obvious potential to recover, i.e. severe crown dieback related to excavation damage or root decay to the extent that the structural branch framework is compromised. This would also apply to diseases with no practical cure'* (Barrell (2006).

Tree No's 60 – 62, 70 – 72, 80, 81, 100 & 101 have SULE Ratings of Z5 – Severe damage or structural defects that cannot be properly addressed by remedial care including cavities, decay, weak junctions, wounds and excessively unbalanced

- **Explanation:** '*Severe means that there is no realistic chance of the tree achieving its full potential with an acceptable level of risk. In many cases, acceptable levels of risk can be achieved by dramatic reduction in tree size, but this has severe health, maintenance cost and amenity implications, so it would not be considered to be a sustainable management option'* (Barrell (2006).

Tree No. 19, 20, 23 & 85 has a SULE Rating of Z6 – Present or future instability because of poor anchorage or increased exposure

- **Explanation:** '*Alterations to tree exposure to the wind occurs because of changes in the shelter provided by adjacent objects such as buildings or other trees. This primarily applies to maturing and mature trees that have greater sail areas to catch the wind and established root systems that are less able to adapt to changes than younger trees. This often applies to groups of trees where one large dominant tree will be lost because of poor health or a structural problem, dramatically exposing the remaining trees in the group'* (Barrell (2006).

Tree No's 48, 51, 52, 66, 68 & 96, 102 – 104 have SULE Rating of Z8 – Poor tree with no realistic potential to improve

- **Explanation**; '*It is common to find trees that are obviously unsuitable for long term retention for many reasons, including poor health, sever imbalance, tall, thin forms, or they have no realistic potential to improve. However, the problems are not so severe that they represent an immediate risk, and they shouldn't be discounted for this reason. The Z8 category is for these trees and relies on the principle of sustained amenity to justify the allocation. The short term retention of a tree that is obviously not going to improve and poses an ongoing level of risk is not good tree management and is just delaying its inevitable removal*' (Barrell (2006).

Tree No's have SULE Ratings of **A1** – No significant defects and could be retained with minimal remedial care 1, 8, 13, 15 – 17, 24 – 40, 47, 49, 50, 53 – 59, 63, 73 – 79, 82 – 84, 87, 88 – 91, 93 – 97 & 117 – 121

5.0 DISCUSSION

This preliminary tree survey and summary report has been prepared in accordance with Clause 5.9 of Penrith LEP 2010 to allow the siting and layout of the proposed development to consider, at the initial concept stage, the location of trees and other vegetation and favour their retention.

This has been achieved by

- A summary of the Retention Values of the trees that is provided in Section 4.5
- An estimate of their Safe Live Expectancies is provided in Section 4.6
- Their recommended Tree Protection Zones and Structural Root Zones , in accordance with AS 4970, are provided in the Tree Survey Sheets in Section 10

In my opinion, the Retention Value Assessment in Section 4.5 doesn't give adequate considerations to the negative attributes that an individual tree may have, or of its suitability for the location. For example. Tree No. 62 in this report is in good health, but poor structural condition, and is suitable for short term retention. Due to the large size of the defective part, I would recommended that a tree in this condition be removed as soon as practically possible

For this reason, I prefer and recommended the TreeA/Z Assessment, provided in Section 4.6 as it considers more structural issues that should be considered on a proposed development site.

5.1 Trees considered unsuitable for retention

5.1.1 Exempt Species (invasive or noxious species)

The following trees are exempt from Clause 5.9 of Penrith LEP 2010

- Tree No's 2 – 7, 10 & 11, 41 – 46, 65, 69, 106, 107 & 109 – 114 are listed as exempt species, and Clause 5.9 of Penrith LEP 2010 does not apply

- Tree No. 108 (within 2m of a dwelling) and Clause 5.9 of Penrith LEP 2010 does not apply

5.1.2 Hazardous Trees:

The following tree were identified as being potentially hazardous

- **Tree No. 60 (*Corymbia citriodora*)** has significant dieback in its canopy and fruiting bodies of root decaying fungus on its root crown. The type of fungus was not identified, but another tree in close proximity (No. 18) has typical symptoms associated with Armillaria Root Decay (see additional information in Appendices 9.8)

- **Tree No. 61 (*Corymbia citriodora*)** has a two equal sized, codominant ascending branches at about 15m high on the main trunk. Staining along the trunk beneath this junction is a symptom of an internal crack, and it has a possible to imminent potential of failure (see Appendices 9.10 & 9.11)

- **Tree No. 62 (*Corymbia citriodora*)** has been heavily suppressed by the more dominant forms of No's 60 & 61. This has resulted in the formation of a significant asymmetrical canopy towards the northwest, and it will have a probable to imminent potential of failure if the more dominant trees are removed.

  'Trees that develop naturally with a lean may be as strong and stable as an upright tree due to the development of reaction wood and compensating root growth. Natural leans can develop in trees along the edge of a stand. Such trees are not prone to failure unless the adjacent trees are removed, exposing the leaning tree to unaccustomed wind stress' (Matheny & Clarke 1991)

  'A sudden increase in exposure to wind is another factor that can lead to the failure of trunks and branches whose support has been provided partly by reaction wood. This problem often arises when neighbouring trees are felled, or when tall buildings are erected or demolished. In some cases, the neighbouring trees may have also provided direct physical support' (Lonsdale 1999).

- **Tree No's 71 and 72 (*Corymbia citriodora*)** both have significant asymmetrical canopies, and their retention will be dependent on the retention of Tree No. 72. The removal of No. 72 will expose the edge type canopies of the remaining trees to uncustomed wind loading, and this will increase their failure potentials.

- **Tree No. 72 (*Corymbia citriodora*)** has formed a significant asymmetrical canopy towards the east, and most of its tall canopy overhangs a unit on No. Derby Street. The potential for a whole tree failure is considered unlikely at this stage, but the species is prone to Summer Branch Drop (see Appendices 9.12)

- **Tree No's 80 & 81 (*Melaleuca quinquenervia*)** are semi-mature trees with ° leans towards the east. They are being supported by the change rooms within their driplines, and the proposed demolition of this building will result in probable to imminent failures

- **Tree No. 85 (*Liquidamber styraciflua*)** is a mature tree with a wide spreading canopy. Some of these branches are receiving mechanical support from the dwelling in its dripline, and the proposed demolition of this building will result in probable to imminent failures

- **Tree No. 92 (*Jacarandar mimosifolia*)** is an over-mature tree with two equal sized diameter, codominant ascending branches and a partially failed weak junction. This has a probable to imminent failure potential.

5.1.3 Dead and declining trees

The following tree were identified as being dead or in decline

- **Tree No. 9 (Cupressus *sempervirens*)** is an over-mature hedgerow. They have typical symptoms associated with Cypress Canker, of which there is no effective control (see Appendices 9.7)

- **Tree No. 18 (*Eucalyptus moluccana*)** is in advanced stages of decline and has typical symptoms of Armillaria Root Decay (see Appendices 9.8)

- **Tree No's 21 (*Melaleuca quinquenervia*)** This tree is dead and is exempt from Clause 5.9 of Penrith LEP 2010

- **Tree No. 22 & 23 (*Melaleuca quinquenervia*)** have sparse foliage, and appear to be in declining health and vitality (see Appendices 9.9)

- **Tree No. 64 & 67 (*Grevillia robusta*)** are in advanced stages of decline. Treatment and or tree surgery techniques are unlikely to increase their safe life expectancies (see Appendices 9.9)

5.1.4 Trees with poor structural forms and are unlikely to improve

- **Tree No's 19 & 20 (*Melaleuca quinquenervia*)** – these trees have suppressed asymmetrical forms that will become recently exposed edge-type trees after No's 18, 20 & 23 are removed

- **Tree No's 48, 51 & 52 (*Casuarina cunninghamiana*) –** these trees have very tall thin canopies, with canopies that lean out of the stand

- **Tree No's 66 & 68 (*Lophostemon conferta*)** – these trees have suppressed asymmetrical forms that will become recently exposed edge-type trees after No's 67, 69 & 70 are removed

- **Tree No's 100 & 101 –** these trees have heavily suppressed, edge type canopies towards the north

- **Tree No's 102 – 104 (*Cinamomum camphora*) –** these are a codominant stand of trees that have originated from suckers on an old stump. They are unsuitable for long term retention

5.2 Tree considered suitable for retention

This assessment determined that Tree No's 1, 8, 13, 15 – 17, 24 – 40, 47, 49, 50, 53 – 59, 63, 73 – 79, 82 – 84, 87, 88 – 91, 93 – 97, & 117 – 121 have SULE Ratings of A1 – No significant defects and could be retained with minimal remedial care.

- **Low Amenity & Ecological Values:** Tree No's 1, 8, 13, 58, 87, 95, 98, 114 and 115 are suitable for long term retention, but have limited ecological and amenity values. Their proposed removals may be considered to be justified for design layout purposes.

- **Tree No. 16 (*Eucalyptus moluccana*)** has been heavily colonised by mistletoe, and this is often associated with an irreversible decline spiral of this species in the local area. Careful consideration should be given to the practicality of trying to retain this tree in the long term.

- **Boundary Screening:** Tree No's 15 (hedgerow), 53 – 57 (hedgerow) 76, 77, 96 & 97 provide screening along property boundaries. Tree No's 87 – 90 are located on No. Derby Street, and also provide boundary screening. A priority should be made to retain these trees.

- **Tree No's 117 – 121 (*Lophostemon conferta*) –** these are council owned street trees, and their safe life expectancies are unlikely to compromised by the proposed development, if appropriate tree protection methods are utilised

6.0 CONCLUSIONS & RECOMMENDATIONS

6.1 Conclusions

- Tree No's 1, 8, 13, 15 – 17, 24 – 40, 47, 49, 50, 53 – 59, 63, 73 – 79, 82 – 84, 87, 88 – 91, 93 – 97, & 117 – 121 have SULE Ratings of A1 – No significant defects and could be retained with minimal remedial care.

- Tree No's 2, 9 – 11, 18 – 23 41 – 46, 48, 51, 52, 60 – 62, 64, 67, 69 – 72, 80 & 81, 85, 86, 92 & 98 - 114 are not considered suitable for retention.

6.2 Recommendations

- This preconstruction survey should be used as a basis to select trees to be retained within the proposed development.

- Trees scheduled to be retained should be shown on the proposed site plan, and their Tree Protection Zones and Structural Root Zones of each tree should be included

- This will assist in the preparation of any required Arboricultural Impact Assessment.

If you require any further information, please feel free to contact me on 0439 758 658.

Lawrie Smith,
Arboricultural Consultant

7.0 REFERENCES

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8.0 TERMINOLOGY

8.1 AGE – Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as Young, Mature and Over-mature.

- **Young** Tree aged less 20% of life expectancy, in situ
- **Mature** Tree aged 20-80% of life expectancy, in situ.
- **Over-mature** Tree aged greater than >80% of life expectancy, in situ, or senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.

8.2 VIGOUR – The ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. dormant, deciduous or semi-deciduous trees. Vigour can be categorized as High Vigour, Average Vigour, Low Vigour and Poor Vigour Dormant Tree Vigour.

- **Average Vigour –** Normal ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

- **Low Vigour –** Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance to predation. This is independent of the structural condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

- **Poor Vigour –** Significant dieback of canopy and other symptoms associated with advanced stages of decline.

8.3.1 TREE FORM

This refers to the growth habit of a tree, including its trunk and main structural branches, and their potential for failure (Modified from Matheny & Clarke 1998)

- **Asymmetrical**

- **Co-dominant** – Trees that define the general upper edge of the canopy, receiving light primarily from above.

- **Dominant** – Trees with crowns above the upper layer of the canopy and generally receiving light from above and the sides.

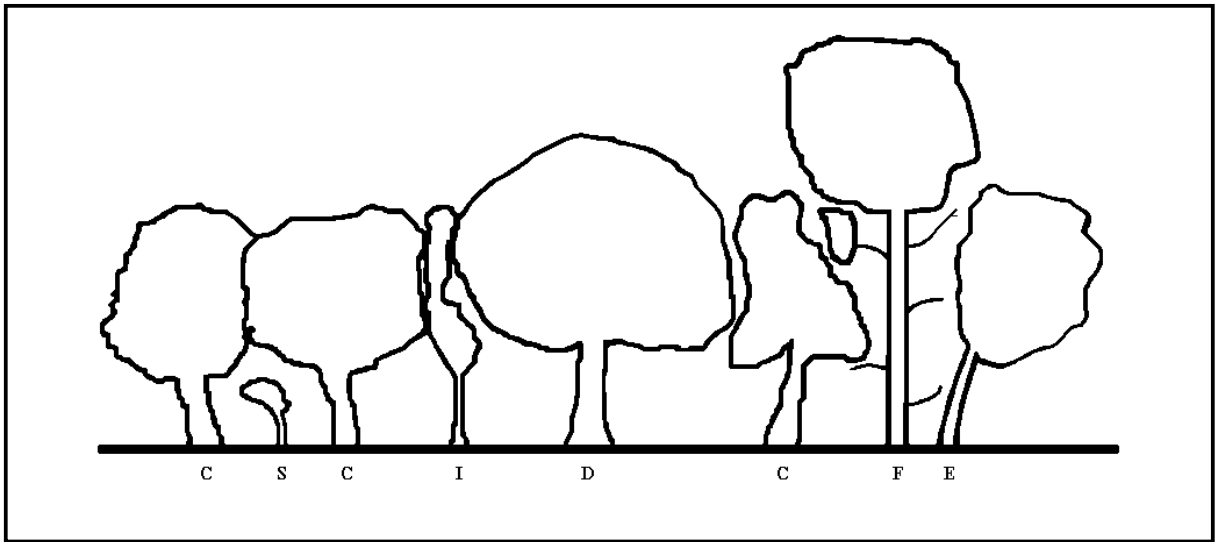
- **Edge-Type** – Trees located on the edge of a more dominant canopy, and frequently possessing asymmetrical canopy (heavier on the open side) and trunks that bow out of the stand

- **Forest-type** – Trees that have grown in a forest setting and only have about 1/3 of their canopy located on tall straight trunks

- **Intermediate** – Trees that have been largely overtopped, but may receive some light from above.

- **Suppressed** – Trees that have been overtopped, and become part of the understorey canopy

- **Understorey** – Small trees and shrubs that form the understorey canopy.



D – Dominant I – Intermediate C – Co-dominant F – Forest
S – Suppressed E – Edge U – Forms part of the understorey canopy

8.4 FAILURE POTENTIAL – This refers to the growth habit of a tree, including its trunk and main structural branches, and their potential for failure.

- **Good –** Trees with a single dominant trunk along which evenly spaced branches are spread. Branches have properly formed collars which provide strong attachment to the trunk, and are about 25% of the trunk diameter. Minor structural defects may be present with low failure potentials.

- **Average –** Trees with structural defects with low failure potential

- **Fair –** Trees with structural defects with medium failure potentials and require monitoring on an annual basis.

- **Poor –**Trees with defects which have failed, or have a high risk of failing soon, and corrective action must be taken as soon as possible.

8.5 STRUCTURAL CONDITION – A tree's crown form and growth habit, as modified by its environment (aspect, suppression by other trees, soils), the stability and viability of the root plate, trunk and the 1st & 2nd order structural branches, including structural defects such as wounds, cavities or hollows, crooked trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with vigour and it is possible for a tree to be of normal vigour but in poor condition. Condition can be categorized as Good Condition, Fair Condition, Poor Condition and Dead.

- **Good Condition** Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from, or contributed to by vigour.

- **Fair Condition** Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival.

  Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from, or contributed to by vigour.

- **Poor Condition** Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage

e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition.

Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from, or contributed to by vigour.

- **Dead TREE** – The tree is no longer capable of performing any of the following processes, or is exhibiting any of the following symptoms;
  - **Processes**
    - Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves);
    - Osmosis (the ability of the roots system to take up water)
    - Turgidity (the ability of the plant to sustain moisture pressure in its cells);
    - Epicormic shoots or epicormic strands in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a lignotuber);

  - **Symptoms**
    - Permanent leaf loss;
    - Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots);
    - Shedding of the epidermis (bark desiccates and peels off to the beginning of the sapwood).

8.6 SAFE LIFE EXPECTANCY – The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as Immediate, Short Term, Medium Term and Long Term.

- **Short Term** Period of time less than 15 years.
- **Medium Term** Period of time 15 - 40 years.
- **Long Term** Period of time greater than >40 years.

9.0 APPENDICES

9.1 QUALIFICATIONS & EXPERIENCE OF AUTHOR

QUALIFICATIONS

- Graduate Certificate in Bushfire Design, University of Western Sydney (2012)
- Diploma in Conservation & Land Management (AQF 5), Hortus Australia (2005)
- Advanced Diploma of Horticulture (Arboriculture – AQF 6), Hortus Australia (2002).
- Small Business Enterprise Certificate, Blue Mountains TAFE (1996).
- Certificate in Tree Care, Lynnfield West (1995).
- Tree Surgery Certificate, Ryde School of Horticulture (1990).
- Certificate in Horticulture, Wollongong TAFE (1987).

WORK HISTORY

- 1998 – Present Self-*employed as an Arboricultural Consultant.*
- 2000 – 2002. *Tree Management Officer,* Blue Mountains City Council.
- 1984 – 1998. *Self employed as a Practicing Arborist.*
- 1977 – 1978. *Tree pruning and removal,* SEC Victoria.
- 1975 – 1976. *Tree maintenance*, Queensland Forestry Commission.

FURTHER TRAINING

- Attendance of the following seminars or conferences;
    1. ISA Tree Risk Assessment Qualification (Renewal) Parramatta (2018)
    2. ICAA Concept to Construction, Parramatta (2017)
    3. Introduction to Risk Management –AS/NZS ISO 31000: 2009 (SAI Global 2014)
    4. ISA Tree Risk Assessment Qualification (TRAQ) Melbourne (2013)
    5. EIANZ Environmental Expert Professional Development Course (Sydney 2013)
    6. HEDRA Workshop (Sydney 2012)
    7. ISA National Conference Newcastle (2009)
    8. Tree Roots in the Built Environment, J. Urban (2008)
    9. *Phytophthora cinnamomi* – Workshop (2008)
    10. Trees on Construction Sites Workshop by J. Barrell (2006)
    11. ISA National Conference, Parramatta (2004)
    12. 5 Day Scientific Workshop on Tree Pathology and Wood Decay by F. Schwarze (2004)
    13. Safe Trees Seminar by Ed Hayes (2002)
    14. ISA National Conference, Melbourne (2002)
    15. Advanced Lecture on Visual Tree Assessment by Dr Claus Mattheck (2001)
    16. Trees for Urban Landscapes (2000)
    17. Assessing Hazardous Trees & their Safe Useful Life Expectancy (1997)

PROFESSIONAL ASSOCIATIONS

- International Society of Arboriculture (#152238)
- Fire Protection Association Australia (#26890)

9.2 SUSTAINABLE RETENTION INDEX VALUE (SRIV) ©

SRIV © provides a dual method of objectively rating the viability of urban trees for development sites based on general tree and landscape assessment criteria, and a numeric index for each tree as a tree management tool.

It is designed as an objective system based on set criteria to replace previous subjective systems, and is based on the principle of sustaining trees in the urban environment including remnant forest trees, but does not cover social aspects of trees, or hedges. Dead trees and environmental or noxious weed species are not considered as removal of these trees is generally encouraged.

The Glossary details the definitions for terms to be used with the SRIV© system are provided in Section 8, and are taken from the Institute of Australian Consulting Arboriculturists (IACA) © Dictionary for Managing Trees in Urban Environments[1].

9.2.1 SRIV Matrix

Good Vigour & Good Condition	**Good Vigour & Fair Condition**	**Good Vigour & Poor Condition**	**Low Vigour & Good Condition**	**Low Vigour & Fair Condition**	**Low Vigour & Poor Condition**
(GVG)	**(GVF)**	**(GVP)**	**(LVG)**	**(LVF)**	**(LVP)**
Able to be retained if sufficient space available above and below ground for future growth.	Able to be retained if sufficient space available above and below ground for future growth.	Able to be retained if sufficient space available above and below ground for future growth.	May be able to be retained if sufficient space available above and below ground for future growth.	May be able to be retained if sufficient space available above and below ground for future growth.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth.
No remedial work or improvement to growing environment required. May be subject to high vigour.	Remedial work may be required or improvement to growing environment may assist.	Remedial work unlikely to assist condition, improvement to growing environment may assist.	No remedial work required, but improvement to growing environment may assist vigour.	Remedial work or improvement to growing environment may assist condition and vigour.	Remedial work or improvement to growing environment unlikely to assist condition or vigour.
Medium to Long Term Retention	**Medium Term Retention** Potential for longer with remediation or favourable environmental conditions.	**Short Term Retention** Potential for longer with remediation work, or favourable environmental conditions.	**Short Term Retention** Potential for longer with remediation work, or favourable environmental conditions.	**Short Term Retention** Potential for longer with remediation work, or favourable environmental conditions.	**Short Term Retention** Potential for longer with remediation work, or favourable environmental conditions.

YGVG - 9	YGVF - 8	YGVP - 5	YLVG - 4	YLVF - 3	YLVP - 1
	Index Value 8	Index Value 5	Index Value 4	Index Value 3	Index Value 1
Long Term Retention Potential	Short - Medium Term Retention Potential	Short Term Retention Potential	Short Term Retention Potential	Short Term Retention Potential	Likely to be removed immediately or retained for Short Term.
Likely to provide minimal contribution to local amenity if height <5m.	Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m.	Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m.	Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m.	Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m.	Likely to provide minimal contribution to local amenity if height <5m.
Retain, move or replace.	Medium-high potential for future growth and adaptability. Retain, move or replace.	Low-medium potential for future growth and adaptability. Retain, move or replace.	Medium potential for future growth and adaptability. Retain, move or replace.	Low-medium potential for future growth and adaptability. Retain, move or replace.	Low potential for future growth and adaptability. Retain, move or replace.

MGVG - 10	MGVF - 9	MGVP - 6	MLVG - 5	MLVF - 4	MLVP - 2
Index Value 10	Index Value 9	Index Value 6	Index Value 5	Index Value 4	Index Value 2
	Medium Term.	Short Term.	Short Term.	Short Term.	Zero to Short
Medium - Long Term.	Potential for longer with improved growing conditions.	Potential for longer with improved growing conditions.	Potential for longer with improved growing conditions.	Potential for longer with improved growing conditions.	Likely to be removed immediately or retained for Short term

OGVF - 6	OGVF - 5	OGVP - 4	OLVG - 3	OLVF - 2	OLVP
Index Value 6	Index Value 5	Index Value 4	Index Value 3	Index Value 2	Index Value 0
Retention potential Medium - Long Term.	Retention potential Medium Term	Retention potential Short Term	Retention potential Short Term Potential for longer with improved growing conditions.	Retention potential Short Term	Retention potential Likely to be removed immediately or retained for Short Term.

9.3 SULE CATEGORIES (Safe useful life expectancy)

TreeAZ' is a systematic method of assessing whether individual trees are important, and how much consideration should be given to them in management decisions. Each tree is considered against a standard list of tree removal tests. If a tree fails any of these tests, it is categorised as 'Z' and further analysis stops. If it passes all the tests, it is categorised as 'A'.

'Z' Tree are not suitable for retention for more than 10 years and not considered important or worthy of consideration in management decisions.

Exempt Species: Trees that could be removed under TPO policies
Z1 Exempt species (invasive or noxious species)

Small Trees: Plants that could realistically be easily replaced in the short term
Z2 Less than 5m tall

Z3 Formal hedges or trees regularly pruned to restrict size

High Risk: Trees that would be removed within 10 years because of declining health or poor structural damage

Z4 **Dead, dying, diseased or declining**

Explanation: '*Trees that should be removed despite statutory protection because they are in poor health, poor structural condition or otherwise unstable. The condition must be terminal with no obvious potential to recover, i.e. severe crown dieback related to excavation damage or root decay to the extent that the structural branch framework is compromised. This would also apply to diseases with no practical cure'* (Barrell (2006).

Z5 **Severe damage or structural defects that cannot be properly addressed by remedial care including cavities, decay, weak junctions, wounds and excessively unbalanced**

Explanation: *Severe means that there is no realistic chance of the tree achieving its full potential with an acceptable level of risk. In many cases, acceptable levels of risk can be achieved by dramatic reduction in tree size, but this has severe health, maintenance cost and amenity implications, so it would not be considered to be a sustainable management option*

Z6 **Present or future instability because of poor anchorage or increased exposure**

Explanation: *Alterations to tree exposure to the wind occurs because of changes in the shelter provided by adjacent objects such as buildings or other trees. This primarily applies to maturing and mature trees that have greater sail areas to catch the wind and established root systems that are less able to adapt to changes than younger trees. This often applies to groups of trees where one large dominant tree will be lost because of poor health or a structural problem, dramatically exposing the remaining trees in the group'* (Barrell (2006).

Good Management: Trees that would be probably pruned or removed within 10 years through responsible management

Z7 **Severe damage or structural defects that can be temporarily addressed by remedial care including cavities, decay, weak junctions, wounds and excessively unbalanced**

Z8 **Poor trees with no potential to improve** –

Explanation: It is common to find trees that are obviously unsuitable for long term retention for many reasons, including poor health, sever imbalance, tall, thin forms, or they have no realistic potential to improve. However, the problems are not so severe that they represent an immediate risk, but their removals should not be discounted for this reason.

This subcategory is for these trees and relies on the principle of sustained amenity to justify the allocation. The short term retention of a tree that is obviously not going to improve and will pose an ongoing risk is not good tree management and is just delaying its inevitable removal.

Z9 **Adversely interfering with adjacent trees**

Z10 **Overgrown hedge or row of trees vulnerable to adverse weather events**

Z11 **Causing unreasonable inconvenience to existing properties (light, dominance, debris, interference)**

Explanation: *In its broadest sense inconvenience is the interference with the authorised use of land. In relation to trees, it can be in the form of root disrupting landscaping and hard surfaces, parts of trees physically preventing land use, tree debris such as leaves and fruit falling and tree crowns causing excessive shade. The principles for establishing what are acceptable levels of inconvenience are the same, irrespective of the cause.*

In a community context, it is reasonable for individuals to tolerate some level of inconvenience from their presence. However, the precise location or value of these thresholds is not always obvious and is often a subjective interpretation rather than a definitive point. There will always have to be a balancing of the benefit to the community weighed against the inconvenience suffered by the individual. What is an acceptable, tolerable or reasonable level of inconvenience is often a matter of judgement for each specific situation, tempered by experience and common sense. This in turn should be guided by court, tribunal and planning decisions that have been made informed judgements on these issues.

Lack of sunlight is a common example, especially in regard to solar panels. People generally expect to be able to use a patio for sitting in the sun and if trees shade is to the extent that irt cannot be used as intended, then that is excessive interference. However, if the garden is large and there are other places to do the same thing, then the case for tree removal might be weakened

On an international level, very large trees near existing occupies buildings can dominate to the extent that the dis-benefit from the anxiety of the occupants outweigh the benefit of the tree. Similarly, regular and sever staining caused by fallen debris to a swimming pool surround may be unacceptable because the stark contrast in colours creates a dirty impression whereas the same staining on a path or driveway surface may be more acceptable. In contrast, falling leaves blocking gutters causing them to be cleaned one a year is not that much of a local inconvenience in the extent of the wider benefits that the trees impart.

Assessing inconvenience is almost entirely a subjective judgement, based on experience and understanding of what is perceived as being reasonable and unreasonable for a normal person. As with all these judgements, a simple test is to imagine a TPO appeal situation where an inspector has to decide if the levels of inconvenience are intolerable. If they are, then the tree is a Z11; if they are not that bad, then the tree belongs in another subcategory (Barrel 2006).

Z12 **Causing or likely to cause damage to existing structures**

Explanation: Damage as opposed to inconvenience – *Where more serious damage occurs to property from root action, then court judgements on liability help to focus on what level of damage is deemed acceptable by society.*

The most common example is direct damage from roots, trunks, and branches to structures and surfacing. Repairs to walls may vary require such extensive excavations and cutting of roots that the tree cannot be retained. However, the use of innovative techniques may reduce root damage but still provide a viable boundary, allowing the tree to be retained.

As a general rule, there would need to be good evidence of or potential for ongoing damage with little scope for remedial works before a tree could reliably allocated to this category (Barrel 2006)

Council tree inspectors are not legal experts, but are often required to follow council policies that tend to put more emphasis on protect trees more than their rate payers and residents when assessing trees under their Tree Preservation Orders. For example, many Councils in the Sydney area do not consider root damage to privately owned fences and paved surfaces as being a valid reason to remove a tree.

A recent court decision in NSW indicates that this is not always consistent with the legal torte of nuisance and negligence. This case sets a president and Councils could now easily find themselves liable for future claims for damages. Refer to Dimitrios Michos & Another v Council of the City of Botany Bay [2012] NSWSC 625 (8 June 2012)

Z13 **Unacceptably expensive to retain**

Explanation: Degree of Cost **–** *This is a matter of judgement and may vary widely. It primarily applies to existing trees that are not suited to their location but there is resistance to their replacement. As a general principle, all trees will incur some management costs and these would normally not be a valid reason for removal. However, as these costs increase, their acceptability decreases to the point where it will be more cost effective to plant a new tree more suited to the location, rather than incur the burden of repeated and excessive costs indefinitely. Typical examples include topped trees with excessive decay, pollarded trees, to reduce subsidence risk, tree beneath powerlines, and trees close to buildings, roads and pathways. All these examples will require high levels of maintenance that may not be financially viable unless the benefits that arise from remaining trees are particularly high*

'A' Trees are suitable for retention for more than 10 years and considered important and worthy of consideration in management decisions.

A1 **No significant defects and could be retained with minimal remedial care**

A2 **Minor defects that could be addressed by limited remedial care or work to adjacent trees**

A3 **Special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years**

A4 **Trees that may have legal protection for ecological reasons**

9.4 SIGNIFICANCE ASSESSMENT

The significance of any tree in the landscape is usually based on the personal opinion of the assessor, and can therefore be very subjective. A major drawback of methodologies based on subjective criteria is the difficulty in consistently arriving at the same answer with different assessors. This problem can never be fully addressed, but if a methodology is going to be effective, it must provide the basis to allow an independent person to arrive at the same conclusion.

This methodology is based on numerous concepts used in the Arboricultural Industry (IACA 2009 & Thyer 2006). Five parameters of a tree are assessed, with each providing a numerical value. Each high significance parameter has a value of 20, each medium parameter has a value of 14, each low parameter has a value of 7 and each very low parameter has a value of 0

Only one parameter can selected for each tree, and they are added together to provide its Significance Value. The highest Significance Value would be 100, and the lowest would be 0.

9.4.1 High Significance in the Landscape

- **Health & Vigour**: Tree with average vigour and typical of the species, considering its age, without noticeable decline, and expected to continue to remain so provided conditions around the tree required for its survival do not change.
- **Structural Condition:** Trees with good form; i.e. a single dominant trunk along which evenly spaced branches are spread. Branches have properly formed collars which provide strong attachment to the trunk, and are about 25% of the trunk diameter. Minor structural defects may be present with low failure potentials.
- **Ecological Value:** Indigenous species being an integral part of a natural ecosystem, and may be protected by Threatened Biodiversity Legislation
- **Amenity Value:** Superb, appealing specimen, attractive or interesting in all seasons.
- **Prominence:** Tree is known widely, of local historical importance, and/or listed as, or part of a Heritage Item

9.4.2 Medium Significance in the Landscape

- **Health & Vigour:** Tree is generally vigorous but shows some indications of decline due to pests and diseases or changes to its growing environment
- **Structural Condition:** Trees with structural defects with low failure potential
- **Ecological Value:** Remnant species of native vegetation
- **Amenity Value:** Attractive or interesting for part of the year
- **Prominence:** Tree is known locally or seen by many passers by

9.4.3 Low Significance in the Landscape

- **Health & Vigour:** Tree is in low vigour and in decline
- **Structural Condition:** Trees with structural defects with medium failure potentials and may require monitoring on an annual basis.
- **Ecological Value:** Native or introduced ornamental species - beneficial to fauna, food resource and/or shelter.
- **Amenity Value:** Ordinary or plain
- **Prominence:** Tree is only seen by neighbourhood residents and passers by

9.4.4 Very Low Significance in the Landscape

- **Health & Vigour:** Tree exhibits symptoms of advanced and irreversible decline due to fungal decay, major dieback of branch and crown canopy, predation of pests, storm or lightning damage, root damage, instability of the tree and alterations to its growing environment
- **Structural Condition:** Trees with defects which have failed, or have a high risk of failing soon, and corrective action must be taken as soon as possible.
- **Ecological Value:** Listed as a Priority Weed, Environmental Weed or an exempt species by the Local Council
- **Amenity Value:** Misshapen and/or unattractive, with little or no benefit to the local amenity
- **Prominence:** Tree is only seen by private owners or adjacent residents

9.5 IMPORTANCE OF THE ROOT SYSTEM

The most vulnerable part of a tree is its root system. As it is not visible and is poorly understood, it is frequently ignored, but damage or death of the root system will affect the health stability of the entire tree. When either a cut or fill occurs near trees, the root system is immediately reduced and the soil available for root growth is reduced.

9.5.1 Tree Protection Zone (TPZ)

The Tree Protection Zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area that requires protection. It is an area isolated from construction disturbance, so that the tree remains viable (AS – 4970)

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12 (DBH = trunk diameter measured at 1.4m above ground level)

The radius of the TPZ is measured from COT (Centre of the trunk).

A sturdy protective fence is required around each tree to prevent damage occurring in the TPZ.

Variations to a TPZ
While TPZ's usually form a circular area under AS 4970, British Standard 5837 allows the area of a TPZ in m² to be converted into a square. This slightly reduces the extent of the TPZ while protecting the same amount of area in m²'s. BS 5837 also allows a 20% variation in the location of the centre of the TPZ, while AS 4970 allows a minor variation of 10%, with any further variation subject to advice from the project Arborist.

9.5.2 Structural Root Zone (SRZ)

The Structural Root Zone (SRZ) is the area around the base of a tree required for its stability. The woody root growth and soil cohesion in this area are necessary to hold the tree upright; therefore there are no variations to its size. The SRZ is normally circular with the trunk at its centre and is expressed by its radius in metres (AS – 4970). Due to the potential of causing instability of a tree, it is highly recommended that no roots within its SRZ are pruned or removed.

9.5.2 References to Appendices 9.5

- AS 4970 (2009) 'Protection of trees on construction sites' Standards Australia, Sydney, Australia

9.6 EXTENT OF THE ROOT SYSTEM

The shape of the main structural root system develops in response to the need to support the tree. Beyond this zone, root growth and development is influenced by the availability of water and nutrients. Unless conditions are uniform around the tree (which would be unusual) the extent of the root-systems can be irregular and difficult to predict. As roots are very opportunistic, they will not generally show the symmetry seen in the aerial parts. The majority is located in the surface 600mm of soil, and it is quite common for it to extend from 1.5 and 2.5 times the spread of the crown (Lonsdale 1999).

9.6.1 Types of Roots

Structural Root Plate: This is referred to in AS 4790 (2009) as the Structural Root Zone (SRZ) and represents the main structural woody root system that provides most of the trees anchorage. It is the central part of the root-system which rotates, and becomes visible, when a tree is wind thrown.

'Between four and eleven major woody roots (primary roots) originate from the base of the stem of most trees, the majority growing horizontally through the soil. Their points of attachment to the trunk are close to ground level and are associated with a marked swelling (root buttress) (Perry 1982). These rapidly subdivide to about 100mm in diameter (zone of rapid taper) and become the main woody, transport roots.

The size of tree's structural root plate varies in accordance to its dimensions, and growing environment. However, the diameter of its root crown can be used to calculate the recommended setback between it and the surrounding infrastructure.

Woody Transport Roots: Beyond the structural root plate the primary roots subdivide into approximately 100mm diameter woody roots. These continue to branch and subdivide into smaller diameter roots which transport water and nutrients from the non-woody roots. Their general direction of growth is radial from the structural root plate and horizontal to the soil surface. In typical clay-loam soils, they are usually located less than 20 to 30cm below the surface and it is not uncommon for them to extend from between 2.5 and 3 times the height of the tree (Stout 1956, Lyford & Wilson 1964)

Little is known about the dimensions and depth of transport roots from about 4m from the trunk outwards to their growing extremities. It can be inferred that for many species, they probably remain at the same depth as where they were recorded near the root plate (Cutler, D. 1995).
Woody transport roots can also be responsible for damage to infrastructure. Column 3 of Table 1 calculates the minimum radius measured from the stem that identifies the area containing the main transport roots. Ideally, this area should not be encroached upon to provide adequate moisture and nutrients needs of a healthy tree, and to minimise the potential of damage to infrastructure (Coder, K. 1996).

Non-Woody Roots:
Feeder Roots; Beyond the woody transport roots, a complex system of smaller non-woody lateral roots develop and these branch 3 to 4 times to form fans or mats of thousands of fine, short non-woody roots. They tend to be 1mm or less in diameter, at least 20cm long and grow predominantly upwards into the top 150mm of soil and leaf litter (Perry 1982 & Craul 1992).
Fine non-woody roots form the major part of a trees surface root system and are often called 'feeder roots' because they are the primary sites of absorption of water and minerals. The combined number of fine root tips of an individual tree has been estimated from 70 to 500 million (Craul 1992).

Root Hairs; The majority of the moisture requirements of a tree is absorbed from the soil into the non-woody roots through root hairs. The number of root hairs on a single plant has been estimated at more than 14 billion, and this can increase at a rate of more than 100 million per day (Robbins & others 1950).

Mycrorrhizal Associations; Many trees die soon after planting because certain fungi are not present to form mycorrhizae associations with their roots. Mycorrhizae (*myco* means fungus and *rhiza* means root) are root structures formed when the non-woody roots are invaded by specific fungi that form a symbiotic relationship beneficial to both organisms (Harris 1983). The fine threads (hyphae) that mycorrhizal fungi send into the soil around roots can increase the effective surface area of the root system by up to 60 times (CSIRO 1979)

9.6.2 References to Appendices 9.6

- Coder, K. (1996) Construction damage assessments: 'Tree and Sites'. University of Georgia Cooperative Extension Service Publication, FOR 96-39 18pp
- Coder, K. (1998) Root Growth Control: Managing Perceptions and Realities in 'The Landscape Below the Ground 2, Proceedings of a Second International Workshop on Tree Root Development in Urban Soils Ed by Neely &Watson
- Craul, P.J. (1992) 'Urban Soils in Landscape Design' John Wiley & Sons New York
- Cutler, D. (1995) Interactions between tree roots and buildings, pp 78 -87 In Watson & Neely (Eds.) Trees and Building Sites: Proceedings of an International Workshop on Trees and Building, Chicago, IL. International Society of Arboriculture
- Gilman, E. (1997 b) 'Trees for Urban and Suburban Landscapes', Delmar Publishers
- Harris (1983)
- Lyford & Wilson (1964) 'Development of the root system of *Acer rubrum*', Harvard Forest Paper No. 10 Harvard University, Petersham Mass
- Lonsdale, D. (1999) 'Principles of Tree Hazard Assessment and Management' Dept of Environment, Transport and the Regions. London.
- Mattheck, C. (1994), 'The Body Language of Trees', International Society of Arboriculture.
- Perry, T.O. (1982) 'The Ecology of Tree Roots and the Practical Significance Thereof' J. Arboriculture V. 8, No 8, August 1982.
- Stout, B.A. (1956) 'Studies of the root systems of deciduous trees' Black Rock Forest Bulletin #15. Harvard Black Rock Forest. Cornwall-on-the-Hudson, New York. In cooperation with the Maria Moors Cabot Foundation, Harvard University, Cambridge, Mass

9.7 CYPRESS CANKER

This is a disease of some *Cupressus* species, caused by the fungus *Monochaetia* sp. This is an air-borne fungal disease which enters the plant through damaged areas of stems and causes die-back of the foliage.

Symptoms: The colour of the foliage of whole branches changes almost overnight; from a healthy green, bluish-green or gold to a duller, lighter shade, then to brown as the foliage is deprived of moisture and nutrients. Splits often occur in the bark of dead branches, revealing a brown powder-like material. Resin exuding from fungus infected bark is also a common sign. Left untreated, the disease progressively moves through the plant, leading to its eventual death (Gardening Australia 1998).

The symptoms are superficially similar to that of Cypress Weevil and Cypress Bark Beetle, but an examination of the bark will readily reveal if insect damage is present. However, caution should be exercised, as borers can often colonize a plant in this weakened condition, and can often be blamed for its decline.

The fungal spores can be transported by wind and by water droplets, insects and birds. Entry to the plant is usually gained through small natural fissures in the bark in the branch crotches, or through injuries to the trunk caused by broken branches or whipper-snipper damage. Once inside the tree, the fungus destroys the sapwood and causes the death of the branches or main trunk above the infected area.

Control: As is the case with many diseases, attack is more likely to occur on weaker individuals

- Keep plants in healthy vigorous condition with regular feeding and watering
- Avoid causing injuries to bark
- Sterilize garden tools to prevent spreading fungus to other plants
- Undertake a regular spraying program during the active growing months (see below)

'Cypress Canker can be controlled to some extent by monthly spraying with Foli-R-Fos 200 or Phos acid 200 according to the manufacturer's instructions from September to April. This doesn't actually kill the fungus, but it gives the plant more resistance to survive the infection (Royal Botanic Gardens, Sydney 1999).

'The chemical used is phosphorous acid, which has been used by the avocado industry to overcome a looming disaster in the form of *Phytophthora* dieback disease. Control of the disease has proved successful where treatment was initiated early, though some varieties respond better than other. For example, 'Naylor's Blue' has shown better rates of recovery than 'Castlewellan Gold'. Trees that had lost more than 30% of their foliage were slow to recover, and some continued to decline. Those with less than 20% damage responded quickly to treatment' (Gardening Australia 1998).

'Small trees can be sprayed with the prepared chemical to the point of run-off from their foliage. An ongoing spraying program of copper oxychloride is also recommended as a preventative measure for all conifers in the garden' (Gardening Australia 1998).

'Control of large trees cannot be considered worthwhile on economic grounds, as fungicides must be injected regularly to protect them from the fungus. *Cupressus macrocarpa*, *C. sempervirens* and *Chamaecyparis lawsoniana* are very susceptible, and it is doubted whether it is worth planting these species. *C. glabra* and *C. torulosa* seem to have some resistance' (Hadlington 1988).

9.8 ARMILLARIA ROOT DECAY

Armillaria are root decaying fungi that cause the death and instability of trees. They are soil transmitted fungi that destroy the cambium (live wood) in the roots of trees and the cambium at the base of trunks. When the cambium area of the root is destroyed, the roots die and continue to decay. This affects the trees stability and finally causes the collapse of the tree.

The base of the tree often has dead and browned areas which are fan shaped and eventually form a large area in the shape of an inverted 'V'. The entire cambium around the base of the tree can be totally destroyed leaving the above ground parts of the tree without any symptoms of a problem. Armillaria-affected trees retain firm wood except in very advanced stages of the disease, when wood becomes wet and soggy. (McCain and Raabe)

Affected trees seldom recover and there is always the danger that these trees may collapse due to the roots decaying. Only valuable trees are worth the efforts to save them. The roots of severely effected trees will rot, making the tree hazardous. (Harris)

9.8.1 *Armillaria luteobubalina*

This species has only recently been identified, and at the present there is little information available about its decay strategy, rate of decay or which tree species can successfully isolate it.

'*A. luteobubalina* is a primary pathogen, causing root rot and consequent decline and death in a wide range of native and exotic hosts' (May & Simpson 1977). 'The host of range of *A. luteobubalina* is very large and poorly defined with little information on the presence of resistant or tolerant species' (Royal Botanic Gardens).

'Armillaria spp species begin their invasion of the host by killing the cambium of roots and thus causing disease before decaying the roots. If *Armillaria* sp. invades the cambium at the base of a tree, the resulting dead bark often conceals a characteristic fan of white mycelium. If decay by *Armillaria* sp. is extensive in a root system, there is a high chance of windthrow. In such cases, the death of roots will usually produce symptoms in the crown of the tree (Lonsdale 1999)

Although *Armillaria* is classed as a white-rot fungus, the decayed wood at first does not appear lighter in colour but light brown to brown. Interestingly, the degradation behaviour of the fungus resembles a brown-rot at least in the early stages of decay. Chemical analysis of wood decayed by *Armillaria* sp showed the fungus breaks down cellulose and hemicellulose first and lignin only latter. *Armillaria* sp are classified as root & butt decay pathogens. Root decays impair the stability of their hosts while butt decays impair the fracture resistance of the lower stems' (Schwarze 2000).

9.8.2 References to Appendices 9.8

Lonsdale, D. (1999) '*Principles of Tree Hazard Assessment and Management'* Dept of Environment, Transport and the Regions. London.

May, T. & Simpson, J. 1997 'Fungi & Eucalypts' in Williams, J., & Woinarski, J. (1997) '*Eucalypt Ecology; Individuals to Ecosystems'*, Cambridge University Press, Cambridge, U.K

Royal Botanic Gardens 1999 '*Armillaria Root Rot Fact Sheet'*

Schwartz, F. (2004) Notes from a 5 Day Scientific Workshop on Tree Pathology and Wood Decay.

9.9 DECLINING HEALTH & DIEBACK

Dieback refers to the progressive death of a tree or branch from its extremities towards the roots (Strouts & Winter 2007). Isolated trees, or entire forests, can be affected (Heatwole & Lowman 1986). It is best described by symptoms that can be observed and grouped into stages of increasing severity.

The first stage is a general decline and thinning of the crown, beginning at the tips of the twigs and progressing along the branches towards the trunk. As the outer parts die, the dead ends of branches may protrude beyond the remaining foliage. These are referred to as stags or stag heads. Once there has been considerable thinning of the foliage in the crown, new shoots may be produced directly from the trunk or main branches. These shoots, called *epicormic shoots*, give the tree a distinct, compact appearance.

If the cause of the initial problem is of a minor nature, or it is otherwise overcome, the epicormic shoots will eventually be replaced by, or develop into, a new healthy crown. If not, they in turn will begin to die. There may be several cycles of production of epicormic shoots followed by their decline and death.

As long as the tree has sufficient reserves of energy to produce new shoots, it can continue to fight the malady. However, once those reserves are exhausted, no further epicormic shoots can be produced; this leads to the third and final stage of dieback, death of the whole tree.' (Heatwole & Lowman 1986)

The death of a tree is a complex event, usually resulting from the cumulative effects of multiple stresses over a prolonged period (Roberts, Jackson & Smith 2006). Unless death is obviously the result of some catastrophic event, such as a lightning strike or deliberate poisoning, attributing death to a single cause or event is not usually possible (Franklin 1987).

In general, trees die when they are unable to acquire or mobilise sufficient resources to occlude injuries or otherwise sustain life (Waring 1987). Therefore, a tree's health and vitality depends on carbon assimilation and allocation to reserves and defensive strategies over the preceding years. If energy reserves are low, or have been depleted, a tree being placed under stress from disease, drought or damage to its root system is unlikely to recover.

9.9.1 Mortality Spiral:

The effect of multiple stresses on a tree over a period of years which eventually cumulate in its death has been described as a mortally spiral (Franklin 1987) These are usually caused by modifications to the tree, or its growing environment, rendering it vulnerable to pests and diseases, which gradually exhausts its energy reserves and results in its premature death. It can be caused by one of, or a combination of, the following:

- Sealing of the ground surface with concrete or bitumen
- Trenches for footings, underground services and storm water systems
- Soil excavation, filling or compaction
- Tree Lopping

A hypothetical mortality spiral of an urban tree could be initiated by replacing turf beneath it with pavement. The normal infiltration of rainwater into the soil around its root system is disrupted and diverted away as runoff. The tree begins to suffer from 'drought' and a relative amount of foliage is shed to avoid dehydration. This reduces the amount of energy produced by photosynthesis, and the tree is predisposed to insect predation, which further weakens it.

Desiccation of portions of the crown and branch dieback might follow in subsequent years, further reducing energy levels and increasing its vulnerability to insects and diseases. Death of the tree will likely follow, and will probably be attributed to a particular pathogen (Roberts, Johnson & Smith, 2006)

9.9.2 References to Appendices 9.2

- Franklin, J., Shugart, H. & Harmon, M. (1987) 'Tree death as an ecological process' BioScience, 37, 550-556
- Heatwole, H. & Lowman, M. (1986) 'Dieback, death of an Australian landscape' Reed Books Pty Ltd. Frenchs Forest, NSW
- Roberts, J. Jackson, N. & Smith, M. (2006) 'Tree Roots in the Built Environment' Research for Amenity Trees No. 8, Department for Communities and Local Government. The Stationary Office, Norwich, NR31BN
- Strouts, R. & Winter, T. (2007) 'Diagnosis of ill-health in trees', Research for Amenity Trees No. 2, Department for Communities and Local Government. The Stationary Office, Norwich, NR31BN
- Waring, R. (1987) 'Characteristics of tree predisposed to die' BioScience, 37, 569-574

9.10 BRANCH STRUCTURE

Collars form around the base of branches to help them remain attached to the trunk (Shigo 1985). The overlapping branch and trunk tissue in the collar physically secures the branch to the trunk. If the collar forms improperly or is lacking, then branches may not be well secured to the trunk (Gilman 2003). Codominant stems typically lack the overlapping tissue present in a collar, as each acts as the main trunk, and this explains why these are somewhat weaker (Edberg 1994).

The pictures in Plate 3 help to show the how a branch stays on a trunk. The dark lines represent the branch tissues. A & B shows show two views of new tissue at the branch base. After the branch tissues have formed new layers of trunk tissues grow over the branch base (No C & D). The Plate 4 represents three consecutive years of trunk collars forming over branch collars (3 is three year old growth, 2 is two year old growth and 1 shows the current seasons growth). The resulting union has such strength that high winds and great pressure cannot usually separate the branch from the trunk.

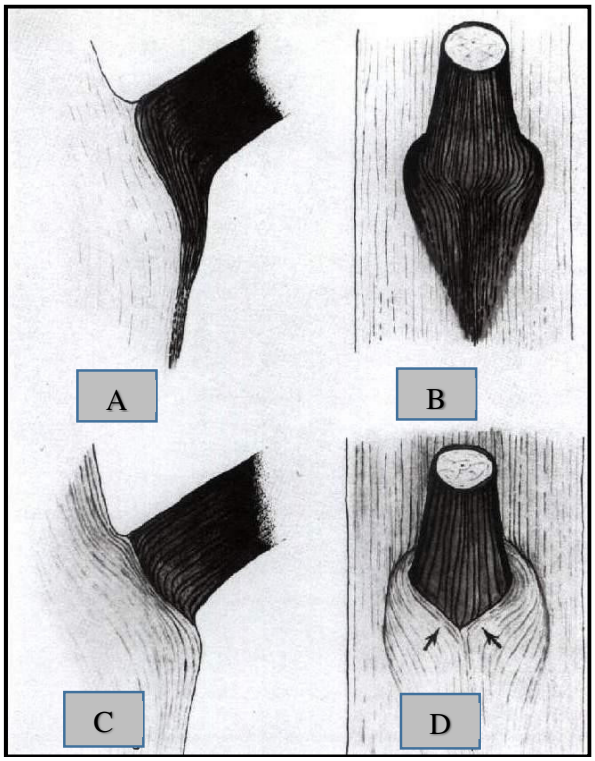


Plate 3 – Branch Collar Formation (Shigo 1986)

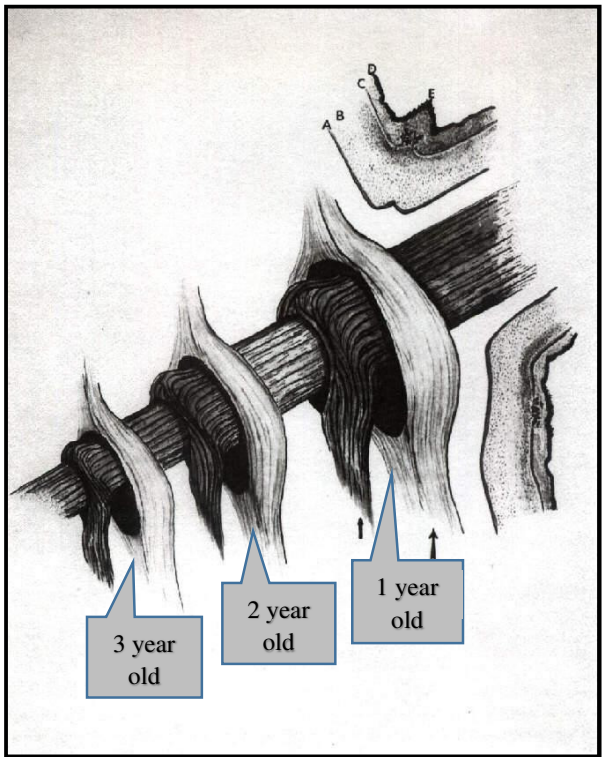


Plate 4 – 3 years of overlapping collars (Shigo 1986)

9.10.1 Defects that may increase the potential for branch failures

'Defects that increase the potential for branch failure include;

- The presence of codominant or multiple stems
- Included bark and weak junctions
- A history of branch failures within a tree,
- Wounds, cavities, cankers, cracks, bulges or decay symptoms, especially on branch junctions.
- Dieback and epicormic growth
- Termite activity
- Poor taper, overly-extended and/or heavily end loaded horizontally inclined branches,
- Extensive removal of large limbs that expose the inner canopy of the tree
- Rubbing branches
- Formation of branch shedding collars

The absence of such defects would indicate that a tree has a low potential for branch failure' (Matheny & Clarke 1994).

9.10.2 References to Appendices 9.10

- Edberg, J., A.M. Berry, and L.R. Costello (1994) '*Patterns of Tree Failure in Monterey Pine'* J. Arboric 20: 297-304.
- Gilman, E, (2003) '*Branch-to-Stem Diameter Ratio Affects Strength of Attachment'* J. Arboriculture V. 29, No 5, Sept 2003.
- Matheny, N.P. & Clark, J.R. (1994) '*A Photographic Guide for Evaluation of Hazard Trees In Urban Areas'*, International Society of Arboriculture.
- Shigo, A, (1985) '*How Tree Branches are Attached to Trunks'* Can. J. Bot. 63: 1391- 1401.
- Shigo, A. 1986 '*A New Tree Biology'* Shigo & Trees, Associates, Durham, New Hampshire USA

9.11 FAILURE POTENTIAL BRANCH JUNCTIONS

In general, the hazard potential of branches is based on the following categories;

Improbable: A tree with a single dominant trunk, along which evenly spaced branches are spread. Branches have collars which provide strong attachment to the trunk, and are approximately 25% of the trunk diameter

Improbable to possible: Codominant branches (see section 9.4.1)

Possible to probable: Codominant branches with an included bark junction (see 9.4.2)

Imminent: Partially failed included bark junctions which contain a crack or have split open.

9.11.1 CODOMINANT STEMS

Two stems or branches that are approximately equal in diameter and that occur at the same location on the main trunk or branch are called 'codominant'. Typically, strong collars (attachments) form when the size of the branch is 25 – 50% to that of the parent stem or branch. When both branches are of similar diameter, the attachments may be weaker. Both act as the main trunk and the formation of a complete collar is suppressed. Stem orientation, weight distribution and branch configurations will affect stress within the junction, making failure more or less likely.

The likelihood of failure is also effected by the shape of the junction and by the presence of included bark. Stems that divide in a gentle U-shape tend to be stronger than those with a sharper V- shape. The likelihood of failure of a codominant stem with an open U-shape is *improbable* to *possible* (see Plate 1). The failure potential of a sharper V-shape is often considered to be *possible* to *probable*

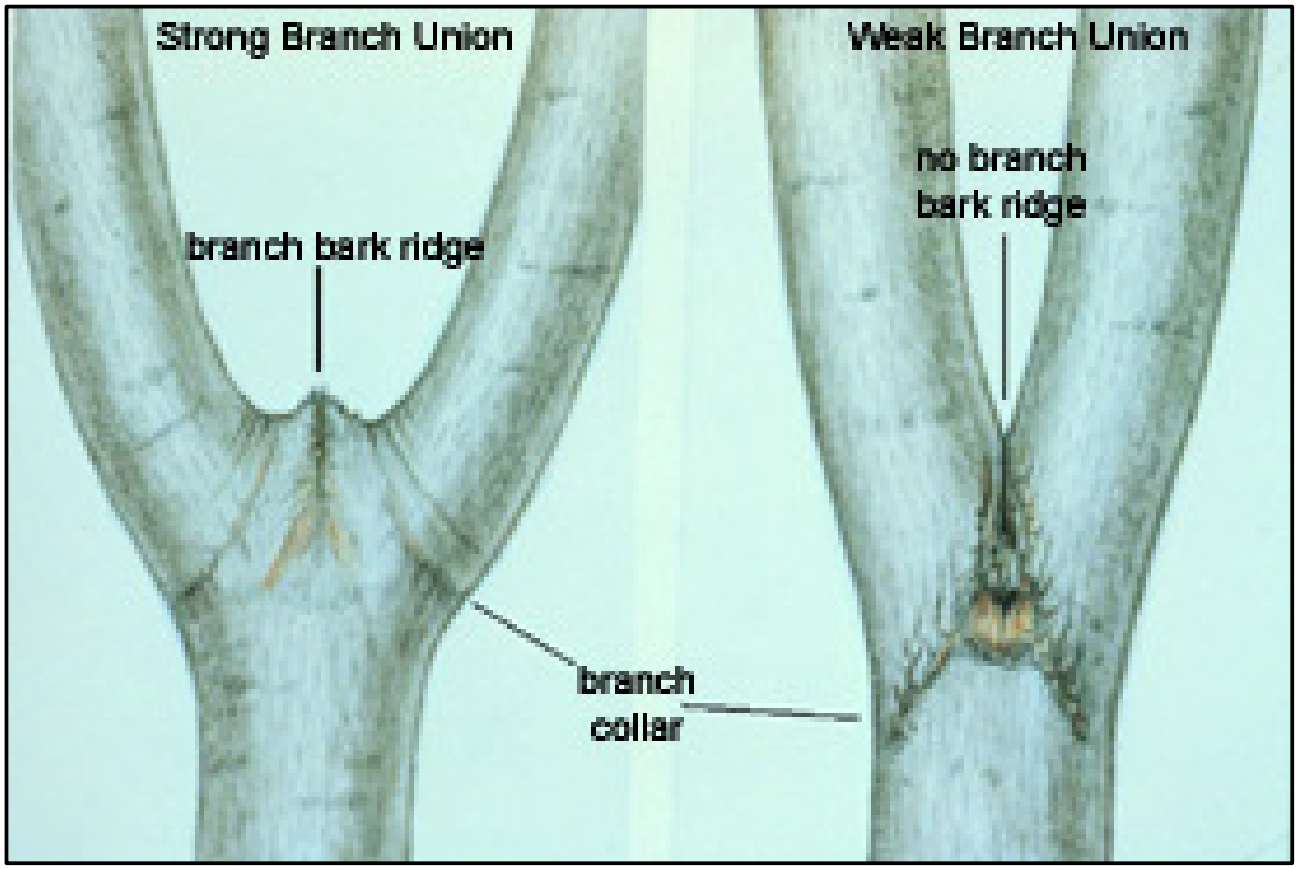


Figure 1 – showing strong and weak branch junctions (http://www.dec.ny.gov/lands/5295.html)

9.11.2 INCLUDED BARK JUNCTIONS

These are usually caused by storm damage, lopping or a genetic predisposition of the species or individual. They usually occur where two or more branches of about equal size arise at approximately the same level on the trunk, especially if the angle of attachment is narrow, and the branches are too close together.

Figure 2 – showing weak junction

Figure 3 – partially failed weak junction

In this situation, two layers of compressed bark are embedded within the junction. Tree branches and trunks increase their girth annually when new wood is produced in the cambial region. If a branch junction is too narrow, this new wood compresses the two layers of bark within the junction a bulge often formed along its sides as addition wood tissue is formed.

Branch junctions with included-bark are structurally weaker than those that have connective tissue throughout the crotch. As the branches above an included bark junction increase in height, they also increase in weight which tends to pull the junction apart. This hazardous situation is increased dramatically in wet and/or windy conditions. A tree with vertical branches has less leverage on the weak junction. As it matures, its growth form is more spreading and if the branches become more horizontal, this applies more leverage force to the weak junction.

9.11.3 References to Appendices 9.11

- Edberg, J., A.M. Berry, and L.R. Costello (1994) '*Patterns of Tree Failure in Monterey Pine'* J. Arboric 20: 297-304.
- Gilman, E, (2003) '*Branch-to-Stem Diameter Ratio Affects Strength of Attachment'* J. Arboriculture V. 29, No 5, Sept 2003.
- Mattheck. C. (1994) '*The Body Language of Trees'* International Society of Arboriculture.
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- Shigo, A. 1986 '*A New Tree Biology'* Shigo & Trees, Associates, Durham, New Hampshire USA.

9.12 SUMMER BRANCH DROP

Predictable tree defects that increase the potential for branch failure include excessive end weight, minimal taper, wounds & associated decay, extensive cankers, recent exposure to winds, degree of horizontal attitude, presence of codominant branches, weak junctions, previous branch failures and an extensive removal of large limbs. The absence of such defects would indicate that a tree has a low potential for branch failure' (Mathany & Clarke 1991)

However, Summer Branch Drop phenomenon is an unpredictable form of branch failure that causes the sudden fracture of a defect free branch on still and hot afternoons. It is suspected that it is partially caused by the stretching and relaxing of the pre-tensioned fibres (Mattheck & Kubler, 1995; Wessolly & Erb, 1998).

Summer Branch Drop has been observed in England, Australia, South Africa and California and in various types of trees, particularly broadleaves. In England, it has been observed in Beech, Horse Chestnut, Sweet Chestnut, Ash, Popular and Willow (Rushforth 1979). Similar limb breakage has also been reported in California in several species of Elm, Eucalypt, Oak, Pine, Plane and Cedar (Harris1972).

As described, most branches fall with little or no warning. Branches that drop are at least 100mm in diameter, and usually extend to or beyond the edge of the canopy of the tree. Such large limbs can cause serious injury and/or property damage. The break most often occurs some distance from the branch attachment, where the wood is frequently sound. Branches up to .6m and trunks up to 1.2m in diameter have occasionally broken and fallen during hot, calm summer afternoons and subsequent evenings (Kellogg 1882, Harris 1972).

It typically occurs in hot dry weather, and it seems likely that altered moisture content disturbs the longitudinal pre-stressing of the wood which normally helps to support the load. This pre-tensioning of the fibres can heighten the resistance against compression-loads even up to a 140% of the original compression strength (Archer, 1996). This could explain why summer branch drop most often involves branches that are growing close to the horizontal and which therefore contain a high proportion of reaction wood.

Tree trunks and branches decrease in diameter during the afternoons (Kozlowski & Winget 1964). Horizontal limbs have been observed to rise during the afternoon and return to their original positions during the night. Both observations indicate that the limbs weigh less in the afternoon because more moisture is being transpired than is received.

High temperature is another possible factor in summer branch drop, as it increases the tendency of wood to creep, i.e. to deform irrecoverably under its own weight. The combination of warming up the fibres, which causes relaxation of the latter, and evaporation, which could influence pre-tensioning, might reduce the load-bearing capacity of those fibres considerably.

Also the compression loads can be quite considerable in heavy, leaning branches and, at least in dry wood, creep-rupture can occur if the duration of load is long (USDA 1999). The stress caused by the weight of the branches would exceed the compression-strength of the wood, leading to sudden limb drop.

Until the phenomenon is better understood, it is advisable to shorten or reduce the weight of long horizontal branches and/or limit the use of susceptible species in close proximity to assets.

9.12.1 References to Appendices 9.12

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10.0 TREE SURVEY

Tree No		#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Species		*Lagerstroemia indica*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Archontophoenix alexandrae*	*Cupressus sempervirens*	*Syagrus romanzoffiana*
DBH (mm)		multi	200	15	150	150	150	2x 200	250	200	200
RCD (mm)		500	300	200	200	200	200	400	300	250	300
Height (m)		7									
Canopy Spread (m)	N	5	5				5	4	3	13	3
	S	5	5				0	4	3	12	3
	E	5	5				4	4	3	3	3
	W	5	5				4	4	3	3	3
Age Class		M	X	X	X	X	X	X	M	M	X
Canopy Type Direction		D	X	X	X	X	X	X	D	C	X
Health		A	X	X	X	X	X	X	A	F/P	X
Condition		A	X	X	X	X	X	X	A	F	X
Amenity		L	X	X	X	X	X	X	L	L	X
Prominence		L	X	X	X	X	X	X	L	L	X
Ecological		L	X	X	X	X	X	X	L	L	X
Significance Value											
Retention Value		>40	0	0	0	0	0	0	>40	0	0
SULE		**A1**	**Z1**	**Z1**	**Z1**	**Z1**	**Z1**	**Z1**	**A1**	**Z4**	**Z1**
TPZ (m)		4.0	X	X	X	X	X	X	3.0	X	X
SRZ (m)		2.5	X	X	X	X	X	X	2.0	X	X
Additional Comments		Retainable	Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Retainable	Over-mature hedgerow	Exempt species in DCP 2014

Tree No		#11	#12	#13	#14	#15	#16	#17	#18	#19	#20
Species		*Syagrus romanzoffiana*	*Ehretia acuminata*	*Melia azedarach*	*Albizia*	*Cupressocyparis leylandii*	*Eucalyptus moluccana*	*Eucalyptus moluccana*	*Eucalyptus moluccana*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*
DBH (mm)		200	14x 150	multi	150	16x 150	1000	900	750	2x 300	400
RCD (mm)		300	14x 200	300	250	16x 250	1100	1000	900	550	500
Height (m)		7.5	8.5	4	6	22	26	29	26	9	9
Canopy Spread (m)	N	3	3	3	0	11	17	8	13	3	4
	S	3	3	4	6	11	14	10	0	5	4
	E	3	11	3	5	2	15	9	8	0	4
	W	3	11	1	4	3	14	12	9	5	4
Age Class		M	M	S/M	O/M	M	M	M	O/M	M	M
Canopy Type Direction		X	X	S	X	C	C	C	C/E	S	C/E
Health		X	X	A	X	A	A/F	A	P	F/P	A
Condition		X	X	A	X	A	A	A	P	A	A
Amenity		X	X	L	X	H	H	H	V/L	L	L
Prominence		X	X	L	X	L	M	M	M	L	L
Ecological		X	X	L	X	L	M	M	M	L	L
Significance Value											
Retention Value		0	0	>40	0	>40	>40	>40	0	0	0
SULE		**Z1**	**A1**	**A2**	**Z4**	**A1**	**A1**	**A1**	**Z4**	**Z6**	**Z6**
TPZ (m)		X	X	3.0	X	2.4	12.0	10.8	X	X	X
SRZ (m)		X	X	2.0	X	1.8	3.4	3.3	X	X	X
Additional Comments		Exempt species in DCP 2014	Hedgerow around tennis court	Heavily suppressed by tree No. 3	Over-mature tree in advanced stages of decline	Retainable hedgerow	Heavily colonised by mistletoe	Retainable	Advanced decline with high failure potential	Heavily suppressed	Significant asymmetrical canopy towards the east

Tree No		#21	#22	#23	#24	#25	#26	#27	#28	#29	#30
Species		*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Liquidambar styraciflua*	*Liquidambar styraciflua*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Liquidambar styraciflua*	*Liquidambar styraciflua*
DBH (mm)		250	500	750	300	450	450	300	4x 400	300	300
RCD (mm)		350	600	850	400	550	600	350	130	450	400
Height (m)		X	16	17.5	14	11	17	16	15.5	14.5	14
Canopy Spread (m)	N	X	4	6	5	5	5	3	7	5	5
	S	X	6	8	4	5	7	4	4	3	4
	E	X	6	3	6	6	6	4	4	4	3
	W	X	0	6	5	5	6	2	5	4	5
Age Class		X	M	M	S/M	S/M	M	M	M	S/M	S/M
Canopy Type Direction		X	C/E	C	C	C	C	S	C/E	C	C
Health		X	F-P	F	A	A	A	A	A	A	A
Condition		X	F	F	A	A	A	A	A	A	A
Amenity		X	M	M	M	M	M	M	M	M	M
Prominence		X	L	L	L	L	L	L	L	L	L
Ecological		X	L	L	L	L	L	L	L	L	L
Significance Value											
Retention Value		0	0	0	>40	>40	>40	>40	>40	>40	>40
SULE		**Z4**	**Z4**	**Z4**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**
TPZ (m)		X	X	X	3.6	5.4	5.4	3.6	15.0	3.6	3.6
SRZ (m)		X	X	X	2.3	2.6	2.7	2.1	1.4	2.4	2.3
Additional Comments		Dead tree	Declining health and vitality	Eastern half of canopy is becoming sparsely foliaged	Retainable	Retainable	Retainable	Retainable	Retainable	Retainable	Retainable

Tree No		#31	#32	#33	#34	#35	#36	#37	#38	#39	#40
Species		*Liquidambar styraciflua*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*	*Melaleuca quinquenervia*
DBH (mm)		400	400	3x 300	2x 300 2x 400	450	350	1x 300 2x 400	200	550	350
RCD (mm)		500	450	700	800	600	500	800	300	600	400
Height (m)		15	15	19	19	13	13	19	12	19	17
Canopy Spread (m)	N	6	8	5	2	2	2	6	3	8	5
	S	4	1	3	6	8	6	6	5	5	4
	E	3	7	1	4	3	5	3	1	1	2
	W	4	3	4	2	3	1	4	1	3	2
Age Class		S/M	M	M	M	M	M	M	M	M	M
Canopy Type Direction		C	C	C	C	C	C	C	C	C	C
Health		A	A	A	A	A	A	A	A	A	A
Condition		A	A	A	A	A	A	A	A	A	A
Amenity		M	M	M	M	M	M	M	M	M	M
Prominence		L	L	L	L	L	L	L	L	L	L
Ecological		L	L	L	L	L	L	L	L	L	L
Significance Value											
Retention Value		>40	>40	>40	>40	>40	>40	>40	>40	>40	>40
SULE		**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**
TPZ (m)		4.8	4.8	9.0	14.0	5.4	4.2	11.0	2.4	6.6	4.2
SRZ (m)		2.5	2.4	2.8	3.0	2.7	2.5	3.0	2.0	2.7	2.3
Additional Comments		Retainable	Retainable	Retainable	Retainable	Retainable	Retainable	Retainable	Retainable	Retainable	Retainable

Tree No		#41	#42	#43	#44	#45	#46	#47	#48	#49	#50
Species		*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Casuarina cuninghamiana*	*Casuarina cuninghamiana*	*Melaleuca quinquenervia*	*Casuarina cuninghamiana*
DBH (mm)		multi	multi	multi	120	`150	multi	400	250	2x 200	450
RCD (mm)		600	400	200	200	200	500	600	300	400	600
Height (m)		8	8	8	8	8	7	22	21	14	22
Canopy Spread (m)	N	5			3		2	6	4	5	7
	S	5			3		2	9	5	4	5
	E	3			4		1	4	4	5	8
	W	3			4		3	7	4	2	8
Age Class		x	x	x	x	x	x	M	M	M	M
Canopy Type Direction		x	x	x	x	x	x	C	I	C	D
Health		x	x	x	x	x	x	A	A	A	A
Condition		x	x	x	x	x	x	A	P	A	A
Amenity		x	x	x	x	x	x	M	M	M	M
Prominence		x	x	x	x	x	x	L	L	L	L
Ecological		x	x	x	x	x	x	M	M	L	M
Significance Value		x	x	x	x	x	x				
Retention Value		0	0	0	0	0	0	>40	<15	>40	>40
SULE		**Z1**	**Z1**	**Z1**	**Z1**	**Z1**	**Z1**	**A1**	**Z8**	**A1**	**A1**
TPZ (m)		X	X	X	X	X	X	4.8	3.0	4.0	5.4
SRZ (m)		X	X	X	X	X	X	2.7	2.0	2.3	2.7
Additional Comments		Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Retainable	Tall thin form, with no realistic potential of improvement	Retainable	Retainable

Tree No		51	52	53	54	55	56	57	58	59	60
Species		*Casuarina cuninghamiana*	*Casuarina cuninghamiana*	*Syzigium luehmannii*	*Syzigium luehmannii*	*Syzigium luehmannii*	*Syzigium luehmannii*	*Syzigium luehmannii*	*Jacarandar mimosifolia*	*Acer palmatum*	*Corymbia citriodora*
DBH (mm)		200	120	150	80	200	150	250	350	1x 150 2x 100	550
RCD (mm)		250	150	180	200	250	180	350	500	200	750
Height (m)		18	13	13	13	13	16	16	17	8	32
Canopy Spread (m)	N	0	3	8					6	6	15
	S	6	0	8					9	5	0
	E	1	0	5					4	5	8
	W	3	3	5					7	5	8
Age Class		S/M	S/M	M	M	M	M	M	M	M	M
Canopy Type Direction		S	S	Codominant hedgerow					D	U	S
Health		A	A	A	A	A	A	A	A	A	L
Condition		F	F	A	A	A	A	A	A	A	P
Amenity		L	L	M	M	M	M	M	L	L	M
Prominence		L	L	M	M	M	M	M	L	L	L
Ecological		M	M	M	M	M	M	M	L	L	L
Significance Value											
Retention Value		<15	<15	>40	>40	>40	>40	>40	>40	>40	0
SULE		**Z8**	**Z8**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**Z4**
TPZ (m)		2.4	1.4	1.8	1.0	2.4	1.8	3.0	4.2	3.5	X
SRZ (m)		1.8	1.5	1.6	1.7	1.8	1.6	2.1	2.5	1.7	X
Additional Comments		Tall thin form, with no realistic potential of improvement	Tall thin form, with no realistic potential of improvement	Retainable	Retainable	Retainable	Retainable	Retainable	Retainable	Retainable	Dieback of 3rd & 4th order branches, evidence of root decay, 25° lean to North

Tree No		61	62	63	64	65	66	67	68	69	70
Species		*Corymbia citriodora*	*Corymbia citriodora*	*Macadamia integrifolia*	*Grevillea robusta*	*Ligustrum lucidum*	*Lophostemon conferta*	*Grevillea robusta*	*Lophostemon conferta*	*Ligustrum lucidum*	*Corymbia citriodora*
DBH (mm)		700	700	4x 150	350	120	250	250	200	250	350
RCD (mm)		900	900	400	450	180	300	300	300	300	400
Height (m)		32	25	13	22	x	13	14	14	x	15
Canopy Spread (m)	N	5	12	6	6	x	6	5	x	X	12
	S	16	6	4	6	x	0	3	x	X	0
	E	10	4	6	6	x	4	4	x	X	6
	W	10	16	6	3	x	4	4	x	X	0
Age Class		M	M	M	O/M	x	S/M	O/M	M	x	M
Canopy Type Direction		C/E	C/E	C	C/E	x	C/E	C	C/E	x	C/E
Health		F	A	A	P	x	A	A	F	x	A
Condition		P	P	A	F/P	x	F	F	F	x	P
Amenity		M	M	M	L	x	M	L	M	x	M
Prominence		L	L	L	L	x	L	L	L	x	L
Ecological		L	L	L	L	x	L	L	L	x	L
Significance Value						x				x	
Retention Value		0	0	>40	0	0	<15	0	<15	0	0
SULE		**Z5**	**Z6**	**A1**	**Z4**	**Z1**	**Z6**	**Z4**	**Z6**	**Z1**	**Z6**
TPZ (m)		x	x	6.0	x	x	3.0	x	2.4	x	4.2
SRZ (m)		x	x	2.3	x	x	2.0	x	2.0	x	2.3
Additional Comments		Asymmetrical canopy towards the south, sap ooze from crack in codominant branch junction	Significant asymmetrical canopy towards the west	Retainable	Over-mature tree in advanced stages of decline	Exempt species in DCP 2014	Asymmetrical canopy towards the north	Declining health and vitality	Asymmetrical canopy towards the west	Exempt species in DCP 2014	Heavily suppressed by No's 71 & 72, with a significant asymmetrical canopy to the N/E

Tree No		71	72	73	74	75	76	77	78	79	80
Species		*Corymbia citriodora*	*Corymbia citriodora*	*Gleditsia triacanthos*	*Gleditsia triacanthos*	*Eucalyptus sideroxylon*	*Casuarina cuninghamiana*	*Casuarina cuninghamiana*	*Jacarandar mimosifolia*	*Jacarandar mimosifolia*	*Melaleuca quinquenervia*
DBH (mm)		500	700	250	450	550	150	150	350	200	250
RCD (mm)		600	900	300	600	700	200	200	450	300	350
Height (m)		28	26	20	24	23	16	16	15	16	16
Canopy Spread (m)	N	8	8	8	10	6	6		0	6	7
	S	10	12	2	4	8	6		8	8	3
	E	0	12	6	6	8	4		8	0	7
	W	10	0	6	12	6	6		7	6	0
Age Class		M	M	S/M	M	M	S/M	S/M	M	M	M
Canopy Type Direction		C/E	C/E	S	D	C/E	C	C	C/E	C/E	C/E
Health		A	A	A	A	A	A	A	A	A	A
Condition		F	F	A	A	A	A	A	A	A	F-P
Amenity		M	M	M	M	M	M	M	M	M	M
Prominence		L	L	L	L	L	L	L	L	L	L
Ecological		L	L	L	L	M	M	M	L	L	L
Significance Value											
Retention Value		0	0	>40	>40	>40	>40	>40	>40	>40	0
SULE		**Z6**	**Z6**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**Z6**
TPZ (m)		X	X	3.0	5.4	6.6	1.8	1.8	4.2	2.4	X
SRZ (m)		X	X	2.0	2.7	2.8	1.7	1.7	2.4	2.0	X
Additional Comments											

Tree No		81	82	83	84	85	86	87	88	89	90
Species		*Melaleuca quinquenervia*	*Acmena smithii*	*Acer saccharinum*	*Acer saccharinum*	*Liquidambar styraciflua*	*Arbutus unedo*	*Palm*	*Cupressus sempervirens*	*Cupressus sempervirens*	*Cupressus sempervirens*
DBH (mm)		300	750	2x 300 3x 150	3x 200 3x 150	900	350	2x 150	2x 300	2x 300	2x 300
RCD (mm)		400	900	600	850	1100	400	2x 250	650	450	650
Height (m)		16	20	15	12	22	8	8	12	10	12
Canopy Spread (m)	N	3	13	7	7	15	2	2	3		
	S	7	2	8	7	13	6	2	3		
	E	7	7	7	8	16	4	2	1.5		
	W	0	10	3	2	16	0	2	1.5		
Age Class		M	M	M	M	M	M	M	M	O/M	M
Canopy Type Direction		C/E	C/E	C	C	D	U	C	C	C	C
Health		A	A	A	A/F	A	A	A	A	A	F
Condition		F-P	A	A	F	F	F-P	A	A	A	A
Amenity		M	M	M	M	M	L	L	M	M	M
Prominence		L	L	L	L	L	L	L	L	L	L
Ecological		L	M	L	L	L	L	L	L	L	L
Significance Value											
Retention Value		0	>40	>40	<15	0	0	>40	<40	<40	<40
SULE		**Z6**	**A1**	**A1**	**Z8**	**Z5**	**Z12**	**A1**	**A1**	**A1**	**A1**
TPZ (m)		x	9.0	11.5	10.5	x	x	2.0	6.0	6.0	6.0
SRZ (m)		x	3.2	2.7	3.1	x	x	1.0	2.8	2.4	2.8
Additional Comments											

Tree No		91	92	93	94	95	96	97	98	99	100
Species		*Lagerstroemia indica*	*Jacarandar mimosifolia*	*Photinia robusta*	*Photinia robusta*	*Magnolia*	*Camellia sasanqua*	*Camellia sasanqua*	*Bauhinia variegata*	*Hedera helix*	*Melaleuca decora*
DBH (mm)		multi	500	1x 200 2x 150	6x 100	250/200 2x 150	multi	multi	300	N/A	300
RCD (mm)		500	700	400	400	600	400	400	400	N/A	400
Height (m)		12	14	10	10	9	5	5	13	3	14
Canopy Spread (m)	N	0	8	7		5	4	4	6	x	8
	S	7	7	6		5	4	4	5	x	0
	E	6	7	5		5	4	4	7	x	4
	W	6	6	5		5	4	4	2	x	5
Age Class		M	O/M	M	M	M	M	M	M	x	M
Canopy Type Direction		M	D	C	C	C	C	C	S	x	C/E
Health		A	F	A	A	A	A	A	A	x	A
Condition		A	P	A	A	A	A	A	F	x	P
Amenity		M	M	M	M	M	M	M	M	x	M
Prominence		L	L	L	L	L	L	L	L	x	L
Ecological		L	L	L	L	L	L	L	L	x	M
Significance Value											
Retention Value		>40	0	>40	>40	>40	>40	>40	<40	0	0
SULE		**A1**	**Z5**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**Z2**	**Z6**
TPZ (m)		4.0	X	5.0	6.0	7.5	3.6	3.6	3.6	x	X
SRZ (m)		2.5	X	2.3	2.3	2.7	2.3	2.3	2.3	x	X
Additional Comments			Two codominant 1st order branches with a weak junction @ 2m high on the main trunk							Climbing plant	Significant asymmetrical canopy towards the north

Tree No		101	102	103	104	105	106	107	108	109	110
Species		*Morus nigra*	*Cinnamomum camphora*	*Cinnamomum camphora*	*Cinnamomum camphora*	*Lagerstroemia indica*	*Ligustrum lucidum*	*Lagunaria patersonia*	*Cinnamomum camphora*	*Ligustrum lucidum*	*Ligustrum lucidum*
DBH (mm)		150	5x 100	2x 200	5x 150	multi	200	3x 100	250/350	200	120/200
RCD (mm)		350	600	600	600	500	250	250	700	350	400
Height (m)		8	18	18	20	10	x	x	16	x	12
Canopy Spread (m)	N	5	10			0	x	4	x	x	x
	S	0	12			6	x	4	x	x	x
	E	6	6			4	x	4	x	x	x
	W	1	8			6	x	4	x	x	x
Age Class		M	S/M	S/M	S/M	M	x	x	M	x	x
Canopy Type Direction		E	C	C	C	E	x	x	C	x	x
Health		A	A	A	A	A	x	x	A	x	x
Condition		F	P	P	P	F	x	x	A	x	x
Amenity		L	M	M	M	M	x	x	M	x	x
Prominence		L	L	L	L	L	x	x	L	x	x
Ecological		L	L	L	L	L	x	x	L	x	x
Significance Value											
Retention Value		0	0	0	0	0	0	0	0	0	0
SULE		**Z8**	**Z8**	**Z8**	**Z8**	**Z5**	**Z1**	**Z1**	**Z1**	**Z1**	**Z1**
TPZ (m)		x	x	x	x	x	x	x	x	x	x
SRZ (m)		x	x	x	x	x	x	x	x	x	x
Additional Comments			Opportunistic weeds with multi-stemmed habits	Opportunistic weeds with multi-stemmed habits	Opportunistic weeds with multi-stemmed habits	Codominant on root crown with No. 116	Codominant on root crown with No. 115. Exempt species in DCP 2014	Exempt species in DCP 2014	Opportunistic weeds with multi-stemmed habits – within 2m of dwelling	Exempt species in DCP 2014	Exempt species in DCP 2014

Tree No		111	112	113	114	115	116	117	118	119	120	121
Species		*Ligustrum lucidum*	*Ligustrum lucidum*	*Ligustrum lucidum*	*Magnolia*	*Camellia sasanqua*	*Lophostemon conferta*	*Lophostemon conferta*	*Lophostemon conferta*	*Lophostemon conferta*	*Lophostemon conferta*	*Lophostemon conferta*
DBH (mm)		200	200	250	Multi	4x 150	650	200	600	450	2x 400	400
RCD (mm)		300	300	350	500	400	750	300	750	600	700	500
Height (m)		x	x	x	8	7	13	9	16	13	13	11
Canopy Spread (m)	x	x	x	X	4	4	6	3	6	6	6	5
	x	x	x	X	4	4	6	4	5	5	6	4
	x	x	x	X	4	4	6	4	6	6	6	3
	x	x	x	X	4	4	6	4	6	6	6	4
Age Class		x	x	x	M	M	M	M	M	M	M	M
Canopy Type Direction		x	x	x	U	U	Codominant Street Trees					
Health		x	x	x	A	F	A	A	A	A	A	A
Condition		x	x	x	A	F	A	A	A	A	A	A
Amenity		x	x	x	M	M	M	M	M	M	M	M
Prominence		x	x	x	L	L	M	M	M	M	M	M
Ecological		x	x	x	L	L	L	L	L	L	L	L
Significance Value												
Retention Value		0	0	0	>40	>40	>40	>40	>40	>40	>40	>40
SULE		**Z1**	**Z1**	**Z1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**	**A1**
TPZ (m)		x	x	x	4.0	4.0	4.0	2.4	7.2	5.4	8.0	4.8
SRZ (m)		x	x	x	2.5	2.3	2.9	2.0	2.9	2.7	2.8	2.5
Additional Comments		Exempt species in DCP 2014	Exempt species in DCP 2014	Exempt species in DCP 2014	Retainable	Retainable	Street tree	Street tree	Street tree	Street tree	Street tree	Street tree

11.0 TREE LOCATION PLAN