Moore Trees
Arboricultural Services

ABN 90887347745

Arboricultural Impact Assessment Report

Nepean Creative and Performing Arts High School
115-119 Great Western Hwy
Emu Plains NSW 2750

October 2020
FINAL

Prepared for: School Infrastructure NSW

Prepared by: Paul Vezgoff, Consulting Arborist
ISA, AA
Arboriculture Australia
Registered Consultant

Member 2020

PO Box 3114 Austinmer NSW 2515
Ph: 0242 680 425
Mob: 0411 712 887
Email: enquiries@mooretrees.com.au
Web: www.mooretrees.com.au

Summary

This report has been compiled for School Infrastructure NSW (SINSW) Level 8, 259 George Street, Sydney NSW 2000. The report concerns a new school hall located at Nepean Creative and Performing Arts High School, 115-119 Great Western Hwy, Emu Plains NSW 2750. This Arborist Report refers to twenty seven (27) individual trees and a group numbered 210-241.

This report contains the following information regarding the site trees:-

1) All trees were assessed for Safe Useful Life Expectancy (SULE).
2) Genus and species 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 to be retained.
6) Any branch or root pruning that may be required for trees.

Based on the concept plans provided approximately 154 trees will be required to be removed. The bulk of these removals are the *Casuarina* specimens (numbered as 210-241) that have been planted in rows as part of a school project many years ago. . Trees 246 and 25 are also proposed to be removed for the purpose of the proposed development works.

Trees numbered as 24, 26, 195, 196, 197, 200-205, 243 and 245 to be retained will require tree protection fencing as specified in Section 5.2 of this report. 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.

Table of Contents

VERSION CONTROL

Date of Issue	Details
9th October 2020	Draft 1 issued
23rd October 2020	Draft 2 issued
29th October 2020	Final issued
9th February 2021	Updated for removal of Trees 206 and 209

1 INTRODUCTION

1.1 This report has been conducted to assess the health and condition of twenty seven (27) individual trees and a group numbered 210-241 located at Nepean Creative and Performing Arts High School, 115-119 Great Western Hwy, Emu Plains NSW 2750. This report has been prepared for School Infrastructure NSW (SINSW) Level 8, 259 George Street, Sydney NSW 2000 as required for the application process for the construction of a new school hall at the site.

The purpose of this report is to collect the appropriate tree related data on the subject trees and to provide advice and recommendations to the design and possible construction alternatives to aid against any adverse impacts on the health of the subject trees' to be retained. Australian Standard *Protection of trees on development sites,* AS 4970, 2009 has been used as a basis for this report.

The subject trees were assessed for their health and condition. Also included in this report are generic 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.

At this stage this report has been prepared for a Complying Development Certificate (CDC) process however the Penrith City Council Development Application guidelines regarding trees have been used as a basis for the tree related information collected for this report. The following data was collected for each tree:

1) A site plan locating all trees over three (3) metres in height.
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 project site is located at Nepean Creative and Performing Arts High School, being Lot 12 in DP 1056135. The proposed development site from herein will be referred to as "the Site".

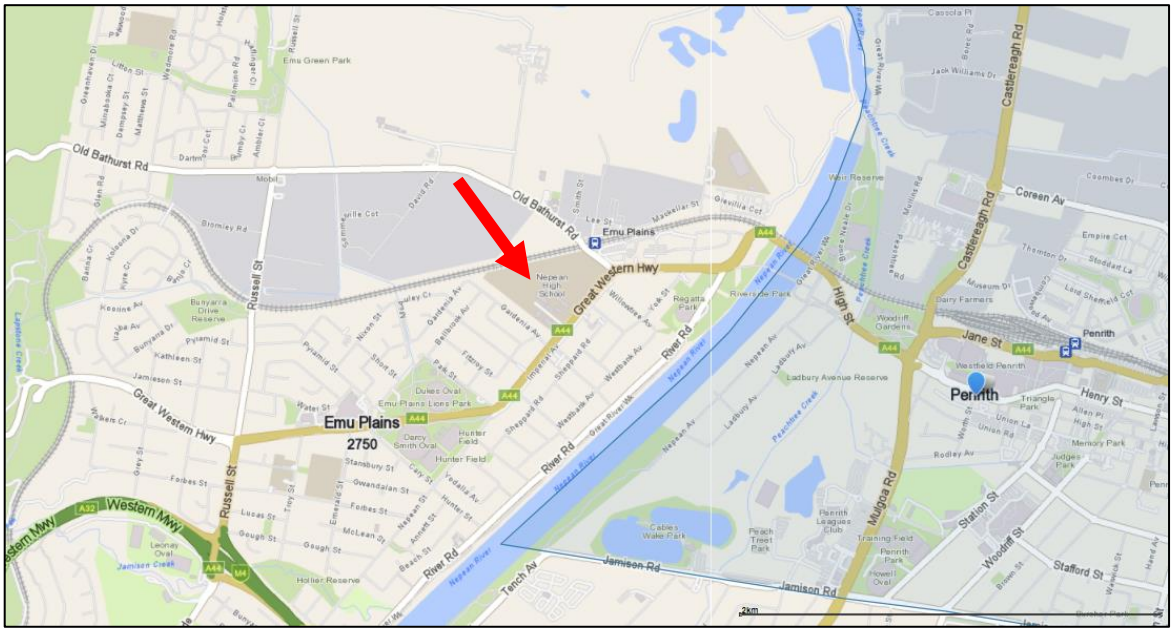


Diagram 1: Location of subject site, Nepean Creative and Performing Arts High School, 115-119 Great Western Hwy, Emu Plains NSW 2750. (Red arrow) (Where is, 2020)

Diagram 2: Location of the study area (Google earth, 2020).

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 30th September 2020. This method of tree evaluation is adapted from Matheny and Clark, 1994 and is recognised by The International Society of Arboriculture. Individual tree assessments are listed in Appendix 2 of this report. All inspections were undertaken from the ground. No diagnostic devices were used on these trees.

2.2 This report is only concerned with trees on the site that come under the Tree Protection Order (TPO) which applies to the whole of the Penrith Local Government Area and is part of the Penrith City Council Local Environmental Plan, 2010. This TPO protects all trees above 3.5 metres in height or with a stem diameter greater than three hundred (300) millimetres, measured at four hundred (400) millimetres from ground level. It is noted that most Public Schools are located on Crown Land and are outside the Local Government Planning Process, however the Project Planner should confirm this.

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

2.4 **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.

2.5 **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.

2.6 **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.

2.7 **Documents and information provided:** For this Arboricultural Report I was supplied the following documents:

- Site plan of the school and location of the new school hall, undertaken by BKA Architecture marked Project # 20001, A101 Rev D dated 15/10/2020, A200 and A201 Rev A dated 12/10/2020; and
- Detail and Levels Plan by YSCO Geomatics, Land Resource Consultants drawn 13 January 2020, reference 6719/2.

I have not been provided any plans for engineering specifications or service diagrams for the site.

2.8 **Impact Assessment:** An impact assessment was conducted on the site trees. This was conducted by assessing the site survey and plans provided by SINSW. 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.

2.9 **Vegetation mapping:** Vegetation maps from the Office of Environment and Heritage were assessed for records of Critically Endangered Plants as mapped and provided by the Office of Environment and Heritage web page;

https://www.environment.nsw.gov.au/AtlasMapViewerApp/index.html

3 RELEVANT BACKGROUND INFORMATION

3.1 Nepean Creative and Performing Arts High School is located at 115-119 Great Western Hwy, Emu Plains NSW 2750. The project area contains a mixture of native and exotic specimens in varying conditions of health. The proposed works entail construction of a new school hall at the rear of the school as seen in Diagram 2.

3.2 **Environmental Significance**: This report is only concerned with trees on the site that come under the Tree Protection Order (TPO) which applies to the whole of the Penrith Local Government Area and is part of the Penrith City Council Local Environmental Plan, 2010. This TPO protects all trees above 3.5 metres in height or with a stem diameter greater than three hundred (300) millimetres, measured at four hundred (400) millimetres from ground level.

3.3 **Legislation:** State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 is referenced for the approval fame work for this project. As detailed in Division 5 Complying development, Point 20 the following points are required to be addressed;

20. Development affecting certain trees or vegetation. Complying development under this Policy is not required to satisfy the requirements of clause 19(2)(e), to the extent that it relates to a permit or development consent required under an environmental planning instrument, in respect of the removal or pruning of a tree or other vegetation if—

(a) in the case of any tree, it is not listed as a significant tree on a register kept by the council, and
(b) the tree or vegetation is within 3 metres of the development, and
(c) the tree or vegetation has a height that is less than 8 metres.

3.4 **The Site Trees:** The site was inspected on 30th September 2020. 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 undertaken by BKA Architects. A pre-existing tree numbering system is in place at this school with most tags still present. This report and the Tree Protection Plan uses these existing numbers however note they are not consecutive.

3.5 The trees in the study area are a mixture of mostly native species with a few exotic specimens located near Building C. Most of the trees within the study area are in good health and condition. The 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. The trees would be considered to have 95% live canopies. The basal areas and woody root zones were free of any ground heaving, or lifting on all of the trees assessed for this report.

3.6 The site exotic specimens consist of Black locust *(Robinia pseudoacacia 'Frisia'), Pyrus sp,* and Poplar *(Populus nigra 'italica').* These trees are all located near Block G, and although growing in harsh conditions, are generally performing well (Plate 1).

Plate 1: Image showing Trees 188-191. P. Vezgoff.

3.7 Trees 24-26 are located between Block F and the proposed hall site. These are a group of three (3) Silky oak *(Grevillea robusta)* that are in good condition however would not be considered highly significant specimens (Plate 2). This species is not indigenous to the local area.

Plate 2: Image showing Trees . P. Vezgoff.

3.8 Along the south western boundary are Trees 243, 245 and 246 that are all *Eucalyptus* specimens (Plate 3). These trees along with the *Callistemon* shrubs in this area create a good visual buffer between the school site and adjoining residential properties.

Plate 3: Image showing vegetation along the south western boundary. P. Vezgoff.

3.9 Various *Eucalyptus* species are on site that include Small leafed pepper mint *(Eucalyptus nicholii),* Red ironbark *(Eucalyptus sideroxylon)* and Grey box *(Eucalyptus moluccana)* however the most common species on site is the River she oak *(Casuarina cunninghamiana).* Trees numbered 210-241 are shown in Plate 4 however the number of individual specimens within this group totals 151, (Plate 4) as they have not all been tagged. These trees are all located within the proposed footprint of the school hall. I have been informed these trees were planted as part of an old school project. These trees have had large quantities of green waste dumped below them.

Plate 4: Image showing Trees 210-241. P. Vezgoff.

3.10 **Trees outside the site:** There are no trees outside the site that will be affected by the proposed development.

3.11 **Exempt trees:** Penrith City Council lists several species of trees as being exempt from the provisions of the DCP. None of the tree species identified for this report are listed as exempt tree species.

3.12 **Critically Endangered Plants:** Vegetation maps from the Office of Environment and Heritage were assessed for records of Critically Endangered Plants. None of the site trees were found to contain Critically Endangered Plant species.

3.13 **Impacts:** Based on the concept plans provided approximately 154 trees will be required to be removed. The bulk of these removals are the *Casuarina* specimens (numbered as 210-241) that have been planted in rows as part of a school project many years ago. Tree 246 is within the building footprint and is also proposed to be removed. Tree 25 will have an incursion of almost 25% of the TPZ. This will not allow the tree to remain viable.

3.14 The seats below Tree 26 shall have minimal footings that do not require deep excavations.

3.15 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 have to 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. This disciplines may include but not be limited to; stormwater design, gas, water and electricity locations.

3.16 Determining a size of root that is acceptable to sever or not is not a definitive answer. A fifty (50) millimetre root severed on a fifteen (15) metre tall tree may have little or no impact. Severing a fifty (50) millimetre root on a tree that is eight (8) metres tall may cause a section of the canopy to die off, and the same size root on a one (1) meter tall tree may kill it. In general, a fifty (50) millimetre root is generally accepted as being the maximum size of root to sever on a semi-mature to mature tree without seeking further arboricultural advice and is aimed at giving the construction contractors a process of quantifying a root and being able to make a decision on site rather than the need for further design changes. It also limits overzealous root pruning.

3.17 Root growth is opportunistic; that is, roots proliferate in areas conducive to root growth. In fertile soils, in the absence of competition, individual roots may extend in more or less a symmetrical manner. Roots of most plants, including large trees, grow primarily in the top one (1) metre of soil (Diagram 3). For this reason, it will be important to limit root damage and severing of roots for the proposed works. It should be noted that Diagram 3 shows a tree growing in ideal ground conditions. The root locations become very hard to predict for trees growing in urban situations, such as the trees in this report.

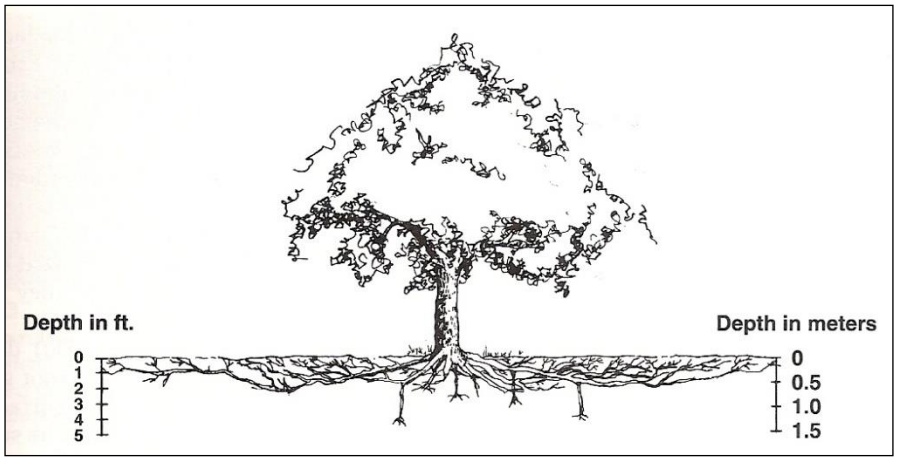


Diagram 3: In the mature tree the tap root is either lost or reduced in size. The vast majority of the root system is composed of horizontally oriented lateral roots (Harris, Clark, Matheny, 1999).

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 Based on the current plans Trees to be removed are numbered as 206, 209, 210-241 (the entire Casurina grove) and Trees 246 and 25 are required to be removed. All other trees appear possible to retain.

4.3 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.

4.4 **Protection of Trees to be retained:** Trees numbered as 24, 26, 195, 196, 197, 200-205, 243 and 245 to be retained will require tree protection fencing as specified in Section 5.2 of this report. 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.

4.5 **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.

4.6 ESEPP Compliance: NSW Legislation framework requirements for the site trees in relation to Division 5 point 20, *Development affecting certain trees or vegetation*;

Development affecting certain trees or vegetation.	**Trees impacted for the project**
(a) in the case of any tree, it is not listed as a significant tree on a register kept by the council, and	None of the site trees impacted are listed on any Council Significant Tree Register.
(b) the tree or vegetation is within 3 metres of the development, and	This will need to be confirmed once designs are finalised.
(c) the tree or vegetation has a height that is less than 8 metres.	At this stage all of the site trees to be removed are greater than 8m in height.

Table 1: Division 5, point 20 compliance.

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). Indicative locations of the fencing are shown in the Tree Protection Plan (Appendix 1).

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). Specifications for this fencing are shown in Tree Protection Fencing Specifications (Appendix 5).

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 any tree to be retained near the project site;

- 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. A sample sign has been attached in Appendix 6. This sign may be copied and laminated then attached to any TPZ fencing.

5.6 **Root Pruning:** If excavations are required within a TPZ this excavation shall be done by hand to expose any roots. Any roots under fifty (50) millimetres in diameter may be pruned cleanly with a sharp saw. Tree root systems are essential for the health and stability of the tree.

5.7 **Arborist Certification:** It is recommended that the Certifying Authority obtain certification from the Project Arborist three (3) times during the construction phase of the development 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 TPZ fencing has been installed;

(2) At mid point of the construction phase;

(3) At completion of the construction phase to ensure trees are all free of any construction damage.

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
23rd October 2020

Appendix 1

Plan 1

Tree Protection Plan

Tree protection plan

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:	23.10.2020 (Updated 9.2.2021)
Drawn:	P.Vezgoff
Site Address:	Nepean Creative and Performing Arts High School Emu Plains, NSW 2750

Appendix 2

Tree health & condition assessment schedule

TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE – Nepean Creative and Performing Arts High School

Tree	Species	Height (m)	Spread (m)	DBH (m)	SRZ basal	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
24	Silky oak (Grevillea robusta)	9	4	0.29	0.39	95	No visual defects	2c removed for more suitable planting	Good	Mature		3.5	2.2
25	Silky oak (Grevillea robusta)	17	5.5	0.55	0.56	95	No visual defects	2c removed for more suitable planting	Good	Mature		6.6	2.5
26	Silky oak (Grevillea robusta)	17	5.5	0.55	0.56	95	No visual defects	2c removed for more suitable planting	Good	Mature		6.6	2.5
183	Black locust (Robinia pseudoacacia 'Frisia')	5.5	3.5	0.22	0.32	95	No visual defects	4a Dead, dying or declining.	Dead	Overmature		2.6	2
184	Small leafed pepper mint (Eucalyptus nicholii)	12	7	0.55	0.65	90	No visual defects	2a May only live for 15-40 years	Fair	Mature		6.6	2.7
185	River she oak (Casuarina cunninghamiana)	10	4	0.18	0.25	95	No visual defects	1a >40 years	Good	Mature		2.2	1.8
186	River she oak (Casuarina cunninghamiana)	15	5	0.42	0.52	95	No visual defects	1a >40 years	Good	Mature		5	2.4
187	Silky oak (Grevillea robusta)	11	6	0.42	0.52	90	No visual defects	2c removed for more suitable planting	Good	Mature		5	2.4
188	Pyrus sp	9	5	0.34	0.44	95	No visual defects	2c removed for more suitable planting	Good	Mature		4.1	2.3
189	Pyrus sp	9	5	0.21	0.31	95	No visual defects	2c removed for more suitable planting	Good	Mature		2.5	2
190	Poplar (Populus nigra 'italica')	17	3.5	0.62	0.72	80	No visual defects	3a May only live for 5-15 years.	Poor	Mature		7.4	2.8
191	Poplar (Populus nigra 'italica')	17	3.5	0.44	0.54	80	No visual defects	3a May only live for 5-15 years.	Poor	Mature		5.3	2.5
192	Red ironbark (Eucalyptus sideroxylon)	14	9	0.91	0.95	95	No visual defects	2c removed for more suitable planting	Good	Mature		10.9	3.1

Tree	Species	Height (m)	Spread (m)	DBH (m)	SRZ basal	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (m)	SRZ (m)
195	Sydney blue gum (Eucalyptus saligna)	15	8	0.49	0.59	95	No visual defects	2c removed for more suitable planting	Good	Mature		5.9	2.6
196	Sydney blue gum (Eucalyptus saligna)	16	8	0.46	0.56	95	No visual defects	2c removed for more suitable planting	Good	Mature		5.5	2.5
197	River she oak (Casuarina cunninghamiana)	11	3	0.23	0.34	95	No visual defects	2c removed for more suitable planting	Good	Mature		2.8	2
200	River she oak (Casuarina cunninghamiana)	11	3	0.23	0.34	95	No visual defects	2c removed for more suitable planting	Good	Mature		2.8	2
203	River she oak (Casuarina cunninghamiana)	12	3	0.25	0.34	95	No visual defects	2c removed for more suitable planting	Good	Mature		3	2
204	River she oak (Casuarina cunninghamiana)	12	3	0.25	0.34	95	No visual defects	2c removed for more suitable planting	Good	Mature		3	2
205	River she oak (Casuarina cunninghamiana)	12	3	0.35	0.45	95	No visual defects	2c removed for more suitable planting	Good	Mature		4.2	2.3
206	River she oak (Casuarina cunninghamiana)	13	5	0.38	0.48	95	No visual defects	2c removed for more suitable planting	Good	Mature	Suckering at base	4.6	2.4
207	River she oak (Casuarina cunninghamiana)	11	4	0.25	0.35	95	No visual defects	2c removed for more suitable planting	Good	Mature		3	2.1
208	River she oak (Casuarina cunninghamiana)	13	5	0.38	0.48	95	No visual defects	2c removed for more suitable planting	Good	Mature	Suckering at base	4.6	2.4
209	River she oak (Casuarina cunninghamiana)	13	5	0.38	0.48	95	No visual defects	2c removed for more suitable planting	Good	Mature		4.6	2.4
210-241	River she oak (Casuarina cunninghamiana)	16	5	0.45	0.55	95	No visual defects	2c removed for more suitable planting	Good	Mature	Large group of similar age and condition.	5.4	2.5
243	Eucalyptus sp.	13	6	0.48	0.58	95	No visual defects	2a May only live for 15-40 years	Fair	Mature	Poor branch attachment	5.8	2.6
245	Red ironbark (Eucalyptus sideroxylon)	15	8	0.42	0.52	95	No visual defects	1a >40 years	Good	Mature		5	2.4
246	Grey box (Eucalyptus moluccana)	14	6	0.38	0.48	95	No visual defects	1a >40 years	Good	Mature		4.6	2.4

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

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 4

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.

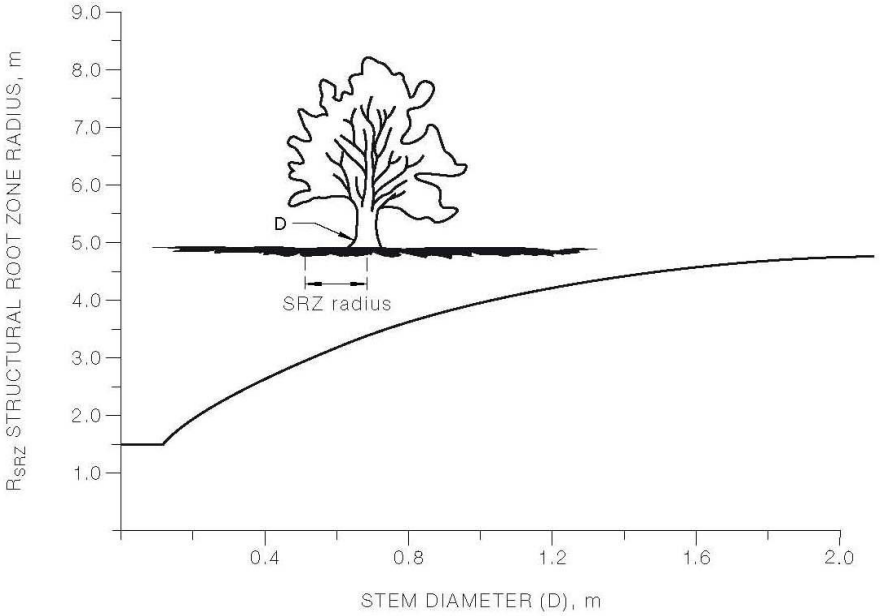
There are many factors that affect the size of the SRZ (e.g. tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the 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).



The curve can be expressed by the following formula:
$R_{SRZ} = (D \times 50)^{0.42} \times 0.64$

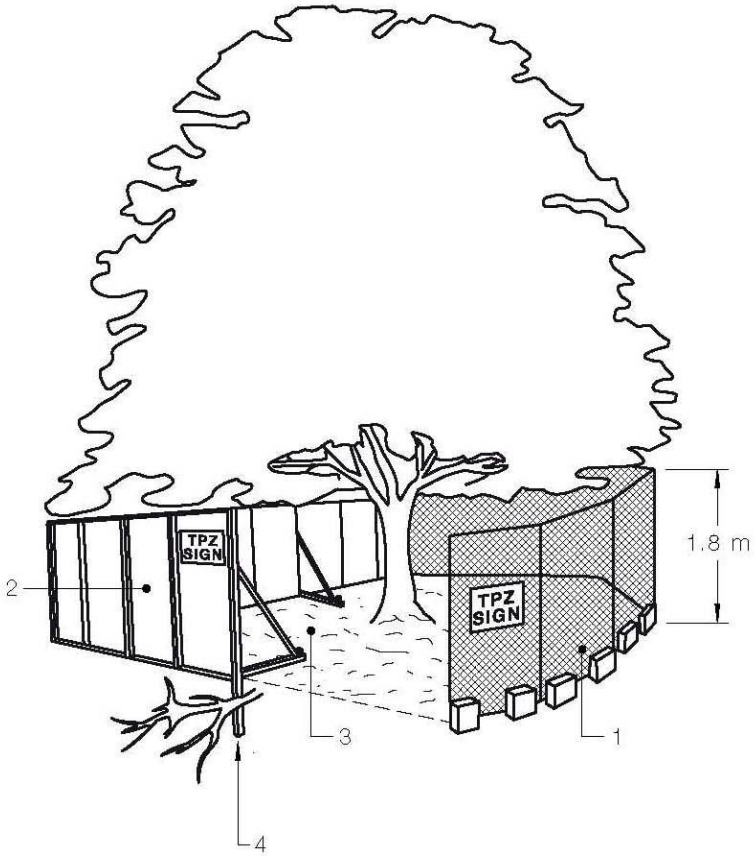
FIGURE 1 - STRUCTURAL ROOT ZONE

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 5

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 6

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 7

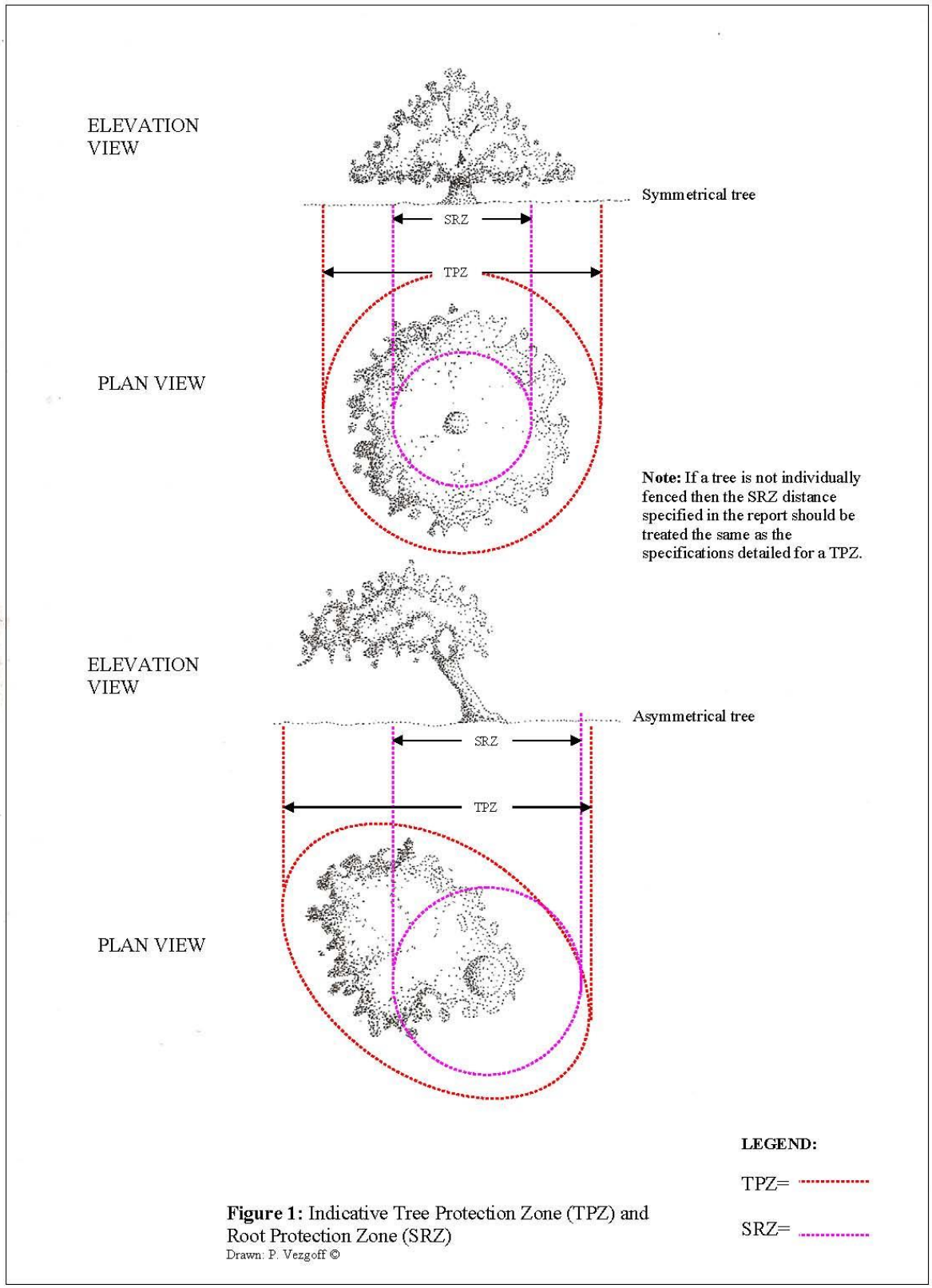


Figure 1: Indicative Tree Protection Zone (TPZ) and Root Protection Zone (SRZ)
Drawn: P. Vezgoff ©

Appendix 8

Tree structure information diagram

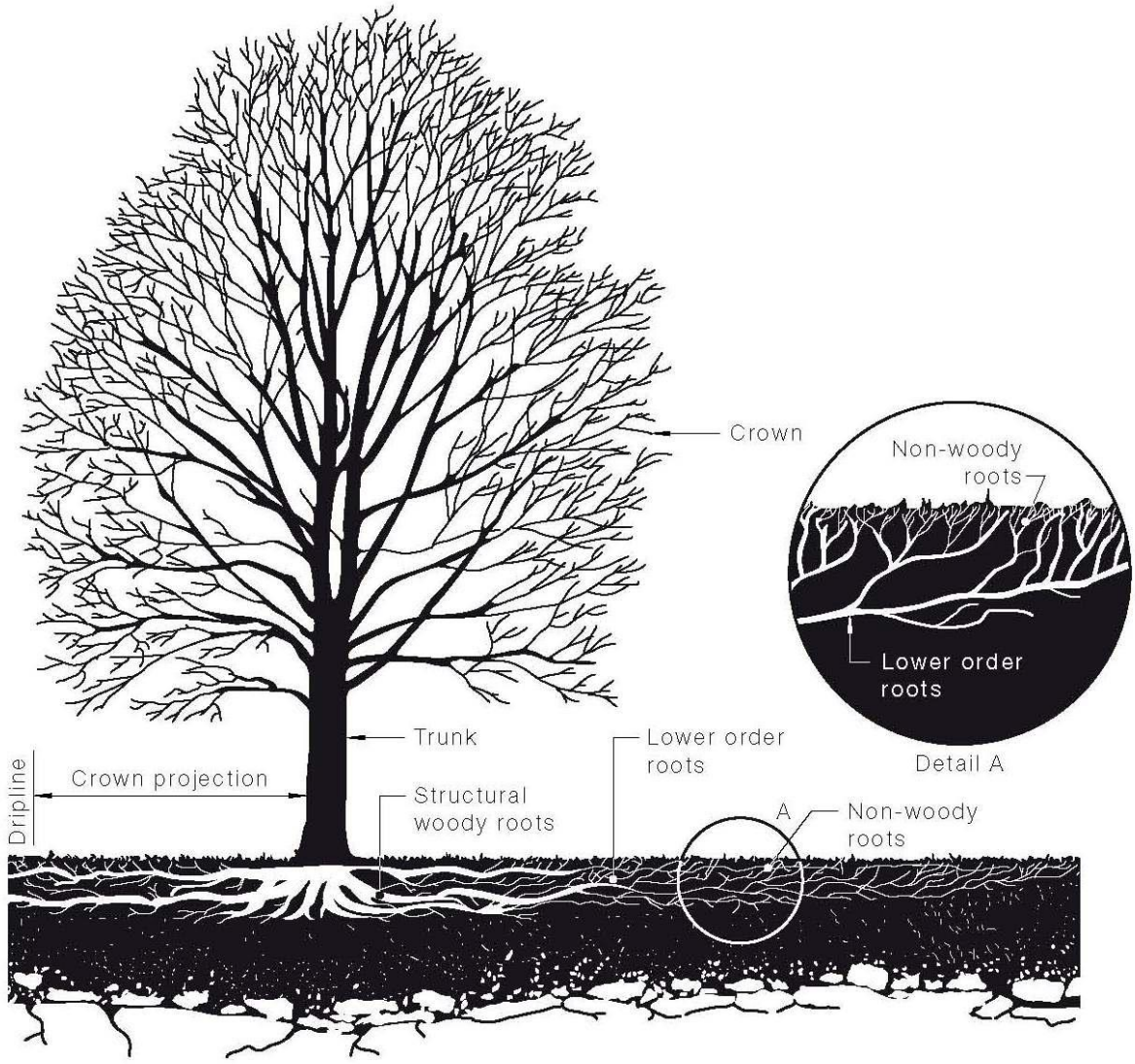


Figure 2: Structure of a tree in a normal growing environment (AS 4970, 2009.).

Appendix 9

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 10

Bibliography

Draper D B & Richards P A (2009) *Dictionary for managing trees in urban environments*
CSIRO Publishing
Collingwood, Vic

Harris R.W, Clark J.R, Matheny N.P (1999). *Arboriculture.* Third edition.
Prentice Hall
New Jersey.

Leonard, Gary (2007) *Eucalypts of the Sydney region.* Second edition
University of New South Wales
Sydney, Australia

Matheny N.P & Clark J.R. (1994) *Evaluation of hazard trees in Urban areas*
Second edition, International Society of Arboriculture
Illinois.

Mattheck C & Breloer H (2003) *The Body Language of Trees: A handbook for failure analysis.* Research for Amenity Trees No. 4,
Seventh edition, The Stationary Office, London.

Shigo A.L. (2002) *A New Tree Biology.*
Shigo and Trees, Associates, Durham, New Hampshire.

Schwarze, F.W.M.R, Engels, J. Mattheck. C (2000) *Fungal strategies of wood decay in trees*
Springer-Verlag Berlin Heidelberg
Germany

Standards Australia, 2007, *Pruning of amenity trees* AS 4373, 2007
Standards Australia Ltd
Sydney

Standards Australia, 2009. *Protection of trees on development sites,* AS 4970, 2009
Standards Australia Ltd
Sydney

Curriculum Vitae

PAUL VEZGOFF - MOORE TREES P O Box 3114, Austinmer NSW 2515
P 0242 680 425 M 0411 712 887 E enquiries@mooretrees.com.au W www.mooretrees.com.au

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

INDUSTRY EXPERIENCE

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

- International Society of Arboriculture Conference (Canberra May 2017)
- QTRA Conference, Sydney Australia (November 2016)
- TRAQ Conference, Auckland NZ / Sydney (2013/2018)
- 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).