

Moore Trees
Arboricultural Services

ABN 90887347745

Arboricultural Development Assessment Report

22 Hospital Road
Bulli NSW 2516
April 2017
FINAL



Member 2017



Registered
Consultant

Prepared for: Health Infrastructure
c/o Johnstaff
Level 12, 70 Pitt St,
Sydney NSW 2000

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

PO Box 3114 Austinmer NSW 2515
Ph: 0242 680 425
Mob: 0411 712 887
Email: enquiries@mooretrees.com.au
Web: www.mooretrees.com.au
PI/PL Insurance: Fitzpatrick & Company

Summary

This report has been compiled for Health Infrastructure c/o Johnstaff, Level 12, 70 Pitt St, Sydney NSW 2000. The report concerns a proposed Development Application for 22 Hospital Road, Bulli NSW 2516. This Arborist Report refers to forty five (45) trees.

This report contains the following information required in Wollongong City Council Development guidelines:-

- 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) for each tree to be retained.
- 6) Any branch or root pruning that may be required for trees.

Trees numbered as 1, 3, 5,6, 7, 8, 9, 12, 15, 16, 28, 36, 37 and 41 are required to be removed for the project. Trees 2 and 4, 10 and 11 along with the row of trees that are 13, 14, 17-27 and trees 29-35, 38-40 will require tree protection fencing as specified in Section 5.2 of this report. This fencing is recommended to be located at the indicative locations shown in the Tree Protection Plan. The specifications for a TPZ are in Section 5.4 of this report. Due to the size and current health of Trees 2, 4, 10 and 11, no ground level changes are recommended within the TPZ distances of these trees.

Reduction pruning should occur to Trees 13, 14, 17-19 to reduce weight on the northern lateral stems and also encourage a finer development of branches, rather than the long stems that are currently developing.

The trees that are proposed to be retained will require tree protection. A Tree Protection Plan, included in this report, shows the trees proposed to be retained and removed. This plan is attached in Appendix 1.

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VERSION CONTROL

Date of Issue	Details
10 th March 2016	Draft 1 issued
31 st March 2016	Draft 2 issued
4 th April 2017	Draft 3 issued
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1 INTRODUCTION

- 1.1** This report has been conducted to assess the health and condition of forty five (45) trees located at 22 Hospital Road, Bulli NSW 2516. This report has been prepared for Health Infrastructure c/o Johnstaff, Level 12, 70 Pitt St, Sydney NSW 2000.

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.

The subject trees were assessed for their health and condition. Also, included in this report are 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 development in the future.

As specified in the Wollongong City Council Development Application guidelines the following data was collected for each tree:

- 1) A site plan locating all trees over three (3) 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) for each tree to be retained.
- 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 Documents and information provided: For this Arborist Report I was given a site plan of the location, undertaken by Billard Leece Partnership P/t Architects and Urban Planners marked project #15617 plan AA-06-0001 Rev E dated 21/1/2/2016. The plan showed the proposed building and existing trees on the site. I have not been provided any plans for the new dwelling, engineering specifications or service diagrams for the site.

1.3 Location: The proposed development site is located at 22 Hospital Road, Bulli NSW 2516, known as Lot 1 in DP 165903. The proposed development site from herein will be referred to as "the Site".

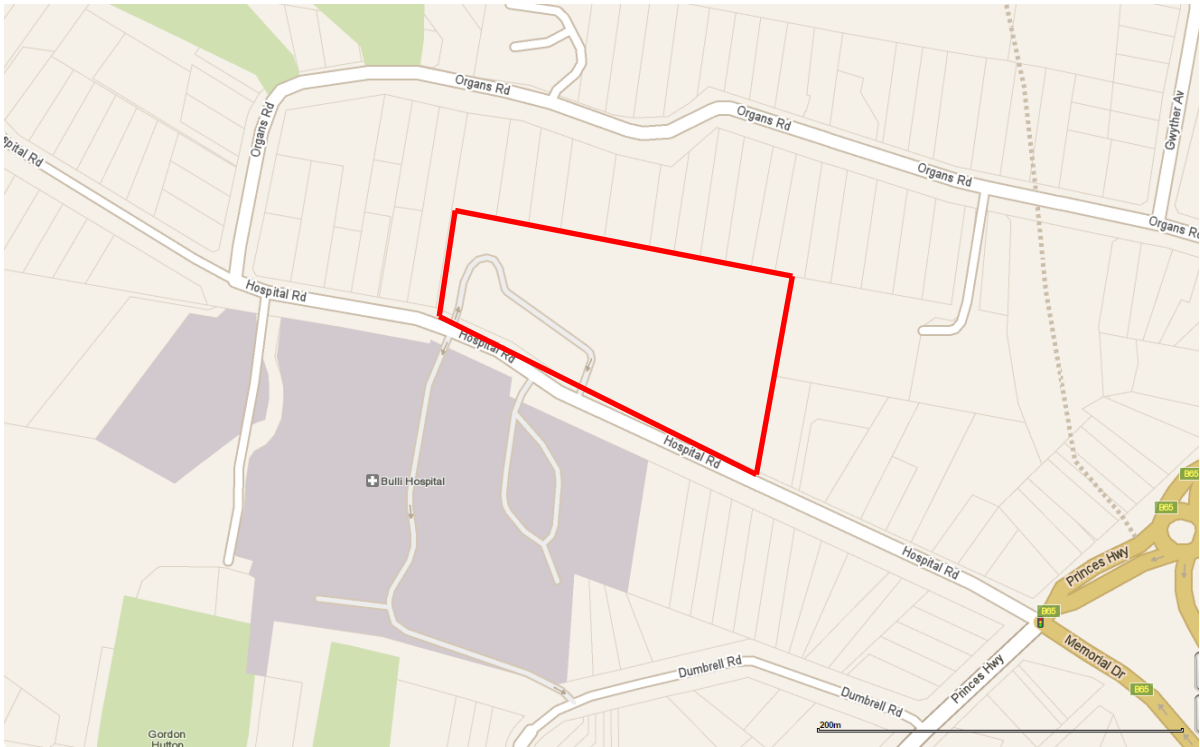


Diagram 1: Location of the study area, 22 Hospital Road, Bulli (whereis.com.au, 2017)

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 20 February 2017. 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 is a NSW State Government project however most impacts to trees on development sites in NSW are based on the Local Council tree regulations, the current site being within the Wollongong LGA. The contents of this report are based on the Tree management permit policy that is part of the Wollongong City Council Development Control Plan, 2009 (Chapter E17 Preservation and management of Trees and vegetation). Also under clause 5.9 of the Wollongong Local Environmental Plan 2009, a person must not ringbark, cut down, top, lop, remove, injure or wilfully destroy any prescribed tree or other vegetation, without development consent or a permit being granted by Council. Refer to Part 3 (Chapter E17) Definitions for the meaning of ‘prescribed tree’ and ‘prescribed other vegetation’. Two application processes have been established to deal with the assessment and approval for prescribed trees:

a) Tree Management Permit (generally for individual/small scale tree removal and pruning in urban areas) - refer to Council’s website for the Tree Management Permit Policy;

b) Development consent via either Complying Development or Development Application. This Chapter of the DCP should be read in conjunction with clauses 5.9 Preservation of trees or vegetation, 5.10 Heritage conservation, 5.11 Bush fire hazard reduction work and 7.2 Natural resource sensitivity – biodiversity of Wollongong Local Environmental Plan 2009.

This Report is based on clause (b) being development of the site.

- 2.3 Height:** The heights and distances within this report have been measured with a Bosch DLE 50 laser measure.
- 2.4 Tree Protection Zones (TPZ):** The Tree Protection Zone (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. The Tree Protection Zones are shown for Trees 2 and 4 as these trees will be individual specimens near construction works. The TPZ areas can be seen in the Tree Protection Plan (Appendix 1).
- 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 this area. A detailed methodology on the TPZ and SRZ calculations can be found in Appendix 4.
- 2.6 SULE:** The subject trees were assessed for a Safe Useful Life Expectancy (SULE). The SULE rating for each tree can be seen the Tree Assessment Schedule (Appendix 2). A detailed explanation of SULE can be found in Appendix 3.
- 2.7 Plans provided:** Billard Leece Partnership P/t Architects and Urban Planners marked project #15617 plans AA-06-0001, AA-06-0101, AA-06-0201, AA-06-0301, AA-06-0401 Rev E and AA-08-0001 Rev B, AA-08- 0201 Rev C, AA-08-0301, AA-08-0401, AA-08-0501, AA-08-0601 dated 21/1/2/2016; Ground Floor loading dock current design plan dated 18-01-2017.

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 Johnstaff. 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.

3 RELEVANT BACKGROUND INFORMATION

3.1 The site is located on the northern side of Hospital Road, adjacent to the existing Bulli Hospital. The site contains a car park that is currently in use for Hospital staff and clients. The trees located on site are a mix of native and exotic tree species. The proposed works consist of construction of a new wing of the Hospital.

3.2 Illegal tree removal: Damaging or removing trees can result in heavy fines. Local Government does have the authority to issue on the spot fines known as penalty infringement notices (PINS) starting from \$1,500 or can elect to have a potential tree damaging incident addressed in the Local Court. Recent cases, for example, include two (2) mature trees removed for development (Sutherland Shire Council (SSC) v Palamara, 2008) costing \$4,500 in fines and \$5,000 in court costs. SSC v El-Hage, 2010 concerning illegal tree removal of a single tree costing \$31,500 in fines and \$5,000 in costs. Poisoning trees can also incur substantial fines (SSC v Hill) resulted in a single tree fine that totalled \$14,000 plus a \$10,000 bond for a replacement tree. All of the above cases resulted in a criminal conviction for the guilty parties.

3.3 Site trees: Trees 1-11 are located on the southern section of the site. Trees 12-27 are located along the northern boundary of the site. Trees 28-41 are located around the Ambulance Garage area. Trees 42, 43, 44 and 45 are located on adjoining properties to the north of the site.

3.4 Tree 1 has a large vertical cavity and fruiting body growing within in it (Plate 1). Fruiting bodies are associated with decay pathogens and generally the decay is at its worst in the location of the fruiting body. Decay affects the strength of wood, only becoming worse with time and making the affected area prone to failure. This tree is structurally dangerous and, as a result, has a short SULE. Tree 2 is in good health and condition. Tree 4 is a large mature Grey iron bark (*Eucalyptus paniculata*) in good health and condition (Plate 2). It consists of three (3) main stems. It is quite a large prominent tree that can be seen from the streetscape. It provides visual amenity to the streetscape. If possible, this tree should be retained.

- 3.5** Trees 6-9 are all small Melaleuca (*Melaleuca linariifolia*) in fair health and condition, however they could readily be replaced with new plantings.
- 3.6** Trees 11-19 are all semi mature, but large, Hill's weeping fig (*Ficus microcarpa* var. *Hillii*). These trees are all in fair health and condition (Plate 3). They have broad domed canopies with low arching branches, which is normal for their growing type. Tree 11 is an individual specimen growing near the car park exit on Hospital Road (Plate 8). Trees 12-19 have been planted as a screening hedge in one row near the northern site boundary.
- 3.7** Despite being an introduced species to the region, the Hill's weeping fig does provide habitat for fauna species, such as fruits (ripe figs) for frugivorous species such as the threatened Grey-headed Flying-fox (*Pteropus poliocephalus*).
- 3.8** Since my initial inspection back in 2015, these trees have had some branch and stem failures such as on Trees 15 and 16 (Plates 5 and 6). Two (2) of these failures have occurred at the basal area (Plate 6) where further failure is possible. It should be remembered that branch failure is not unusual for any tree, it is a natural process. I have allocated these trees a SULE rating of 15-40 years provided weight reduction pruning occurs. The weight reduction pruning will provide a reduction in risk for the next 10-15 years. The weight reduction will reduce tension and compression forces on the main branch unions but also reduce the length of branch to an extent that should it fail it will not fall entirely onto private property. Due to the potential size these trees can grow to, they will require reduction pruning approximately every 5 years.
- 3.9** Leaf and small branch drop are a common occurrence with mature trees. With regards to the leaf drop and shedding of small branches from any tree, the Land & Environment Court does not consider these issues enough to warrant the removal of a tree. Generally speaking, they are considered '*the natural process of a tree*'. What is known as the 'Target area' directly below these trees will not be a pedestrian area or an area where people will dwell for long periods of time.

- 3.10** Trees 20-27 are all native trees. These trees are in fair health and condition. No cracks, splits or fruiting bodies were noted on these trees however they have been planted close together and, as a result, some of these specimens are suppressed as they are competing for light and root space with the larger more significant specimens (Plate 3). Tree 20 was noted as in good health and condition however it does have a failed branch at approximately nine (9) metres. Should this tree be retained, this branch shall be removed.
- 3.11 Trees outside the site:** Trees located outside the site but are close to the adjoining northern boundary have been included in this report. These trees are numbered as 25, 42, 43 (Plate 8), 44 and 45 along with some smaller shrubs not numbered for the purpose of this report. These appear to be mostly native species. There is a Kaffir Plum (*Harpephyllum caffrum*) present, Spotted Gum (*Corymbia maculata*), Broad-leaved Paperbark (*Melaleuca quinquenervia*), small Firewheel Tree (*Stenocarpus sinuatus*), Cocos Palm (*Syagrus romanzoffianum*), Camphor laurel (*Cinnamomum camphora*), Small leafed pepper mint (*Eucalyptus nicholii*), Bangalay (*Eucalyptus botryoides*) and other small shrubs.
- 3.12 Exempt trees:** Wollongong City Council lists several species of trees as being exempt from the provisions of the TMCP under Section 3 of the TMCP. Trees 24 and 26 are Silky Oak (*Grevillea robusta*) and Trees 28, 29, 37 and 41 are Camphor laurel (*Cinnamomum camphora*). These trees are listed on the exempt species list and do not require Council consent for removal. Trees 29 and 37 are outside the project area.

3.13 Impacts: Based on the proposed designs, trees numbered as 1, 3, 5, 6, 7, 8, 9, 12, 15, 16, 28, 36, 37 and 41 are required to be removed for the project. All other trees are possible to retain provided the tree protection measures specified in this report are implemented. Additional trees have been retained from Draft 2 of this report based on local resident feedback. The additional trees that can be retained are 10, 11, 24, 26, 38-40.

Trees 2, 4, 10 and 11 will be near grade changes however provided that at least 80% of the TPZ around these trees (as shown in the Tree protection plan) can be maintained impacts will be minimal. Grade increases within the TPZ are acceptable provided the fill is free draining and not mounded up against the trunks of these trees.

The design near Trees 13-21 shows an adequate set back (Diagram 2). The proposed subsoil drain will require widening to achieve the required excavation width however this is well outside of the TPZ area for these trees.

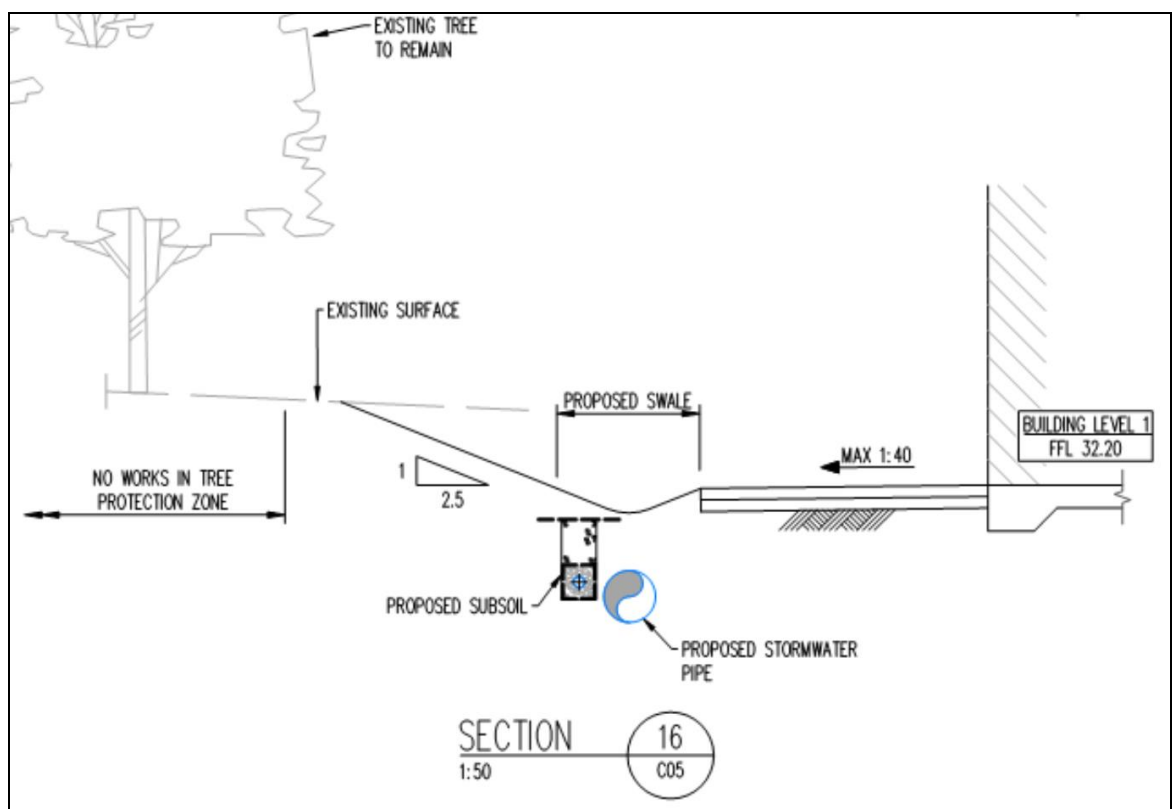


Diagram 2: Plan detail showing the cross section near Trees 13-21.

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** Trees numbered as 1, 3, 5,6, 7, 8, 9, 12, 15, 16, 28, 29, 36, 37 and 41 are required to be removed for the project. Trees 28, 29, 37 and 41 are the noxious weed species Camphor laurel (*Cinnamomum camphora*).
- 4.3** Trees 2, 4, 10 and 11 along with the row of trees that are 13, 14, 17-27 and trees 38-40 will require tree protection fencing as specified in Section 5.2 of this report. This fencing is recommended to be located at the indicative locations shown in the Tree Protection Plan. The specifications for a TPZ are in Section 5.4 of this report. Due to the size and current health of Trees 2 and 4 no ground level changes are recommended within the TPZ distances of these trees.
- 4.4** The root zones of Trees 2, 4, 10 and 11 will require protection from compaction. Compaction of the root zone reduces oxygen and moisture exchange of the roots. This will lead to premature death of the tree. To reduce compaction of the root zone mulch is recommended to be spread around the base of each tree to the extent of the fence line.

- 4.5** Reduction pruning should occur to Trees 13, 14, 17-19 to reduce weight on the northern lateral stems and also encourage a finer development of branches rather than the long stems that are currently developing.

Branches on the northern portion of the canopies should be reduced by 20% in length. 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 150mm in diameter. This pruning is known as reduction pruning and can be read about in more detail in the Australian Standard for the Pruning of Amenity Trees (AS 4373) 2007.

- 4.6 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).

5 TREE PROTECTION

- 5.1 Trees to be protected:** Trees 2 and 4, 10 and 11 along with the row of trees that are 13, 14, 17-27 and trees 29-35, 38-40 will be required to be fenced for protection from the construction works. All fencing shall be installed as specified in Section 5.4 (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 Instructional videos:** Alternatively, you can view the Moore Trees short instructional films on the links below. These films are a quick onsite reference for builders, project managers and architects.

Film #2, Tree Protection Fencing

<https://www.youtube.com/watch?v=ffMabxLN9nU>

- 5.4 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. TPZ distances for all trees are shown in the Tree Schedule in Appendix 2. SRZ distances for Trees 2 and 4 are listed below for these trees as they are single specimens that will be surrounded by various works.

The Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) have been measured from the centre of the trunk. The following activities shall be avoided within the TPZ and SRZ of the 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.

Tree	TPZ (mm)	SRZ (mm)
2	7200	4000
4	6000	4000
10	7200	4000
11	1200	5000

Table 1: TPZ and SRZ distances measured as a radial measurement.

- 5.5 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.
- 5.6 Signage:** It is recommended that TPZ 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.
- 5.7 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. A hand dig area can be seen in the Tree Protection Plan, Plan 2. Severed roots shall be treated with Steriprune®, available at most large Hardware Stores.

5.8 Arborist Certification: It is recommended that the developer to supply the Principal Certifying Authority with certification 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 application of mulch and fencing has been installed;
- (2) At mid point of the construction phase;
- (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
4th April 2017



www.mooretrees.com.au

6 IMAGES



Plate 1: Trees 1 (Right) and 2 (Left). Tree 1 is recommended for removal. P. Vezgoff.



Plate 2: Trees 3 (right) and Tree 4 (left). P. Vezgoff.



Plate 3: Trees 18-25 in the north western corner. P. Vezgoff.



Plate 4: Trees 12-19 being a dominant planting on the site. P. Vezgoff.



Plate 5: Old stem failure on Tree 16. P. Vezgoff.



Plate 6: Tree 15 basal failure. P. Vezgoff.



Plate 7: Tree 12. P. Vezgoff.



Plate 8: Tree 11. P. Vezgoff.



Plate 9: Trees located in the north eastern corner. P. Vezgoff.



Plate 10: Image showing Trees 36-41. P.Vezgoff



Plate 11: Image showing Tree 43 on the adjoining property to the north. P.Vezgoff

Appendix 1

Plan 1

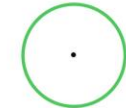
Tree Protection Plan



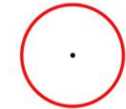
Tree Protection Plan

MOORE TREES

Moore Trees

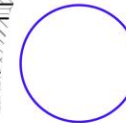


Tree to be retained



Tree to be removed

Removals: 1, 3, 5, 6, 7, 8, 9, 12, 15, 16, 28, 36, 37, 41



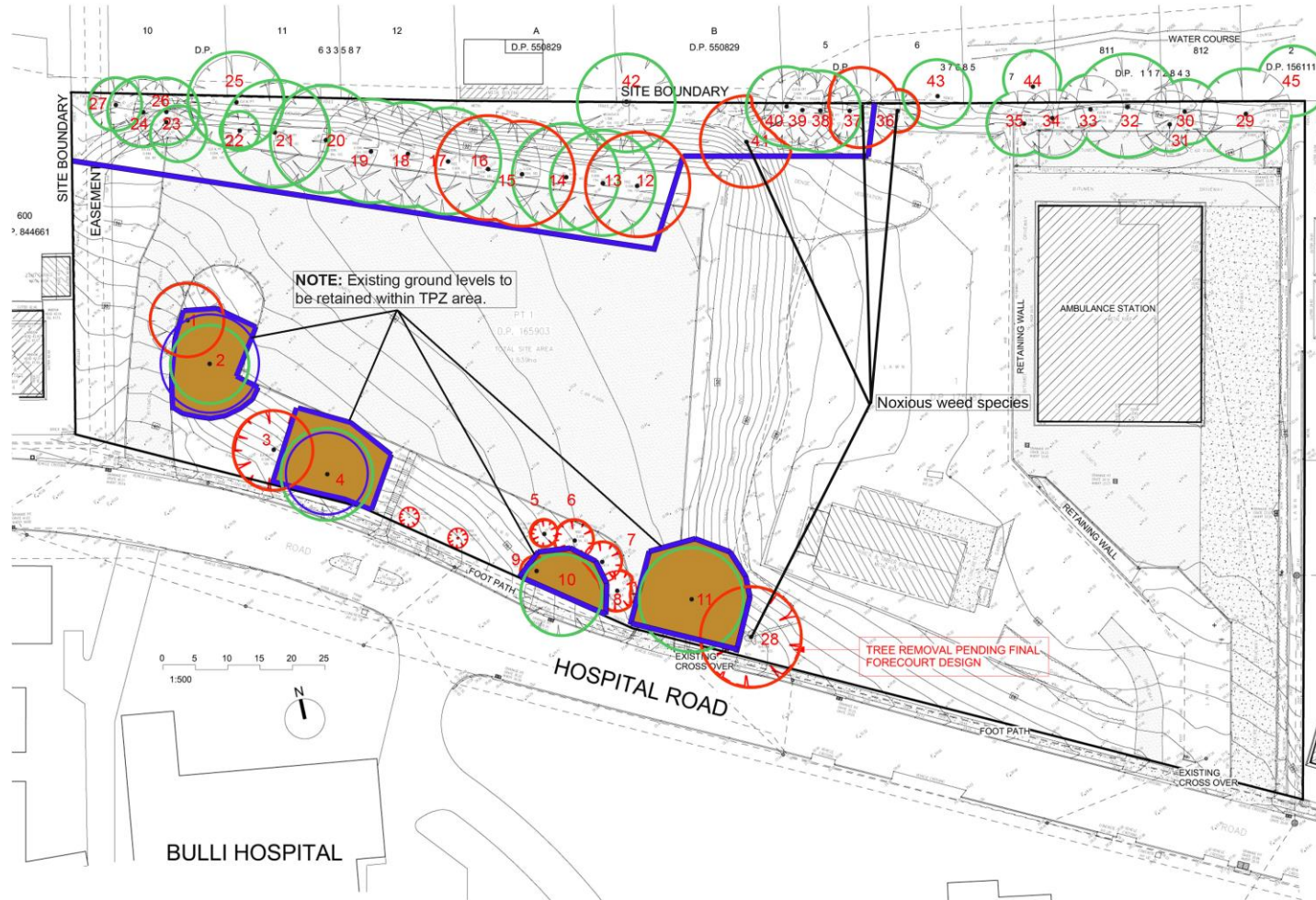
Tree Protection Zone (TPZ). TPZ area based on AS 4970. See *Recommendations* and *Tree Protection* section of Arborist Report.



Mulching. Area recommended for mulching. Prior to any demolition or construction work mulch shall be applied to a depth of 100mm to this area for the duration of the construction period. Once construction is complete the mulch shall be reduced to a depth of no greater than 70mm.



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: 4.4.17
 Drawn: P.Vezgoff
 Site Address: Hospital Road, Bulli
 NSW

Appendix 2

Tree health & condition
assessment schedule

TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE – 22 Hospital Road, Bulli

Tree	Exotic Species	Height (m)	Spread (m)	DBH (mm)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (mm)
1	Sydney blue gum (Eucalyptus saligna)	19	6	600	90	Fruiting body (large)	4c Dangerous tree due to structural defect.	Fair	Mature	Wound cavity and fruiting body at 3m	7200
2	Sydney blue gum (Eucalyptus saligna)	18	7	600	95	Extensive borer damage and dieback.	3a May only live for 5-15 years.	Poor	Mature		7200
3	Grey iron bark (Eucalyptus paniculata)	17	6	500	80	Dead wood >50mm	3a May only live for 5-15 years.	Fair	Mature	Large wound at base from old pruning point.	6000
4	Grey iron bark (Eucalyptus paniculata)	19	8	500	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Group of three stems	6000
5	River peppermint (Eucalyptus elata)	7	3	250	70	No visual defects	4a Dead, dying or declining.	Poor	Mature		3000
6	Melaleuca (Melaleuca linariifolia)	5	2.5	200	90	No visual defects	2a May only live for 15-40 years	Good	Mature		2400
7	Melaleuca (Melaleuca linariifolia)	5	2.5	200	90	No visual defects	2a May only live for 15-40 years	Good	Mature		2400
8	Melaleuca (Melaleuca linariifolia)	5	2.5	200	90	No visual defects	2a May only live for 15-40 years	Good	Mature		2400
9	Melaleuca (Melaleuca linariifolia)	5	2.5	200	90	No visual defects	2a May only live for 15-40 years	Good	Mature		2400
10	Sydney blue gum (Eucalyptus saligna)	18	7	600	95	No visual defects	2a May only live for 15-40 years	Good	Mature		7200
11	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	9	1000	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Low arching habit	12000

Tree	Exotic Species	Height (m)	Spread (m)	DBH (mm)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (mm)
12	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	7	600	95		4c Dangerous tree due to structural defect.	Poor	Mature	Basal failure, Part of a row of 8.	7200
13	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	7	600	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Low arching habit. Part of a row of 8.	7200
14	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	7	600	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Low arching habit. Part of a row of 8.	7200
15	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	7	600	95	No visual defects	3c Removed for a better specimen.	Poor	Mature	Low arching habit. Part of a row of 8. Basal failure	7200
16	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	7	600	95	No visual defects	3c Removed for a better specimen.	Fair	Mature	Low arching habit. Part of a row of 8. Stem failure noted	7200
17	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	7	600	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Low arching habit. Part of a row of 8.	7200
18	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	7	600	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Low arching habit. Part of a row of 8.	7200
19	Hill's weeping fig (Ficus microcarpa var. Hillii)	17	7	600	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Low arching habit. Part of a row of 8.	7200
20	Lemon-scented gum tree (Corymbia citriodora)	20	8	650	95	Stem wounds on upper branches	2a May only live for 15-40 years	Good	Mature	Defective branch from old failure point 7m north side.	7800
21	Sydney red gum (Angophora costata)	19	8	600	95	No visual defects	1a >40 years	Good	Mature		7200
22	Sydney red gum (Angophora costata)	7	3	200	90	No visual defects	2a May only live for 15-40 years	Fair	Mature	Suppressed by larger tree	2400
23	Yellow Bloodwood (Corymbia eximia)	13	5	500	350	No visual defects	2a May only live for 15-40 years	Good	Mature		5700
24	Silky oak (Grevillea robusta)	18	4	480	80	No visual defects	3c Removed for a better specimen.	Fair	Mature		5760

Tree	Exotic Species	Height (m)	Spread (m)	DBH (mm)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (mm)
25	River she oak (Casuarina cunninghamiana)	15	4	300	95	No visual defects	2a May only live for 15-40 years	Fair	Mature		3600
26	Silky oak (Grevillea robusta)	10	3	200	80	No visual defects	3c Removed for a better specimen.	Fair	Mature	Storm damage noted.	2400
27	Tallowwood (Eucalyptus microcorys)	21	4.5	450	95	No visual defects	2a May only live for 15-40 years	Good	Mature	On boundary edge.	5400
28	Camphor laurel (Cinnamomum camphora)	13	7	1500	95	No visual defects	2c removed for more suitable planting	Good	Mature	Multistemmed specimen. Coppice regrowth from old stump	18000
29	Small leafed pepper mint (Eucalyptus nicholii)	14	5	400	70	No visual defects	3a May only live for 5-15 years.	Poor	Mature	Suppressed	4800
30	Small leafed pepper mint (Eucalyptus nicholii)	14	5	400	70	No visual defects	3a May only live for 5-15 years.	Poor	Mature	Suppressed	4800
31	Small leafed pepper mint (Eucalyptus nicholii)	14	5	400	70	No visual defects	3a May only live for 5-15 years.	Poor	Mature	Suppressed	4800
32	Camphor laurel (Cinnamomum camphora)	15	7	500	95	No visual defects	3c Removed for a better specimen.	Good	Mature	Exempt from TPO	6000
33	Small leafed pepper mint (Eucalyptus nicholii)	14	5	250	70	Canopy dieback	3a May only live for 5-15 years.	Poor	Mature		3000
34	Small leafed pepper mint (Eucalyptus nicholii)	14	5	400	70	Canopy dieback	3a May only live for 5-15 years.	Poor	Mature		4800
35	Small leafed pepper mint (Eucalyptus)	14	5	400	70	No visual defects	3a May only live for 5-15 years.	Poor	Mature		4800

Tree	Exotic Species	Height (m)	Spread (m)	DBH (mm)	Live canopy %	Defects	SULE	Condition	Age	Comments	TPZ (mm)
	nicholii)										
36	Camphor laurel (Cinnamomum camphora)	9	5	480	80	No visual defects	3c Removed for a better specimen.	Poor	Mature	Exempt from TPO	5760
37	Camphor laurel (Cinnamomum camphora)	9	5	480	80	No visual defects	3c Removed for a better specimen.	Poor	Mature	Exempt from TPO	5760
38	Bangalay (Eucalyptus botryoides)	16	5	550	95	No visual defects	2a May only live for 15-40 years	Good	Mature		6600
39	Bangalay (Eucalyptus botryoides)	16	5	550	95	No visual defects	2a May only live for 15-40 years	Good	Mature		6600
40	Bangalay (Eucalyptus botryoides)	8	4	390	95	No visual defects	3a May only live for 5-15 years.	Fair	Mature		4680
41	Camphor laurel (Cinnamomum camphora)	9	5	480	80	No visual defects	3c Removed for a better specimen.	Good	Mature		5760
42	Broad leaved paperbark (Melaleuca quinquenervia)	11	5	350	95	No visual defects	2a May only live for 15-40 years	Good	Mature	On boundary fence. Canopy overhangs site.	4200
43	Camphor laurel (Cinnamomum camphora)	18	9	1000	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Located on northern adjoining property. On fence line	12000
44	Sydney blue gum (Eucalyptus saligna)	17	5	300	95	No visual defects	1a >40 years	Good	Mature	Located on northern adjoining property.	3600
45	Camphor laurel (Cinnamomum camphora)	18	9	1000	95	No visual defects	2a May only live for 15-40 years	Good	Mature	Located on northern adjoining property. On fence line	12000

KEY

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

Appendix 3

SULE categories (after Barrell, 2001)¹

SULE Category	Description
<i>Long</i>	<i>Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.</i>
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.
<i>Medium</i>	<i>Trees that appeared to be retainable at the time of assessment for 15-40 years with an acceptable level of risk.</i>
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.
<i>Short</i>	<i>Trees that appeared to be retainable at the time of assessment for 5-15 years with an acceptable level of risk.</i>
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.
<i>Remove</i>	<i>Trees that should be removed within the next five years.</i>
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.
<i>Small</i>	<i>Small or young trees that can be reliably moved or replaced.</i>
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 radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

$$\text{TPZ} = \text{DBH} \times 12$$

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.

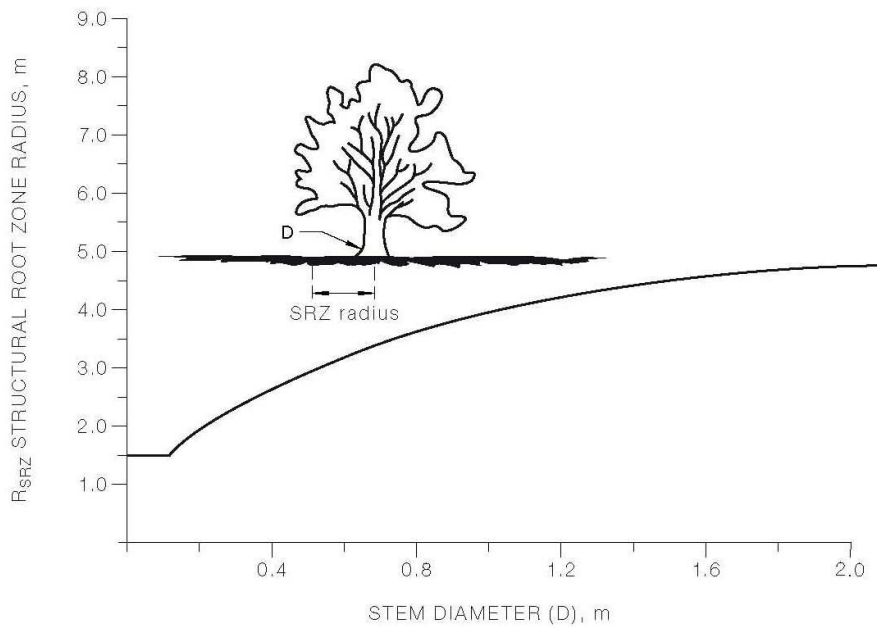
There are many factors that affect the size of the SRZ (e.g. tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the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

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

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

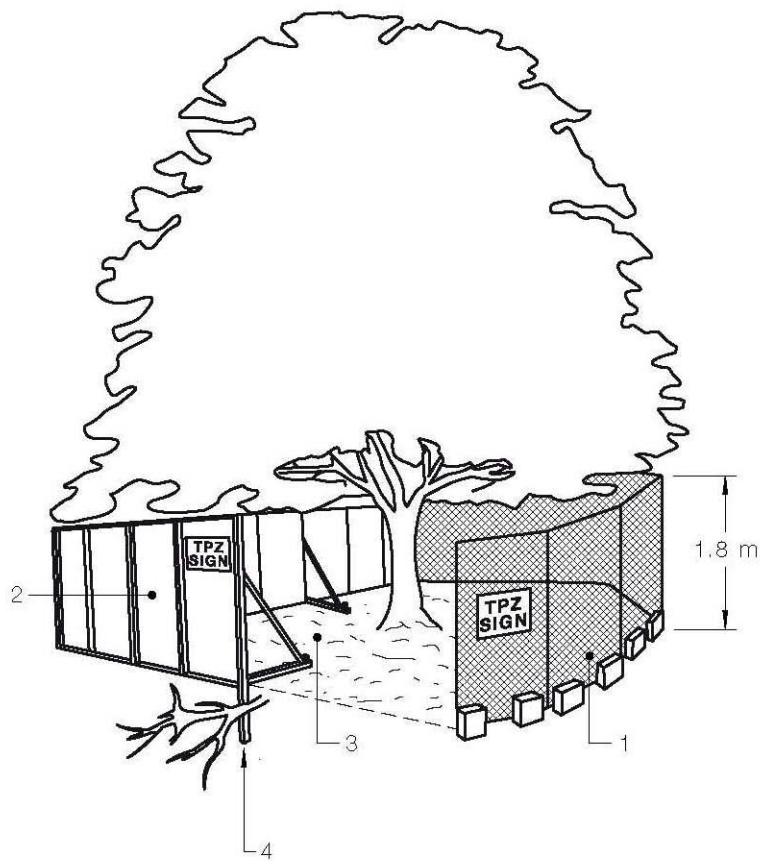
FIGURE 1 - STRUCTURAL ROOT ZONE

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 0.15 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

Tree Protection Zone

Fence not to be moved without approval from Arborist

Within this fence there is to be

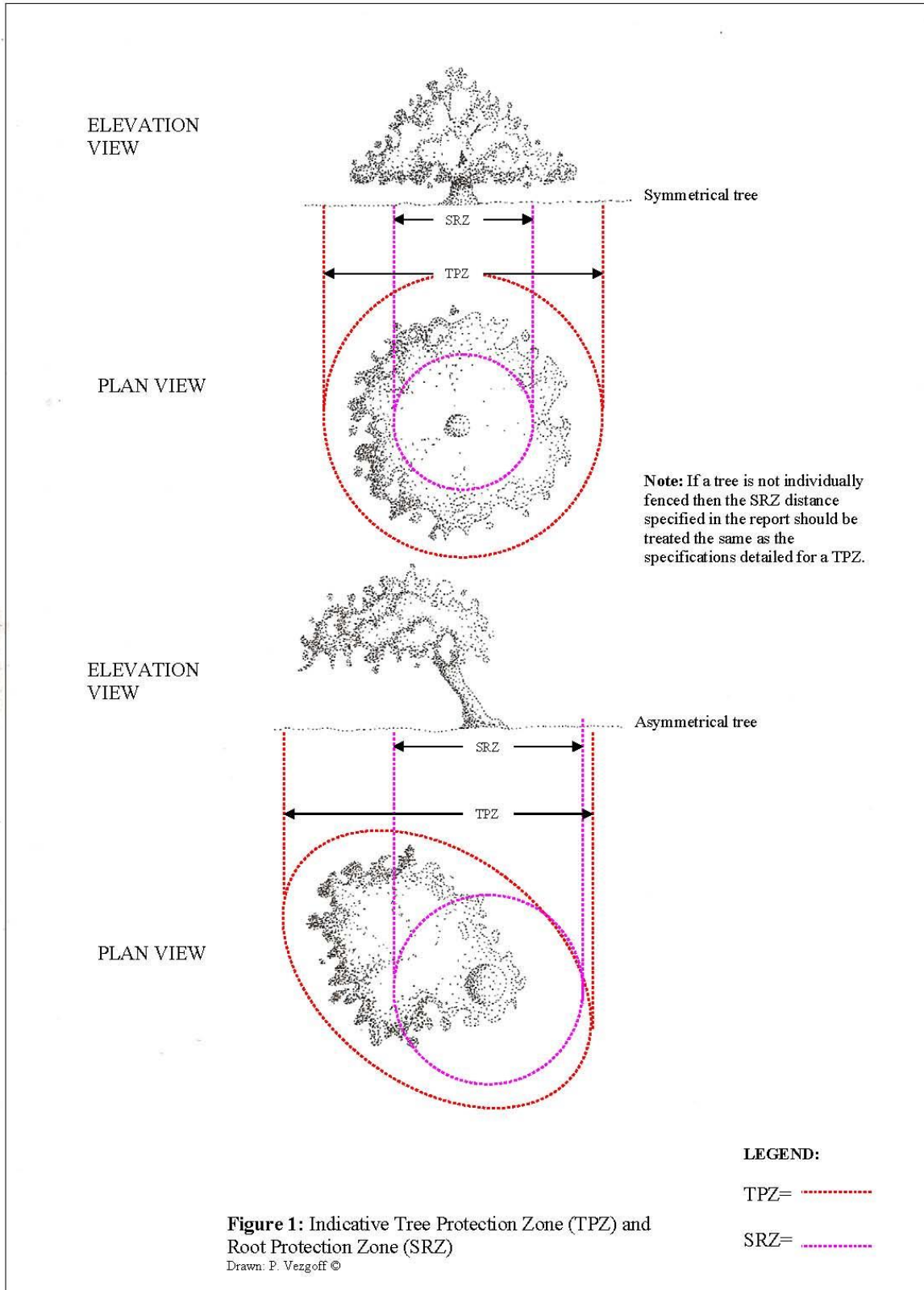
NO

Storage of materials

Trenching or excavation

Washing of tools or equipment

Appendix 7



Appendix 8

Tree structure information diagram

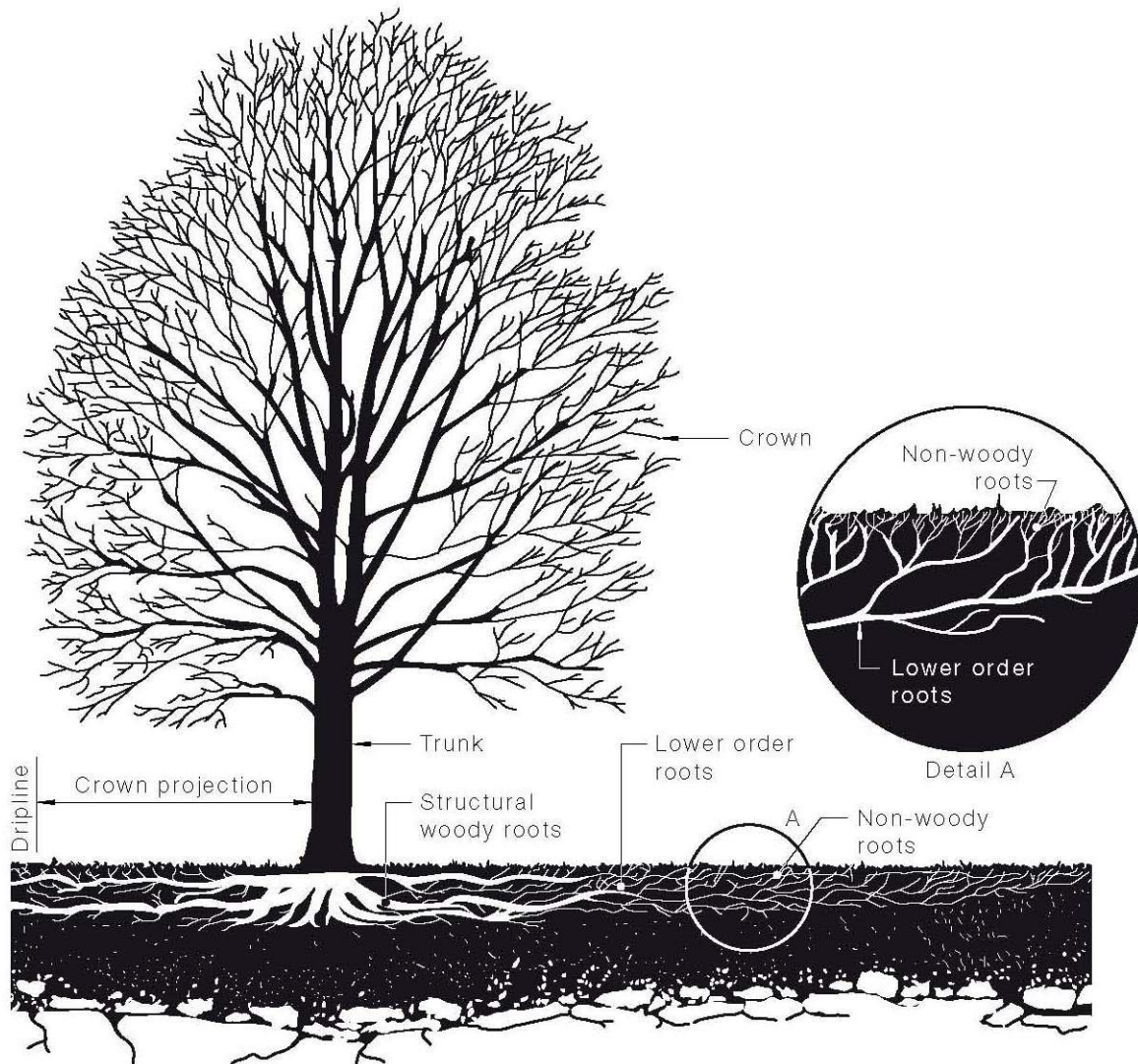


Figure 2: Structure of a tree in a normal growing environment (AS 4970, 2009.).

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

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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

- 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

Tree asset management, programmed inspection, inventory and condition surveys of council trees, hazard and risk appraisal, Tree root damage investigation and reporting, assessment of impacts of capital works projects on council trees.

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

TEAM LEADER

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

- QTRA Conference, Sydney Australia (November 2016)
- TRAQ Conference, Auckland NZ (October 2013)
- International Society of Arboriculture Conference (Brisbane 2008)
- Tree related hazards: recognition and assessment by Dr David Lonsdale (Brisbane 2008)
- Tree risk management: requirements for a defensible system by Dr David Lonsdale (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).