



Project No: CARS/USYD/16 Report No: LEES/USYD/AIA/D

ARBORICULTURAL IMPACT ASSESSMENT TREE PROTECTION SPECIFICATION

**Lees Building
University of Sydney**

Prepared for: UNIVERSITY OF SYDNEY

11th April 2016
Revision D

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Contents

1.0	INTRODUCTION	3
1.1	Background	3
2.0	RESULTS	4
2.1	The Site	4
2.2	The Proposal	4
2.3	The Trees	4
3.0	ARBORICULTURAL IMPACT ASSESSMENT	5
3.1	Tree 435	5
3.2	Trees 963, 964, 1170 & 1171	5
3.3	Trees 965, 966 & 968	5
3.4	Tree 967	5
3.5	Tree 969	6
3.6	Trees 970-973	6
3.7	Pruning	7
3.8	Replacement Planting	8
4.0	CONCLUSION	8
5.0	LIMITATIONS & DISCLAIMER	9
6.0	BIBLIOGRAPHY & REFERENCES	10
7.0	APPENDICES	11
	Appendix 1: Methodology	12
	Appendix 2: Plans	14
	Appendix 3: Tree Assessment Schedule	15
	Appendix 4: Plates	17
	Appendix 5: Root Map	20
	Appendix 6: Tree Protection Specification	21
	Appendix 7: Typical Tree Protection Details	24

1.0 INTRODUCTION

1.1 Background

- 1.1.1 This Arboricultural Impact Assessment Report and Tree Protection Specification was prepared for the University of Sydney in relation to the proposed construction of a new multi-storey building (Lees Building) to the south of the Carlsaw Building within the University's Camperdown Campus. The purpose of this report is to determine the impact of the proposed works on the trees, and where appropriate, recommend the use of sensitive construction methods to minimise adverse impacts.
- 1.1.2 An assessment of the subject trees was undertaken as part of the preparation for the Preliminary Arboricultural Report prepared by TreeIQ (Report No. CARS/USYD/PAR/A, dated 14th January 2015). The scope of the January 2015 Report was to provide advice on appropriate building setbacks for the row of four (4) mature *Ficus macrophylla* - Moreton Bay Figs (Trees 970-973) located along the City Road boundary.
- 1.1.3 Subsequent to the preparation of the January 2015 Preliminary Report, root investigations were undertaken in February 2015 to determine the potential impact of the proposal on Trees 970-973. Based on the results of root investigations it was determined that root pruning could be undertaken, and should be split over two seasons (prior to the commencement of the construction stage) to minimise the physiological stress of the works on the trees.
- 1.1.4 It should be noted that consent for tree removal/pruning identified within this Report is being sought through the City of Sydney tree pruning and removal application process. In addition, the first stage of the root pruning was undertaken in August 2015 based on a consent issued by the City of Sydney.
- 1.1.5 For consistency, the tree numbers used within this Report correlates with the University's tree inventory database (ArborPlan). In preparing this Report, the author is aware of and has taken into account the objectives of the City of Sydney's *Development Control Plan 2012 (Section 3.5 Urban Ecology)*, University of Sydney's *Tree Management Plan 2016*, *Australian Standard 4970 Protection of Trees on Development Sites (2009)*, *Australian Standard 4373 Pruning of Amenity Trees (2007)* and *Australian Standard 2303 (2015) Tree Stock for Landscape Use*.

Refer to Methodology (**Appendix 1**)

- 1.1.6 This impact assessment is based on an assessment of the following supplied documentation/plans only:

- Overall Site Plan (A0001) – prepared by Rice Daubney (undated)
- Site Plan (P0000) – prepared by Rice Daubney (undated)
- Site Plan – Tree Retention (DA18) – prepared by Rice Daubney (11.04.16)
- Presentation Plans Levels 1-7 (P0001-P0007) – prepared by Rice Daubney (undated)
- GA Plans Level 8 (A0010) – prepared by Rice Daubney (undated)
- GA Plans Roof (A0011) – prepared by Rice Daubney (undated)
- Short Section (A0013) – prepared by Rice Daubney (undated)
- West Elevation (A0014) – prepared by Rice Daubney (undated)
- South Elevation (A0015) – prepared by Rice Daubney (undated)
- East Elevation (A0016) – prepared by Rice Daubney (undated)
- North Elevation (A0017) – prepared by Rice Daubney (undated)

Refer to Plans (**Appendix 2**)

2.0 RESULTS

2.1 The Site

2.1.1 The site is a roughly triangular-shaped landscape area within the University of Sydney, Camperdown Campus. The site is located adjacent to the northern side of City Road and fronts the Carslaw Building.

2.1.2 The site is comprised of lawn and garden bed areas with footpaths running through the site.

Refer to Tree Location Plan¹ (**Appendix 2**)

2.2 The Proposal

2.2.1 The supplied plans show the proposal is for the construction of a new multi-storey Lees Building to the south of the existing Carslaw building.

2.2.2 Consent for tree removal/pruning identified within this Report is being sought through the City of Sydney tree pruning and removal application process.

Refer to Plans (**Appendix 2**)

2.3 The Trees

2.3.1 Fourteen (14) trees were assessed in the preparation of this report. All of the trees assessed are covered by the controls within *Section 3.5 Urban Ecology* of Council's *Development Control Plan 2012*.²

2.3.2 Tree 967 has been identified as *Syzygium paniculatum* (Magenta Lillypilly). A search of the BioNet Atlas of NSW Wildlife Database was undertaken in December 2014. This species is listed as *Endangered* under the NSW *Threatened Species Conservation Act (1995)* and *Vulnerable* under the commonwealth *Environment Protection and Biodiversity Conservation Act (1999)*.³ Based on the age, size and location of Tree 967, it is assumed this tree is a planted specimen and not a specimen of an indigenous plant community. In addition, an ecological assessment of the University was conducted in 2013 and determined that no threatened flora species or threatened ecological communities exist on the Camperdown and Darlington Campuses.⁴ The ecological significance and habitat value of the trees has not been assessed and is beyond the scope of this report.

2.3.3 Tree 969 has been identified as a *Celtis sinensis* (Chinese Hackberry). *Celtis sinensis* (Chinese Hackberry) are prolific self-seeders and are considered an environmental weed species. Trees under 10m within the City of Sydney are not covered by the controls within *Section 3.5 Urban Ecology* of Council's *Development Control Plan 2012*.⁵ Tree 969 is sufficiently large to be covered by these controls.

2.3.4 Trees 970-973 have been identified as *Ficus macrophylla* (Moreton Bay Fig). The *Ficus macrophylla* (Moreton Bay Figs) that extend along City Road to Broadway are listed within the Council's *Register of Significant Trees 2013* (Victoria Park – Broadway Listing).⁶ It is noted in the Register that the planting is regarded as one of the longest contiguous examples of the species in the City of Sydney's managed parkland (excluding Centennial Parklands).

¹ ArborSafe Australia Pty Ltd (2013), *University of Sydney, ArborPlan Tree Inventory Assessments*.

² City of Sydney (2012), *Development Control Plan 2012 (Section 3.5 Urban Ecology)*.

www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0003/129891/Sydney-DCP-Tree-Management-Controls.pdf, accessed 13.01.2014

³ NSW Office of Environment and Heritage's Atlas of NSW Wildlife (2011), *BioNet Atlas of NSW Wildlife*.

www.environment.nsw.gov.au/wildlifeatlas/about.htm, accessed 13.01.15

⁴ Australian Museum Consulting (2013), *University of Sydney Ecological Assessment*.

⁵ City of Sydney (2012), *Development Control Plan 2012 (Section 3.5 Urban Ecology)*.

www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0003/129891/Sydney-DCP-Tree-Management-Controls.pdf, accessed 13.01.2014

⁶ City of Sydney (2013) *Register of Significant Trees*.

- 2.3.5 The use of Moreton Bay Figs is typical of the late Victorian-era and Charles Moore (Director of the Botanic Gardens Sydney (1848-1896). Moore promoted a distinctive approach to the design of public open space and parkland, and his influence at the University of Sydney is widespread. Moreton Bay Figs became the key species in the structural layout of parklands at the time. Over time, this legacy of Victorian-era public planting has matured to produce landscapes which are dominated by massive native figs. The species were used predominately in row plantations along the boundaries of parks.⁷
- 2.3.6 Further detail on the assessment of the trees is provided in the Tree Assessment Schedule (**Appendix 3**) and Preliminary Arboricultural Report (January 2015).

3.0 ARBORICULTURAL IMPACT ASSESSMENT

3.1 Tree 435

- 3.1.1 Tree 435 has been identified as a *Ficus macrophylla* (Moreton Bay Fig) and is located in the north-western corner of the site. This tree has been allocated a moderate Landscape Significance and a Retention Value of *Priority for Retention*.
- 3.1.2 The supplied plans show that Tree 435 is to be removed as part of the proposed landscape treatment. Given the tree's species and age, it may be possible to transplant Tree 435 to an alternative location within the University campus.

3.2 Trees 963, 964, 1170 & 1171

- 3.2.1 Trees 963, 964, 1170 and 1171 have been identified as *Corymbia maculata* (Spotted Gum) and are located in the north-western corner of the site. These trees have been allocated a low Landscape Significance and a Retention Value of *Consider for Removal*.
- 3.2.2 The supplied plans show that Trees 963, 964, 1170 and 1171 will need to be removed to accommodate the proposed building footprint.

3.3 Trees 965, 966 & 968

- 3.3.1 Trees 965, 966 and 968 have been identified as *Lophostemon confertus* (Brush Box) and are located in lawn areas, centrally within the site. These trees have been allocated a moderate Landscape Significance and a Retention Value of *Consider for Retention*.
- 3.3.2 The supplied plans show that Trees 965, 966 and 968 will need to be removed to accommodate the proposed building footprint.

3.4 Tree 967

- 3.4.1 Tree 967 has been identified as a *Syzygium paniculatum* (Lillypilly) and is located roughly centrally within the site. This tree has been allocated a low Landscape Significance and a Retention Value of *Consider for Removal*.
- 3.4.2 The supplied plans show that Tree 967 will need to be removed to accommodate the proposed building footprint.

⁷ Aitken, R & Looker, M (2002), *The Oxford Companion to Australian Gardens*, Oxford University Press, pg 438.

3.5 Tree 969

- 3.5.2 Tree 969 has been identified as a *Celtis sinensis* (Chinese Hackberry) and is located in the north-eastern corner of the site. This tree has been allocated a high Landscape Significance and a Retention Value of *Priority for Retention*.
- 3.5.3 The supplied plans show that Tree 969 will need to be removed to accommodate the proposed building footprint.

3.6 Trees 970-973

- 3.6.1 Trees 970-973 have been identified as *Ficus macrophylla* (Moreton Bay Fig) and are located in a row on the City Road frontage. They have been allocated a very high Landscape Significance and a Retention Value of *Priority for Retention*.
- 3.6.2 The supplied plan shows that the proposed building footprint and pavements fall within the Tree Protection Zone (TPZ) areas of Trees 970-973 and represent *Major Encroachments* as defined by *Australian Standard 4970 Protection of Trees on Development Sites (2009)* (AS-4970).
- 3.6.3 Clause 3.3.4 of AS-4970 provides for undertaking works within the TPZ when more detailed root investigations indicate the works will not significantly impact the tree health, stability, or long-term viability. Root investigations were undertaken in February 2015 to examine the impacts of the proposed works on the root systems of Trees 970-973. The location of the root mapping trench followed the approximate footprint of the proposed building within TPZ areas. The trench was excavated to a depth of between 500-600mm. Root investigations indicated there may have been previous soil disturbance/fill installation based on the presence of an old stump and road/footpath at a depth of approximately 300mm below grade. No roots greater than 50mm in diameter were exposed within the trench. Refer Root Map (**Appendix 5**).
- 3.6.4 Based on the size and number of roots identified, the proposed works should not significantly impact the health or Useful Life Expectancy (ULE) of the trees. However, due to the age of the trees and the possibility that roots may be present at greater depths than possible to excavate by hand, it was determined that a two (2) staged approach to root pruning should be implemented to reduce physiological stress on the trees. Stage 1 of the root pruning program was undertaken in August 2015. The Stage 1 root pruning works involved pruning approximately 50% of the roots exposed within the root mapping trench. The roots which were pruned in August 2015 are noted in the Root Map (**Appendix 5**).
- 3.6.5 Recommendations**
- Stage 2 root pruning works should be undertaken in autumn 2016 and should include the excavation and pruning of remaining roots within the root mapping trench. No over excavation, benching or battering should extend beyond the building footprint/root mapping trench location.
- 3.6.6 A permanent, automated drip irrigation system should also be installed across the entire garden bed area in which Trees 970-973 are located (excluding the proposed building footprint) to support the health of the trees during prolonged dry periods and minimise physiological stress. The drip irrigation system should be installed prior to the commencement of the development works. In addition, regular ongoing applications of a seaweed-based soil conditioner (e.g. Seasol) should be applied to the garden bed area.
- 3.6.7 The supplied plans also show that Levels 5-8 of the proposed building project beyond the lower levels in a series of sets along the building façade. The maximum extent of the projection is approximately 2.5m and begins at approximately 11m above grade. This projection extends by a relatively small amount over the northern edge of the trees' crowns. This projection is not anticipated to significantly alter the level of shading to which the trees are currently subject as the existing Carslaw Building and adjacent trees (proposed for removal) already casts shade onto the trees. Additional minor clearance pruning in sections of the trees' upper crowns may be required to accommodate sections of the proposed building projection. Any additional clearance pruning should be limited to branches no greater than 50mm diameter.

- 3.6.8 The supplied plans show that new pavements are proposed within TPZ areas of Trees 970-973. New pavements and sub-base layers should be constructed from permeable materials and installed at or above existing grade (including sub-base layers). The pavement should be designed as to eliminate the need for high levels of compaction of the underlying soil profile.
- 3.6.9 No additional works within the TPZ areas should be undertaken. The remaining areas should be maintained as soft landscape with groundcover planting and mulch only, installed without the requirement for mechanical decompaction/cultivation.

3.7 Pruning

- 3.7.1 The crowns of Trees 970 to 973 were assessed to determine the extent to which pruning could be undertaken to reduce the spread of the northern side of their crowns. Based on the form and branch structure of the trees, it was determined that the maximum amount of pruning possible would reduce the radial crown spread of the trees to approximately 10m (measured from the centre of the trunk at ground level). Other than the removal of deadwood, no pruning of larger diameter branches is required on Tree 970.

3.7.2 Table 1: Tree 971

Orientation of Branch	Height of Branch above Grade	Order of Branch	Branch Diameter	Comments	Plate (Appendix 4)
N	6m	2nd	120mm		15

3.7.3 Table 2: Tree 972

Orientation of Branch	Height of Branch above Grade	Order of Branch	Branch Diameter	Comments	Plate (Appendix 4)
N	5m	3rd	150mm		16
N	12-14m	3rd + 4th	<50mm	Selectively reduce to suitable small diameter lateral branches	17
N	8m	3rd (x2)	<50mm	Selectively reduce to suitable small diameter lateral branches	18

3.7.4 Table 3: Tree 973

Orientation of Branch	Height of Branch above Grade	Order of Branch	Branch Diameter	Comments	Plate (Appendix 4)
N	6m	4th	180mm		19
N	4.5m	3rd	220mm		19
N	6.5m	5th (x3)	40-60mm	Retain southern, most upright branch	19

- 3.7.5 If required, additional pruning in sections of the trees' upper crowns to accommodate sections of the proposed building projection should be limited to branches no greater than 50mm diameter. Deadwood greater than 40mmØ should also be removed from the crowns of Trees 970-973.
- 3.7.6 Pruning works should be supervised by an AQF Level 5 Arborist and undertaken in accordance with *Australian Standard 437 Pruning of Amenity (2007) Trees* and the *Workcover Code of Practice for the Amenity Tree Industry (1998)*.
- 3.7.7 The assessment of the pruning requirements detailed in this report were estimated by assessment of the trees from ground level. No additional pruning for scaffolding/hoarding, building clearance or construction access should be undertaken. An accurate measurement of the trees' height, spread and crown shape should be undertaken by a Surveyor to ensure sufficient building clearance is allowed for within the design.

3.8 Replacement Planting

- 3.8.1 Replacement planting is recommended where trees are proposed for removal.
- 3.8.2 New tree plantings should be supplied in accordance with *Australian Standard 2303 (2015) Tree Stock for Landscape Use* to ensure the quality of plant material.

4.0 CONCLUSION

- 4.1 Fourteen (14) trees were assessed in the preparation of this report. All of the trees assessed are covered by the controls within *Section 3.5 Urban Ecology* of Council's *Development Control Plan 2012*.⁸ The *Ficus macrophylla* (Moreton Bay Figs) that extend along City Road to Broadway are listed within the Council's *Register of Significant Trees 2013* (Victoria Park – Broadway Listing).⁹
- 4.2 The supplied plans show the proposal is for the construction of the new multi-storey Lees Building to the south of the existing Carslaw building. Consent for tree removal/pruning is being sought through the City of Sydney tree pruning and removal application process.
- 4.3 The supplied plan shows that Trees 435, 963-969, 1170 and 1171 will need to be removed to accommodate the proposed development.
- 4.4 The supplied plan shows that Trees 970-973 are proposed for retention as part of the proposed development. The proposed site footprint and pavement falls within their TPZ areas and represents *Major Encroachments* as defined by AS-4970. Root investigations were undertaken to examine the impacts of the proposed works on the trees' root systems. Based on the size and number of roots identified, the proposed works should not significantly impact the trees' health or Useful Life Expectancy. The trees should be protected in accordance with Tree Protection Specification (**Appendix 6**).
- 4.5 Due to the age of the trees and the possibility that roots may be present beyond the depth of the root mapping trench, pre-development preparatory works (including the 2nd stage of the root pruning and the installation of a permanent drip irrigation system) should be undertaken to minimise potential development impacts to the trees.
- 4.6 The crowns of Trees 971 to 973 will need to be pruned to reduce the northern side of their crowns. Based on the form and branch structure of the trees, it was determined that the maximum amount of pruning possible would reduce the northern side of the trees' crowns to approximately 10m. Additional minor pruning in sections of the trees' upper crowns may be required to accommodate sections of the proposed building projection of Level 5 and above. This additional pruning should be limited to branches no greater than 50mm diameter. Deadwood greater than 40mmØ should also be removed from the crowns of Trees 970-973. Pruning works should be supervised by an AQF Level 5 Arborist and undertaken in accordance with *Australian Standard 437 Pruning of Amenity (2007) Trees* and the *Workcover Code of Practice for the Amenity Tree Industry (1998)*.
- 4.7 Replacement planting is recommended where trees are proposed for removal. New tree plantings should be supplied in accordance with *Australian Standard 2303 (2015) Tree Stock for Landscape Use* to ensure the quality of plant material.

⁸ City of Sydney (2012), *Development Control Plan 2012 (Section 3.5 Urban Ecology)*.

www.cityofsydney.nsw.gov.au/_data/assets/pdf_file/0003/129891/Sydney-DCP-Tree-Management-Controls.pdf, accessed 13.01.2014

⁹ City of Sydney (2013) *Register of Significant Trees*.

5.0 LIMITATIONS & DISCLAIMER

TreeiQ takes care to obtain information from reliable sources. However, TreeiQ can neither guarantee nor be responsible for the accuracy of information provided by others. Plans, diagrams, graphs and photographs in this Arboricultural Report are visual aids only and are not necessarily to scale. This Report provides recommendations relating to tree management only. Advice should be sought from appropriately qualified consultants regarding design/construction/ecological/heritage etc issues.

This Report has been prepared for exclusive use by the client. This Report shall not be viewed by others or for any other reason outside its intended target or without the prior written consent of TreeiQ. Unauthorised alteration or separate use of any section of the Report invalidates the Report.

Many factors may contribute to tree failure and cannot always be predicted. TreeiQ takes care to accurately assess tree health and structural condition. However, a tree's internal structural condition may not always correlate to visible external indicators. There is no warranty or guarantee, expressed or implied that problems or deficiencies regarding the trees or site may not arise in the future. Information contained in this report covers only the trees assessed and reflects the condition of the trees at the time of inspection. Additional information regarding the methodology used in the preparation of this Report is attached as Appendix 1. A comprehensive tree risk assessment and management plan for the trees is beyond the scope of this Report.

Reference should be made to any relevant legislation including Tree Management Controls. All recommendations contained within this Report are subject to approval from the relevant Consent Authority.

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www.cityofsydney.nsw.gov.au/development/planning-controls/development-control-plans (website accessed Dec, 2013)

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Matheny & Clark (1994), *A Photographic Guide to the Evaluation of Hazard Trees in Urban Areas*, International Society of Arboriculture, USA.

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Simon, Dormer & Hartshorne (1973), *Lowson's Botany*, Bell & Hyman, London.

Standards Australia (2009), *Protection of Trees on Development Sites AS-4970*.

Standards Australia (2007), *Pruning of Amenity Trees AS-4373*.

Appendix 1: Methodology

- 1.1 Site Inspection:** This report was determined as a result of a comprehensive site during January 2015. The comments and recommendations in this report are based on findings from this site inspection.
- 1.2 Visual Tree Assessment (VTA):** The subject tree(s) was assessed using the Visual Tree Assessment criteria and notes as described in *The Body Language of Trees – A Handbook for Failure Analysis*.¹⁰ The inspection was limited to a visual examination of the subject tree(s) from ground level only. The inspection was limited to a visual examination of the subject tree(s) from ground level only. No internal diagnostic testing was undertaken as part of this assessment. Trees outside the subject site were assessed from the property boundaries only.
- 1.3 Tree Dimensions:** The dimensions of the subject tree(s) are approximate only.
- 1.4 Tree Locations:** The location of the subject tree(s) was determined from the supplied plans.
- 1.5 Trees & Development:** Tree Protection Zones, Tree Protection Measures and Sensitive Construction Methods for the subject tree were based on methods outlined in *Australian Standard 4970-2009 Protection of Trees on Development Sites*.
- The *Tree Protection Zone* (TPZ) is described in AS-4970 as 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.
- The *Structural Root Zone* (SRZ) is described in AS-4970 as the area around the base of a tree required for the tree's stability in the ground. Severance of structural roots within the SRZ is not recommended as it may lead to the destabilisation and/or demise of the tree.
- In some cases it may be possible to encroach into or make variations to the theoretical TPZ. A *Minor Encroachment* is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. A *Major Encroachment* is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.
- 1.6 Tree Health:** The health of the subject tree(s) was determined by assessing:
- I. Foliage size and colour
 - II. Pest and disease infestation
 - III. Extension growth
 - IV. Crown density
 - V. Deadwood size and volume
 - VI. Presence of epicormic growth
- 1.7 Tree Structural Condition:** The structural condition of the subject tree(s) was assessed by:
- I. Assessment of branching structure
(i.e co-dominant/bark inclusions, crossing branches, branch taper, terminal loading, previous branch failures)
 - II. Visible evidence of structural defects or instability
(i.e root plate movement, wounds, decay, cavities, fungal brackets, adaptive growth)
 - III. Evidence of previous pruning or physical damage
(root severance/damage, lopping, flush-cutting, lions tailing, mechanical damage)
- 1.8 Useful Life Expectancy (ULE):** The ULE is an estimate of the longevity of the subject tree(s) in its growing environment. The ULE is modified where necessary to take in consideration tree(s) health, structural condition and site suitability. The tree(s) has been allocated one of the following ULE categories (Modified from Barrell, 2001):
- I. 40 years +
 - II. 15-40 years
 - III. 5-15 years
 - IV. Less than 5 years

¹⁰ Mattheck & Breloer (2003)

- 1.9 Landscape Significance:** Landscape Significance was determined by assessing the combination of the cultural, environmental and aesthetic values of the subject tree(s). Whilst these values are subjective, a rating of high, moderate, low or insignificant has been allocated to the tree(s). This provides a relative value of the tree's Landscape Significance which may aid in determining its Retention Value. If the tree(s) can be categorized into more than one value, the higher value has been allocated.

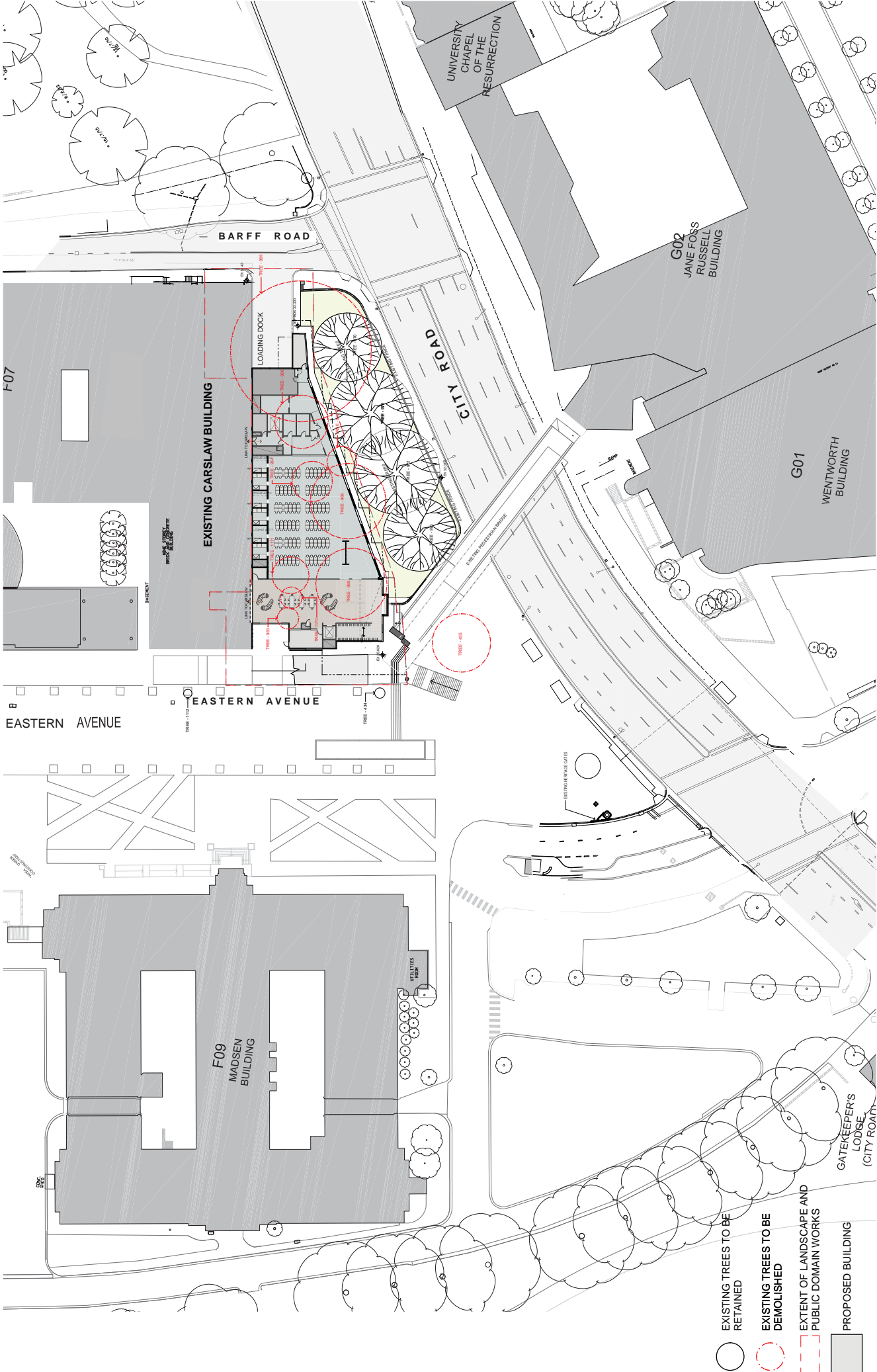
Landscape Significance	Description
Very High	The subject tree is listed as a Heritage Item under the <i>Local Environmental Plan</i> with a local or state level of significance.
	The subject tree is listed on Council's Significant Tree Register or is considered to meet the criteria for significance assessment of trees and/or landscapes by a suitably qualified professional. The criteria are based on general principles outlines in the Burra Charter and on criteria from the Register of the National Estate.
	The subject tree is a remnant tree.
High	The subject tree creates a 'sense of place' or is considered 'landmark' tree.
	The subject tree is of local, cultural or historical importance or is widely known.
	The subject tree has been identified by a suitably qualified professional as a species scheduled as a Threatened or Vulnerable Species or forms part of an Endangered Ecological Community associated with the subject site, as defined under the provisions of the <i>Threatened Species Conservation Act 1995 (NSW)</i> or the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> .
	The subject tree is known to provide habitat to a threatened species.
	The subject tree is an excellent representative of the species in terms of aesthetic value.
	The subject tree is of significant size, scale or makes a significant contribution to the canopy cover of the locality.
	The subject tree forms part of the curtilage of a heritage item with a known or documented association with that item.
Moderate	The subject tree makes a positive contribution to the visual character or amenity of the area.
	The subject tree provides a specific function such as screening or minimising the scale of a building.
	The subject tree has a known habitat value.
	The subject tree is a good representative of the species in terms of aesthetic value.
Low	The subject tree is an environmental pest species or is exempt under the provisions of the local Council's Tree Management Controls
	The subject tree makes little or no contribution to the amenity of the locality.
	The subject tree is a poor representative of the species in terms of aesthetic value.
Insignificant	The subject tree is declared a Noxious Weed under the Noxious Weeds Act

- 1.10 Retention Value:** Retention Value was based on the subject tree's Useful Life Expectancy and Landscape Significance. The Retention Value was modified where necessary to take in consideration the subject tree's health, structural condition and site suitability. The subject tree(s) has been allocated one of the following Retention Values:

- I. Priority for Retention
- II. Consider for Retention
- III. Consider for Removal
- IV. Priority for Removal

ULE		Landscape Significance			
	Very High	High	Moderate	Low	Insignificant
40 years +	Priority for Retention	Priority for Retention		Consider for Removal	Priority for Removal
15-40 years		Priority for Retention	Consider for Retention		
5-15 years		Consider for Retention			
Less than 5 years	Consider for Removal	Priority for Removal			

The above table has been modified from the Footprint Green Tree Significance and Retention Value Matrix.



REV		ISSUE FOR DA	CR	AM	DATE	NORTH POINT		THE UNIVERSITY OF SYDNEY CONSTRUCTIONS		RICHARD CROOKES DAUBNEY		PROJECT		DRAWING TITLE:		SCALE:		CHECKED:	
B					11.03.13							LEES1 BUILDING SYDNEY UNIVERSITY SYDNEY, NSW, 2006		SITE PLAN - TREE RETENTION		1:200 @ A2		SS	



Appendix 3: Tree Assessment Schedule

Tree No.	Species	DBH (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Condition Rating	Comments	L/Significance	ULE (years)	Retention Value	TPZ (m)	SRZ (m)	Implication
435	<i>Ficus macrophylla</i> (Moreton Bay Fig)	400	6	5	Good	Good	Potential to transplant.	Moderate	40+	Priority for Retention	4.8	2.3	Remove. Landscape treatment.
963	<i>Corymbia maculata</i> (Spotted Gum)	200	10	2	Good	Good	None	Low	40+	Consider for Removal	2.4	1.7	Remove. Building footprint.
964	<i>Corymbia maculata</i> (Spotted Gum)	150	10	2	Good	Good	Small (<25mm) diameter deadwood in low volumes. Partially suppressed.	Low	40+	Consider for Removal	2	1.5	Remove. Building footprint.
965	<i>Lophostemon confertus</i> (Brush Box)	450	10	5	Poor	Good	Crown density 0-25%. Small (<25mm) diameter deadwood in moderate volumes. Possible recent improvement in health.	Moderate	5-15	Consider for Retention	5.4	2.4	Remove. Building footprint.
966	<i>Lophostemon confertus</i> (Brush Box)	500	10	5	Fair	Fair	Crown density 75-100%. Partially suppressed. Basal cavity.	Moderate	15-40	Consider for Retention	6	2.5	Remove. Building footprint.
967	<i>Syzygium paniculatum</i> (Lillypilly)	150	6	2	Good	Good	Partially suppressed. Potential to transplant.	Low	40+	Consider for Removal	2	1.5	Remove. Building footprint.
968	<i>Lophostemon confertus</i> (Brush Box)	450	10	5	Fair	Good	Crown density 75-100%. Small (<25mm) diameter deadwood in low volumes.	Moderate	15-40	Consider for Retention	5.4	2.4	Remove. Building footprint.

Tree No.	Species	DBH (mm)	Height (m)	Radial Crown Spread (m)	Health Rating	Structural Condition Rating	Comments	L/Significance	ULE (years)	Retention Value	TPZ (m)	SRZ (m)	Implication
969	<i>Celtis sinensis</i> (Chinese Hackberry)	1000	15	12	Good	Good	Crown density 75-100%. Branch inclusion/s, minor. First order branch cavity, minor. Small (<25mm) diameter deadwood in low volumes.	High	15-40	Priority for Retention	12	3.4	Remove. Building footprint.
970	<i>Ficus macrophylla</i> (Moreton Bay Fig)	1000	15	10	Good	Good	Partially suppressed. Small (<25mm) epicormic growth in low volumes. Wound/s, early stages of decay. Wound/s, advanced stages of decay. Previous branch failure/s.	Very High	15-40	Priority for Retention	12	3.4	Retain. Major encroachment.
971	<i>Ficus macrophylla</i> (Moreton Bay Fig)	1100	14	10	Good	Good	Medium (25-75mm) epicormic growth in moderate volumes. Wound/s, early stages of decay. Wound/s, advanced stages of decay. Previous branch failure/s. Small (<25mm) diameter epicormic growth in low volumes. Partially suppressed.	Very High	15-40	Priority for Retention	13.2	3.5	Retain. Major encroachment.
972	<i>Ficus macrophylla</i> (Moreton Bay Fig)	800	15	10	Fair	Good	Crown density 50-75%. Medium (25-75mm) epicormic growth in low volumes. Wound/s, early stages of decay. Wound/s, advanced stages of decay. Small (<25mm) epicormic growth in low volumes. Partially suppressed.	Very High	15-40	Priority for Retention	9.6	3.1	Retain. Major encroachment.
973	<i>Ficus macrophylla</i> (Moreton Bay Fig)	1150	14	12	Good	Good	Medium (25-75mm) diameter epicormic growth in low volumes. Small (<25mm) diameter epicormic growth in low volumes. Partially suppressed.	Very High	15-40	Priority for Retention	13.8	3.6	Retain. Major encroachment.
1170	<i>Corymbia maculata</i> (Spotted Gum)	150	10	3	Good	Good	Wound/s, no visible signs of decay.	Low	40+	Consider for Removal	2	1.5	Remove. Building footprint.
1171	<i>Corymbia maculata</i> (Spotted Gum)	250	10	3	Good	Good	Small (<25mm) diameter deadwood in low volumes.	Low	40+	Consider for Removal	3	1.9	Remove. Building footprint.

Appendix 4: Plates



Plate 1: Showing Trees 963, 1170 & 1171



Plate 2: Showing Tree 964



Plate 3: Showing Tree 965



Plate 4: Showing Tree 967



Plate 5: Showing Tree 968



Plate 6: Showing Tree 969

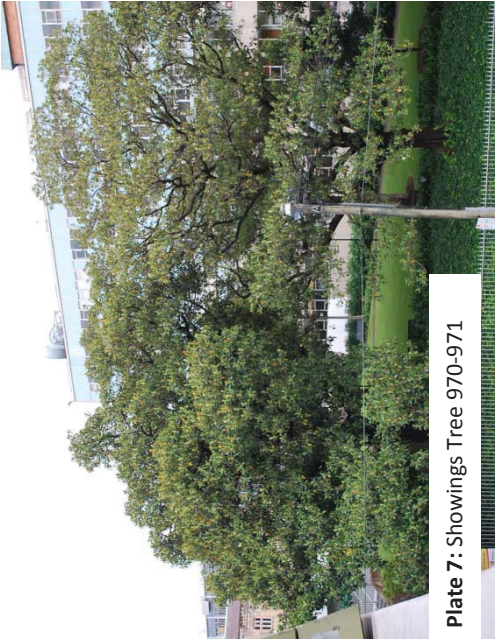


Plate 7: Showings Tree 970-971



Plate 8: Showing Tree 972-973



Plate 9: Showing western end of root mapping trench

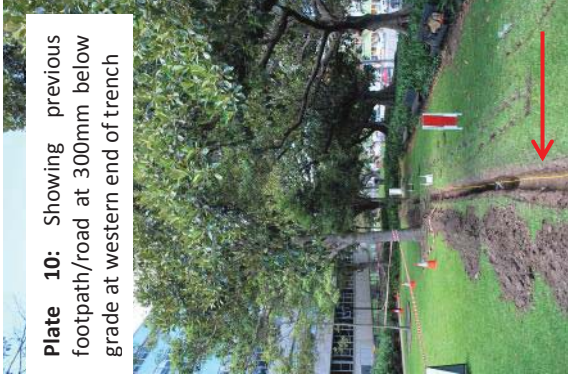


Plate 10: Showing previous footpath/road at 300mm below grade at western end of trench



Plate 11: Showing 45mm root at 600mm below grade



Plate 12: Showing buried stump with root collar 300mm below grade

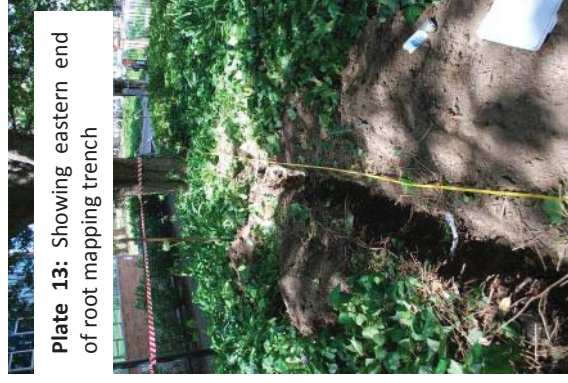
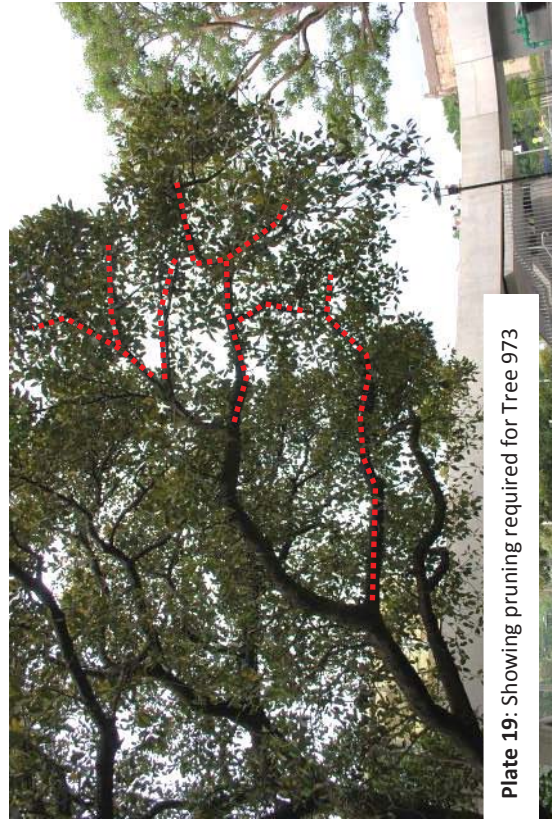
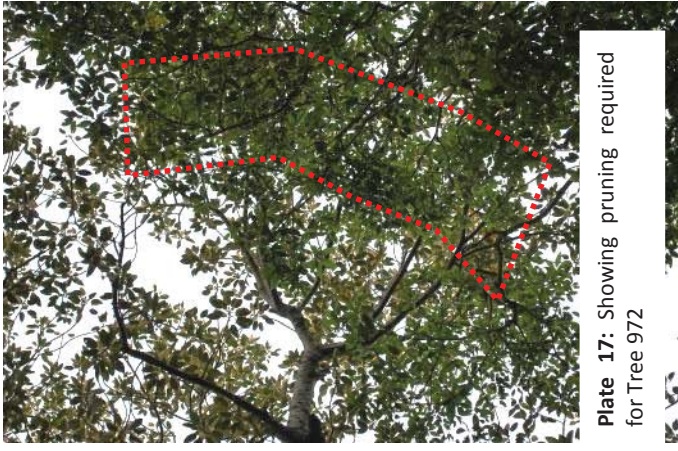


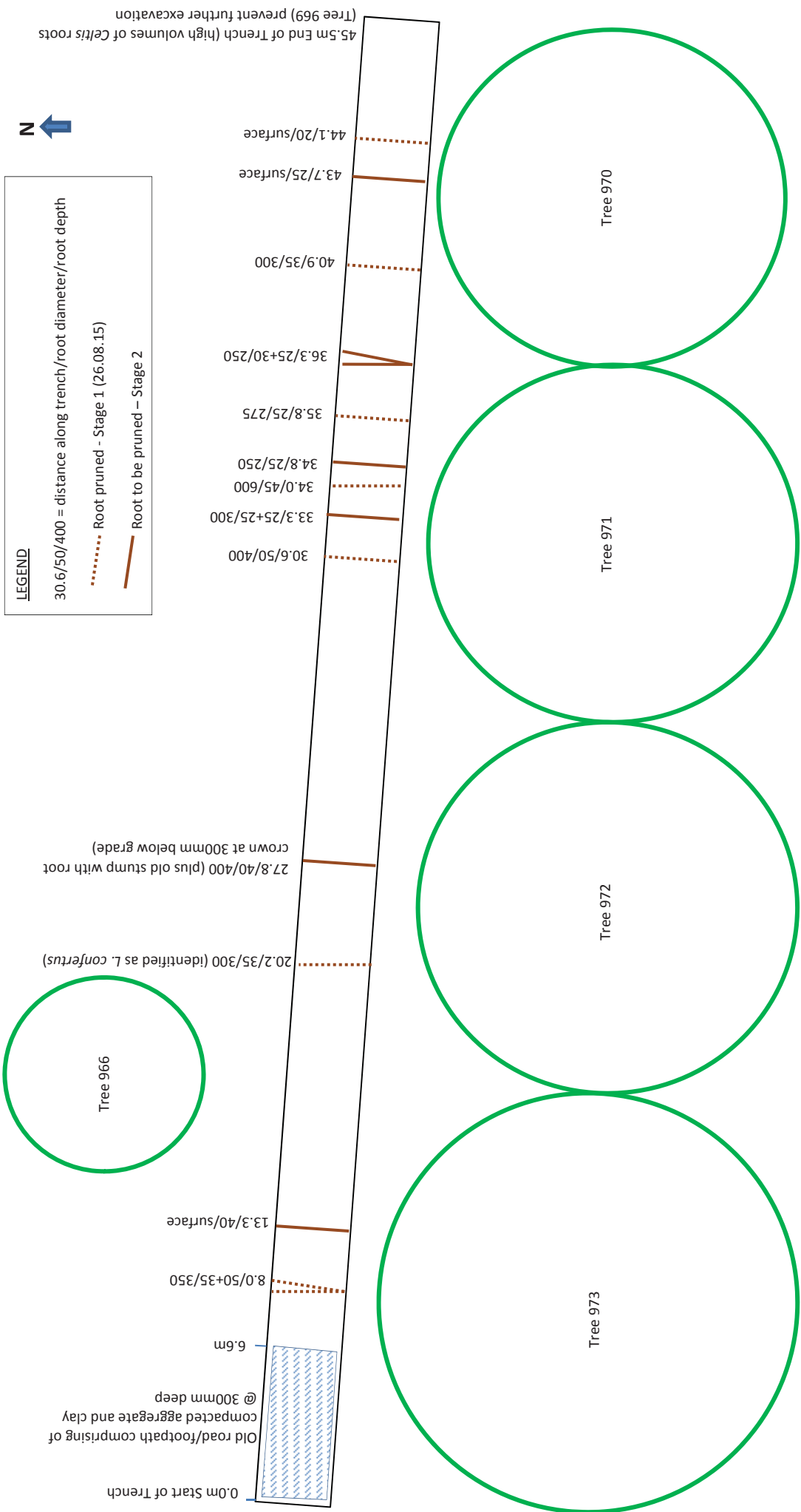
Plate 13: Showing eastern end of root mapping trench



Plate 14: Showing roots in eastern section of root mapping trench



Appendix 5: Root Investigation Results



Appendix 6: Tree Protection Specification

1.0 Appointment of Project Arborist

A Project Arborist shall be engaged prior the commencement of work on-site and monitor compliance with the protection measures. The Project Arborist shall inspect the tree protection measures and Compliance Certification shall be prepared by the Project Arborist for review by the Principal Certifying Authority prior to the release of the Compliance Certificate.

The Project Arborist shall have a minimum qualification equivalent (using the Australian Qualifications Framework) of NSW TAFE Certificate Level 5 or above in Arboriculture.

The site specific requirement for mulching, irrigation, the location of tree protection fencing and temporary access, and other specific tree protection measures shall be confirmed through consultation between the Head Contractor/Project Manager and the Project Arborist prior to the commencement of works.

1.1 Compliance

Contractors and site workers shall receive a copy of these specifications a minimum of 3 working days prior to commencing work on-site. Contractors and site workers undertaking works within the Tree Protection Zone shall sign the site log confirming they have read and understand these specifications, prior to undertaking works on-site.

1.2 Tree Protection Zone

The tree to be retained shall be protected prior and during construction from activities that may result in an adverse effect on their health or structural condition. The area within the Tree Protection Zone (TPZ) shall exclude the following activities, unless otherwise stated:-

- Modification of existing soil levels, excavations and trenching
- Mechanical removal of vegetation
- Movement of natural rock
- Storage of materials, plant or equipment or erection of site sheds
- Affixing of signage or hoarding to the trees
- Preparation of building materials, refueling or disposal of waste materials and chemicals
- Lighting fires
- Movement of pedestrian or vehicular traffic
- Temporary or permanent location of services, or the works required for their installation
- Any other activities that may cause damage to the tree

NOTE: If access, encroachment or incursion into the TPZ is deemed essential, prior authorisation is required by the Site Arborist.

1.3 Tree Protection Fencing

TPZ fencing for Trees 970-973 shall be combined into one large TPZ area that encompasses the entire garden bed area in which the trees are located. Refer to appended **Tree Protection Plan**. The exact location of the fencing shall be confirmed through consultation between the Head Contractor/Project Manager and the Project Arborist prior to the commencement of works. Fencing may be setback to allow for demolition/construction access and for the installation of pavements only where appropriate ground protection is installed and approved by the Project Arborist.

As a minimum, the Tree Protection Fence shall consist of 1.8m high wire mesh panels supported by concrete feet. Panels shall be fastened together and supported to prevent sideways movement. The tree shall not be damaged during the installation of the Tree Protection Fencing. Refer to Typical Tree Protection Details (3) (**Appendix 5**).

1.4 Signage

Signs identifying the TPZ should be placed around the edge of the TPZ and be visible from within the development site. The lettering on the sign should comply with *Australian Standard - 1319 (1994) Safety signs for the occupational environment*. The signage shall be installed prior to the commencement of works on-site and shall be maintained in good condition for the duration of the development period.

1.5 Site Management

Materials, waste storage, and temporary services shall not be located within the TPZ.

1.6 Irrigation & Mulching

An automated drip irrigation system shall be installed within the fenced TPZ area prior to the commencement of development works. Irrigation lines shall be spaced at 1m centres (approx.) and covered with a 75mm layer of woodchip mulch (where the existing ground cover vegetation is to be removed). The irrigation system shall be programmed to operate for a duration of 1 hour every second day unless otherwise directed by the Project Arborist. In addition, regular ongoing applications of a seaweed based-soil conditioner (e.g. Seasol) shall be applied to the TPZ area in accordance with the manufacturer's recommendations.

1.7 Ground Protection

To protect the underlying soil from compaction, machinery movements shall be restricted to areas of existing pavement or from areas of temporary ground protection such as ground mats or steel road plates. Refer to appended **Tree Protection Plan** and Typical Tree Protection Details (3) (**Appendix 5**).

1.8 Scaffolding

Scaffolding shall not be in contact with the trees. As necessary, this shall be achieved by erecting scaffolding around branches. Branches shall be tied back and protected as deemed necessary by the Project Arborist. Refer to Typical Tree Protection Details (5) (**Appendix 5**) and

1.9 Works within the Tree Protection Zones

In some cases works within the TPZ may be authorized by the determining authority. **These works shall be supervised by the Project Arborist.** When undertaking works within the TPZ, care should be taken to avoid damage to the tree's root system, trunks and lower branches.

If roots (>25mm \varnothing) are encountered during the demolition, excavation and construction works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Adjustment of final levels and design shall remain flexible to enable the retention of roots (>25mm \varnothing) where deemed necessary by the Project Arborist.

1.10 Underground Services

Installation of underground services within the TPZ shall be supervised by the Project Arborist. Wherever possible, underground services shall not be located within the TPZ.

Where underground services run through the TPZ of trees to be retained, hand /hydro-vacuum excavation methods shall be used to minimise damage to tree roots. When undertaking hydro-vacuum excavation, the tip of the high pressure lance is not to be pointed directly at roots at close range to avoid the removal or damage to bark. It is essential that the bark of roots remain intact.

If roots (>25mm \varnothing) are encountered during the excavation works, these roots should be retained in an undamaged condition and advice sought from the Project Arborist. In section of trench where roots (>25mm \varnothing) are present and are to be retained, the services shall be either be re-routed or where falls permit, feed below these roots.

1.11 Pavement Installation

Installation of the pavements and sub-base within the TPZ shall be supervised by the Project Arborist. The new surfaces and sub-base materials shall permeable, and placed above grade to minimise excavations and retain roots (unless prior root mapping results show above sensitive construction to be unnecessary).

New sub-base material shall be a 20mm no-fines road base (Benedict Sand & Gravel - Product Code 20NF/RB or similar approved material). Recycled concrete aggregates shall not be used to avoid raising soil pH levels.

If roots (>25mm \varnothing) are encountered during the installation of the new sub-base and surfaces, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Adjustment of final levels and design shall remain flexible to enable the retention of structural roots (>25mm \varnothing) where deemed necessary by the Project Arborist. Compaction of the ground surface prior to the installation of fill shall not be permitted.

1.12 Plant & Turf Installation

Plant and turf installation within TPZ areas shall be undertaken using hand tools and roots (>25mm \varnothing) shall be protected. No mechanical cultivation/ripping of soils shall be undertaken within TPZ areas.

Landscape planting shall be completed in the final stage of the development works and tree protection fencing and trunk protection shall remain in place until these works are due to commence.

1.13 Excavations

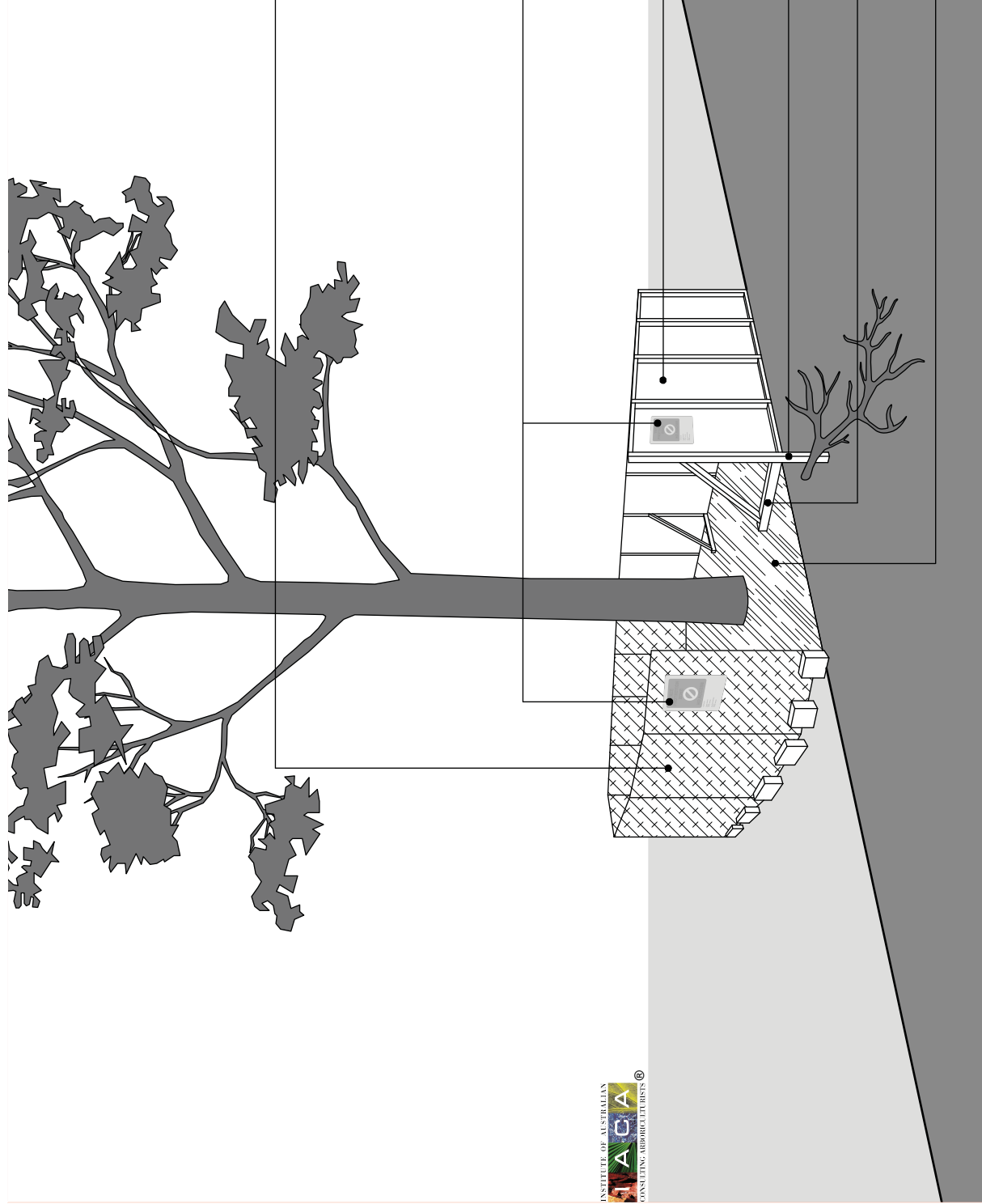
Excavations and root pruning within the TPZ shall be supervised by the Project Arborist. Excavations within the TPZ shall be avoided wherever possible.

Excavations within the TPZ shall be undertaken by hand or using hydro vacuum excavation methods (or similar approved device) to protect tree roots. If there is any delay between excavation works and backfilling, exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute mat. The mat shall be kept in a damp condition at all times.

No over excavation, benching or battering should be permitted when excavating adjacent to or within TPZ areas.

Appendix 7: Typical Tree Protection Details

Adapted from *AS 4970-2009 Protection of Trees on Development Sites*
(Source: Institute of Australian Consulting Arboriculturists)



Note:

No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

Option 1 - Fencing

1.8m high chain wire mesh panels with shade cloth attached (if required), held in place with concrete feet.

Tree Protection Zone (TPZ) sign

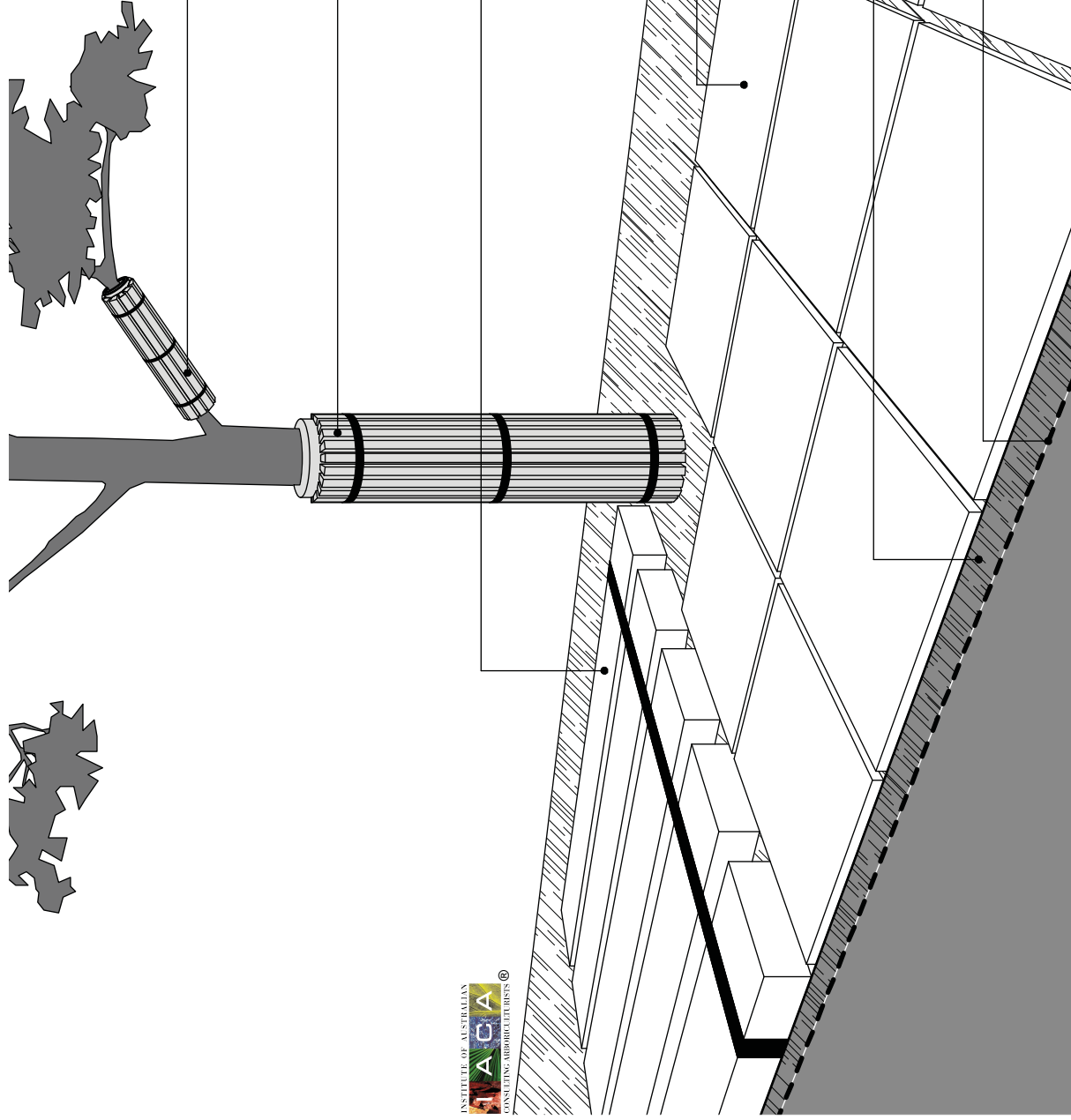
Option 2 - Fencing

Plywood or wooden panel paling fence. This type of fencing material also prevents building materials or soil entering the TPZ.

Installation of supports should avoid damaging roots.

Bracing is permissible within the TPZ.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer installed across surface of TPZ.



Branch Protection - use boards and padding to prevent damage to bark on branch. Boards are to be strapped, not screwed or nailed to the branch.

Trunk Protection - use boards and padding to prevent damage to bark (minimum 2m). Boards are to be strapped, not screwed or nailed to the trunk.

Ground Protection - use device strapped over mulch or aggregate layer. Ground protection device should be of a suitable thickness to prevent soil compaction and root damage.

Steel plates (or approved equivalent) with or without mulch or aggregate layer below.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer.

Geotextile fabric underneath mulch or aggregate layer.

