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Kim Bazeley
Mirvac Design
Level 28, 200 George Street
Sydney NSW 2000

11th April 2017

Dear Kim

Vertical Transportation Design Statement – Marrickville Community Hub Development

We are writing with reference to the performance of the vertical transportation systems for Buildings A1 and A2 of the Marrickville Community Hub Re-development, NSW.

Design Methodology

We would note that two (2) additional lifts have been included in the proposed development which equates to four (4) lifts serving 166 apartments.

When designing the vertical transportation systems we have referenced the performance criteria for residential buildings, as discussed within the Chartered Institute of Building Services Engineer's – Transportation Systems in Buildings (CIBSE) Guide D.

CIBSE Guide D is an internationally recognised document for defining the parameters of elevator equipment and performance outcomes when designing vertical transportation systems.

Performance Targets

The performance levels targeted for Building A1 and A2 are commensurate or better than a normal type residential development, as summarised below.

Performance Targets			
Development Type	**Luxury**	**Normal**	**Low Income**
Average Waiting Interval	45 – 50 seconds	50 – 60 seconds	60 – 70 seconds
Balanced 2 – Way Handling Capacity	8%	6% to 8%	5% to 7%

Population

The theoretical building population has been estimated using the below assumptions for a normal

residential type as summarised below.

Occupancy Ratio's	
Studio	1.5 persons
1 Bedroom	1.8 persons
2 Bedroom	3.0 persons
3 Bedroom	4.0 persons
Car Park	1 person / car with 50% churn during peak period

Based on the building design and the above discussed design assumptions, we would confirm that the vertical transportation systems will achieve the below calculated performance levels.

Performance Outcomes		
Building	**A1**	**A2**
Average Waiting Interval	60 seconds	51 seconds
Balanced 2 – Way Handling Capacity	12.8%	11.6%

As can be seen from the above, the performance for the vertical transportation systems in Buildings A1 and A2 easily exceeds the performance targets for a “normal type” residential development. The average waiting intervals are commensurate with a normal type residential development while the handling capacity exceeds the performance requirements for a “luxury” type development. We would note that these performance levels are for peak periods, during off peak periods the average waiting interval would decrease proportional to the reduction in demand.

Accordingly it is our opinion that the proposed lifting arrangement is more than suitable for the development and will result in an excellent level of service.

I am an appropriately qualified and competent person in this area and as such can certify that the design complies with the above.

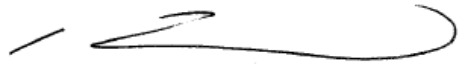
Full Name of Designer — Peter Tomlinson
Associate Principal
Discipline Leader – Vertical Transportation

Address of Designer — Level 10, 201 Kent Street, Sydney
(Ph) 02 9320 9320
(Fax) 02 9320 9321

Name of Employer — Ove Arup Pty Ltd

We trust the information meets with your requirements however should you have any questions or would like to discuss further any aspect of the above please feel free to contact me at any time.

Yours sincerely



Peter Tomlinson
Associate Principal - Vertical Transportation

Our Ref: 20160047

30 November 2016

Mirvac Developments
Level 28, 200 George Street
Sydney NSW 2000
Australia

Attention: Angela Kavanagh

Dear Angela,

Re: Marrickville Community Hub DA Submission

AJ Whipps Consulting Group

Where ingenuity flows

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SYSTEM OVERVIEW

The basis of the roof design for the Marrickville Community Hub Development involves a patented Syphonic Drainage system. During a rain event, this incorporates the build-up of rainwater within the box gutter to a predetermined height which then causes a suction effect that syphons the rainwater into the downpipes. Rainwater flow is then transferred to the stormwater drainage system and ultimately to the rainwater harvesting tanks/OSD or Council drainage infrastructure as required. As rainfall persists, this 'syphon' effect within the box gutter continues and the collected rainwater is directed away from the box gutter at exceptionally higher flow rates than a conventional gravity drainage system.

SYSTEM PERFORMANCE

The design intent for the box gutter gradient of 1:200 relates to the overall size of the roof and the length of the box gutter of some 50metres. A 1:100 gradient in the box gutter would result in an overall difference of 500mm from the highest point in the gutter to the lowest. From a buildability and client cost point of view this neither desirable nor practical as it does not improve the performance of the water flow from box gutter to the drainage system.

With regards to provisions for the effects during hailstorms, AS3500 provides the following advice, *"Although hail can restrict or block roof drainage systems, the present lack of performance data prevents the inclusion of requirements for hail barriers".* Other than standard overflow provisions within the gutter, no specific design parameters are provided for such events.

SYSTEM MAINTENANCE

Generally, maintenance for box gutters is provided by incorporating a minimum width of 300mm to allow unrestricted access to the length of the box gutter (which obviously for safety reasons would not be undertaken during a hail storm event). A recommended maintenance regimen would be that inspections are conducted on an annual basis to ensure box gutters are free from debris and foreign material and overflows/downpipe inlets are clear.

CONCLUSION

The roof gutter design has been undertaken in accordance with minimum requirements as noted in the NCC and AS3500 which is typically used for all roof water drainage systems.

Sincerely,
AJ WHIPPS CONSULTING GROUP PTY LTD

Greg Haggett

Senior Hydraulic Engineer

AJ Whipps Consulting Group

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TREE MANAGEMENT CONSULTING ARBORICULTURISTS

ARBORICULTURAL IMPACT ASSESSMENT

for

MIRVAC PROJECTS
Level 26, 60 Margaret Street
SYDNEY NSW 2049

SITE ADDRESS
MARRICKVILLE COMMUNITY HUB DEVELOPMENT
313–319 MARRICKVILLE ROAD
(FORMER MARRICKVILLE HOSPITAL SITE)
MARRICKVILLE NSW

APRIL 2016

Accredited member of
INSTITUTE OF AUSTRALIAN CONSULTING ARBORICULTURISTS ®

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CONTENTS

1 INTRODUCTION

1.1 This Arboricultural report was commissioned by Mr Vince Tusa, for Mirvac Projects.

1.2 The subject site is identified as Lots 36 & 37 in DP 3164, Lot 2 in DP 872693 and Lot 2 in DP 103507, known as the Former Marrickville Hospital site at 313 – 319 Marrickville Road, Marrickville ("the site").

1.3 This report is to accompany a development application to Marrickville Council for the proposed development known as the Marrickville Community Hub Development. The Marrickville Community Hub proposal seeks to redevelop the Old Marrickville Hospital site to provide:

- a Community Hub (approximately 3,300m^2 of floor space) to contain a library and pavilion, including the adaptive re-use of the former Main Ward Block fronting Lilydale Street;
- new public open space (approximately 1,250m^2) on the corner of Livingstone and Marrickville Roads;
- a cafe and children's play area;
- development of 3 residential apartment buildings ranging in height from 2-11 storeys, incorporating the adaptive re-use of the Old Nurses' Quarters (Lilydale House), with a total of 225 dwellings including 9 affordable housing dwellings;
- the upgrade of the northern-end of the heritage structure fronting Lilydale Street to provide a small commercial tenancy of approximately 300m^2;
- basement parking for approximately 300 vehicles, including 60 public spaces for the Community Hub;
- an upgrade to the historically significant Hospital Lane, and
- creation of a new landscaped area of approximately 1,000m^2 on either side of Hospital Lane to be known as 'The Common'.

1.4 The purpose of this report is to identify the potential impacts the proposed development may have on those trees in proximity to the works, and give recommendations for tree retention or removal, and provides guidelines for tree protection and maintenance.

1.6 All data has been verified as far as possible; however, I can neither guarantee nor be responsible for the accuracy of information provided by others.

1.7 This Arboricultural report is not intended as an assessment of impacts on trees by any proposed future development of the site, other than the current application for the Marrickville Community Development.

1.8 This report is not intended to be a comprehensive *hazard* assessment; however, the report may make recommendations, where appropriate, for further assessment, treatment or testing of trees where potential structural problems have been identified, or where below ground investigation may be required.

2 METHODOLOGY

2.1 In preparation for this report, Urban Forestry Australia ("UFA") carried out *Visual Tree Assessments* ("VTA") of sixty-three (63) on 24th April, 2012. These trees were previously assessed by Earthscape Horticultural Services in 2009 ("EHS"). UFA has adopted the tree identification numbers used in the EHS report.

2.2 Details of the re-assessed trees are included in the Schedule of Assessed Trees (Appendix D). The locations and *Retention Values* of the trees are provided on a marked up copy of the 2012 Masterplan and Site Survey (Appendix E).

2.3 Tree heights and crown spreads were visually estimated. Unless otherwise noted in this report, trunk diameters were measured at 1.4 m above ground level (*DBH*), using a Yamiyo® diameter tape.

2.4 Field observations were written down or recorded on HanDBase4 for iphone. Photographs were taken using a Canon EOS1000D digital SLR camera.

2.5 No *aerial inspections, root mapping* or woody tissue testing were undertaken as part of the 2012 tree assessment.

2.6 The Retention Value ("RV") of the assessed trees was determined on the basis of their *Useful Life Expectancies* ("ULE") and their *Landscape Significance Rating* ("LSR") in accordance with the Institute of Australian Consulting Arboriculturist's *Significance of a Tree Assessment Rating* 2010 (Appendix C).

2.6 Information contained in this tree report covers only the trees that were examined and reflects the condition of those trees at the time of inspection. Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible; however, I can neither guarantee nor be responsible for the accuracy of information provided by others.

2.4 Documents referenced in the preparation of this report include:

- Detail and Level Survey, ref. No., 148/09, dated 23/11/09, prepared by Eric Scerri & Associates Pty Ltd,
- 2012 Masterplan and Site Survey, provided by Marrickville Council.
- Plans DA002—006, Rev J., dated 08.04.16, by Mirvac Design.
- Pre-development Tree Assessment Report, dated August 2006, prepared by Earthscape Horticultural Services ("EHS"),
- Arboricultural Development Impact Report dated April, 2012, by Urban Forestry Australia.

3 OBSERVATIONS AND DISCUSSION

3.1 Trees within the proposed development site

3.1.1 The 2009 EHS report identified and assessed sixty-three (63) trees within, or immediately adjacent to the site. These trees were re-assessed by UFA approximately three and a half years after the EHS tree assessments.

3.1.2 Trees have not been re-assessed for this 2016 report. This report relies on Nearmap and Google Earth images to confirm if individual trees have been removed since the 2012 assessment by Urban Forestry Australia.

3.1.3 No assessed trees are listed as Threatened or Vulnerable Species under the provisions of the *Threatened Species Conservation Act* 1995 (NSW) or the *Environmental Protection and Biodiversity Conservation Act* 1999.

3.2 Removed / not located Trees 2016

3.2.1 Ten (10) trees have been removed, or were not present as of April 2016, in comparison against the 2009 and 2012 tree assessments. These are trees 28, 43, 49, 51, 52, 53, 54, 55, 57, and 77a.

3.3 Trees of Low Retention Value

3.3.1 A total of thirty-five (35) trees are accorded low retention values. These are generally trees of low landscape significance, and/or declining in vigour and/or condition, and/or are environmental weed species.

3.3.2 Eleven (11) of these 34 trees are have been accorded low retention values due to their undesirable growth and/or prolific self-propagating capabilities, which identify them as environmental weed species (Trees 4a, 4b, 8, 9, 10, 13, 32, 46, 51a, 51b, and 56).

3.3.3 Under DCP-TM, these trees are of species listed as exempt from protection, regardless of their physical dimensions, unless a specimen is listed as a Heritage Item, or occurs within the curtilage of a Heritage Item or within a Heritage Conservation Area i.e. the Main Ward Block and Old Nurses Home facing Lilydale Street, and the Victorian cottages facing Livingstone Road:

- Tree 9 – *Lagunaria patersonia* (Norfolk Island Hibiscus),
- Tree 10 – *Nerium oleander* (Oleander),
- Tree 13 – *Schefflera actinophylla* (Umbrella Tree),
- Tree 32 – *Cotoneaster* spp. (Cotoneaster),
- Tree 46 – *Olea europea* subsp. *cuspidata* (African Olive),
- Tree 56 – *Ligustrum lucidum* (Large-leaved Privet).

3.3.4 The remaining five (5) environmental weed species in the site are not protected under the DCP.

- Trees 4a and 4b – *Ailanthus altissima* (Tree of Heaven),
- Tree 8 – *Schefflera actinophylla* (Umbrella Tree)
- Trees 51a and 51b – *Morus nigra* (Mulberry).

3.3.5 The following twenty-four (24) trees are accorded low retention values for the reasons set out below.

- Tree 7 – *Michelia figo* (Port Wine Magnolia)
  Small, shrubby tree of low landscape amenity, readily replaced if required.
- Tree 11 – *Lagerstroemia indica* (Crape Myrtle)
  Small tree of low landscape amenity, readily replaced if required.
- Tree 15 – *Eucalyptus nicholii* (Small leaved Peppermint).
- Trees 17, 18, 19, 21, 23, 26, 27, 35, 36 – *Allocasuarina torulosa* (Forest Oak)
  Generally highly suppressed and declining in vigour and structure.
- Trees 29, 30, 47 and 60 – *Pittosporum undulatum* (Sweet Pittosporum)
  Very poor condition and/or of low landscape amenity value.
- Tree 31 – *Bauhinia variegata* (Orchid Tree)
  Small tree of low landscape amenity, readily replaced if required.
- Tree 37 – *Casuarina glauca* (Swamp She-oak)
  Very poor vigour and condition- almost dead.
- Tree 44 – *Cinnamomum camphora* (Camphor Laurel >10m high)
  Environmental weed species, poor location near built structures.
- Tree 45 – *Araucaria heterophylla* (Norfolk Island Pine)
  Poor long term retention prognosis.This tree is suppressed by nearby trees. Due to the proximity to the existing building, as the tree matures it would require substantial pruning to keep clear of the building line. Given the mature dimension of the species, it is my opinion this pine tree is not a suitable candidate for long term retention and should be removed and replaced with a smaller tree species suited to the relatively confined growing area between the building and street.
- Tree 48 – *Cupressus glabra* (Arizona Cypress)
  Very close to existing heritage building resulting in inappropriate and excessive pruning, yet has some amenity value when viewed from the street. Stem defects have been identified. It is possible the tree could be retained, however it presents an unreasonable restriction on building maintenance or upgrading works and removal and replacement with more suitable species is likely a better long term option.
- Tree 50 –*Allocasuarina littoralis* (Black She-oak)
  Poor vigour-declining.
- Tree 59 – *Tecoma stans* (Golden Bells)
  Environmental weed species.
- Tree 77 – *Tristaniopsis laurina* (Water Gum)
  Very young and small street tree, could be readily replaced if required.

3.4 Trees of Medium Retention Value

3.4.1 Eleven (11) trees are accorded medium retention values.

- Trees 4, 5 and 6 – *Liquidambar styraciflua* (Liquidambar)
- Trees 14 and 58 – *Grevillea robusta* (Silky Oak)
- Tree 16 – *Jacaranda mimosifolia* (Jacaranda)
- Trees 20, 22 and 34 – *Casuarina glauca* (Swamp She-oak)
- Trees 24 and 33 –*Allocasuarina torulosa* (Forest Oak)

3.5 Trees of High Retention Value

3.5.1 Seven (7) trees are accorded high retention values.

- Tree 12 – *Jacaranda mimosifolia* (Jacaranda), which requires removal to accommodate the development;
  - The tree has similar dimensions to those recorded in 2012, although it has extended its lateral north/south spread by at least 2m. The tree is currently approximately 12m high and 16m spread.
  - The tree is routinely lopped back by Ausgrid on its west side to clear power lines.
  - We note Marrickville Council does not have a Significant Tree Register, and as far as I am able to ascertain, there are no Council records that identify this specimen as having special significance.
  - The species has no special significance in the current setting, and is a very common species in gardens of all periods.
- Tree 25 – *Cinnamomum camphora* (Camphor Laurel), noted to be removed in the previous report by Urban Forestry Australia, pages 6 and 33, and
- Trees 38, 39, 40, 41 and 42 – *Phoenix canariensis* (Canary Island Date Palm).

3.6 Tree Removal Resulting from the Proposed Development

3.6.1 With exception of Trees 1, 2 and 3 located on the adjoining property to the north, it is proposed to remove all site trees.

3.6.2 Trees 38, 39, 40, 41 and 42 (Date Palms), are proposed to be transplanted.

3.6.3 The landscaping component of the proposal will reintroduce canopy trees into the landscape.

3.7 Potential Impacts on Trees to be Retained

3.7.1 Tree 1 – Camphor Laurel (located on adjoining property to north)

- Excavation appears to be right at the edge of the notional SRZ, and what appear to be walls and strip footings inside the SRZ and may affect woody roots crucial to anchorage. I note an existing wall between the tree and site, which may contribute to restricting root growth into the site. Only root mapping will confirm this, although

woody roots providing tree anchorage are unlikely to extend beneath the existing building.

- The TPZ area would not be consistent with the notional symmetrical offset, but likely extend several metres east beyond the TPZ radius. There are boundary and landscape/courtyard walls and level changes proposed within the TPZ. The estimated TPZ encroachment is in the vicinity of 65m^2 or 22.4% which is in the high range and may not be tolerated by the tree.
- To accommodate construction scaffolding (and a pile rig, if used), pruning of approximately 10–15% is likely as its branches currently extend to the existing building line.

3.7.2 Tree 2 – Cook Pine (located on adjoining property to north)

- No likely SRZ impact identified—there is a substantial, existing wall between the tree and site which has most likely deflected any major woody roots from entering the site.
- About 12.5m2 or about 17.5% of the notional TPZ would be affected. This is a moderate impact and within an acceptable range given the robust nature and impact tolerance of the species.
- No pruning of this tree is anticipated.

3.7.3 Tree 3 – Camphor Laurel (on adjoining property to north)

- There are no apparent obstructions or restrictions to woody root growth into the site. Therefore, the proposed walls well inside the tree's SRZ, as well as the proposed level changes, may have a profound impact on tree stability if significant anchor roots are severed at construction.
- The tree may have up to 40% of its TPZ affected by encroachments, consisting of level changes, walls and the like. This is a significant level of impact and is likely to cause a decline in tree health.
- The crown extends some 8–10m or so into the site, therefore the tree may require pruning up to at least 20% to accommodate the building line and scaffolding.

3.7.4 Trees 38, 39, 40, 41 and 42 – Canary Island Date Palms.

- All palms are to be retained and relocated within the Community Hub.
- Trees 38 and 39 are to be relocated within the site, opposite the leased area and facing Lilydale Street.

- Trees 40, 41 and 42 are most likely to be relocated to the public domain at the south of the site, i.e. Marrickville Road.
- The species is quite tolerant of transplanting; the works would need to be undertaken by a contractor with proven transplanting experience to ensure successful relocation. In this regard, the final planting location pit must be designed in liaison with the transplanter's advice.
- A Palm Transplant Methodology Statement, April 2016 has been prepared by Urban Forestry Australia. This document should be referred to as a guide in regard to any future decision relating to the relocation of the palms.

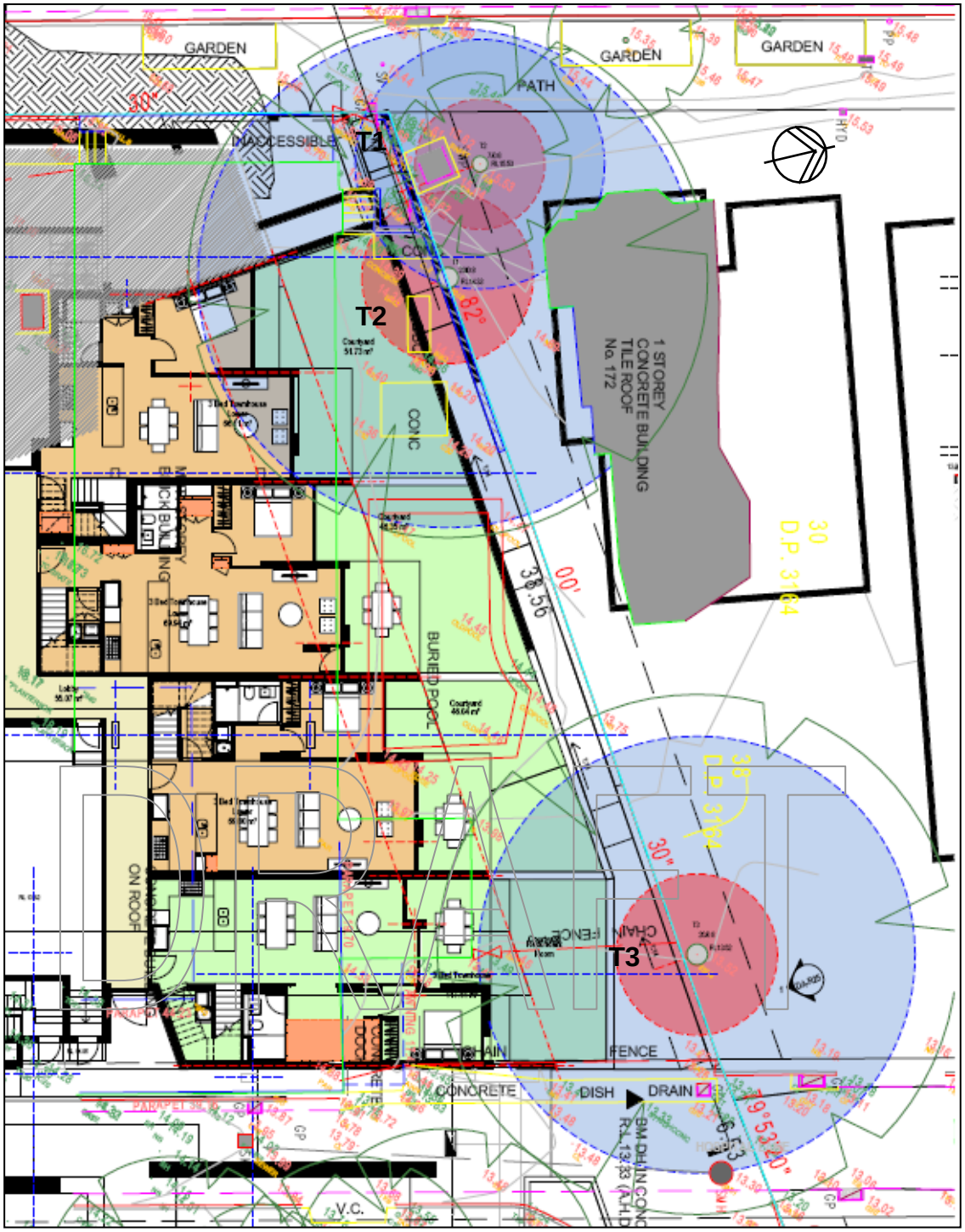

Figure 1
Shows the approximate location of Trees1, 2 and 3 in relation to the proposed development, adjacent to the proposed north walkway. The trees notional SRZ's (red, inner circles), TPZ (blue, outer circles) are shown to illustrate potential impact areas. Not to scale.

3 CONCLUSIONS

- All site trees would be removed for the proposed development.
- Trees 38, 39 40, 41 and 42 (Canary Island Date Palms) are proposed to be transplanted.
- Under the development proposal, Tree 12—Jacaranda and Tree 25, a prominent Camphor Laurel, which has a potential remaining life span up to 40 years, would be removed.

  Retention of these trees would require major design changes to the proposal that would substantially reduce the provision for car parking and community facilities.
- The management of the long term retention of Trees 1 and 3—Camphor Laurels on the adjoining property to the north, is best undertaken through the following:
  - Root mapping to determine the impact on the SRZ of both trees.
  - Close arboricultural supervision of works within the TPZ of the adjoining trees 1—3 is required to minimise any possible damage to the trees occurring during demolition, excavation and construction works.

5 RECOMMENDATIONS

5.1 Tree removal

5.1.1 All site trees are to be removed to facilitate site development.

5.1.2 Trees 38, 39, 40, 41 and 42 (Canary Island Date Palms), are proposed to be transplanted.

5.2 Minimising Impacts on trees to be retained

5.2.1 Trees 1, 2 and 3—Camphor Laurel, Cook Pine, Camphor Laurel

Detailed design of footings for the new equitable access ramp to be carried out in consultation with an AQF5 arboriculturist, and works for same to be supervised by an AQF5 arboriculturist within a 3.5m radius of the trees.

- undertake root mapping works prior to final design, to determine the appropriate locations for walls that do not require cutting of woody roots.
- The project arboriculturist is to specify the location of fencing within the site to protect the root zones of the trees.
- Pruning of Trees 1 and 3 is likely required for building demolition and construction. Removal of live material should be closely supervised by an AQF5 arboriculturist, and preferably not exceed 20% of the trees overall crown area. Refer to s.5.4.4 for more information.
- An Australian Qualification Framework Level 5 ("AQF5") arboriculturist is to supervise excavation works within 5m of Trees 1 and 3.

5.2.5 Trees 38, 39, 40, 41 and 42—Canary Island Date Palms

- If a palm is to be transplanted it will require the services of an experienced transplanting contractor to ensure the palm is relocated successfully.
- Refer to the Palm Transplant Methodology Statement prepared by Urban Forestry Australia, April 2016, for detailed advice.

5.2.7 Demolition and construction access

- Where access is over a TPZ, the ground is to be covered with a geo-textile fabric. Coarse mulch to a depth of 100mm is to be laid over the fabric and maintained at this depth. Rumble boards or similar material is/are to be placed over the wheel or track route. Alternatively, Trakmat® may be used over mulch in the TPZ.

5.3 Tree Protection Zones

5.3.1 The Tree Protection Zone TPZ is to be in accordance with the following:

- Prior to any site works commencing, the project arboriculturist and the principal site contractor must meet on site to discuss appropriate tree protection devices, and the location of fencing, mulch, etc.
- Protection fencing shall be located as close as practicable to the specified TPZ offsets provided in the Schedule of Assessed Trees – Appendix D.

- The most appropriate fencing for TPZ is 1.8m chainlink with 50mm metal pole supports. During installation care must be taken to avoid damage to significant roots. The practicality of providing this fencing on this site must be addressed by the arboriculturist.
- Locate large primary roots by careful removal of soil within the fencing area. ***Do not drive any posts or pickets into tree roots.*** Replace soil back over tree roots.
- Protection devices may include mulching, tree guards and other devices other than fencing.
- TPZ must be in place prior to any site works commencing, including clearing, demolition or grading.
- Any areas of the TPZ outside fenced protection areas must, where practicable, be covered in thick, coarse mulch to a depth of 100mm to reduce soil compaction and soil moisture losses.
- It is recommended that the arboriculturist provide written certification that the TPZ is installed and will satisfy tree protection requirements.
- Nothing should occur inside the TPZ, so therefore all access to personnel and machinery, storage of fuel, chemicals, cement or site sheds is prohibited.
- No washing or rinsing of tools is to be carried out upslope of any trees, or within 8 metres of the trees.
- Signage should explain exclusion from the area defined by TPZ and carry a contact name for access or advice.
- The TPZ cannot be removed, altered, or relocated without the project arborists' prior assessment and approval.

5.4 General

5.4.1 The following general comments apply to trees nominated for retention.

- Service trenches should not pass through a fenced area, although if this cannot be avoided, a qualified arboriculturist should be present to supervise excavation, cut torn roots cleanly or redesign around roots.
- Any roots that must be severed must be cut cleanly with a sharp handsaw. Tearing of roots is not acceptable.
- No stockpiling can take place around the root zone.
- A qualified arboriculturist must be retained to carry out and/or supervise works within the SRZ and TPZ of the trees.
- Providing a regular supply of water to the tree during the period of works is recommended.
- During this period it also recommended that the trees be given fortnightly applications of a rooting hormone, such as Hormone 20® to encourage the development of new roots.
- Removal of mulch is advised after construction to remove any contaminants.
- Regular monitoring of the trees during development works for unforeseen changes or decline will help maintain the trees in a healthy state.

5.4.2 Replacement tree plantings and soft landscaping

- For all new tree purchases request written confirmation from the supplier that received stock has passed an external inspection of below ground parts and conforms to the Tree Supply Guide Specification as described in Ross Clark's *Specifying Trees – A Guide to Assessment of Tree Quality*, 2nd Edition, 2003.

- Container size of proposed plants within the SRZ of trees to be retained should be determined prior to purchase of plants, not at landscape final design stage. This is to verify appropriate planting locations and maximum container sizes to avoid disturbance or damage to woody roots, and establishes appropriate numbers of plants to be used without excessive soil removal at the time of planting. Otherwise, any proposed landscaping within the SRZ must consist of tubestock or plant plugs only.
- Mattocks and similar digging instruments must not be used within the SRZ of the existing trees. Planting holes should be dug carefully by hand with a garden trowel, or similar small tool.
- The level of introduced planting media into any proposed landscaped areas within the TPZ of trees to be retained, including assessed trees off site is not to be greater than 75mm depth, and be of a coarse, sandy material to avoid development of soil layers that may impede water infiltration.

5.4.3 Other treatments, inspections, testing, investigation or of trees

- Any additional investigation of trees e.g. root mapping, *root crown inspections*, soil tests, installation of restraint systems, etc., are to be carried out by appropriately qualified and experienced personnel.

5.4.4 Pruning of trees

- Pruning methods and techniques used are to be in accordance with these written specifications complying with Australian Standard AS 4373 – 2007 *Pruning of Amenity Trees* ("AS4373"). A copy of this document must be available and held on site by the supervisor.
- Contracted tree workers must have a minimum AQF3 in Tree Surgery to carry out any pruning works on this site.
- Pruning work is to be carried out under the direct supervision of a nominated qualified tree worker or the project arboriculturist.
- During all pruning works any defective or diseased tree parts encountered by tree workers are to be reported to the supervising arboriculturist.
- Removal of any deadwood from the trees is recommended prior to project commencement.
- When pruning trees the following are to be complied with:
  - Australian Standard AS4373 – 2007 *Pruning of Amenity Trees*;
  - The NSW Workcover Authority's *Code of Practice for the Amenity Tree Industry*, No. 34, May, 1998.

5.5 Post Construction Tree Care

5.5.1 Tree preservation requires a long-term commitment to monitoring and rectifying problems associated with trees.

- Risk Management – Mature and/or large trees should be inspected by an experienced and competent arboriculturist at least once each year, or as recommended after testing of trees has occurred. Particular attention must be given to monitoring of existing defects. The trees must be inspected after any major storm event e.g. gale force winds, excessive or prolonged rain periods, or damaging electrical storms. The site inspection date and all relevant observations, data, recommendations, etc., are to be recorded and forwarded to Council.

- Mulching – removal of mulch after construction to remove any contaminants. Replacement with a good quality mulch and addition of 10% organic matter will improve beneficial soil micro-organisms, retain moisture and improve aeration and water infiltration.
- Irrigation – An arboriculturist should determine whether irrigation should be carried out during extended periods of drought.
- Pest management – Monitoring is required as trees under stress are more prone to insect attack.

Report prepared April 2016, by:

Catriona Mackenzie
Consulting arboriculturist, horticulturist and landscape designer.
Tree Risk Assessment Qualified 2014 (TRAQ)
Certificate of Horticulture *Honours*
Diploma of Horticulture (Arboriculture) *Distinction*
Associate Diploma of Applied Science (Landscape) *Distinction*
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APPENDIX A

TERMS AND DEFINITIONS

TERMS AND DEFINITIONS

The following relates to terms or abbreviations that have been used in this report and provides the reader with a detailed explanation of those terms.

Aerial inspection Where the subject tree is climbed by a professional tree worker or arborist specifically to inspect and assess the upper stem and crown of the tree for signs or symptoms of defects, disease, etc.

Age classes

Y	*Young* refers to a well-established but juvenile tree
SM	*Semi-mature* refers to a tree at growth stages between immaturity and full size
M	*Mature* refers to a full sized tree with some capacity for further growth
LM	*Late Mature* refers to a full sized tree with little capacity for growth that is not yet about to enter decline
OM	*Over-mature* refers to a tree about to enter decline or already declining
LS	*Live Stag* refers to a tree in a significant state of decline. This is the last life stage of a tree prior to death

Branch failure The structural collapse of a branch that is physically weakened by wounding or from the actions of pests diseases, or overcome by loading forces in excess of its load-bearing capacity.

Co-dominant refers to stems or branches equal in size and relative importance.

Compression fork A fork formed where two stems or branches with an acute branch crotch grow pressing against each other with included bark. Eventually the bark becomes enclosed bark where the stems flatten at their interface under increasing compression from each successive growth increment, forming a weak graft as a welded fork, which remains susceptible to tensile stress.

Condition refers to the tree's form and growth habit, as modified by its environment
aspect, suppression by other trees, soils and the state of the scaffold i.e. trunk and major branches, including structural defects such as cavities, crooked trunks or weak trunk/branch junctions. These are not directly connected with health and it is possible for a tree to be healthy but in poor condition.

Crown All the parts of a tree arising above the trunk where it terminates by its division forming branches, e.g. the branches, leaves, flowers and fruit: or the total amount of foliage supported by branches.

Dead wood refers to any whole limb that no longer contains living tissues e.g. live leaves and/or bark. Some dead wood is common in a number of tree species.

Decay Process of degradation of woody tissues by fungi or bacteria through decomposition of cellulose and lignin. There are numerous types of decay that affect different types of tissues, spread at different rates and have different affect on both the tree's health and structural integrity.

Defect Any structural weakness or deformity.

Diameter at Breast Height DBH refers to the tree trunk diameter at breast height
1.4 metres above ground level

Dieback Death of growth tips/shoots and partial limbs, generally from tip to base. Dieback is often an indicator of stress and tree health.

Epicormic Shoots which arise from adventitious or latent buds. These shoots often have a weak point of attachment. They are often a response to stress in the tree.
Epicormic growth/shoots are generally a survival mechanism, often indicating the presence of a current, or past stress event such as fire, pruning, drought, etc.

Excurrent Tree where the trunk is erect, straight and continuous, tapering gradually, with the main axis clear from base to apex, e.g. *Araucaria heterophylla* Norfolk Island Pine.

Inclusion - the pattern of development at branch or stem junctions where bark is turned inward rather than pushed out. This fault is located at the point where the stems/branches meet. This is normally a genetic fault and potentially a weak point of attachment as the bark obstructs healthy tissue from joining together to strengthen the joint.

Lopping Cutting between branch unions not to branch collars, or at internodes on a tree, with the final cut leaving a stub. Lopping may result in dieback of the stub and can create infection courts for disease or pest attack.

Root Mapping The exploratory process of recording the location of roots usually in reference to a datum point where depth, root diameter, root orientation and distance from trunk is structures are measured. It may be invasive disturbs or displaces soil to locate but not damage roots, e.g. hand excavation, or use of air or water knife, or non-invasive does not disturb soil, e.g. ground penetrating radar.

Self corrected Lean which has naturally corrected to a vertical orientation by the development of reaction wood.

Structural Root Zone SRZ refers to the critical area required to maintain stability of the tree. Only thorough investigation into the location of structural roots within this area can identify whether any minor incursions into this protection zone are feasible.

Suppressed In crown class, trees which have been overtopped and whose crown development is restricted from above.

Topping or heading is a pruning practice that results in removal of terminal growth leaving a cut stub end. Topping causes serious damage to the tree.

Tree Protection Zone TPZ, generally the minimum distance from the center of the tree trunk where protective fencing or barriers are to be installed to create an exclusion zone. The **TPZ** surrounding a tree aids the tree's ability to cope with disturbances associated with construction works. Tree protection involves minimising root damage that is caused by activities such as construction. Tree protection also reduces the chance of a tree's decline in health or death and the possibly damage to structural stability of the tree from root damage.
To limit damage to the tree, protection within a specified distance of the tree's trunk must be maintained throughout the proposed development works. No excavation, stockpiling of building materials or the use of machinery is permitted within the TPZ.

USEFUL LIFE EXPECTANCY (ULE)
In a planning context, the time a tree can expect to be usefully retained is the most important long-term consideration. ULE i.e. a system designed to classify trees into a number of categories so that information regarding tree retention can be concisely communicated in a non-technical manner.
ULE categories are easily verifiable by experienced personnel without great disparity.
A tree's ULE category is the life expectancy of the tree modified first by its age, health, condition, safety and location to give safe life expectancy; then by economics i.e. cost of maintenance - retaining trees at an excessive management cost is not normally acceptable; and finally, effects on better trees, and sustained amenity i.e. establishing a range of age classes in a local population.
ULE assessments are not static but may be modified as dictated by changes in tree health and environment. Trees with a short ULE may at present be making a contribution to the landscape,
but their value to the local amenity will decrease rapidly towards the end of this period, prior to them being removed for safety or aesthetic reasons.
For details of ULE categories see Appendix B, modified from Barrell 2001.

Vigour refers to the tree's health as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion, and the degree of dieback.

Visual Tree Assessment (VTA) a procedure of defect analysis developed by Mattheck and Breloer (1994), that uses the growth response and form of trees to detect defects.

Woody roots usually used in reference to the first order roots i.e. structural anchor roots and woody lateral roots within the Structural Root Zone.

APPENDIX B

ULE CATEGORIES

Useful Life Expectancy ULE CATEGORIES after Barrell 1996, updated 01/04/01

The five categories and their sub-groups are as follows:

1. Long ULE - tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance:

A. structurally sound trees located in positions that can accommodate future growth
B. trees which could be made suitable for long term retention by remedial care
C. trees of special significance which would warrant extraordinary efforts to secure their long term retention

2. Medium ULE - tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance:

A. trees which may only live from 15 to 40 years
B. trees which may live for more than 40 years but would be removed for safety or nuisance reasons
C. trees which may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
D. trees which could be made suitable for retention in the medium term by remedial care

3. Short ULE - tree appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance:

A. trees which may only live from 5 to 15 years
B. trees which may live for more than 15 years but would be removed for safety or nuisance reasons
C. trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
D. trees which require substantial remediation and are only suitable for retention in the short term

4. Removal - trees which should be removed within the next 5 years

A. dead, dying, suppressed or declining trees
B. dangerous trees through instability or recent loss of adjacent trees
C. dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
D. damaged trees that are clearly not safe to retain.
E. trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.
F. trees which are damaging or may cause damage to existing structures within the next 5 years.
G. trees that will become dangerous after removal of other trees for the reasons given in a to f.
H. trees in categories a to g that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

5. Small, young or regularly pruned - Trees that can be reliably moved or replaced.

A. small trees less than 5m in height.
B. young trees less than 15 years old but over 5m in height.
C. formal hedges and trees intended for regular pruning to artificially control growth.

APPENDIX C

SIGNIFICANCE OF A TREE ASSESSMENT RATING

IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. An example of its use in an Arboricultural report is shown as Appendix A.

Tree Significance - Assessment Criteria

1. High Significance in landscape

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

2. Medium Significance in landscape

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

3. Low Significance in landscape

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

Environmental Pest / Noxious Weed Species

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

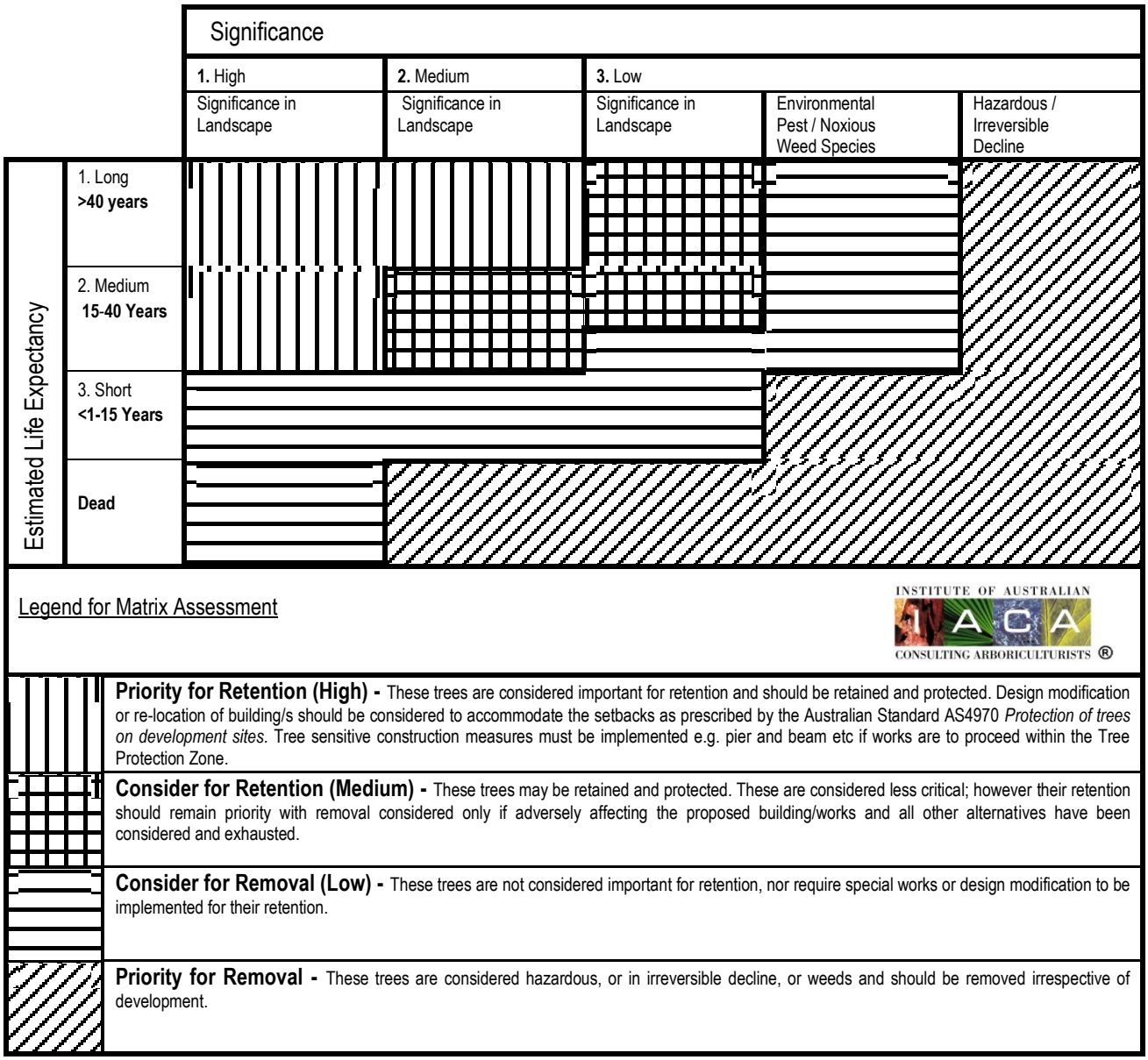
Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

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

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

Table 1 - Tree Retention Value - Priority Matrix.



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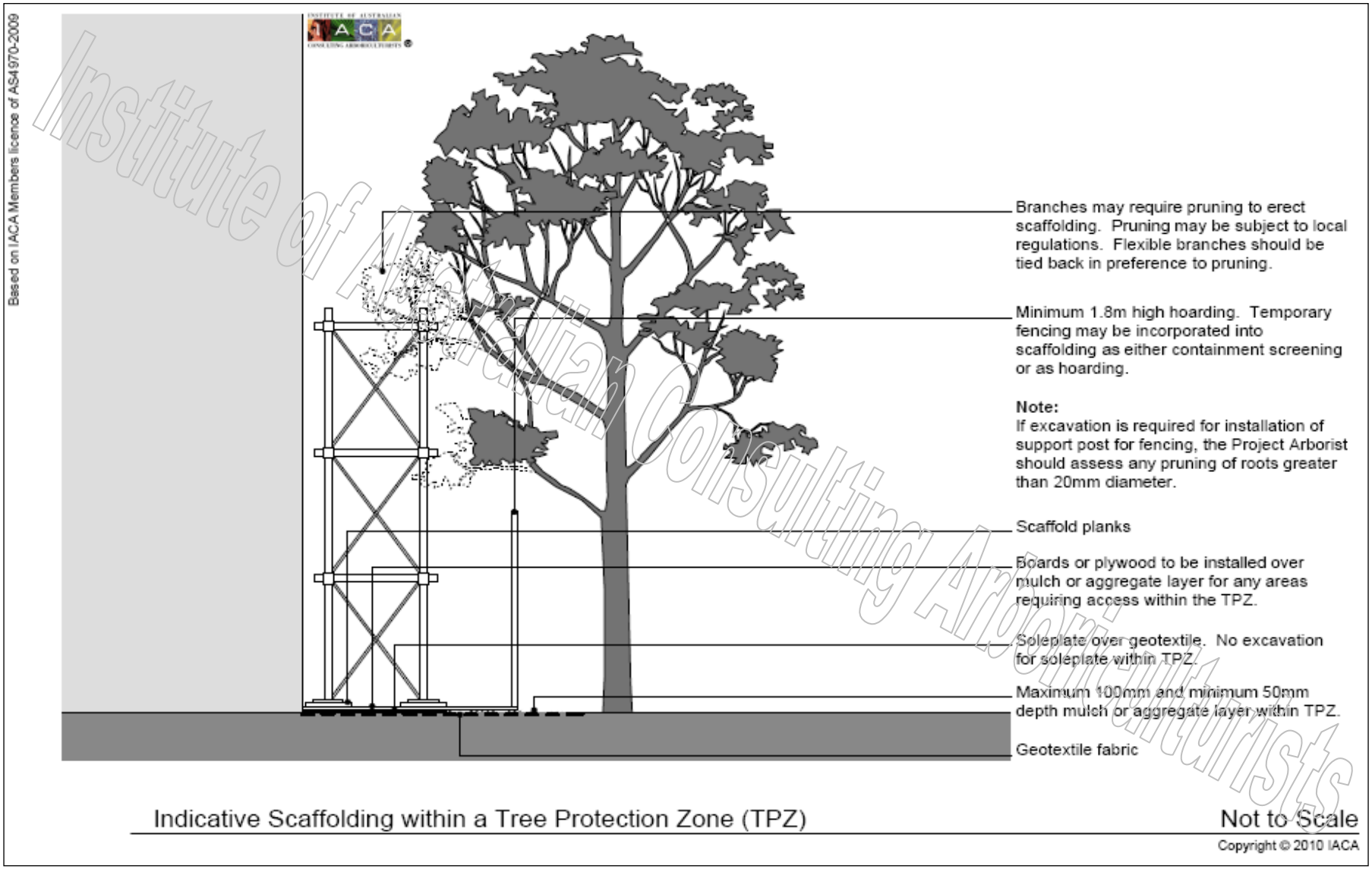
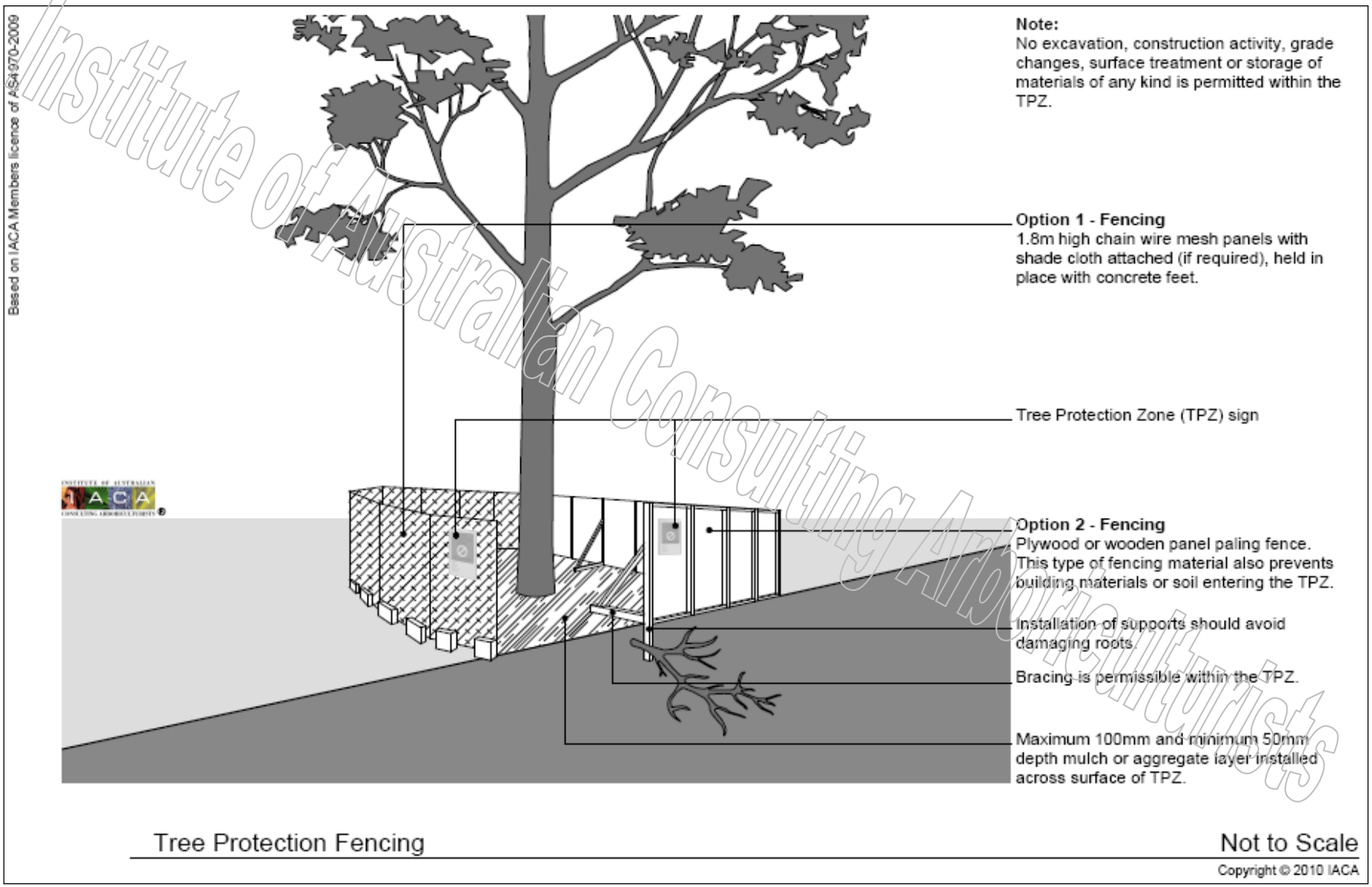
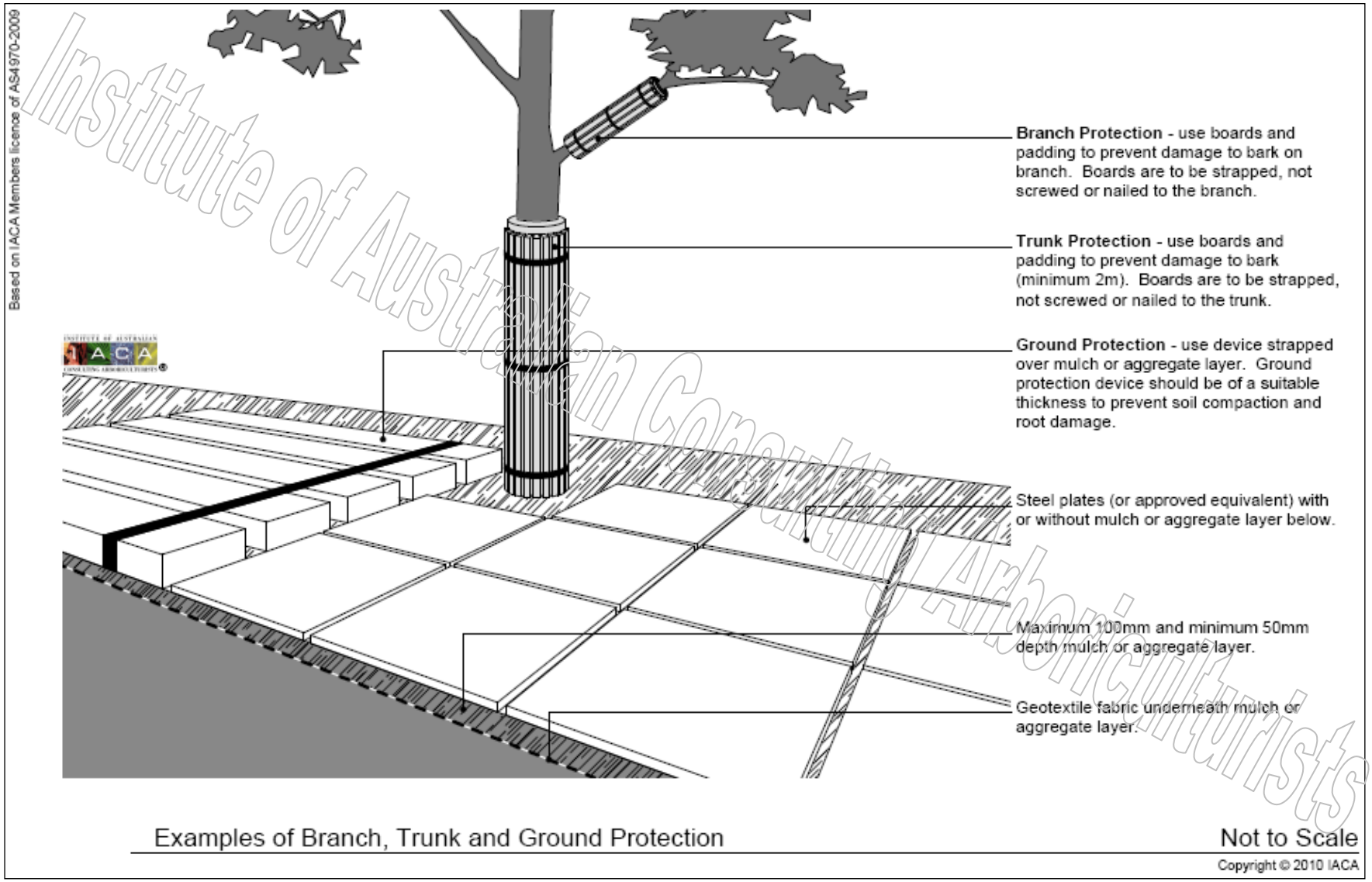
APPENDIX D

TREE PROTECTION DEVICES







Based on IACA Members licence of AS4970-2009

Example of Tree Protection Zone (TPZ) Signage

Scale 1:5 @ A4

APPENDIX E

SCHEDULE OF ASSESSED TREES

SCHEDULE OF ASSESSED TREES

313 – 319 MARRICKVILLE ROAD, MARRICKVILLE, NSW. APRIL, 2012, AMENDED APRIL 2016.

Tree No.	Botanic & Common Name	Ht m	Sp m	DBH mm	Age	V	C	Observations and Comments	ULE	LSR	RV	SRZ (m^r)	TPZ (m^r)	TPZ (m^2)
1	***Cinnamomum camphora*** Camphor Laurel	18	15	*800	M	F	F?	In adjoining property – inspection limited. **Mature** specimen with a single trunk, multi-trunked at 2m. Broad rounded **crown** with ascending branching habit. Balanced canopy & branch development. **Suppressed** on W side due to crowding. Crown extends into site. Previously **lopped** to clear powerlines. Declining on NE side with large Ø **deadwood**. TO BE RETAINED	?	M	L ?	3.3	9.6	290
2	***Araucaria columnaris*** Cook Pine	14	5	*400	M	G	F – G?	In adjoining property – inspection limited. Mature specimen with a single trunk exhibiting a prominent **lean** to the NW. Narrow, columnar crown with horizontal **excurrent** branching habit. Balanced canopy & branch development. TO BE RETAINED	?	M	M ?	2.5	4.8	72
3	***Cinnamomum camphora*** Camphor Laurel	14	14	*700	M	G	G?	In adjoining property – inspection limited. Mature specimen with a single trunk. Broad, rounded crown with ascending branching habit. Balanced canopy & branch development. Crown extends into site about 3 – 4m @ 2 – 3m AGL. TO BE RETAINED	?	M	L ?	3.1	8.4	222
4	***Liquidambar styraciflua*** Liquidambar	17	12	*550	M	G	F	Inspection limited – area fenced off. Asymmetrical crown. Suppressed on N and E side due to building & crowding. Crown lifted to 2m.	2?	H	M	2.8	6.6	137
4a	***Ailanthus altissima*** Tree of Heaven	10	5	325	SM	G	G?	**Semi-mature** specimen with a single trunk, twin-trunked at 2.5m exhibiting a slight lean to the S. Elliptical crown with ascending branching habit. Suppressed on S side due to crowding. Selectively pruned to clear powerlines. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	2?	L	L	2.2	4	49
4b	***Ailanthus altissima*** Tree of Heaven	9	5	200 x 2	SM	G	G?	Semi-mature specimen with a twin trunk. Elliptical crown with ascending branching habit. Balanced canopy & branch development. Suppressed on N side due to crowding. Trunk has grown into wire of fence. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	2?	L	L	2.2	3.6	41
5	***Liquidambar styraciflua*** Liquidambar	17	12	*450	M	G	F – G?	Inspection limited – area fenced off. Mature specimen with a single trunk exhibiting a slight lean to the S. Asymmetrical crown weighted to S. Suppressed on W and N sides due to crowding/building shade. Some large sections of deadwood.	2?	H	M	2.5	5.4	92
6	***Liquidambar styraciflua*** Liquidambar	18	14	*650	M	G	F – G?	Inspection limited – area fenced off. Mature specimen with a single trunk exhibiting a slight lean to the S. Asymmetrical canopy & branch development. Suppressed on N side due to building. Some large sections of deadwood.	2?	H	M	2.9	7.8	191
7	***Michelia figo*** Port-wine Magnolia	4	4.5	300 AB	SM	G	G	Semi-mature specimen with a multiple trunk. Balanced canopy & branch development. Previously lopped at 1m.	2A	L	L	2	3.4	35
8	***Schefflera actinophylla*** Umbrella Tree	7	5	100 x 8	M	G	F?	Inspection limited – area fenced off. Mature specimen with a multiple trunk. Vase-shaped crown with ascending branching habit. Balanced canopy & branch development. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	3?	L	L	2.9	7.2	163

Tree No.	Botanic & Common Name	Ht m	Sp m	DBH mm	Age	V	C	Observations and Comments	ULE	LSR	RV	SRZ (m^r)	TPZ (m^r)	TPZ (m^2)
9	***Lagunaria patersonia*** Norfolk Island Hibiscus	10	7	*550	M	G	F	Mature specimen with a single trunk, multi-trunked at 3m. Broad conical crown with ascending branching habit. Balanced canopy & branch development. Previously lopped at 3m. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	2D	M	L	2.8	6.6	137
10	***Nerium oleander*** Oleander	6	5	100 x 6	M	G	F	Mature specimen with a multiple trunk. Vase-shaped crown with ascending branching habit Balanced canopy & branch development. Crown lifted to 2m. Nuisance species.	2B	L	L	2.5	5.4	92
11	***Lagerstroemia indica*** Crepe Myrtle	6	5	100+ 120	SM	G	G	Semi-mature specimen with a twin trunk exhibiting a slight lean to the S. Vase-shaped crown with ascending branching habit. Balanced canopy & branch development. Lower limbs selectively pruned. Competing with T12 for crown space.	3A	L	L	1.7	2.2	15
12	***Jacaranda mimosifolia*** Jacaranda	12	14	550 AB	M	G	G	Mature specimen with a twin trunk. Rounded crown with ascending branching habit. Balanced canopy & branch development. The tree has similar dimensions to those recorded in 2012, although it has extended its lateral north/south spread by at least 2m. The tree is currently approximately 12m high and 16m spread. The tree is routinely lopped back by Ausgrid on its west side to clear power lines. Marrickville Council does not have a Significant Tree Register; there are no Council records that identify this specimen as having special significance. The species has no special significance in the current setting, and is a very common species in gardens of all periods.	1A	M	H	2.5	6	113
13	***Schefflera actinophylla*** Umbrella Tree	8	6	*200	SM	G	G	Semi-mature specimen with a single trunk. Rounded crown with ascending branching habit. Balanced canopy & branch development. Suppressed on N side due crowding. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	2B	L	L	1.8	2.4	18
14	***Grevillea robusta*** Silky Oak	15	6	*325	SM	G	G	Semi-mature specimen with a single trunk. Conical crown with horizontal excurrent branching habit. Balanced canopy & branch development. I noted the stem near the base of the tree (northwest side), appears to have been damaged and the wood tissue is rolling inwards (Plate 1). This is often referred to as a 'rams horn' effect. This is recognised as a defect. The wood tissue rolls inward and does not cohese with the inner tissues and a crack may form. Often this type of defect is accompanied by decay behind the inrolling sides. At this time, the defect does not appear to be serious, although if the tree is retained it will require routine inspections to monitor the progression of the problem and its influence on tree condition. This tree is not identified as a significant specimen in any documentation, or Council records. The species is commonly used in many urban and rural garden settings.	2A	M	M	2.2	4	49
15	***Eucalyptus nicholii*** Small-leaved Peppermint	10	12	*500	SM	F	P	Semi-mature specimen with a single trunk exhibiting a prominent lean to the W. Irregular rounded crown with ascending branching habit. **Dieback** and partial crown decline to W. Suppressed on E side due to past crowding. Selectively pruned to clear powerlines. I identified a clear and large crack arising at the junction of the secondary stems with the main trunk, at about 2m above ground level. The crack extends through to the other side of the tree and is also clearly extending at least 500–600mm down the north side of the trunk. The crack extends back into the trunk and there are no indications the wood tissues have bonded. In effect, the tree limb to the east is already failing and will just reach a point where its weight will cause it to separate and fall. At present, there is a low risk that someone might be injured	3B	M	L	2.7	6	113

								when the limb attachment fails and crashes down to the east, where the majority of crown weight is focused. However, if the tree is retained, the risk of property damage or personal injury will increase.						
16	***Jacaranda mimosifolia*** Jacaranda	10	16	375 x 2	M	G	G	Mature specimen with a twin trunk exhibiting a slight lean to the N. Broad spreading crown with ascending branching habit. Balanced canopy & branch development. Suppressed on S side due crowding. Low branching to W @ 1.3m AGL.	2A	M	M	2.9	7	152
17	***Allocasuarina torulosa*** Forest Oak	7.5	3	175	SM	G	F	Semi-mature specimen with a single trunk. Elliptical crown with ascending branching habit. Highly suppressed.	3D	L	L	1.7	2.2	15
18	***Allocasuarina torulosa*** Forest Oak	6	6	225	M	F	F	Mature specimen with a single trunk, multi-trunked at 2 m. Broad elliptical crown with ascending branching habit. Balanced canopy & branch development. Suppressed on SE side due to crowding. Heavily pruned to W.	3D	L	L	1.9	2.8	24
19	***Allocasuarina torulosa*** Forest Oak	5	2	125	SM	P	F	Semi-mature specimen with a single trunk exhibiting a slight lean to the W. Elliptical crown with ascending branching habit. Suppressed on E side due crowding. Crown lifted to 2m. Declining.	3D	L	L	1.6	2	8
20	***Casuarina glauca*** Swamp Oak	14	10	500	M	G	F	Mature specimen with a single trunk exhibiting a slight lean to the SW Broad elliptical crown with ascending branching habit. Crown bias to W. Suppressed on E side due to crowding. **Co-dominant** stems with distinct **compression fork** @ 3.5m.	2D	M	M	2.7	6	113
21	***Allocasuarina torulosa*** Forest Oak	8	4	150	SM	P	F	Semi-mature specimen with a single trunk Elliptical crown with ascending branching habit. Most of the canopy & branch development distributed to the S due to crowding. Lots of deadwood – crown decline and **epicormic** shoots along stems.	4A	L	L	1.6	2	10
22	***Casuarina glauca*** Swamp Oak	12	9	500	M	G	G	Mature specimen with a single trunk exhibiting a slight lean to the S Broad elliptical crown with ascending branching habit. Balanced canopy & branch development. Suppressed on N side due crowding.	2A	M	M	2.7	6	113
23	***Allocasuarina torulosa*** Forest Oak	16	9	300	M	F	F	Mature specimen with a single trunk, twin trunked at 2 m. Elliptical crown with ascending branching habit. Balanced canopy & branch development. Suppressed on N & S side due crowding – lots of small deadwood in lower crown area.	3D	M	L	2.2	3.6	41
24	***Allocasuarina torulosa*** Forest Oak	14	8	400	M	F	F	Mature specimen with a single trunk Broad elliptical crown with ascending branching habit. Balanced canopy & branch development.	2A	M	M	2.5	4.8	72
25	***Cinnamomum camphora*** Camphor Laurel	12	20 - 24	1600 AB	M	G	G	Mature specimen with a multiple trunk. Broad rounded crown with ascending branching habit. Balanced canopy & branch development. Previously cut to ground level. Weed species.	2A	H	H	3.9	15	707
26	***Allocasuarina torulosa*** Forest Oak	15	8	350	M	F	F	Mature specimen with a single trunk. Elliptical crown with ascending branching habit. Balanced canopy & branch development. Crown lifted N & S sides.	3A	M	L	2.3	4.2	55
27	***Allocasuarina torulosa*** Forest Oak	14	14	300 + 200	M	G	F – G	Mature specimen with a single trunk, twin ***included*** trunks at 1m. Irregular rounded crown with ascending branching habit. Balanced canopy & branch development. Suppressed on S side due crowding.	3D	M	L	2.4	4.6	65

Tree No.	Botanic & Common Name	Ht m	Sp m	DBH mm	Age	V	C	Observations and Comments	ULE	LSR	RV	SRZ (m^r)	TPZ (m^r)	TPZ (m^2)
~~28~~	No tree allocated to this number													
29	***Pittosporum undulatum*** Native Daphne	7	8	450 AB	M	G	P	Mature specimen with a twin trunk exhibiting a prominent lean to the NE. Rounded crown with ascending branching habit. Balanced canopy & branch development. Suppressed on E side due crowding.	4A	L	L	2.5	4.8	72
30	***Pittosporum undulatum*** Native Daphne	6	6	175 x 3	M	F	F	Mature specimen with a twin trunk exhibiting a slight lean to the NE. Irregular rounded crown with ascending branching habit. Balanced canopy & branch development. Suppressed on SW side due crowding.	3A	L	L	2.5	4.8	72
31	***Bauhinia variegata*** Orchid Tree	8	6	200 x 2	M	F	G	Mature specimen with a single trunk, twin trunked at 1.2m. Elevated rounded crown with ascending branching habit. Suppressed to W, pruned to E.	3A	L	L	2.2	3.6	41
32	***Cotoneaster sp.*** Cotoneaster	6	6	50 x 20	M	F	G	Mature specimen with a multiple trunk Irregular vase-shaped crown with ascending branching habit. Balanced canopy & branch development. Crown lifted to 1m. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	3A	L	L			
33	***Allocasuarina torulosa*** Forest Oak	12	8	300	M	G	G	Mature specimen with a single trunk. Elevated irregular rounded crown with ascending branching habit. Balanced canopy & branch development. Crown lifted to 3m	2A	M	M	2.2	3.6	41
34	***Casuarina glauca*** Swamp Oak	15	7	400	M	G	G	Mature specimen with a single trunk, twin trunked at 2m. Broad elliptical crown with ascending branching habit. Balanced canopy & branch development.	2A	M	M	2.5	4.8	72
35	***Allocasuarina torulosa*** Forest Oak	6	4	300 AB	SM	F	F	Semi-mature specimen with a single trunk. Elliptical crown with ascending branching habit. Balanced canopy & branch development. Suppressed on S side due overshadowing – some decline. Crown lifted to 3m.	3D	L	L	2	3.4	35
36	***Allocasuarina torulosa*** Forest Oak	8	6	225	SM	F	F	Semi-mature specimen with a single trunk exhibiting a slight lean to the NE. Irregular rounded crown with ascending branching habit. Suppressed on S side due to crowding. Grass trimmer damage to base of stem.	3A	L	L	1.9	2.8	24
37	***Casuarina glauca*** Swamp Oak	15	6	450	M	P	P	Mature specimen with a single trunk exhibiting a slight lean to the N. Broad elliptical crown with ascending branching habit. Significant crown decline and dieback. Deadwood >200mmØ.	4A	M	L	2.5	5.4	92
38	***Phoenix canariensis*** Canary Island Palm	13	6	700	M	G	G	Mature specimens with a single trunk. Elevated rounded crown with ascending branching habit. Balanced canopy & branch development. Crown lifted. Row of palms has high landscape significance moderate landscape significance for individual specimens. TO BE TRANSPLANTED	1A	H	H	1.5	5	78
39	***Phoenix canariensis*** Canary Island Palm	15	8	700	M	G	G	As above. Smaller palm near SW side. TO BE TRANSPLANTED	1A	H	H	1.5	5	78
40	***Phoenix canariensis*** Canary Island Palm	15	8	700	M	G	G	As above. TO BE TRANSPLANTED	1A	H	H	1.5	5	78

Tree No.	Botanic & Common Name	Ht m	Sp m	DBH mm	Age	V	C	Observations and Comments	ULE	LSR	RV	SRZ (m^r)	TPZ (m^r)	TPZ (m^2)
41	***Phoenix canariensis*** Canary Island Palm	12	8	700	M	G	G	As above TO BE TRANSPLANTED	1A	H	H	1.5	5	78
42	***Phoenix canariensis*** Canary Island Palm	15	8	700	M	G	G	As above. TO BE TRANSPLANTED	1A	H	H	1.5	5	78
~~43~~	No tree, presumed removed.													
44	***Cinnamomum camphora*** Camphor Laurel	13	8	450	SM	G	G	Semi-mature specimen with a single trunk. Elliptical crown with ascending branching habit. Balanced canopy & branch development. Selectively pruned to clear powerlines	2B	M	L	2.5	5.4	92
45	***Araucaria heterophylla*** Norfolk Island Pine	16	6	350	SM	F	G	Semi-mature specimen with a single trunk exhibiting a slight, **self corrected** lean to the E. Elliptical crown with horizontal excurrent branching habit. Balanced canopy & branch development.	3B	L - M	L	2.3	4.2	55
46	***Olea europea* subsp. cuspidata** African Olive	8	6	300	M	G	F	Mature specimen with a single trunk, twin trunked at 1m, exhibiting a prominent lean to the N. Broad elliptical crown with ascending branching habit. Balanced canopy & branch development. Suppressed on S side due crowding. Weed species.	3B	L	L	2.2	3.6	41
47	***Pittosporum undulatum*** Native Daphne	7	7	250	M	G	G	Mature specimen with a single trunk exhibiting a prominent lean to the N. Rounded crown with ascending branching habit. Balanced canopy & branch development. Crown lifted to 2 m	3B	L	L	2.1	3	28
48	***Cupressus glabra*** Arizona Cypress	15	8	*550	M	G	F	Mature specimen with a single trunk exhibiting a slight lean to the NE. Broad elliptical crown with ascending branching habit. Heavily **topped** and lopped W side 2 6 – 8m due to building proximity. Multiple stem/branch inclusions.	3B	M	L	2.8	6.6	137
~~49~~	***Picea pungens* 'Glauca'** Blue Colorado Spruce							Removed since 2012 assessment.						
50	***Allocasuarina littoralis*** Black She-oak	8	9	400	M	P	F	Mature specimen with a single trunk. Vase-shaped crown with ascending branching habit. Balanced canopy & branch development. Suppressed on W side due to building proximity. Declining.	4A	L	L	2.5	4.8	72
~~51~~	***Eucalyptus sp.*** Gum							Removed since 2012 assessment.						
51a	***Morus nigra*** Mulberry	10	10	160 x 2	M	G	F?	Limited inspection – no access. Mature specimen with a multiple trunk. Rounded crown with ascending branching habit.. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	2B	L	L	2.1	3	28
51b	***Morus nigra*** Mulberry	5	5	150	SM	G	F?	Limited inspection – no access. Semi-mature specimen with a single trunk. Rounded crown with ascending branching habit. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	2B	L	L	1.6	2	10

Tree No.	Botanic & Common Name	Ht m	Sp m	DBH mm	Age	V	C	Observations and Comments	ULE	LSR	RV	SRZ (m^r)	TPZ (m^r)	TPZ (m^2)
~~52~~	***Callistemon viminalis*** Weeping Bottlebrush							Removed since 2012 assessment.						
~~53~~	***Callistemon viminalis*** Weeping Bottlebrush							Removed since 2012 assessment.						
~~54~~	***Callistemon viminalis*** Weeping Bottlebrush							Removed since 2012 assessment.						
~~55~~	***Callistemon viminalis*** Weeping Bottlebrush							Removed since 2012 assessment.						
56	***Ligustrum lucidum*** Large-leaved Privet	10	10	150 x 6	M	G	F	No access – limited inspection. Mature specimen with a multiple trunk. Broad rounded crown with ascending branching habit. Balanced canopy & branch development. Weed and/or undesirable species – exempt from protection under s2.20 of DCP 2011.	2D	L	L	2.4	4.6	65
~~57~~	***Cinnamomum camphora*** Camphor Laurel							Not located – presumed removed.						
58	***Grevillea robusta*** Silky Oak	16	10	*250 x 2	SM	G	F	No access – limited inspection. Semi-mature specimen with a twin trunk. Conical crown with horizontal excurrent branching habit. Balanced canopy & branch development. Included co-dominant stems.	2D	M	M	2.4	4.6	65
59	***Tecoma stans*** Golden Bells	8	10	*200 x 2	M	G	F	No access – limited inspection. Mature specimen with a twin trunk exhibiting a prominent lean to the N & E. Broad irregular spreading crown with ascending branching habit. Balanced canopy & branch development. Suppressed on S side due crowding. Crown lifted to 2 m. Environmental weed species.	3B	L	L	2.2	3.6	41
60	***Pittosporum undulatum*** Native Daphne	8	8	*200 + 250	M	G	F	No access – limited inspection. Mature specimen with a twin trunk. Rounded crown with ascending branching habit. Balanced canopy & branch development.	3B	L	L	2.3	4.2	55
~~61~~ - ~~76~~	No tree allocated to these numbers													
77	***Tristaniopsis laurina*** Water Gum	5	3	100	Y	G	G	Immature specimen with a single trunk exhibiting a slight lean to the SW. Elliptical crown with ascending branching habit. Balanced canopy & branch development. Lower limbs selectively pruned. Readily replaced if required.	2A	L	L	1.6	2	7
~~77a~~	***Agonis flexuosa*** WA Willow Myrtle							Not located – presumed removed.						

KEY

Tree on adjoining property where a RV cannot be allocated due to limited inspection.

Tree not present on site, or has been removed

Trees that have a low retention value.

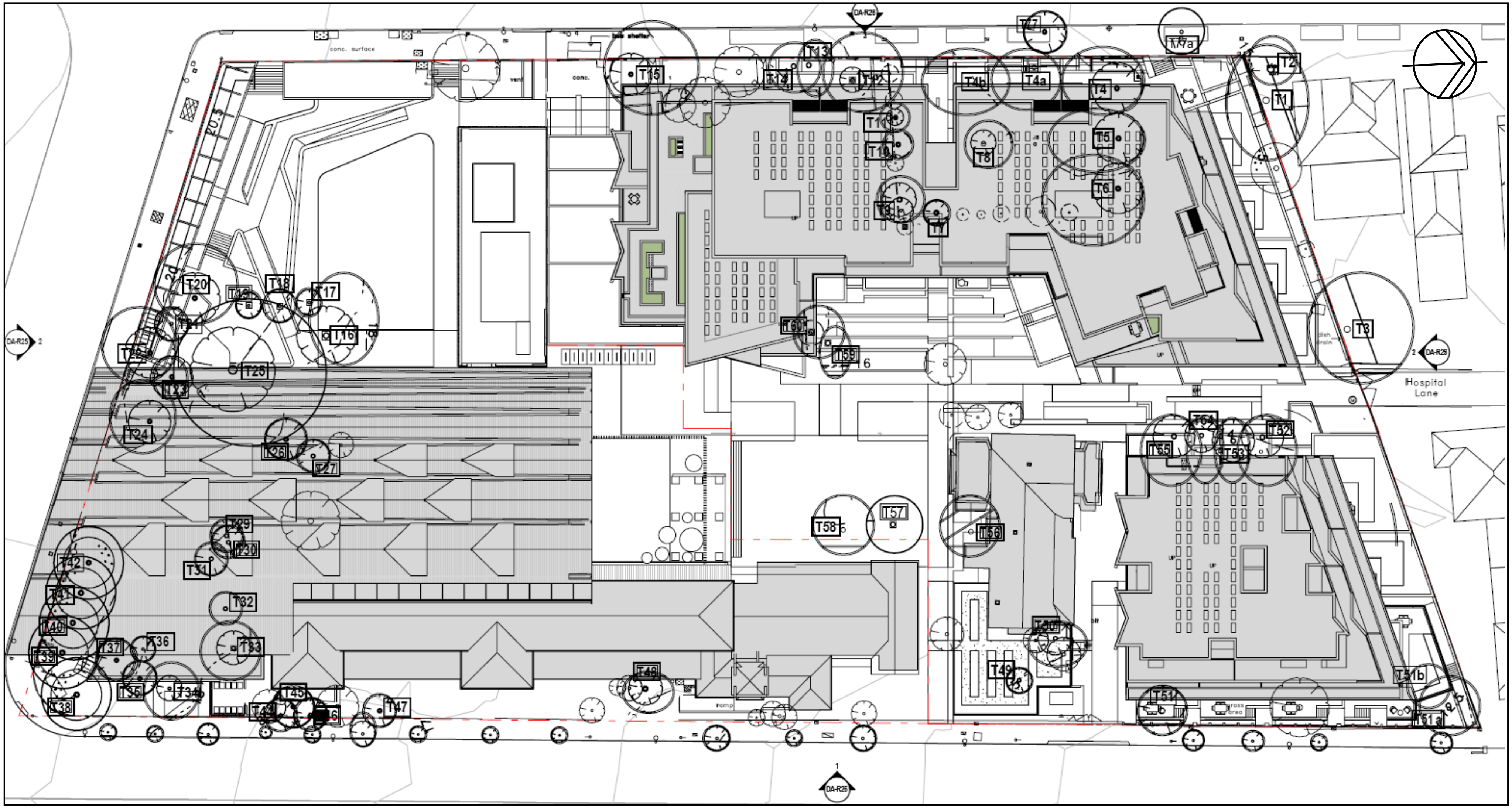
Trees that have a medium retention value.

Trees that have a high retention value.

*DBH stem diameter visually estimated. Tree may be on adjoining property, or stem obscured or difficult to access.
AB – refers to the approximate diameter of a tree stem, measured immediately above the *root buttress*.
AGL – refers the approximate diameter of a tree stem measured at ground level.
Ht refers to the approximate height of a tree in metres, from base of stem to top of tree crown.
Sp refers to the approximate spread in metres of branches/canopy of a tree.
DBH refers to the approximate diameter of tree stem at breast height i.e. 1.4 metres above ground unless otherwise noted, and expressed in millimetres.
Age refer to Appendix A -Terms and Definitions for more detail.
V refers to the tree's vigour health Refer to Appendix A -Terms and Definitions for more detail.
C refers to the tree's structural condition. Refer to Appendix A -Terms and Definitions for more detail. Note: Where further investigation or testing of trees to be retained is required, a Condition rating for those trees cannot be provided until these investigations have taken place.
ULE refers to the estimated Useful Life Expectancy of a tree. Refer to Appendices A and B for more detail.
Note: Where physical access to the tree is limited, or further investigation or testing of trees is recommended, a ULE cannot be accorded to those trees until unobstructed visual access to the tree is obtained and/or recommended investigations have taken place.
LSR refers to the Landscape Significance Rating of a tree, considering the importance of the tree as a result of its prominence in the landscape and its amenity value, from the point of public benefit. Refer to Appendix C -Terms and Definitions for more detail.
RV refers to the retention value of a tree, based on the tree's Useful Life Expectancy ULE *and* Landscape Significance. Refer to Appendix C - for more detail.
***SRZ (m^r)** Structural Root Zone SRZ refers to the critical area required to maintain stability of the tree. Refer to Appendix A -Terms and Definitions for more detail.
***TPZ (m^r)** refers to the *tree protection zones* for trees to be retained. It is based on the combination of the Crown Protection Zone CPZ and the Root Protection Zone RPZ, to ensure appropriate protection of below and above ground tree parts. Refer to Appendix A -Terms and Definitions for more detail.
TPZ (m^2) area in square metres of the tree's TPZ.

APPENDIX F

SITE PLAN & EXISTING TREES


T1
T2
T3
T4
T4a
T4b
T5
T6
T7
T7a
T8
T9
T10
T11
T12
T13
T14
T15
T16
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T42
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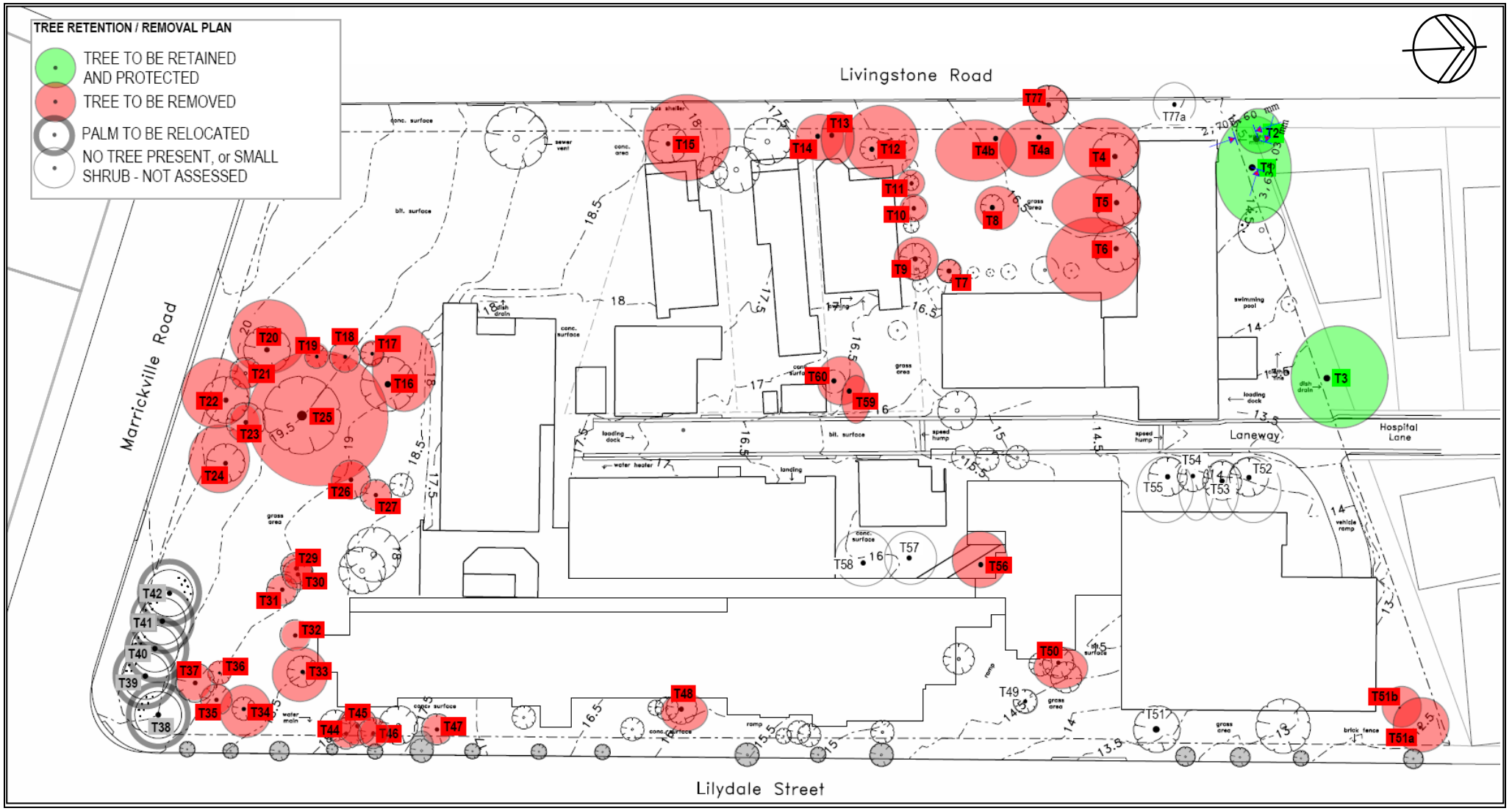
T48
T49
T50
T51
T51a
T51b
T52
T53
T54
T55
T56
T57
T58
T59
T60
Hospital Lane
DA-R25

Not to scale

APPENDIX G

TREE RETENTION AND REMOVAL PLAN


TREE RETENTION / REMOVAL PLAN
TREE TO BE RETAINED AND PROTECTED
TREE TO BE REMOVED
PALM TO BE RELOCATED
NO TREE PRESENT, or SMALL SHRUB - NOT ASSESSED
Livingstone Road
Marrickville Road
Lilydale Street
Laneway
Hospital Lane

Not to scale

TREE MANAGEMENT CONSULTING ARBORICULTURISTS

ARBORICULTURAL IMPACT ASSESSMENT

Proposed underground services in proximity to public trees in Lilydale Street

for

MIRVAC PROJECTS
Level 26, 60 Margaret Street
SYDNEY NSW 2049

SITE ADDRESS
LILYDALE STREET
MARRICKVILLE COMMUNITY HUB DEVELOPMENT
(FORMER MARRICKVILLE HOSPITAL SITE)
MARRICKVILLE NSW

NOVEMBER 2016

Accredited member of
INSTITUTE OF AUSTRALIAN CONSULTING ARBORICULTURISTS ®

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CONTENTS

1 INTRODUCTION

1.1 This Arboricultural Impact Assessment report was commissioned by Mr Gareth Linaker, for Mirvac Projects.

1.2 The subject site is identified as the west side of Lilydale Street, Marrickville ("the site") and adjoins the former Marrickville Hospital site, which is approved to be developed and known as the Marrickville Community Hub.

1.3 The purpose of this report is to identify the potential impacts the proposed undergrounding of new services (e.g. low and high voltage power, kiosk substation installation, and sewer connection) may have on street trees in proximity to the works, and provides recommendations and guidelines for work methodologies to protect those trees and maintain their expected useful life expectancies.

1.4 All data has been verified as far as possible; however, I can neither guarantee nor be responsible for the accuracy of information provided by others.

1.5 This report is not intended to be a comprehensive *hazard* assessment; however, the report may make recommendations, where appropriate, for further assessment, treatment, testing or works to trees where potential structural problems have been identified, or where below ground investigation may be required.

2 METHODOLOGY

2.1 In preparation for this report, Urban Forestry Australia (UFA) carried out *Visual Tree Assessments* of fifteen (15) trees on 21 October, 2016. Details of the assessed trees are included in the Schedule of Assessed Trees (Appendix E).

2.2 No *aerial inspections, root mapping* or woody tissue testing were undertaken as part of this tree assessment.

2.3 The locations of the trees are provided on a marked up copy of the Site & Survey Plan (Appendix G).

2.4 Tree heights and crown spreads were visually estimated. Unless otherwise noted in this report, trunk diameters were measured at 1.4 m above ground level (*DBH*), using a Yamiyo® diameter tape.

2.5 Field observations were written down or recorded on HanDBase4 for iphone. Photographs were taken using a Canon EOS1000D digital SLR camera.

2.6 The Retention Value (RV) of the assessed trees was determined on the basis of their *Useful Life Expectancies* (ULE) and their *Landscape Significance Rating* (LSR) in accordance with the Institute of Australian Consulting Arboriculturist's *Significance of a Tree Assessment Rating* 2010 (Appendix C).

2.7 Information contained in this tree report covers only the trees that were examined and reflects the condition of those trees at the time of inspection. Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible; however, I can neither guarantee nor be responsible for the accuracy of information provided by others.

2.8 Documents referenced in the preparation of this report include:

- Site & Survey Plan, dwg. No.SK0051, dated 11/07/16, Mirvac Design.
- Summary Environmental Report NS174A, dated 23/09/2016, Ausgrid.
- Item 13 of Council Register Document, 14/07/2016 from Sadat Rahman.
- Hoarding Plan, dated 12/09/2016 (A), Mirvac Design.
- Kiosk Substation Plan, Project No.SC08510/1, Sheets1–4 of 4, Submission dated 29/09/2016, by Power Solutions.
- Kiosk Substation Plan, Project No.SC08513/1, Sheets1–5 of 5, Submission dated 29/09/2016, by Power Solutions.
- Draft Sewer Service Plan, Case No. 152589WW, Revision 06, undated, Sydney Water.

3 OBSERVATIONS AND DISCUSSION

3.1 The Trees

3.1.1 The 15 assessed trees are growing in small 'cut-outs' in the concrete public footpath on the west side of Lilydale Street. The trees are located close to the kerbs. There are distances between the base of trees to the adjoining property boundary (i.e. the former Marrickville Hospital), of between 1.5–1.9m (Plate 1).

3.1.2 With the exception of one (1) tree—Tree 6 *Photinia glabra* (Photinia), the assessed trees are all *Callistemon viminalis* (Weeping Bottlebrush) or cultivars thereof. The species is not subject to conservation status under State or Federal biodiversity and environmental protection legislation.

3.1.3 Site inspection revealed the majority of the 15 assessed trees are of good vigour, and can be generally described as being of fair condition due to the ongoing pruning practices for overhead power line clearance, the restricted tree root zones, and stem damage from motor vehicles (Plate 2).

3.1.4 A number of trees have substantial basal shoots /suckers that are causing some issue with visibility. This is particularly important in regard to any children in the street as they would have their view limited by the low clumpy growth and could unwittingly step out into the roadway and risk being hit by a moving vehicle (Plate 2).

3.1.5 The trees generally have short ULE's and, individually, most of the subject street trees are of low retention value. When viewed as a whole, the row of 15 trees, albeit punctuated by some 'gaps' where trees have been removed in the past, can be described as having a moderate landscape significance as it contributes in a positive manner to the overall streetscape (Plate 3).

3.1.6 A number of trees are conflicting with the footpath, causing substantial displacement of pavement sections (Plate 4).

3.1.7 Review of documentation reveals the following:

- At 2.4 (p.6) of the Summary Environmental Report, a specific construction control;
  - *During construction digging with hand tools within the TPZ.*
  - roots larger than 50mm in diameter should not be severed as these maintain the structural integrity of the tree
  - avoid using backhoes or excavators in the top 600mm of the TPZ to prevent root damage
  - trench outside the Structural Root Zone
  - where the requirements cannot be met, an arborist is to carry out a health and stability Assessment of the tree.

- Item 13 of the Council Register Document, specific controls;
  - *Any excavation work within a 5m radius of any tree must be supervised by a project arborist min qualification AQF5, in accordance with AS 4970 'Protection of Trees on Development Sites'.*
  - *Council permission is required to severe* [sic]*, remove or injure any roots in excess of 40mm in diameter.*
  - *All trees are protected by the Marrickville Development Control Plan 2.20. Any damage to council trees will be referred to council's compliance officers, penalties may apply to the contractor.*

- Proposed kiosk substations and underground power services along the west side of Lilydale Street, between the existing subject trees and the adjoining property (former hospital site) boundary.
  - a minimum 800–1000mm wide and 1230mm depth trench for service installation is required.
  - Trenching will pass directly through the *Structural Root Zone* (SRZ) of the trees.

- Proposed stormwater and sewer lines in the road footprint, parallel to the kerb and adjacent to the trees.
- Proposed hoarding of 2.4m high around the entire perimeter of the adjoining property to be developed.

3.2 Potential Impacts on Trees to be Retained

3.2.1 <u>Main tree-related constraints to the proposed works.</u>

- The SRZ is considered a 'no-go' zone for machine excavation.
- The pavement width between the bases of trees to the boundary site fencing is approximately 1.5–1.9m.
- Some trees have large, low branches (i.e. under 2m AGL) over the footpath. Due to past pruning for overhead power lines there is a concentration of tree canopy below 4–5m AGL.

3.2.2 Identified conflicts with trees and proposed works

- Excavations within the SRZ's of the trees can result in inappropriate root cutting, loss of tree stability and loss of tree vigour.
- The pavement width between the bases of trees to the adjoining property construction site fencing is insufficient to accommodate an approximately 2m wide, 5 tonne excavator (as proposed), without substantial risk of mechanical damage to tree stems and root buttresses.
- Several trees have branches as low as 2m above ground and a concentration of canopy below 5m. As the working height of the 5 tonne excavator boom is up to 4m (Figure 1) there is a high risk of mechanical damage to branches, or for unacceptable loss of live canopy via pruning.
- Installation of a proposed 2.4m high hoarding will conflict with overhanging tree crowns (as well as future scaffolding that will require pruning to create future construction access).
- Proposed sewer and/or stormwater services in the road immediately adjacent to trees and within their SRZ's.

WORKING RANGE

	Model			U55-4
A	Max. digging height		mm	5665
B	Max. dumping height		mm	4005
C	Max. digging depth		mm	3630
D	Max. vertical digging depth		mm	2830
E	Max. digging radius at ground		mm	5960
F	Max. digging radius		mm	6105
G	Min. turning radius	W/O swing	mm	2460
		W swing	mm	2020
H	Min. tail turning radius		mm	1045

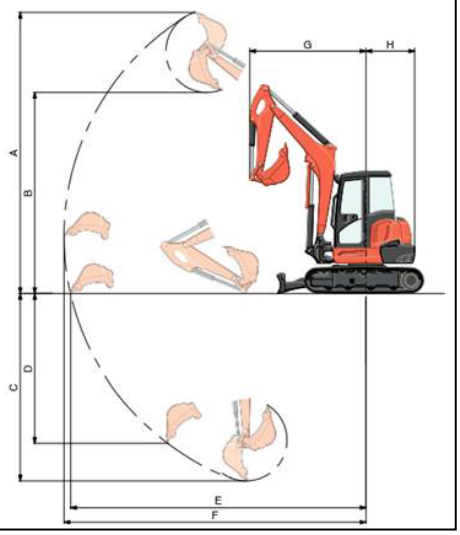


Figure 1
Shows the working range for a typical 5 tonne excavator. The machine width varies, but is generally around 1800–2200mm. Image provided by Mirvac.

3.3 Minimising the Risk of Impacts on Trees to be Retained.

3.3.1 In some circumstances it is possible for some encroachment into a SRZ by machine, however this is only ever possible where:

- initial hand excavation indicates it is safe to do so;
- there is minimal interference with tree crowns (i.e. any pruning is limited to branches <50mm diameters and <10% removal of living material), and
- the work is directly supervised by the project arboriculturist.

It must be noted however, these circumstances do not often occur together, and that hand digging within the SRZ offset is the normally accepted practice.

3.3.2 It is my understanding the laying of power services does not rely on an unwavering gradient as, say, stormwater or sewer would; and slight gradient changes can be accommodated to avoid root cutting, if necessary. This provides some flexibility that assists in avoiding impacts on the trees as there will surely be roots encountered during works.

3.3.3 If the 5 tonne excavator is to be used, it will likely require removal of the adjoining construction site fencing to accommodate its width. Excavators of 3 tonnes or less would be able to fit past trees and the existing chainlink fencing, however the boom height range is still likely to conflict with tree branches. The preferred and recommended option will be that the 5 tonne excavator is not used at all within 4–5m of any trees, or that a considerably smaller excavator is used near the trees, between the 5m TPZ offset and the 2–3m SRZ offset.

3.3.4 The working dimensions of the 5 tonne machine will preclude its use within 4–5m of trees to avoid substantial crown reduction and large diameter branch pruning. A smaller machine with a low boom reach may be able to be used at a closer distance to the trees, i.e. up to the 2–3m SRZ offset or as otherwise approved by Council or the project arboriculturist during the works.

3.3.5 Tree 14 is directly affected by the proposed sewer works. The draft plans indicate pipelines and maintenance shafts located directly over the centre of tree. The tree will not be retained under this proposal. Options to relocate these shafts could be considered. There is a gap of approximately 14–15m between this tree and the next (Tree 13) where it would appear there could be potential to place shafts without requiring the removal of the street trees; however, this may introduce other utility issues of which I am not qualified to comment.

3.3.6 Tree 15 is located very close to the proposed sewer line. Removal of surfaces, kerbs and the like may affect tree stability. Trenching at <100mm from the base of the tree is likely to require cutting of tree roots, cause tree instability and subsequent tree removal.

3.3.6 The sewer plans indicate new sewer and stormwater lines in the roadway within 1–1.5m of the trees. Given the trenching proposed between the trees and the adjoining development site, further root cutting, disturbance and pruning of overhanging crowns would not be appropriate. Underboring of theses services could be considered.

3.3.7 The direct, on-site arboricultural supervision of works and hand digging within 3–5m of the trees will require the excavator use to be limited to those pink shaded areas on the tree plans (Appendix F). This will cause the works to take considerably longer than would normally be usual for works where trees are not affcted.

3.3.8 Given the proposed undergrounding of new services, associated costs, and disruption to the public during works, the removal and replacement of the trees with other, suitable tree species that can be grown to a height not affected by routine, *'top and lop'* pruning, may be a more effective long-term tree management solution. This is keeping in mind that a replacement footpath would hopefully allow more accommodating planting spaces for replacement trees.

3.3.9 From an arboricultural and landscape design perspective, the replacement of the trees could potentially create a streetscape that has a positive and engaging relationship with the future, adjoining Marrickville Community Hub development.

3.3.10 Installation of hoarding would require pruning of trees with overhanging crowns (e.g. Trees 5, 7, 8, 11 and 13). The pruning would be generally light and unlikely to have any impact on tree health, form or structure; hoarding could be constructed around any larger limbs if needed, and subject to advice from the project arboriculturist.

4 CONCLUSIONS

- The Trees 1–15 have relatively short life spans as viable, amenity trees. Past damage (e.g. inappropriate pruning, impacts of vehicles on tree parts), significant restrictions to root growth and the impact of the roots on the public path, combine to reduce the retention value of the trees.
- The proposed undergrounding of new electrical services, and the proposed sewer and stormwater will impact on the public path and road, affecting the trees on two offsets. These utility requirements are major works and will require a very high level of arboricultural supervision to reduce roots and tree canopy lost to those works.
- All site trees are to be retained; however, it is possible the proposed sewer works will impact on Trees 14 and 15 to an extent that they would probably require removal.
- All site trees 1–15 will require hand excavation only within a 3–5m radius to avoid or minimise impacts on the structural root system. The works will be slow, costly in terms of on-site supervision and timing of works, and could cause issues with the public due to prolonged exclusion of use of the entire, or part of, the road and parking spaces.
- Utility services in the road will impact on the trees on a second offset which would likely have issues with tree stability and health.
- The utility infrastructure is critical to the proposed, approved Marrickville Community Hub development.

5 RECOMMENDATIONS

5.1 Tree Removal

5.1.1 Trees 14 and 15 may require removal. This will be established at commencement of works, with tree replacement provided at completion. The replacement species selected should be consistent with those recommended in the Marrickville Street Tree Master Plan 2014, or as directed by Council.

5.2 Minimising Impacts on Trees to be Retained

5.2.1 Trees 14 and 15

- The Australian Qualification Framework Level 5 (AQF5) project arboriculturist is to liaise with the hydraulic engineer in regard to the relocation of stormwater and sewer pits and pipes to avoid removal of these trees. If this cannot be achieved, it must be confirmed in writing by the engineer and arboriculturist.
- Underboring of pipes should be considered an option for sewer installation.
- Trees 14 and 15 are to be removed if their safe retention is compromised by the proposed works. As above, the reasons for removal are to be confirmed in writing.
- The trees will require replacing following works, see s5.1.1 and s5.4.2 for recommendations.

5.2.2 All trees

- The trunks, stems and branches must be protected to a height of 2m above ground level. This may require installation of tree guards (Figure 2), and/or wrapping of tree parts to minimise any contact damage during works.
- All exposed roots are to be protected by placement and securing of suitable materials capable of cushioning and/or preventing direct impacts from foot traffic and the like (e.g. thick rubber, carpet or similar).
- Removal of concrete sections within 3–5m of the trees must be done under supervision of the AQF5 project arboriculturist.
- The project arboriculturist is to supervise the excavation works within 5m of all trees (see Tree Plans—Appendix G for areas where excavators can be used).
- Pruning of trees is to be limited to a maximum 10% live foliage removal and a maximum 50mm diameter branches cut. Refer to s.5.4.4 for more information.
- Proposed sewer/stormwater services in the road and adjacent to the trees should be underbored. A minimum depth of 600mm to top of pipe should be adopted if possible to minimise impacts on a second side of tree root zones.

5.3 Tree Protection Zones

5.3.1 The Tree Protection Zone TPZ is to be in accordance with the following:

- Prior to any site works commencing, the project arboriculturist and the principal site contractor must meet on site to discuss appropriate tree protection devices (TPD), and the locations of the TPD, e.g. tree guards, root protection, mulches, temporary platforms, etc.
- TPD must be in place prior to any site works commencing, including path and road demolition or removal of any other structures within 5m of the trees.
- It is recommended that the project arboriculturist provide written certification that the TPD are installed and will satisfy tree protection requirements.
- Nothing should occur inside the TPZ, so therefore all access to personnel and machinery, storage of fuel, chemicals, cement or site sheds is prohibited.
- No washing or rinsing of tools is to be carried out upslope of any trees, or within 8 metres of the trees.
- Signage should explain exclusion from the area defined by TPZ and carry a contact name for access or advice.
- The TPZ cannot be removed, altered, or relocated without the project arborists' prior assessment and approval.

5.4 General

5.4.2 Replacement tree plantings

- Proposed tree replacement species should be made in consultation with Council's Tree Management Officers and/or be consistent with the species outlined for use in the Street Tree Masterplan 2014.
- For all new tree purchases request written confirmation from the supplier that received stock has passed an external inspection of below ground parts and conforms to the Tree Supply Guide Specification as described in Ross Clark's *Specifying Trees – A Guide to Assessment of Tree Quality*, 2nd Edition, 2003.

5.4.3 Other treatments, inspections, testing, investigation or of trees

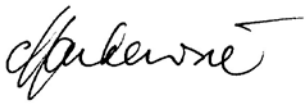
- Any additional investigation of trees e.g. root mapping, *root crown inspections*, soil tests, installation of restraint systems, etc., are to be carried out by appropriately qualified and experienced personnel.

5.4.4 Pruning of trees

- Pruning methods and techniques used are to be in accordance with Australian Standard AS 4373 – 2007 *Pruning of Amenity Trees* ("AS4373"). A copy of this document must be available and held on site by the supervisor.
- Contracted tree workers must have a minimum AQF3 in Tree Surgery to carry out any pruning works on this site.
- Pruning work is to be carried out under the direct supervision of a nominated qualified tree worker or the project arboriculturist.
- During all pruning works any defective or diseased tree parts encountered by tree workers are to be reported to the supervising arboriculturist.
- Removal of any deadwood from the trees is recommended prior to project commencement.

- When pruning trees the following are to be complied with:
  - Australian Standard AS4373 – 2007 *Pruning of Amenity Trees*;
  - The NSW Workcover Authority's *Code of Practice for the Amenity Tree Industry*, No. 34, May, 1998.

Report prepared November 2016, by:



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APPENDIX A

TERMS AND DEFINITIONS

TERMS AND DEFINITIONS

The following relates to terms or abbreviations that have been used in this report and provides the reader with a detailed explanation of those terms.

Aerial inspection Where the subject tree is climbed by a professional tree worker or arborist specifically to inspect and assess the upper stem and crown of the tree for signs or symptoms of defects, disease, etc.

Co-dominant refers to stems or branches equal in size and relative importance.

Condition refers to the tree's form and growth habit, as modified by its environment aspect, suppression by other trees, soils and the state of the scaffold i.e. trunk and major branches, including structural defects such as cavities, crooked trunks or weak trunk/branch junctions. These are not directly connected with health and it is possible for a tree to be healthy but in poor condition.

Crown All the parts of a tree arising above the trunk where it terminates by its division forming branches, e.g. the branches, leaves, flowers and fruit: or the total amount of foliage supported by branches.

Dead wood refers to any whole limb that no longer contains living tissues e.g. live leaves and/or bark. Some dead wood is common in a number of tree species.

Diameter at Breast Height DBH refers to the tree trunk diameter at breast height
1.4 metres above ground level

Dieback Death of growth tips/shoots and partial limbs, generally from tip to base. Dieback is often an indicator of stress and tree health.

Lean Where the tree's trunk grows or moves away from upright. A lean may occur anywhere along the trunk influenced by a number of contributing factors. A leaning tree may maintain a static lean or display an increasing, progressive lean over time. Slight lean = 0°–15°; Moderate lean = 15°–30°; Severe lean = 30°–45°; Critical lean = >45°.

Lopping Cutting between branch unions not to branch collars, or at internodes on a tree, with the final cut leaving a stub. Lopping may result in dieback of the stub and can create infection courts for disease or pest attack.

Mature refers to a full sized tree with some capacity for further growth

Occlusion Wound wood growth that encloses the wound face by the merging of wound margins concealing the wound and restoring the growing surface of the structure by growth increments re-aligning the wood fibres longitudinally along the stem to maximize uniform stress loading.

Root Mapping The exploratory process of recording the location of roots usually in reference to a datum point where depth, root diameter, root orientation and distance from trunk is structures are measured. It may be invasive disturbs or displaces soil to locate but not damage roots, e.g. hand excavation, or use of air or water knife, or non-invasive does not disturb soil, e.g. ground penetrating radar.

Structural Root Zone (SRZ) refers to the critical area required to maintain stability of the tree. Only thorough investigation into the location of structural roots within this area can identify whether any minor incursions into this protection zone are feasible.

Sucker Epicormic shoots growing from latent buds in older wood. Such shoots are vigourous and usually upright, arising from below the graft union on the understock, or at or below ground from the trunk or roots.

Topping or heading is a pruning practice that results in removal of terminal growth leaving a cut stub end. Topping causes serious damage to the tree.

Tree Protection Zone (TPZ) generally the minimum distance from the center of the tree trunk where protective fencing or barriers are to be installed to create an exclusion zone. The TPZ surrounding a tree aids the tree's ability to cope with disturbances associated with construction works. Tree protection involves minimising root damage that is caused by activities such as construction. Tree protection also reduces the chance of a tree's decline in health or death and the possibly damage to structural stability of the tree from root damage.To limit damage to the tree, protection within a specified distance of the tree's trunk must be maintained throughout the proposed development works. No excavation, stockpiling of building materials or the use of machinery is permitted within the TPZ.

USEFUL LIFE EXPECTANCY (ULE)
In a planning context, the time a tree can expect to be usefully retained is the most important long-term consideration. ULE i.e. a system designed to classify trees into a number of categories so that information regarding tree retention can be concisely communicated in a non-technical manner. ULE categories are easily verifiable by experienced personnel without great disparity.
A tree's ULE category is the life expectancy of the tree modified first by its age, health, condition, safety and location to give safe life expectancy; then by economics i.e. cost of maintenance - retaining trees at an excessive management cost is not normally acceptable; and finally, effects on better trees, and sustained amenity i.e. establishing a range of age classes in a local population.
ULE assessments are not static but may be modified as dictated by changes in tree health and environment. Trees with a short ULE may at present be making a contribution to the landscape,
but their value to the local amenity will decrease rapidly towards the end of this period, prior to them being removed for safety or aesthetic reasons. For details of ULE categories see Appendix B, modified from Barrell 2001.

Vigour refers to the tree's health as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion, and the degree of dieback.

Visual Tree Assessment (VTA) a procedure of defect analysis developed by Mattheck and Breloer (1994), that uses the growth response and form of trees to detect defects.

APPENDIX B

ULE CATEGORIES

Useful Life Expectancy ULE CATEGORIES after Barrell 1996, updated 01/04/01

The five categories and their sub-groups are as follows:

1. Long ULE - tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance:

    A. structurally sound trees located in positions that can accommodate future growth
    B. trees which could be made suitable for long term retention by remedial care
    C. trees of special significance which would warrant extraordinary efforts to secure their long term retention

2. Medium ULE - tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance:

    A. trees which may only live from 15 to 40 years
    B. trees which may live for more than 40 years but would be removed for safety or nuisance reasons
    C. trees which may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
    D. trees which could be made suitable for retention in the medium term by remedial care

3. Short ULE - tree appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance:

    A. trees which may only live from 5 to 15 years
    B. trees which may live for more than 15 years but would be removed for safety or nuisance reasons
    C. trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
    D. trees which require substantial remediation and are only suitable for retention in the short term

4. Removal - trees which should be removed within the next 5 years

    A. dead, dying, suppressed or declining trees
    B. dangerous trees through instability or recent loss of adjacent trees
    C. dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
    D. damaged trees that are clearly not safe to retain.
    E. trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.
    F. trees which are damaging or may cause damage to existing structures within the next 5 years.
    G. trees that will become dangerous after removal of other trees for the reasons given in a to f.
    H. trees in categories a to g that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

5. Small, young or regularly pruned - Trees that can be reliably moved or replaced.
    A. small trees less than 5m in height.
    B. young trees less than 15 years old but over 5m in height.
    C. formal hedges and trees intended for regular pruning to artificially control growth.

APPENDIX C

SIGNIFICANCE OF A TREE ASSESSMENT RATING

IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. An example of its use in an Arboricultural report is shown as Appendix A.

Tree Significance - Assessment Criteria

1. High Significance in landscape

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

2. Medium Significance in landscape

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

3. Low Significance in landscape

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

Environmental Pest / Noxious Weed Species

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

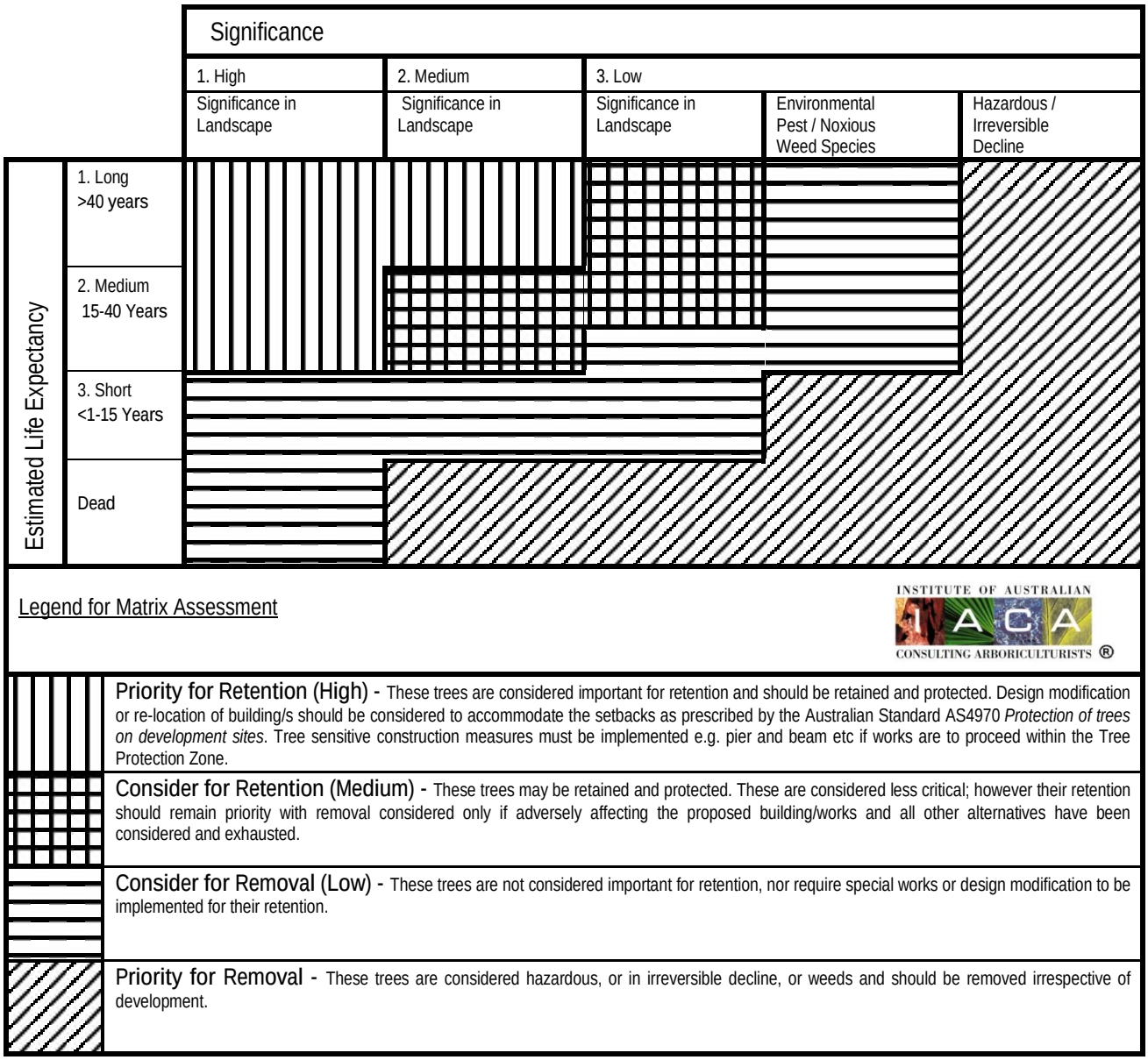
Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

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

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

Table 1 - Tree Retention Value - Priority Matrix.



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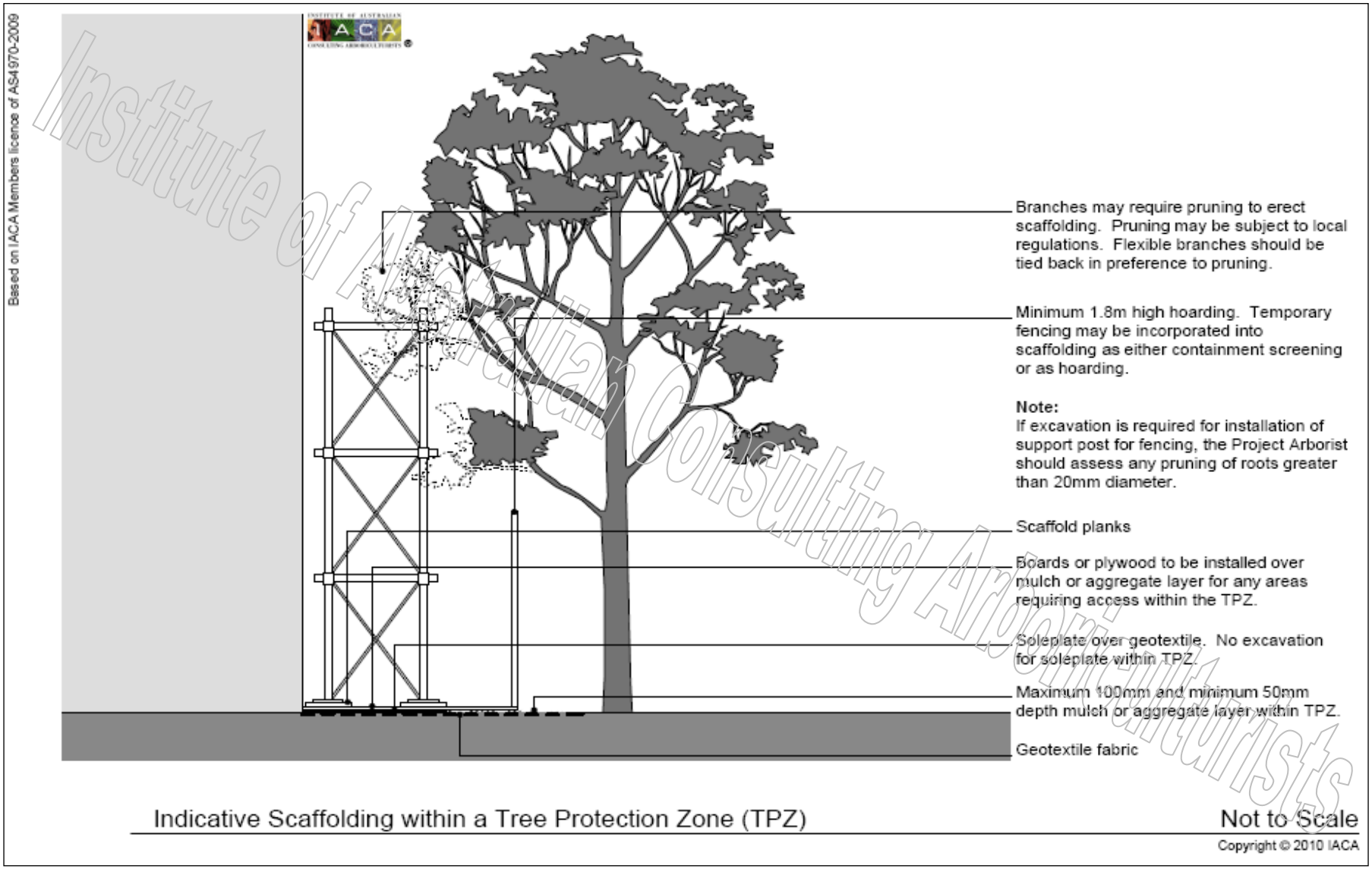
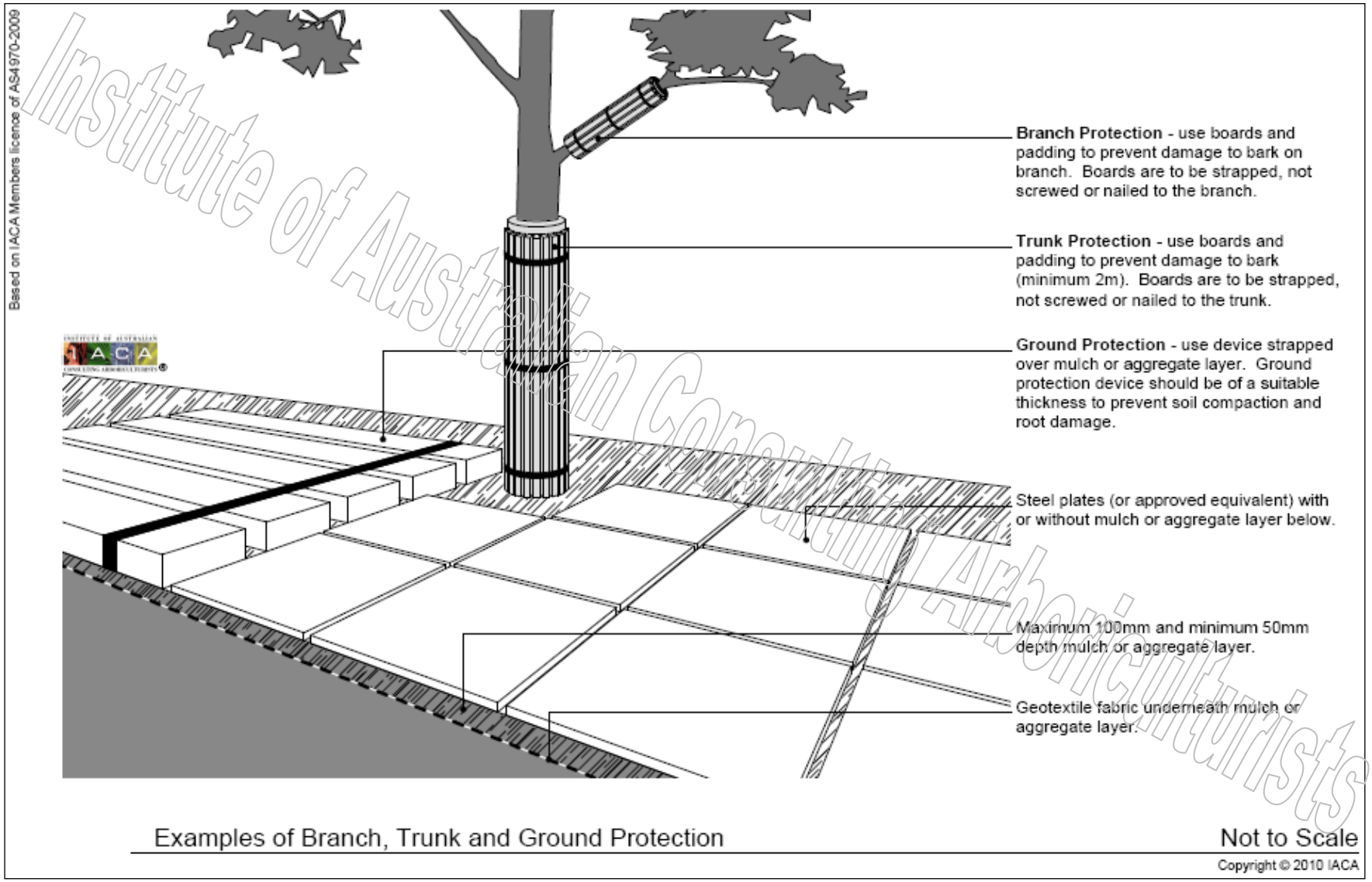
APPENDIX D

TREE PROTECTION DEVICES





APPENDIX E

SCHEDULE OF ASSESSED TREES

SCHEDULE OF ASSESSED TREES
LILYDALE STREET (WEST SIDE), MARRICKVILLE, NSW. OCTOBER, 2016.

Tree No.	Botanic & Common Name	Ht m	Sp m	DBH mm	Age	V	C	Observations and Comments	ULE	LSR	RV	SRZ (m^r)	TPZ (m^r)	TPZ (m^2)
1	*Callistemon viminalis* Weeping Bottlebrush	5.5	4	175	M	G	F	Basal **suckers**. Restricted root zone.	Short 3C	L	L	1.7	2.2	15
2	*Callistemon viminalis* Weeping Bottlebrush	4	4.5	200 GL	M	G	F	**Co-dominant** stems @ 850mm. Basal suckers. Restricted root zone.	Short 3C	L	L	1.7	2.4	18
3	*Callistemon viminalis* Weeping Bottlebrush	5.5	6	250 @1m	M	G	F	Co-dominant stems @ 1.4m and 1.7m. Basal Suckers. Restricted root zone.	Short 3C	M	L	2.1	3.0	28
4	*Callistemon viminalis* Weeping Bottlebrush	8	6	200	M	G	F	Old, partially **occluded** wound to road side—probably vehicle impact tearout. Large, maturing basal suckers. Crown pruned for overhead power lines. Restricted root zone.	Short 3C	M	L	1.8	2.4	18
5	*Callistemon viminalis* Weeping Bottlebrush	6	6.5	225	M	G	F	Noticeable stem **lean** over fence into site by about 4–5m. Stem only 2m AGL over path. Restricted root zone.	Short 3C	M	L	1.9	2.7	23
6	*Photinia glabra* Photinia	4.5	8	*325 GL	M	G	F	Basal shoots. Restricted root zone.	Short 3C	M	L	2.1	3.9	48
7	*Callistemon viminalis* Weeping Bottlebrush	7	6	300	M	G	F	Co-dominant stems @ 1.8m Basal suckers. Restricted root zone. Significant upheaval of path by roots—30mm 'kickpoint'.	Short 3C	M	L	2.2	3.6	41
8	*Callistemon viminalis* Weeping Bottlebrush	8	9	400	M	G	F	Basal shoots. Restricted root zone. Substantial crown **lopping** and **topping** @ 4–5m (i.e. 'gully-cut') for power line clearance. Crown spread to building line in site. Substantial roadside wounding from past vehicle impacts. Substantial path lifting and displacement up to 100mm above path level.	Short 3C	H	M	2.5	4.8	72
9	*Callistemon viminalis* Weeping Bottlebrush	4.5	6	225	M	G	F	Basal suckers. Restricted root zone. Old stem wounds, especially to road side.	Short 3C	M	L	1.9	2.7	23
10	*Callistemon viminalis* Weeping Bottlebrush	5	8	325	M	G	F	Prolific basal shoot growth. Restricted root zone.	Short 3C	M	L	2.2	3.9	48
11	*Callistemon viminalis* Weeping Bottlebrush	5	5	275	M	G	F	Co-dominant stems @ 1.8m. Basal shoots. Restricted root zone.	Short 3C	M	L	2.1	3.3	35
12	*Callistemon viminalis* Weeping Bottlebrush	5	6	2 x 275	M	F	F	Some **dieback** and small branch **deadwood**. Basal suckers. Restricted root zone.	Short 3C	M	L	2.3	4.7	69
13	*Callistemon viminalis* Weeping Bottlebrush	4	4	200	M	G	F	Major limb @ 2m AGL over path. Basal suckers. Restricted root zone.	Short 3C	L	L	1.8	2.4	18

Tree No.	Botanic & Common Name	Ht m	Sp m	DBH mm	Age	V	C	Observations and Comments	ULE	LSR	RV	SRZ (m^r)	TPZ (m^r)	TPZ (m^2)
14	*Callistemon viminalis* Weeping Bottlebrush	5	7	300	M	G	F	Stem kink/lean to N (parallel to road), self-correcting. Major limb @ 2m AGL, over path. Basal suckers. Restricted root zone	Short 3C	M	L	2.2	3.6	41
15	*Callistemon viminalis* Weeping Bottlebrush	8	5	400 GL	M	G	F	Trifurcate @ approximately 950mm. Small number of basal shoots.	Short 3C	M	L	2.3	4.8	72

KEY

Trees that have a low retention value.

Trees that have a medium retention value.

Trees that have a high retention value.

NOTE: despite the generally low RV for individual trees in the street, the landscape significance of the street tree planting, when considered in its totality, is high and should be considered to have a high RV also.

*DBH stem diameter visually estimated. Tree may be on adjoining property, or stem obscured, or difficult to access.
AB – refers to the approximate diameter of a tree stem, measured immediately above the *root buttress*.
AGL – refers the approximate diameter of a tree stem measured at ground level.
Ht refers to the approximate height of a tree in metres, from base of stem to top of tree crown.
Sp refers to the approximate spread in metres of branches/canopy of a tree.
DBH refers to the approximate diameter of tree stem at breast height i.e. 1.4 metres above ground unless otherwise noted, and expressed in millimetres.
Age refer to Appendix A -Terms and Definitions for more detail.
V refers to the tree's vigour health Refer to Appendix A -Terms and Definitions for more detail.
C refers to the tree's structural condition. Refer to Appendix A -Terms and Definitions for more detail. Note: Where further investigation or testing of trees to be retained is required, a Condition rating for those trees cannot be provided until these investigations have taken place.
ULE refers to the estimated Useful Life Expectancy of a tree. Refer to Appendices A and B for more detail.
Note: Where physical access to the tree is limited, or further investigation or testing of trees is recommended, a ULE cannot be accorded to those trees until unobstructed visual access to the tree is obtained and/or recommended investigations have taken place.
LSR refers to the Landscape Significance Rating of a tree, considering the importance of the tree as a result of its prominence in the landscape and its amenity value, from the point of public benefit. Refer to Appendix C -Terms and Definitions for more detail.
RV refers to the retention value of a tree, based on the tree's Useful Life Expectancy ULE *and* Landscape Significance. Refer to Appendix C - for more detail.
*SRZ (m^r) Structural Root Zone (SRZ refers to the critical area required to maintain stability of the tree. Refer to Appendix A -Terms and Definitions for more detail.
*TPZ (m^r) refers to the *tree protection zones* for trees to be retained. The TPZ offset is usually based on a radius of 12 x the tree's DBH, but must also consider the Crown Protection Zone and the Root Protection Zone. If the CPZ and or the RPZ exceed the TPZ radius, they will be the overarching offset to be considered in terms of providing appropriate protection of below and above ground tree parts. Refer to Appendix A -Terms and Definitions for more detail.
TPZ (m^2) area in square metres of the tree's TPZ.

APPENDIX F

PHOTOGRAPHS

Plate 1 (left)
Looking south towards Tree 14. Illustrating the proximity of trees to the adjoining, future Marrickville Community Hub site.

Plate 2 (right)
Substantial pruning to clear power lines has resulted in prolific growth, potential branch end-weight issues, and encouraged basal shoots, which affects visibility from the footpath to the road.

Plate 3 (left)
Looking north from the intersection of Lilydale Street and Marrickville Road. The subject trees are on the left (west) side of the street.

Plate 4 (right)
The base of Tree 8, showing the substantial cracking and lifting of the pavement.

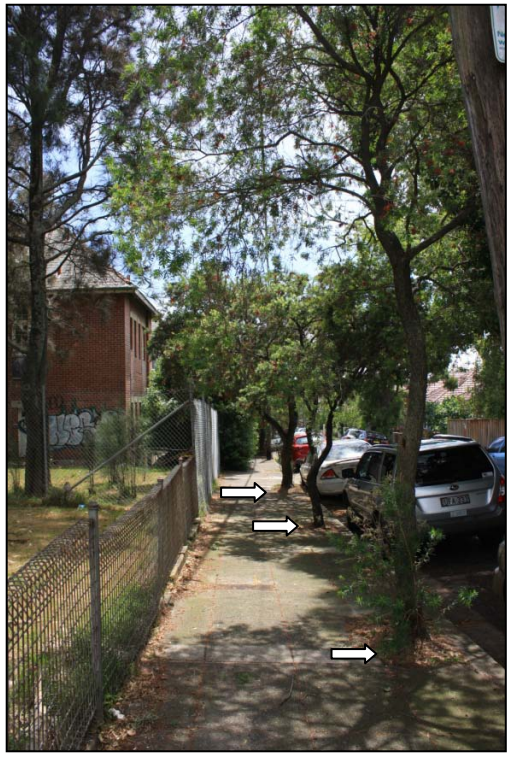


Plate 5 Trees 1 (foreground), 2 and 3, looking north.

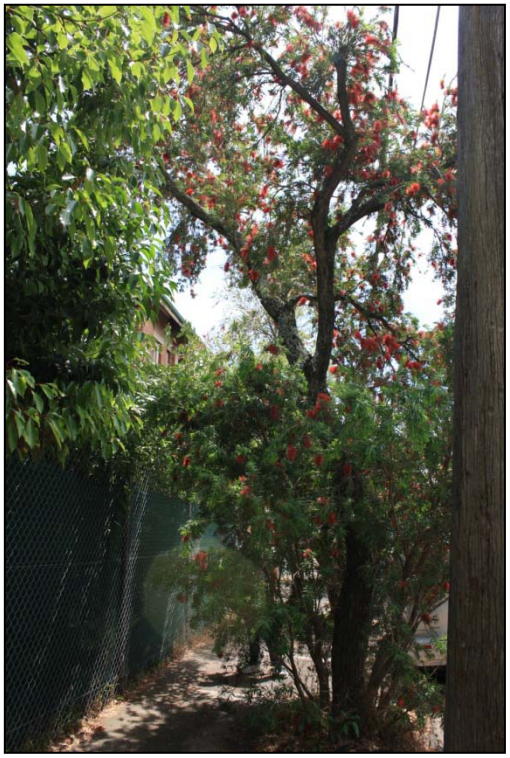


Plate 6 Tree 4, looking north.

Plate 7 Tree 5, looking north.

Plate 8 Tree 6, looking north.

Plate 9 Tree 7, looking north.

Plate 10 Tree 8, looking south.

Plate 11 Tree 9, looking south.

Plate 12 Tree 10, looking north.

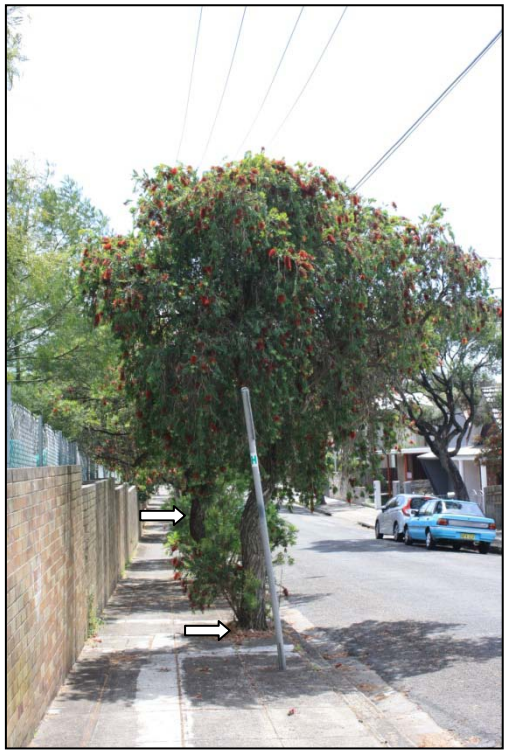


Plate 13 Tree 11 (foreground) and 12, looking north.

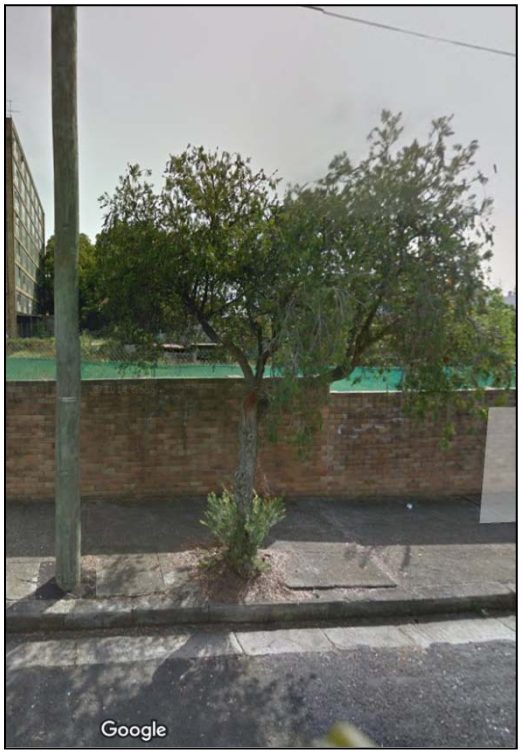


Plate 14 Tree 13, looking northwest. Google™ Image 2014

Plate 15 Tree 14, looking north.

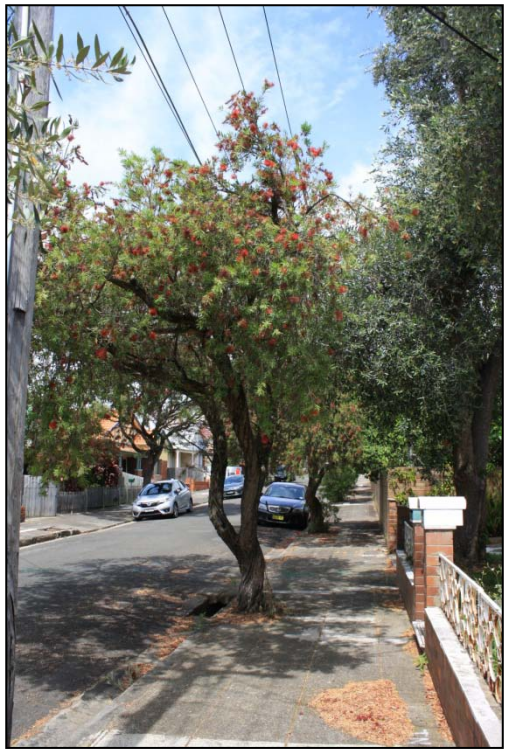
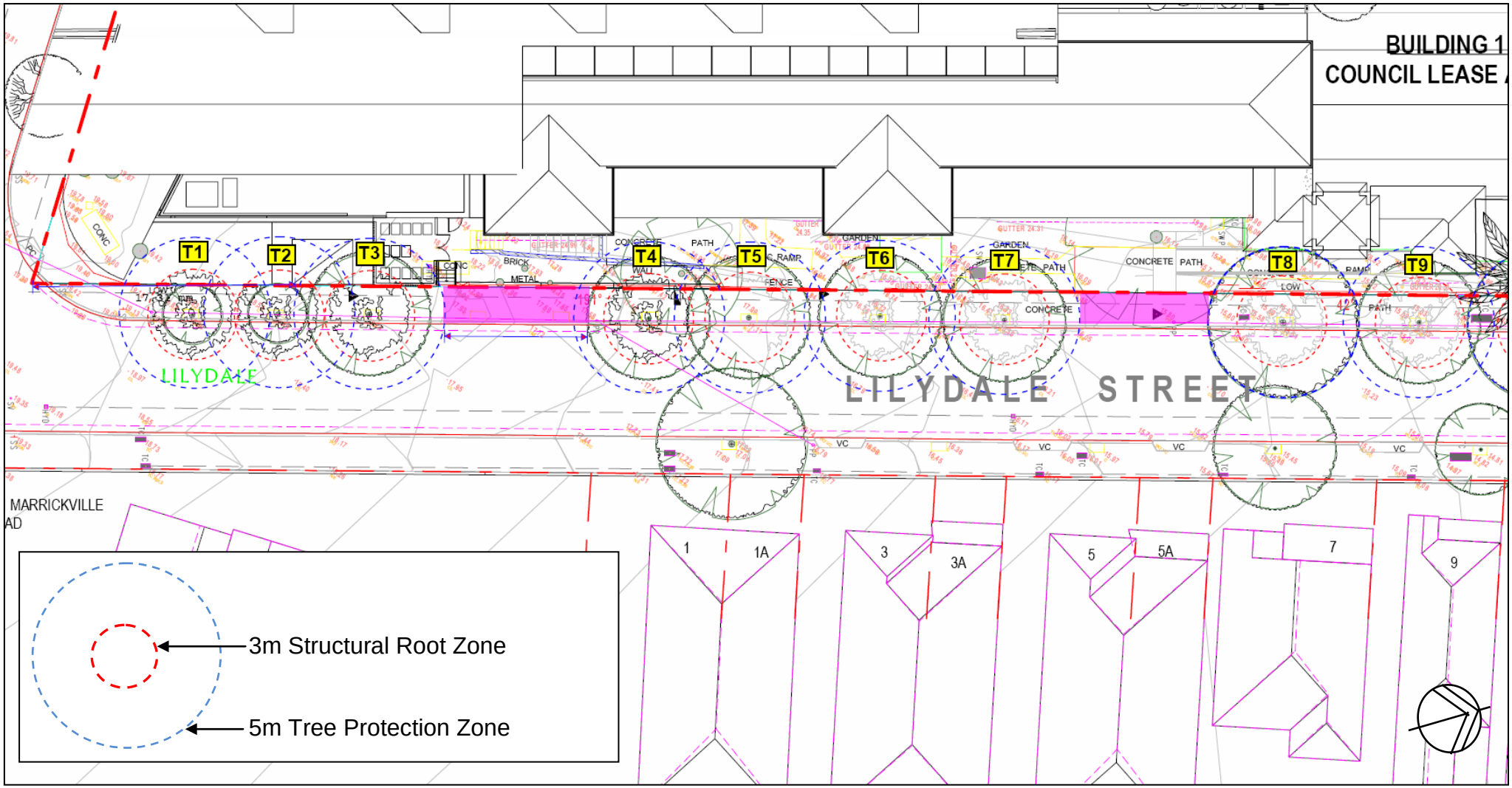


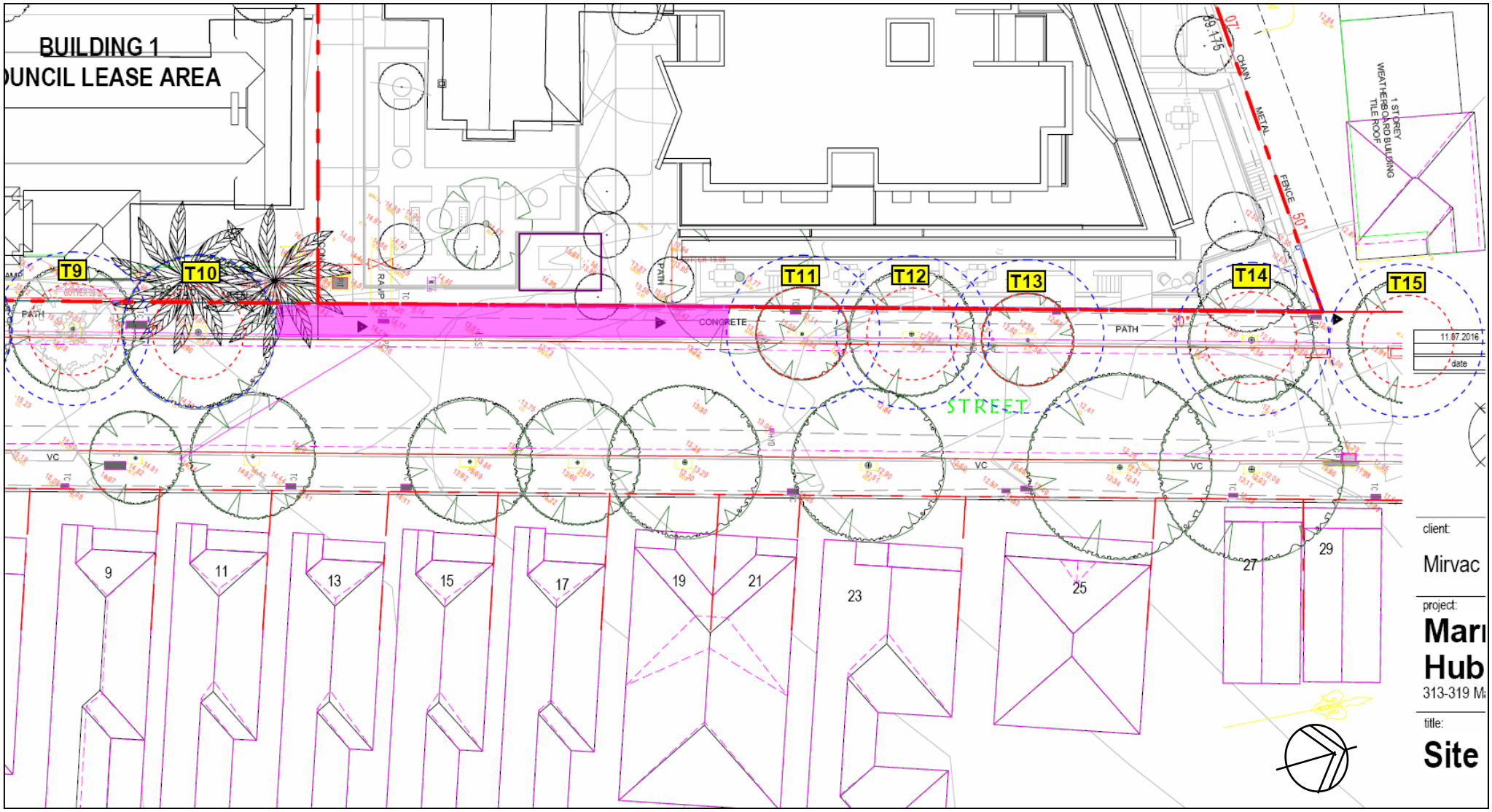
Plate 14 Tree 15 looking south.

APPENDIX G

TREE PLANS



Not to scale. Note: the shaded pink areas between trees identify those sections where excavator use can be used, subject to arboriculturist advice on known or unforeseeable limitations, such as pruning, presence of roots greater than 30mm diameters encountered during path demolition, and the like.



Not to scale. Note: the shaded pink areas between trees identify those sections where excavator use can be used, subject to arboriculturist advice on known or unknown limitations, such as pruning, roots greater than 30mm diameters encountered during path demolition, and the like.