Moore Trees
Arboricultural Services
ABN 90887347745

ARBORICULTURAL ASSESSMENT REPORT for REF

85-91 Cowper Street, Warrawong NSW 2502
Warrawong Community Health Centre

December 2023
FINAL
Updated March 2024

Prepared for: Savills Australia, L25, Governor Phillip Tower
1 Farrer Place, Sydney NSW 2000

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Summary

This report has been compiled for Savills Australia for a Review of Environmental Factors (REF) for this site. This report concerns proposed development works at 85-91 Cowper Street, Warrawong NSW 2502 and refers to fifty one (51) trees within the study area.

Although not a Development Application, I have used the Wollongong City Council Arboricultural requirements for Development Applications as a framework for the data collected for this report. The Australian Standard *Protection of trees on development sites*, AS 4970, 2009 has also been reference for this report. The following data was collected for each tree:

1) All trees over five (5) metres in height were assessed for Safe Useful Life Expectancy (SULE).
2) Genus and species identification of each tree.
3) Impact of the proposed development on each tree.
4) Impact of retaining tree on the proposed development.
5) The Tree Protection Zone (TPZ) calculated for each tree.
6) Any branch or root pruning that may be required for trees.

Based on the demolition plan provided, there will be impacts to trees numbered as 2, 3, 7, 9, 10, 11, 12, 13, 28, 29, 30, 31, 32, 33, 39, 40, 41, 49, 50 and 51. Trees located within the proposed building footprint that will be required to be removed are numbered as Trees 2, 3, 7, 9, 10, 11, 12, 13, 31, 32, 39, 40, 41, 42, 47 and 48. Trees 49, 50 and 51 near Building H will require removal due to the existing car park being enlarged.

Trees that appear possible to retain are numbered as 1, 4, 5, 6, 8, 14-27, 32-38 and 43-46.

Basic tree protection measures have been specified to ensure the protection of the trees to be retained during the demolition are protected from damage.

Tree 14 may require reduction pruning of branches, for roof clearance, on the eastern portion of the canopy (Plate 10). These branches should be reduced back so as to maintain the canopy of the tree (ie, no lopping or 'flat topping'). Pruning points should be no greater than 100mm in diameter. This pruning is known as selective pruning and can be read about in more detail in the Australian Standard for the Pruning of Amenity Trees (AS 4373) 2007.

A footing detail within the TPZ of Tree 14 will need to specify that existing levels along the existing retaining wall will need to be retained and that any retaining wall in this area may require lintels or beams to bridge any woody roots that are exposed (Plate 10).

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VERSION CONTROL

Date of Issue	Details
26/09/2023	Draft 1 issued
13/10/2023	Draft 2
4/12/2023	Draft version issued incorp. GL and review of Plans/RAP
5/12/2023	Final version issued.
22/02/2024	Updated for removal of Trees 30 and 33.
05/03/2024	Updated for removal of Trees 28 and 29.

1 INTRODUCTION

1.1 This report has been conducted to assess the health and condition of fifty one (51) trees located at 85-91 Cowper Street, Warrawong NSW 2502. This report has been prepared for Savills Australia, Level 25, Governor Phillip Tower, 1 Farrer Place, Sydney NSW 2000 as required for a Review of Environmental Factors (REF) for the proposed works at this site.

The subject trees were assessed for their health and condition. This report also includes tree protection measures that will help retain and ensure that the long term health of the trees to be retained are not adversely affected by the proposed works.

Although not a Development Application, I have used the Wollongong City Council Arboricultural requirements for Development Applications as a frame work for the data collected for this report. The Australian Standard *Protection of trees on development sites,* AS 4970, 2009 has also been reference for this report.

The following data was collected for each tree:

1) A site plan locating all trees over five (5) metres in height, including all street trees.
2) All trees were assessed for Safe Useful Life Expectancy (SULE), health and amenity value.
3) Genus and species identification of each tree.
4) Impact of the proposed development on each tree.
5) The Tree Protection Zone (TPZ) calculated for each tree.
6) Any branch or root pruning that may be required for trees.

Also noted for the purpose of this report were:

- Health and vigour; using foliage colour and size, extension growth, presence of deadwood, dieback and epicormic growth throughout the tree.
- Structural condition using visible evidence of bulges, cracks, leans and previous pruning.
- The suitability of the tree taking into consideration the proposed development.
- Age rating; Over-mature (>80% life expectancy), Mature (20-80% life expectancy), Young, Sapling (<20% life expectancy).

1.2 **Location:** The proposed development site is located at 85-91 Cowper Street, Warrawong NSW 2502, the Port Kembla Hospital site (Diagram 1). The proposed development site from herein will be referred to as "the Site". The study area can be seen in Diagram 2.

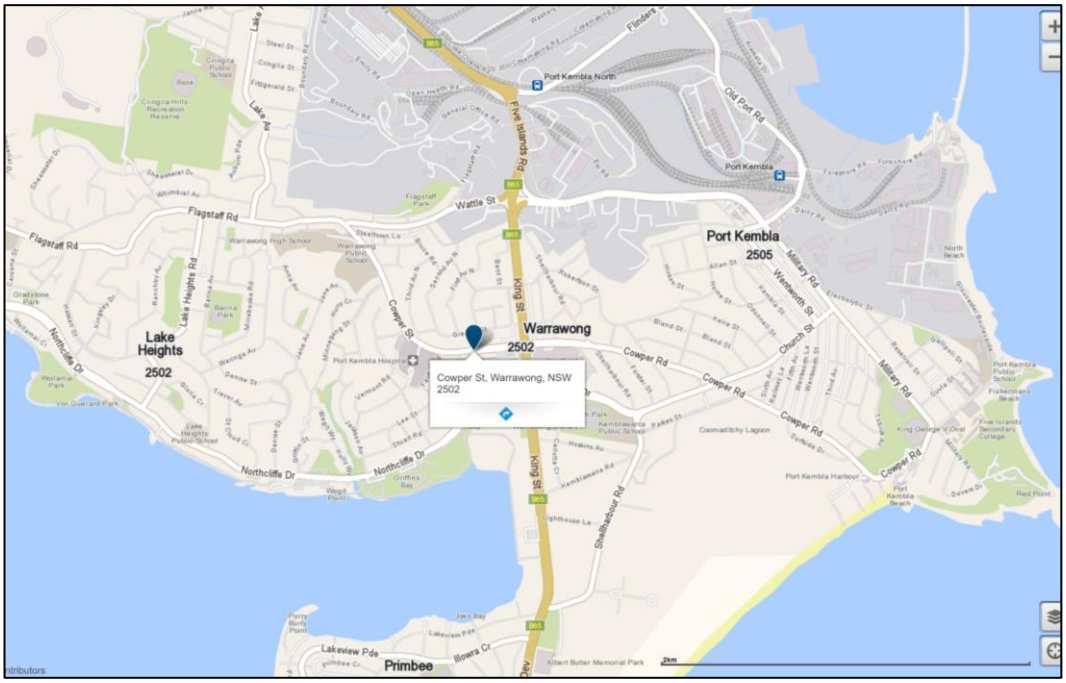

Diagram 1: Location of subject site, 85-91 Cowper Street, Warrawong NSW 2502 (Blue Marker) (whereis.com.au, 2023)

Diagram 2: Location of study area (Google Earth, 2023).

2 METHODOLOGY

2.1 To record the health and condition of the trees, a Visual Tree Assessment (VTA) was undertaken on the subject trees on 13/09/2023. This method of tree evaluation is adapted from Matheny and Clark, 1994 and is recognised by The International Society of Arboriculture, Arboriculture Australia and The Institute Australian of Consulting Arborists (IACA). It is also known as a Level 2: Basic Assessment Process as per the International Society of Arboriculture best management practices titled *'Tree Risk Assessment"* (Smiley, Matheny & Lilly, 2011).

2.2 **Height:** The heights and distances within this report have been measured with a Bosch DLE 50 laser measure.

2.3 **Tree Protection Zone (TPZ):** The TPZ is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. TPZ's have been calculated for each tree to determine construction impacts. The TPZ calculation is based on the Australian Standard *Protection of trees on development sites*, AS 4970, 2009.

2.4 **Structural Root Zone (SRZ)**: The SRZ is a specified distance measured from the trunk that is set aside for the protection of tree roots, both structural and fibrous. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The TPZ and SRZ are measured as a radial measurement from the trunk. No roots should be severed within the SRZ area. A detailed methodology on the TPZ and SRZ calculations can be found in Appendix 4.

2.5 **Safe Useful Life Expectancy (SULE)**: The subject trees were assessed for a Safe Useful Life Expectancy (SULE). The SULE rating for each tree can be seen in the Tree Assessment Schedule (Appendix 2). A detailed explanation of SULE can be found in Appendix 3.

2.6 Plans and information provided: For this Arboricultural Report I was supplied the following documents:

- Draft Remediation Action Plan (RAP) by Brendan Page, JK Environments dated 30/11/23;
- Yerrabingin Landscape Architect Plan set dated 25.02.24, Rev D, job ref. 0122;
- Site services Infrastructure Report by ARUP dated 26/10/2023;
- Demolition Plan by Cox + Sth Architecture marked Job # 130562-WCHC-CAS-AR-DWG-01-99-1001, Revision A dated 4 September 2023.
- Site works plan, Rev01, Dwg number 5988-cv-10301
- **Survey note:** The tree canopies in the survey are not accurate and, as such, have been shown to a more realistic scale in Appendix Plan 1, Tree Retention Values.

DRAWING LIST - REF

SHEET No.	SHEET NAME
01 Cover Sheets	
01-99-0001	COVER SHEET - DRAWING INDEX
11 OVERALL PLANS	
11-99-1001	EXISTING SITE PLAN
11-99-1003	SITE ANALYSIS
11-99-1004	GFA BREAKDOWN
11-99-5001	SHADOW DIAGRAM - SUMMER
11-99-5002	SHADOW DIAGRAM - WINTER
11-99-9001	PROPOSED SITE PLAN - REF
15 DEMOLITION PLANS	
15-99-9901	DEMOLITION PLAN - REF
21-1 GENERAL ARRANGEMENT 1:200	
21-02-9901	LEVEL 02 (ROOF) GENERAL ARRANGEMENT
21-99-9901	LEVEL 00 GENERAL ARRANGEMENT - REF
21-99-9902	LEVEL 01 GENERAL ARRANGEMENT - REF
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30-99-9901	ELEVATIONS - SHEET 1 - REF
30-99-9902	ELEVATIONS - SHEET 2 - REF
30-99-9903	ELEVATIONS - SHEET 3 - REF
40 SECTIONS	
40-99-1001	SECTIONS - SHEET 1
40-99-1002	SECTIONS - SHEET 2
82 PERSPECTIVES	
82-99-1001	EXTERIOR PERSPECTIVES SHEET 1
90 Schedules	
97-99-1001	MATERIAL FINISHES

2.7 Impact Assessment: An impact assessment was conducted on the site trees. This was conducted by assessing the site survey and plans provided by the Client. The plans provided were assessed for the following:

- Reduced Level (R.L.) at base of tree.
- Incursions into the Tree Protection Zone (TPZ).
- Assessment of the likely impact of the works.
- Location of sediment controls in relation to TPZ areas
- Location of stockpile areas in relation to TPZ areas
- Canopy clearance for scaffolding Australian Standard (Scaffolding) 1576.1, 2010 and Scaffolding Code of Practice 2009-Safe work Australia.

2.8 Tree Significance & Retention Value: The Tree Significance & Retention Value used in this report is known as the Significance of a Tree, Assessment Rating System or STARS© system created by the Australian Institute of Consulting Arboriculturists (IACA). As noted by IACA, this system is a free to use system by Arboriculturists as at the date of this report. This system allows a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments (Draper and Richards 2009). The system uses a scale of *High, Medium and Low significance* in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. The Retention Value is selected between *High, Medium, Low and Priority for removal.* The Matrix can be seen in Appendix 3.

2.9 Tree Retention Value Plans: All trees have been allocated a Tree Retention Value. These values have been applied to the colour coded plan in Appendix 1 (Tree Retention Plan 1).

3 RELEVANT BACKGROUND INFORMATION

3.1 This site is located on the corner of Cowper Street and Fairfax Avenue, Warrawong. The site contains a multi-level nurse accommodation building along with a kindergarten daycare centre and associated outdoor playing area. To the east and south of the structures are outdoor car parking areas. The proposed works entail demolition of the existing structures and the construction of a new community health centre.

3.2 **The Site Trees:** The site was inspected on 13/09/2023. Each tree has been given a unique number for this site and can be viewed on the Tree Protection Plan (Appendix 1). This plan is based on the plan provided by the Client. All site trees have been tagged to correspond with the Tree Protection Plan.

3.3 The site trees consist of a mixture of native and exotic specimens that have been planted in a random pattern across most of the site. The tree species were identified as Coastal banksia *(Banksia integrifolia),* Weeping bottle brush *(Callistemon viminalis), Corymbia gummiferra,* Bangalay *(Eucalyptus botryoides),* Forest red gum *(Eucalyptus tereticornis),* Melaleuca decora, Brushbox *(Lophostemon confertus),* and Silky oak *(Grevillea robusta).*

3.4 The most significant trees on site are Trees 6, 8, 14, 16-18, 20-27, 36-38 and 43-46. These trees are all in good health and condition. Their main trunks, first and second order branches are free of any cracks, splits or fruiting bodies. Old pruning wounds are showing good occlusion, a sign that the trees are photosynthesizing effectively. New extension growth was noted with leaf colour showing good vitality on most specimens. Most of these trees would be considered to have 90% live canopies that are codominant with each other. The basal area and woody root zones were free of any ground heaving or lifting. Due to the trees growing in close proximity to each other they will have grafted root zones.

3.5 The low value trees on site are numbered as Trees 2, 3, 4, 7, 9, 10, 29, 31, 34, 39, 41 and 42 and are either exotic or weed specimens, being Pepper tree *(Schinus molle var. areira),* Liquidambar *(Liquidambar styraciflua),* Brazilian peppertree *(Schinus terebinthifolia),* Large leaf privet *(Ligustrum lucidum),* along with some smaller native shrubs.

Plate 1: Image showing Trees 6 (left) and 8 (right). P. Vezgoff.

Plate 2: Image showing Tree 14. P. Vezgoff.

Plate 3: Image showing the Trees 16, 17 and 18 around the existing substation. P. Vezgoff.

Plate 4: Image showing Trees 28-32 on the eastern side of the site. P. Vezgoff.

Plate 5: Image showing Trees 36, 37 and 38. P. Vezgoff.

Plate 6: Image showing Trees 20 and 21. P. Vezgoff.

Plate 6: Image showing Tree 43. P. Vezgoff.

Plate 7: Image showing Trees 50 (left) and 51 (right) near Building H. P. Vezgoff.

3.6 The trees were assessed as below for the Significance of a Tree, Assessment Rating System or STARS©. The STARS© Matrix can be seen in Appendix 3.

Retention Value	**High (Priority for retention)**	**Medium (Consider for retention)**	**Low (Consider for removal)**
Tree No.	6, 8, 14, 16, 17, 18, 20-27, 36-38 and 43-46	1, 5, 11, 12, 13, 15, 19, 28, 30, 32, 33, 35, 40, 47, 48-51	2, 3, 4, 7, 9, 10, 29, 31, 34, 39, 41, 42

Table 1: Retention Value of STARS©

These Retention Values have been applied to the colour coded plan in Appendix 1 (Tree Retention Values, Plan 1).

3.7 **Impacts:** Based on the demolition plan provided there will be impacts to trees numbered as 2, 3, 7, 9, 10, 11, 12, 13, 28, 29, 30, 31, 32, 33, 39, 40, 41, 49, 50 and 51. Trees 14 will, in theory, have minor incursions to its TPZ, however this tree will have grown since the construction of the main building (Plate 9). As such, roots will have deflected from the concrete footings and the demolition of the existing structure is unlikely to reveal woody roots.

3.8 The proposed plans and landscape design (Plate 8) will not impact Trees 4, 5, 6 and 8, however the demolition and grading of surfaces to the north of these trees shall be undertaken carefully so as not to damage any woody surface roots that may be present.

3.9 Trees located within the proposed building footprint and new retaining walls that will be required to be removed are numbered as Trees 2, 3, 7, 9, 10, 11, 12, 13, 28, 29, 30, 31, 32, 33, 39, 40, 41, 42, 47 and 48. Trees 49, 50 and 51 near Building H will require removal due to the existing car park being enlarged. Trees that appear possible to retain are numbered Trees 1, 4, 5, 6, 8, 14-27, 32-38 and 43-46.

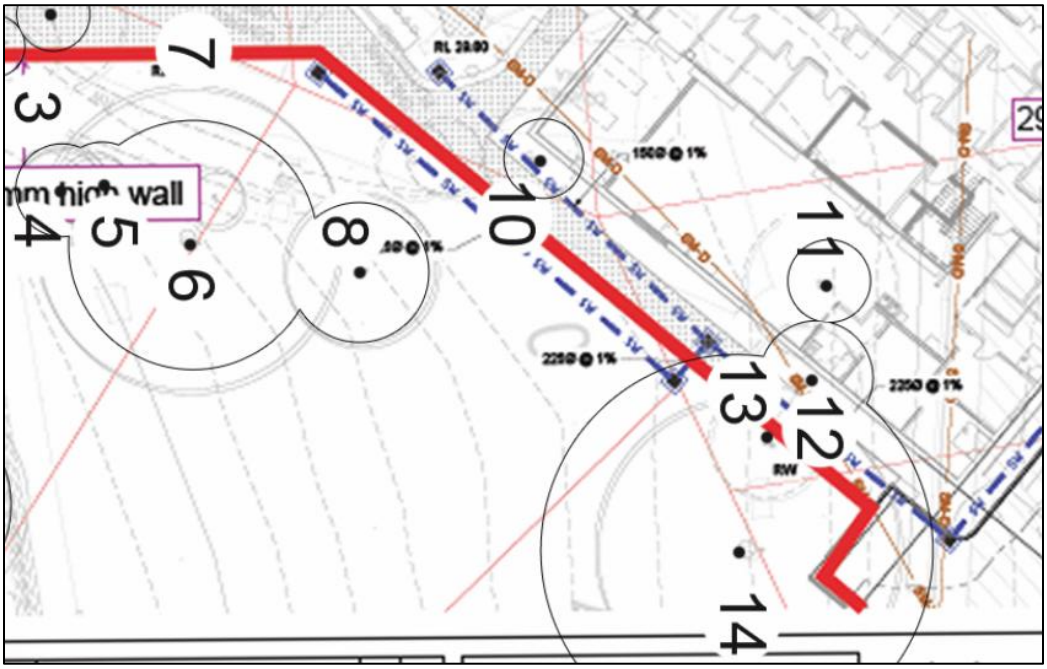


Plate 8: Part plan showing the works near Trees 4-14.

Plate 9: 1970 image showing the lack of site trees (NSW Gov spatial services).

4 RECOMMENDATIONS

4.1 A Project Arborist should be appointed to oversee the arboricultural related works for the project. The Project Arborist should be used for arboricultural certification services and also used as a point of contact should any questions arise during the project. As specified in AS 4970, 2009, a Project Arborist is a person with a minimum Australian Qualification Framework (AQF) level 5 Diploma of Arboriculture or Horticulture qualification.

4.2 It is possible that the current design may change. It is strongly recommended that the Project manager applies the calculated TPZ and SRZ distances (Appendix 2) to their construction drawings and assess impacts should the current designs change. The Project manager should notify Moore Trees during the design stage should any works fall within the TPZ and SRZ distances of any tree to be retained.

4.3 **Tree construction protection:** Some of the site trees will require tree protection fencing as specified in Section 5.2 of this report due to their proximity to the works. This fencing will be located at the Tree Protection Zones (TPZ) listed in the Tree Schedule (Appendix 2). The specifications for a TPZ are in Section 5.3 of this report.

4.4 Trees possible to retain are numbered as retain are numbered as 1, 4, 5, 6, 8, 14-27, 32-38 and 43-46. Trees proposed to be removed are numbered as Trees 2, 3, 7, 9, 10, 11, 12, 13, 28, 29, 30, 31, 32, 33, 39, 40, 41, 42, 47, 48, 49, 50 and 51.

4.5 Tree 14 may require reduction pruning of branches, for roof clearance, on the eastern portion of the canopy (Plate 10). These branches should be reduced back so as to maintain the canopy of the tree (ie, no lopping or 'flat topping'). Pruning points should be no greater than 100mm in diameter. This pruning is known as selective pruning and can be read about in more detail in the Australian Standard for the Pruning of Amenity Trees (AS 4373) 2007.

4.6 A footing detail within the TPZ of Tree 14 will need to specify that existing levels along the existing retaining wall will need to be retained and that any retaining wall in this area may require lintels or beams to bridge any woody roots that are exposed (Plate 10).

Plate 10: Canopy pruning of Tree 14 may be required. The red line is where lintels or concrete beams may have to be used to bridge woody roots.

4.7 **Building material storage:** Areas on the Site shall have to be set aside for the exclusive use of:

- Construction access points
- Position of site sheds and latrines and temporary services
- Storage of materials

These points are to be outside of any TPZ area. Any area set aside for the stockpiling of soil and waste shall have the appropriate erosion control measures around this area as specified by an engineer. These erosion control measures shall be monitored and maintained regularly throughout the construction period of the Site. These measures are to restrict any waste material entering the TPZ areas of the trees to be retained.

4.8 **Tree removal:** All tree work shall be carried out by a qualified Arborist and work shall be completed following AS 4373 (Pruning of Amenity Trees, 2007).

4.9 The location of services may potentially impact on the site trees and their root systems. Strip trenching through TPZ areas can sever roots, thus destabilising trees. All disciplines that must plan service locations that require trenching shall be supplied the TPZ distances in this report so that major incursions of greater than 10% can be avoided. These disciplines may include but not be limited to, stormwater design, gas, water and electricity locations.

4.10 Contaminated soils: Asbestos soil remediation often involves either capping of the contaminated soil or total soil removal. When trees are involved, this can often slow if not stop construction whilst remediation processes are undertaken. Remediation also involves altering the soil up to the base of the tree, which in turn can affect the health and/or structure of the tree. The soil contamination report states that only isolated areas of contamination were present within the study area. These isolated areas appear to be away from the site trees to be retained and, as such, no soil removal is expected to occur within the TPZ of these trees.

5 TREE PROTECTION

5.1 Trees to be protected: Trees to be retained will be required to be fenced for protection. All fencing shall be installed as specified in Section 5.2 (Tree Protection – Implementation of Tree Protection Zone) as per the Australian Standard for Trees on development sites (AS4970). Indicative locations of the fencing are shown in the Tree Protection Plan (Appendix 1, Plan 2).

5.2 Implementation of Tree Protection Zone: All tree protection works should be carried out before the start of demolition or building work. It is recommended that chain mesh fencing with a minimum height of 1.8 metres be erected as shown in the Tree Protection Plan (Appendix 1, Plan 2). Specifications for this fencing are shown in Tree Protection Fencing Specifications (Appendix 6).

5.3 The Tree Protection Zone (TPZ) and Structural Root Zone (SRZ): The TPZ is implemented to ensure the protection of the trunk and branches of the subject tree. The TPZ is based on the Diameter at Breast Height (DBH) of the tree. The SRZ is also a radial measurement from the trunk used to protect and restrict damage to the roots of the tree.

The Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) have been measured from the centre of the trunk. TPZ and SRZ distances are all listed in the Tree Schedule (Appendix 2). The following activities shall be avoided within the TPZ and SRZ of Trees to be retained;

- Erecting site sheds or portable toilets.
- Trenching, ripping or cultivation of soil (with the exception of approved foundations and underground services).
- Soil level changes or fill material (pier and beam or suspended slab construction are acceptable).
- Storage of building materials.
- Disposal of waste materials, solid or liquid.

5.4 **Tree Damage:** If the retained trees are damaged, a qualified Arborist should be contacted as soon as possible. The Arborist will recommend remedial action so as to reduce any long-term adverse effect on the tree's health.

5.5 **Signage:** It is recommended that signage is attached to the tree protection fencing areas. A sample sign has been attached in Appendix 7. This sign may be copied and laminated then attached to any TPZ fencing area. These should be attached to every third panel.

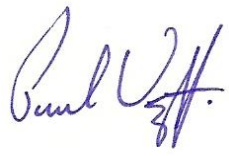
5.6 **Arborist Certification:** It is recommended that the contractor supply the Principal Certifying Authority with certification from the Project Arborist at the hold points listed below in order to verify that retained trees have been correctly retained and protected as per the conditions of consent and Arborist's recommendations. The certification is to be conducted by a Qualified Consulting Arborist with AQF level 5 qualifications that has current membership with either Arboriculture Australia (AA) or Institute of Australian Consulting Arboriculturists (IACA). Arborist certification is recommended:

(1) Before the commencement of demolition or construction to confirm the fencing has been installed;

(2) Monthly inspections to ensure retained trees maintain health and condition and that TPZ fencing is maintained;

(3) At completion of the construction phase.

If you have any questions in relation to this report, please contact me.



Paul Vezgoff
Consulting Arborist
Dip Arb (Dist), Arb III, Hort cert, AA, ISA

22nd February 2024

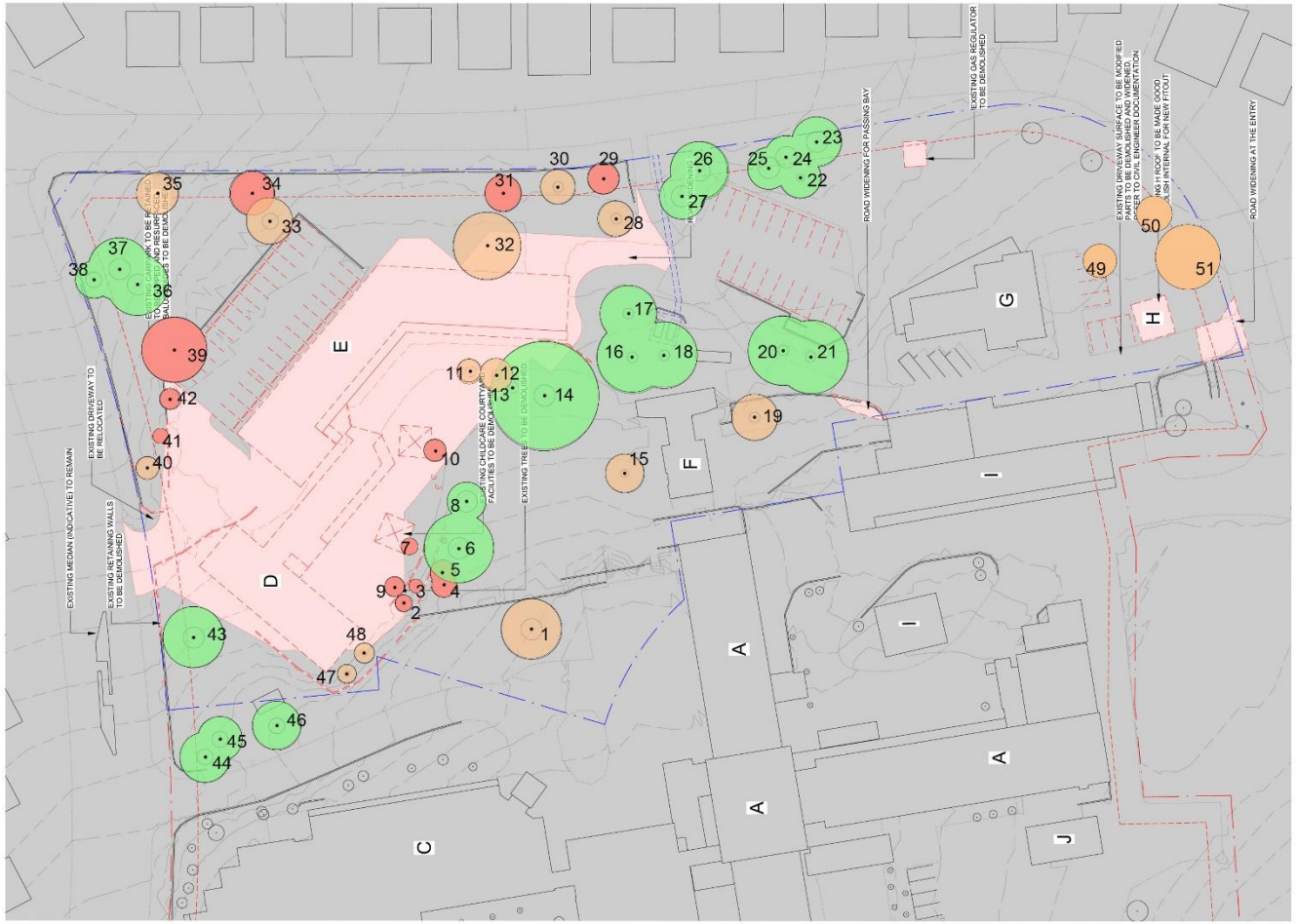
Appendix 1

Plan 1

Tree Retention Values

Plan 2

Tree Protection Plan



Tree Retention Values

MOORE TREES

Moore Trees

Plan 1

- High
- Medium
- Low

Note: The tree condition plan is seperate to the SULE categories that have been allocated to the site trees.

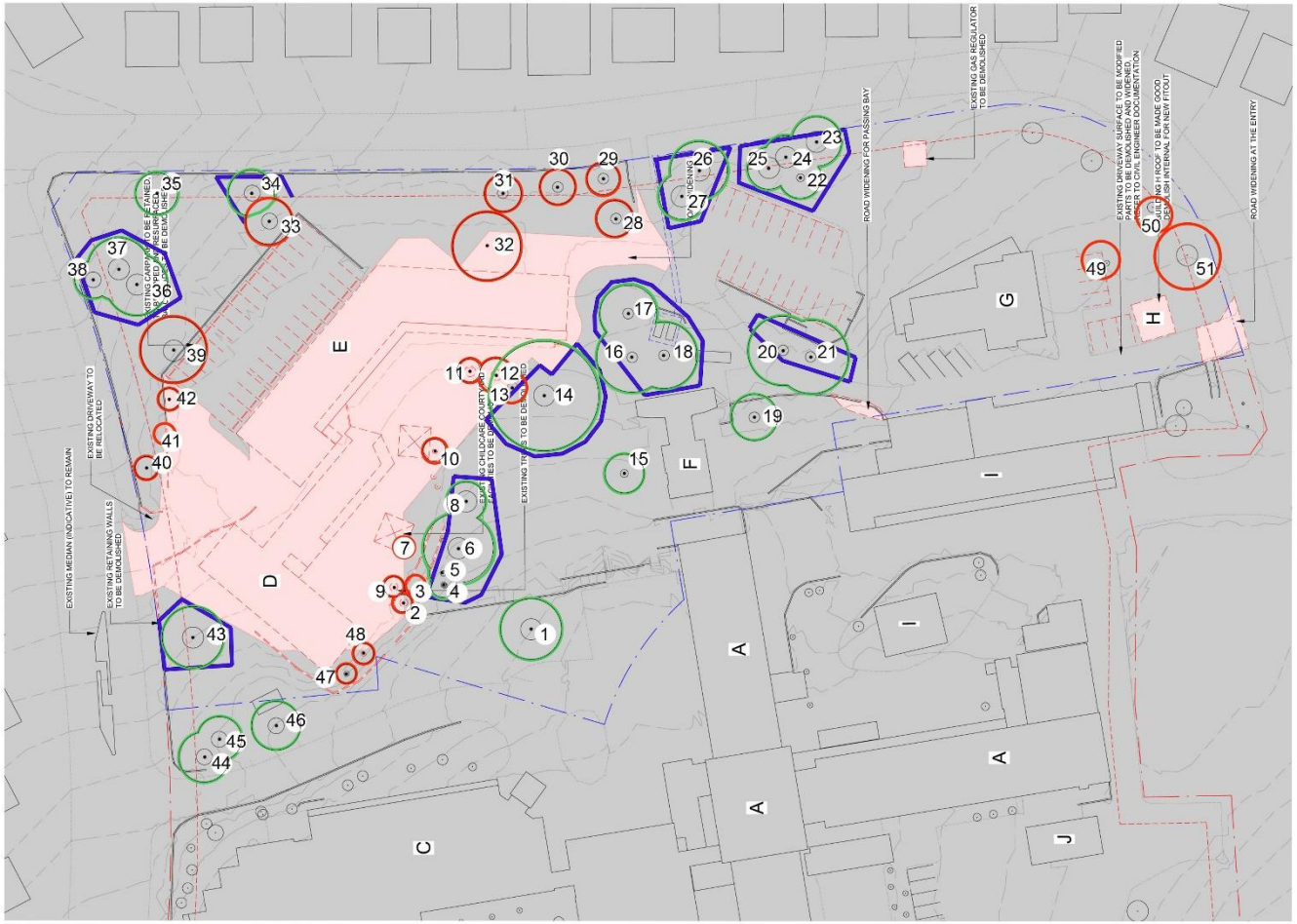
The Tree Significance & Retention Value used in this report is known as the Significance of a Tree, Assessment Rating System or STARS© system created by the Australian Institute of Consulting Arboriculturists (IACA). See Appendix 3 within the report for the full assessment specification.

Date: 13.10.23
Drawn: P.Vezgoff
Site Address: 85-91 Cowper Street
Warrawong NSW 2502

Tree protection plan

Plan 2

Moore Trees



Tree to be retained

Tree to be removed

Fence. Implementation of tree protection zone (TPZ). All tree protection works should be carried out before the start of demolition or building works. It is recommended that chain mesh fencing with a minimum height of 1.8 metres be erected

Date:	05.03.24
Drawn:	P.Vezgoff
Site Address:	85-91 Cowper Street Warrawong NSW 2502

Appendix 2

Table 2

Tree health & condition assessment schedule

TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE – 85-91 Cowper Street, Warrawong NSW 2502

Tree	Species	Height (m)	Spread (m)	DBH (m)	SRZ basal	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
1	Coastal banksia (Banksia integrifolia)	5.5	4.6	0.52	0.62	90	No visual defects	1a >40 years	Good	Mature		6.2	2.6
2	Weeping bottle brush (Callistemon viminalis)	6	3.5	0.18	0.28	80	No visual defects	1a >40 years	Good	Mature	Multi-Stemmed Specimen	2.2	1.9
3	Corymbia gummiferra	6	5	0.24	0.34	0	No visual defects	1a >40 years	Good	Mature		2.9	2
4	Bangalay (Eucalyptus botryoides)	5	3.2	0.11	0.21	100	No visual defects	1a >40 years	Good	Mature	Multi-Stemmed Specimen	1.3	1.7
5	Forest red gum (Eucalyptus tereticornis)	5.5	2.6	0.1	0.2	100	No visual defects	1a >40 years	Good	Mature		1.2	1.6
6	Bangalay (Eucalyptus botryoides)	11	10	0.78	0.88	90	Dead wood >50mm	1a >40 years	Good	Mature	two large dead limbs >50mm	9.4	3
7	Forest red gum (Eucalyptus tereticornis)	4	1.8	0.09	0.19	100	No visual defects	1a >40 years	Good	Mature		1.1	1.6
8	Bangalay (Eucalyptus botryoides)	7.5	6	0.42	0.52	60	Dead wood >50mm	1a >40 years	Good	Mature		5	2.4
9	Corymbia gummiferra	5	5.7	0.28	0.38	60	No visual defects	2a May only live for 15-40 years	Good	Mature	multiple small fruiting bodies present	3.4	2.1
10	Hakia sp	5	3	0.36	0.46	15	No visual defects	1a >40 years	Good	Mature		4.3	2.3
11	Melaleuca decora	7	3.7	0.32	0.42	80	No visual defects	1a >40 years	Good	Mature	Codominant Stems	3.8	2.2

Tree	Species	Height (m)	Spread (m)	DBH (m)	SRZ basal	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
12	Coastal banksia (Banksia integrifolia)	8	3.5	0.29	0.39	0	No visual defects	4a Dead, dying or declining.	Good	Mature		3.5	2.2
13	Melaleuca decora	6.5	3.5	0.47	0.57	70	No visual defects	1a >40 years	Good	Mature	Majority of canopy is under tree 14, with a large branch growing through the canopy	5.6	2.5
14	Bangalay (Eucalyptus botryoides)	13	10.8	0.74	0.84	90	No visual defects	1a >40 years	Good	Mature		8.9	3
15	Melaleuca decora	7.5	3.8	0.46	0.56	60	No visual defects	1a >40 years	Good	Mature	Epicormic Growth Multi-Stemmed Specimen	5.5	2.5
16	Brushbox (Lophostemon confertus)	9	6.2	1.02	1.12	80	Dead wood <50mm	1a >40 years	Good	Mature		12.2	3.4
17	Brushbox (Lophostemon confertus)	9.5	5.2	0.77	0.87	90	No visual defects	1a >40 years	Good	Mature		9.2	3
18	Brushbox (Lophostemon confertus)	8	4	0.42	0.52	90	No visual defects	1a >40 years	Good	Mature		5	2.4
19	Melaleuca decora	5.5	4.8	0.57	0.67	90	No visual defects	1a >40 years	Good	Mature		6.8	2.7
20	Spotted gum (Corymbia maculata)	10.5	6.8	0.42	0.52	95	No visual defects	1a >40 years	Good	Mature		5	2.4
21	Silky oak (Grevillea robusta)	11	6.6	0.49	0.59	60	No visual defects	1a >40 years	Good	Mature		5.9	2.6
22	Brushbox (Lophostemon confertus)	11	5.2	0.55	0.65	90	No visual defects	1a >40 years	Good	Mature	Codominant Stems .36	6.6	2.7
23	Hill's weeping fig (Ficus microcarpa var. Hillii)	12	9.3	0.75	0.85	90	No visual defects	1a >40 years	Good	Mature	large cavity on first order branch 4.5m high	9	3
24	Brushbox (Lophostemon confertus)	7	8.1	0.38	0.48	10	No visual defects	4a Dead, dying or declining.	Good	Mature	Epicormic Growth Asymmetrical Canopy	4.6	2.4

Tree	Species	Height (m)	Spread (m)	DBH (m)	SRZ basal	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
25	Brushbox (Lophostemon confertus)	9.5	5.4	0.45	0.55	90	No visual defects	1a >40 years	Good	Mature		5.4	2.5
26	Tallowwood (Eucalyptus microcorys)	11	6.7	0.81	0.91	90	No visual defects	1a >40 years	Good	Mature		9.7	3.1
27	Brushbox (Lophostemon confertus)	9	5.2	0.51	0.61	90	No visual defects	1a >40 years	Good	Mature		6.1	2.6
28	Brushbox (Lophostemon confertus)	8.5	4.3	0.46	0.56	90	No visual defects	1a >40 years	Good	Mature	exposed woody roots	5.5	2.5
29	Pepper tree (Schinus molle var. areira)	8	4.7	0.39	0.49	65	No visual defects	2a May only live for 15-40 years	Good	Mature	Multi-Stemmed Specimen, Epicormic Growth	4.7	2.4
30	Melaleuca decora	8	3.4	0.64	0.74	80	No visual defects	1a >40 years	Good	Mature		7.7	2.8
31	Liquidambar (Liquidambar styraciflua)	6.5	3.5	0.43	0.53	35	No visual defects	1a >40 years	Good	Mature		5.2	2.5
32	Swamp mahogany (Eucalyptus robusta)	8	7	0.39	0.49	90	No visual defects	1a >40 years	Good	Mature		4.7	2.4
33	Swamp mahogany (Eucalyptus robusta)	9	4.2	0.38	0.48	80	No visual defects	1a >40 years	Good	Mature	Codominant Stems	4.6	2.4
34	Schinus terebinthifolia	4.5	5	0.43	0.53	90	No visual defects	1a >40 years	Good	Mature	Multi-Stemmed Specimen, exposed woody roots	5.2	2.5
35	Illawarra flame tree (Brachychiton acerifolius)	7.5	3.3	0.39	0.49	100	No visual defects	1a >40 years	Good	Mature		4.7	2.4
36	Spotted gum (Corymbia maculata)	12	7	0.63	0.73	90	No visual defects	1a >40 years	Good	Mature	potential Habitat Hollows	7.6	2.8
37	Spotted gum (Corymbia maculata)	12	7	0.58	0.68	90	No visual defects	1a >40 years	Good	Mature		7	2.7
38	Spotted gum (Corymbia maculata)	13	7	0.6	0.7	90	No visual defects	1a >40 years	Good	Mature		7.2	2.8
39	Large leaf privet (Ligustrum lucidum)	6	3	0.12	0.22	100	No visual defects	1a >40 years	Good	Mature	Multi-Stemmed Specimen	1.4	1.7

Tree	Species	Height (m)	Spread (m)	DBH (m)	SRZ basal	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
40	Lemon-scented gum tree (Corymbia citriodora)	9	3.8	0.29	0.39	90	No visual defects	1a >40 years	Good	Mature		3.5	2.2
41	Weeping bottle brush (Callistemon viminalis)	3.5	1.4	0.1	0.2	90	No visual defects	1a >40 years	Good	Mature	Multi-Stemmed Specimen	1.2	1.6
42	Lepto petersonii	4	2.5	0.12	0.22	100	No visual defects	1a >40 years	Good	Mature	Multi-Stemmed Specimen	1.4	1.7
43	Small leafed pepper mint (Eucalyptus nicholii)	11.5	4.6	0.66	0.76	90	No visual defects	1a >40 years	Good	Mature		7.9	2.9
44	Melaleuca styphelioides	7.5	4	0.36	0.46	90	No visual defects	1a >40 years	Good	Mature	Multi-Stemmed Specimen	4.3	2.3
45	Melaleuca styphelioides	7.5	4	0.36	0.46	90	No visual defects	1a >40 years	Good	Mature	Multi-Stemmed Specimen	4.3	2.3
46	River she oak (Casuarina cunninghamiana)	9	4.5	0.38	0.48	90	No visual defects	1a >40 years	Good	Mature		4.6	2.4
47	Bangalow palm (Archontophoenix cunninghamiana)	7.5	2	0.16	0.26	80	No visual defects	1a >40 years	Good	Mature		1.9	1.8
48	Bangalow palm (Archontophoenix cunninghamiana)	8	2	0.16	0.26	80	No visual defects	1a >40 years	Good	Mature		1.9	1.8
49	Melaleuca decora	3.2	2	0.18	0.2	95	No visual defects	5a Small tree <5 m in height.	Good	Mature		2.2	1.6
50	Melaleuca decora	4.5	2	0.25	0.35	95	No visual defects	5a Small tree <5 m in height.	Good	Mature		3	2.1
51	Bangalay (Eucalyptus botryoides)	10	8	0.55	0.65	80	Storm damage	2a May only live for 15-40 years	Fair	Mature	Mechanical wounds on main stem, slight upper Dieback possible internal decay	6.6	2.7

KEY

Tree No: Relates to the number allocated to each tree for the Tree Plan.

Height: Height of the tree to the nearest metre.

Spread: The average spread of the canopy measured from the trunk.

DBH: Diameter at breast height. An industry standard for measuring trees at 1.4 metres above ground level, this measurement is used to help calculate Tree Protection Zones.

Live Crown Ratio: Percentage of foliage cover for a particular species.

Age Class:	Young:	Recently planted tree	Semi-mature:< 20% of life expectancy
	Mature:	20-90% of life expectancy	Over-mature:>90% of life expectancy

SULE: See SULE methodology in the Appendix 3

Tree Protection Zone (TPZ): The minimum area set aside for the protection of the trees trunk, canopy and root system throughout the construction process. Breaches of the TPZ will be specified in the recommendations section of the report.

Structural Root Zone (SRZ): The SRZ is a specified distance measured from the trunk that is set aside for the protection of the trees roots both structural and fibrous.

Appendix 3

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

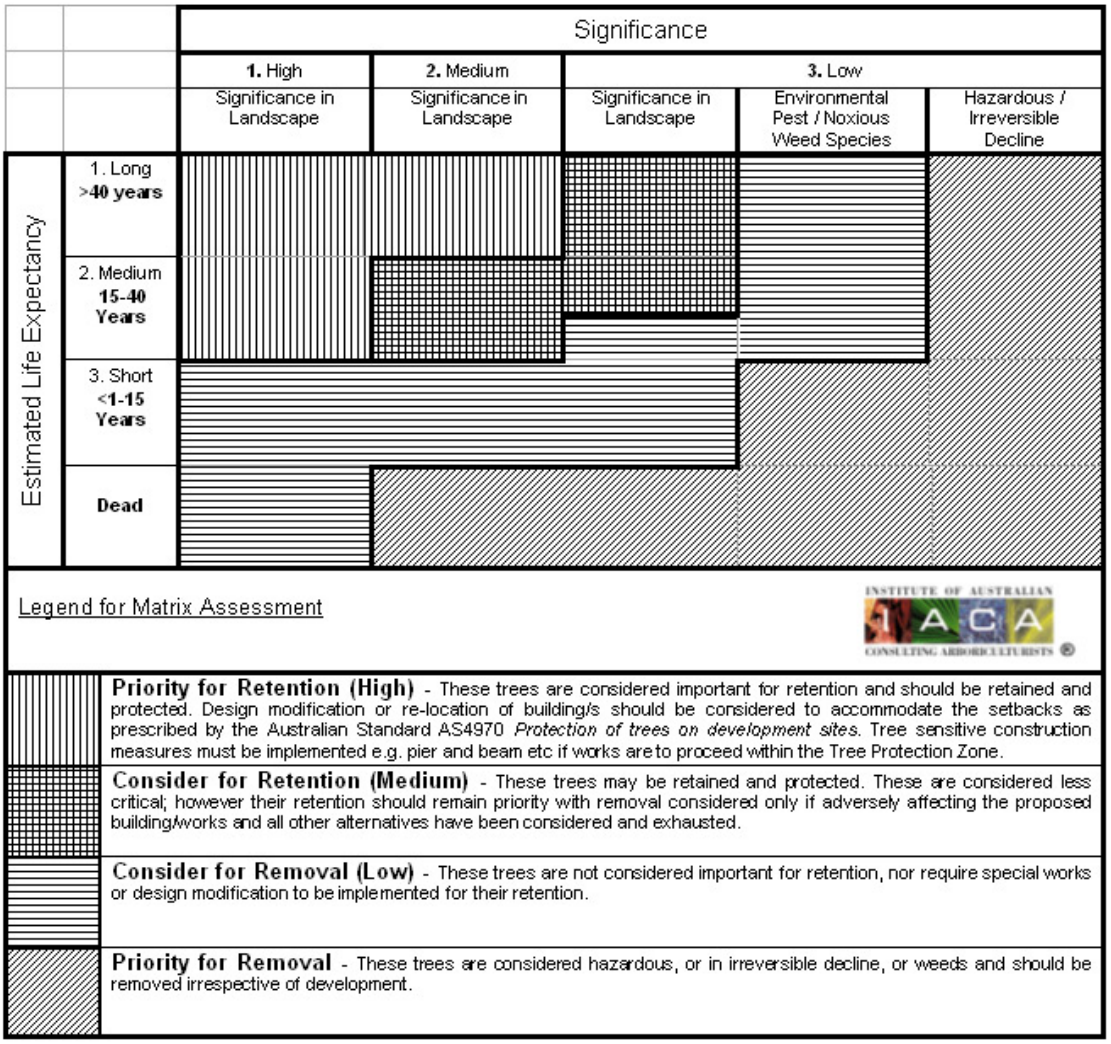
- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous, - The tree is

dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.



Legend for Matrix Assessment.

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia, **www.iaca.org.au**

Appendix 4

SULE categories (after Barrell, 2001)[1]

SULE Category	Description
Long	*Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.*
1a	Structurally sound trees located in positions that can accommodate for future growth
1b	Trees that could be made suitable for retention in the long term by remedial tree care.
1c	Trees of special significance that would warrant extraordinary efforts to secure their long term retention.
Medium	*Trees that appeared to be retainable at the time of assessment for 15-40 years with an acceptable level of risk.*
2a	Trees that may only live for 15-40 years
2b	Trees that could live for more than 40 years but may be removed for safety or nuisance reasons
2c	Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide for new planting.
2d	Trees that could be made suitable for retention in the medium term by remedial tree care.
Short	*Trees that appeared to be retainable at the time of assessment for 5-15 years with an acceptable level of risk.*
3a	Trees that may only live for another 5-15 years
3b	Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.
3c	Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide for a new planting.
3d	Trees that require substantial remedial tree care and are only suitable for retention in the short term.
Remove	*Trees that should be removed within the next five years.*
4a	Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
4b	Dangerous trees because of instability or loss of adjacent trees
4c	Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
4d	Damaged trees that are clearly not safe to retain.
4e	Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide for a new planting.
4f	Trees that are damaging or may cause damage to existing structures within 5 years.
4g	Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f).
4h	Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
Small	*Small or young trees that can be reliably moved or replaced.*
5a	Small trees less than 5m in height.
5b	Young trees less than 15 years old but over 5m in height.
5c	Formal hedges and trees intended for regular pruning to artificially control growth.

updated 01/04/01)

1 (Barrell, J. (2001) "SULE: Its use and status into the new millennium" in *Management of mature trees*, Proceedings of the 4th NAAA Tree Management Seminar, NAAA, Sydney.

Appendix 5

TPZ and SRZ methodology

Determining the Tree Protection Zone (TPZ)

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

TPZ = DBH x 12

Where

DBH = trunk diameter measured at 1.4 metres above ground

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2 metres no greater than 15 metres (except where crown protection is required.). Some instances may require variations to the TPZ.

The TPZ of palms, other monocots, cycads and tree ferns should not be less than 1 metre outside the crown projection.

Determining the Structural Root Zone (SRZ)

The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree.

The SRZ only needs to be calculated when major encroachment into a TPZ is proposed.

There are many factors that affect the size of the SRZ (e.g. tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the root buttress using the following formula or Figure 1. Root investigation may provide more information on the extent of these roots.

SRZ radius = $(D \times 50)^{0.42} \times 0.64$

Where

D = trunk diameter, in m, measured above the root buttress

NOTE: The SRZ for trees with trunk diameters less than 0.15m will be 1.5m (see Figure 1).

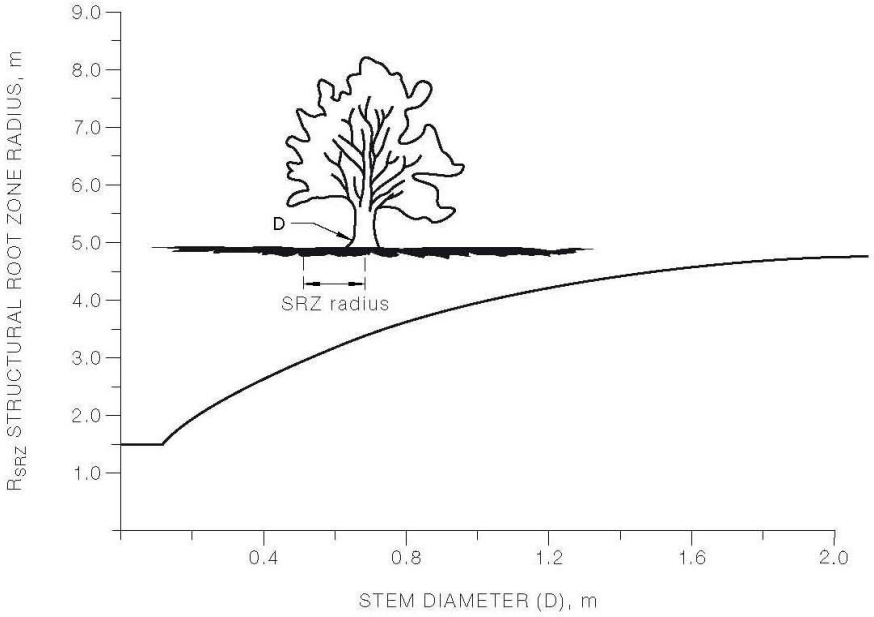


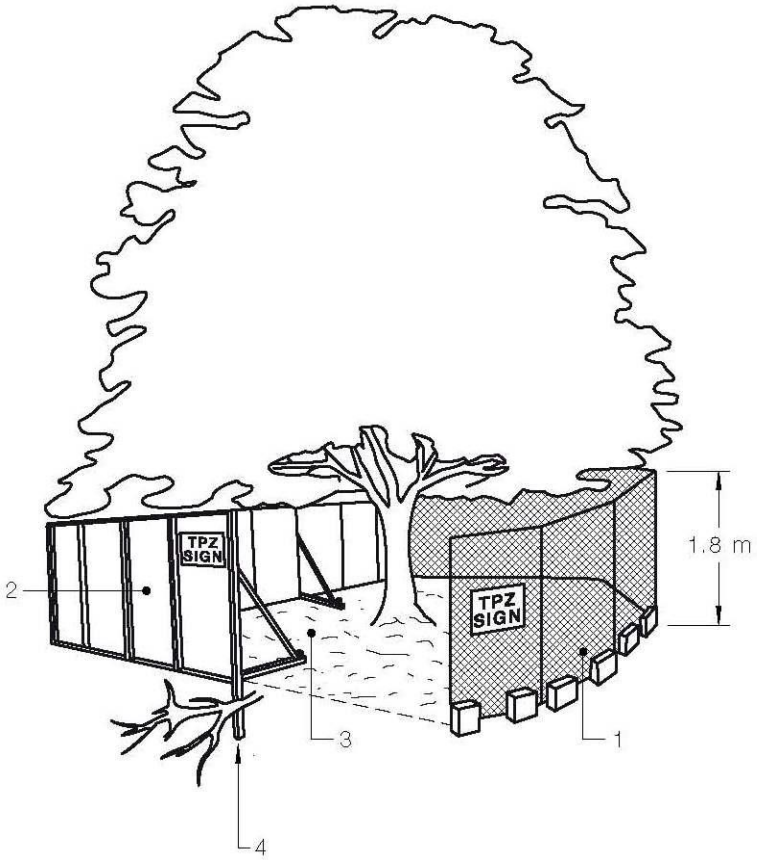
FIGURE 1 - STRUCTURAL ROOT ZONE

Notes:

1 R_{SRZ} is the structural root zone radius.
2 *D* is the stem diameter measured immediately above root buttress.
3 The SRZ for trees less than o.15 metres diameter is 1.5 metres.
4 The SRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns.
5 This does not apply to trees with an asymmetrical root plate.

Appendix 6

Tree protection fencing specifications



LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.

2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.

3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Figure 1: Protective fencing as specified in AS 4970, 2009.

Appendix 7

Tree protection sign

sign sample

Moore Trees
Tree Consultancy
0411 712 887

Tree Protection Zone

Fence not to be moved without approval from Arborist

Within this fence there is to be

NO

Storage of materials

Trenching or excavation

Washing of tools or equipment

Appendix 8

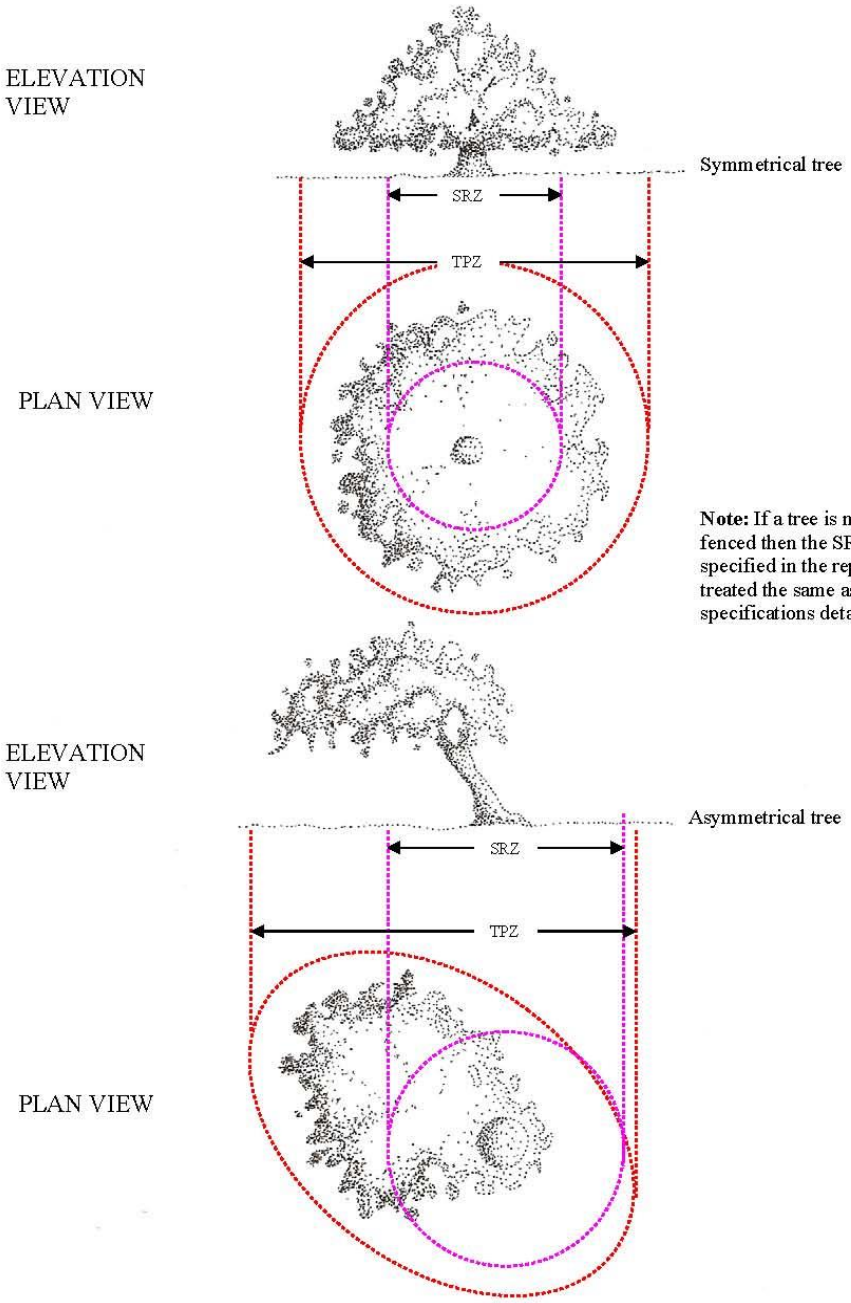


Figure 1: Indicative Tree Protection Zone (TPZ) and Root Protection Zone (SRZ)
Drawn: P. Vezgoff ©

Appendix 9

Tree structure information diagram

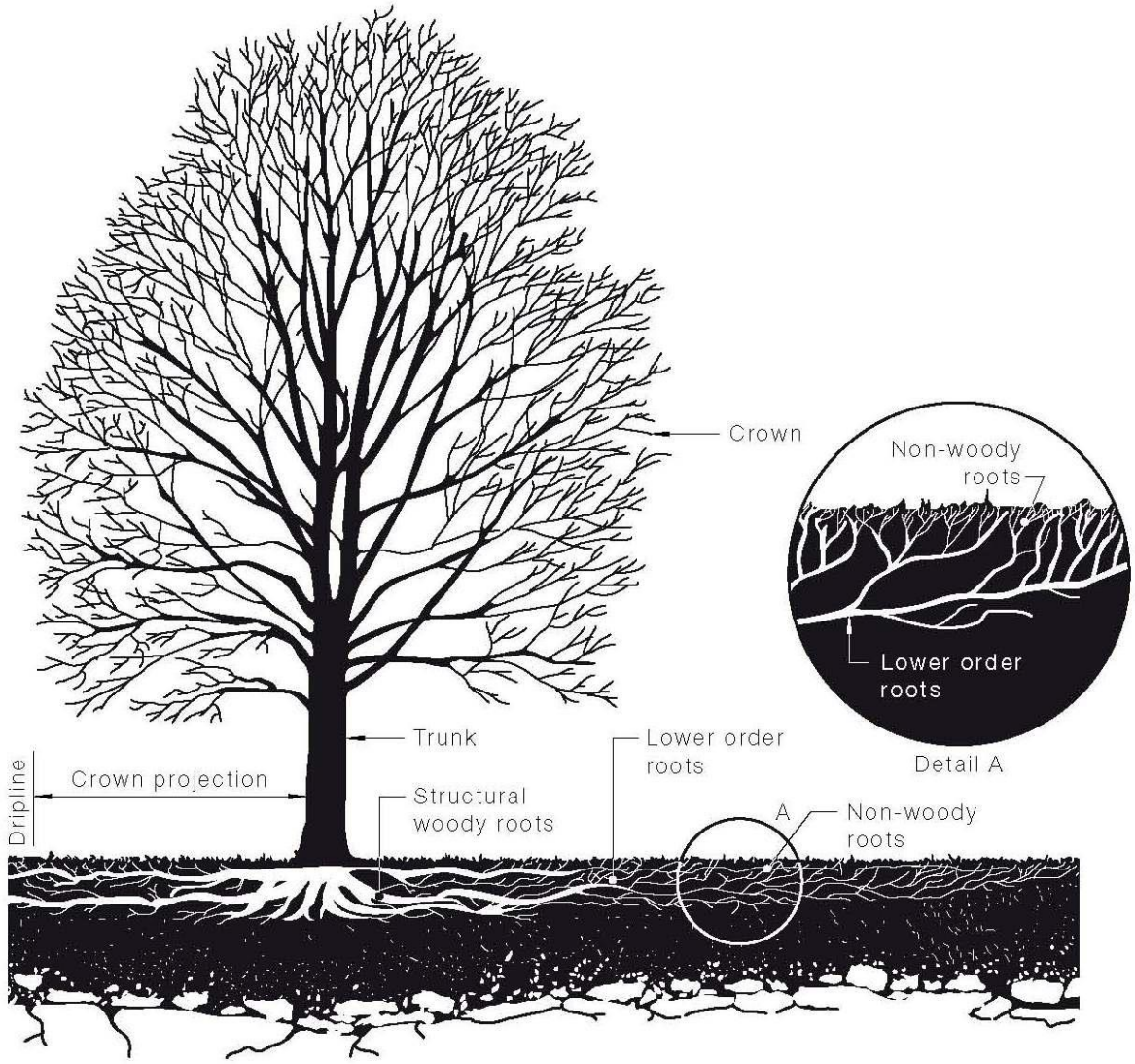


Figure 2: Structure of a tree in a normal growing environment (AS 4970, 2009.).

Appendix 10

Explanatory Notes

- **Mathematical abbreviations:** > = Greater than; < = Less than.

- **Measurements/estimates:** All dimensions are estimates unless otherwise indicated. Less reliable estimated dimensions are indicated with a '?'.

- **Species:** The species identification is based on visual observations and the common English name of what the tree appeared to be is listed first, with the botanical name after in brackets. In some instances, it may be difficult to quickly and accurately identify a particular tree without further detailed investigations. Where there is some doubt of the precise species of tree, it is indicated with a '?' after the name in order to avoid delay in the production of the report. The botanical name is followed by the abbreviation sp if only the genus is known. The species listed for groups and hedges represent the main component and there may be other minor species not listed.

- **Height:** Height is estimated to the nearest metre.

- **Spread:** The maximum crown spread is visually estimated to the nearest metre from the centre of the trunk to the tips of the live lateral branches.

- **Diameter:** These figures relate to 1.4m above ground level and are recorded in centimetres. If appropriate, diameter is measure with a diameter tape. 'M' indicates trees or shrubs with multiple stems.

- **Estimated Age:** Age is estimated from visual indicators and it should only be taken as a provisional guide. Age estimates often need to be modified based on further information such as historical records or local knowledge.

- **Distance to Structures:** This is estimated to the nearest metre and intended as an indication rather than a precise measurement.

Appendix 11

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EDUCATION and QUALIFICATIONS

- 2013 / 2018 – ISA TRAQ qualification
- 2007 – Diploma of Arboriculture (AQF Cert V) Ryde TAFE. (Distinction)
- 1997 – Completed Certificate in Crane and Plant Electrical Safety
- 1996 – Attained Tree Surgeon Certificate (AQF Cert II) at Ryde TAFE
- 1990 – Completed two month intensive course on garden design at the Inchbald School of Design, London, United Kingdom
- 1990 – Completed patio, window box and balcony garden design course at Brighton College of Technology, United Kingdom
- 1989 – Awarded the Big Brother Movement Award for Horticulture (a grant by Lady Peggy Pagan to enable horticulture training in the United Kingdom)
- 1989 – Attained Certificate of Horticulture (AQF Cert IV) at Wollongong TAFE

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Moore Trees Arboricultural Services **January 2006 to date**
Tree Consultancy and tree ultrasound. Tree hazard and risk assessment, Arborist development application reports
Tree management plans.

Woollahra Municipal Council **Oct 1995 to February 2008**
ARBORICULTURE TECHNICAL OFFICER
August 2005 – February 2008
ACTING COORDINATOR OF TREES MAINTENANCE
June – July 2005, 2006
Responsible for all duties concerning park and street trees. Prioritising work duties, delegation of work and staff supervision.
TEAM LEADER
January 2003 – June 2005
September 2000 – January 2003
HORTICULTURALIST
October 1995 – September 2000

Northern Landscape Services **July to Oct 1995**
Tradesman for Landscape Construction business

Paul Vezgoff Garden Maintenance (London, UK) **Sept 1991 to April 1995**

CONFERENCES AND WORKSHOPS ATTENDED

- TRAQ Conference, Auckland NZ / Sydney (2023)
- International Society of Arboriculture Conference (Canberra May 2017)
- QTRA Conference, Sydney Australia (November 2016)
- International Society of Arboriculture Conference (Brisbane 2008)
- Tree related hazards: recognition and assessment by Dr David Londsdale (Brisbane 2008)
- Tree risk management: requirements for a defensible system by Dr David Londsdale (Brisbane 2008)
- Tree dynamics and wind forces by Ken James (Brisbane 2008)
- Wood decay and fungal strategies by Dr F.W.M.R. Schwarze (Brisbane 2008)
- Tree Disputes in the Land & Environment Court – The Law Society (Sydney 2007)
- Barrell Tree Care Workshop- Trees on construction sites (Sydney 2005).
- Tree Logic Seminar- Urban tree risk management (Sydney 2005)
- Tree Pathology and Wood Decay Seminar presented by Dr F.W.M.R. Schwarze (Sydney 2004)
- Inaugural National Arborist Association of Australia (NAAA) tree management workshop- Assessing hazardous trees and their Safe Useful Life Expectancy (SULE) (Sydney 1997).