# Arboricultural Impact Assessment

## 45 Earl Street, Beacon Hill

## DP 25164

**Prepared By:**

**Temporal Tree Management Pty Ltd.**
**William Dunlop: Consulting Arborist (M. UrbHort, Grad. Dip(Arb), B.Sc).**
**willdunlop8@gmail.com**
**0414137659**

**Prepared For:**

**Rapid Plans Pty Ltd.**
**carly@rapidplans.com.au**

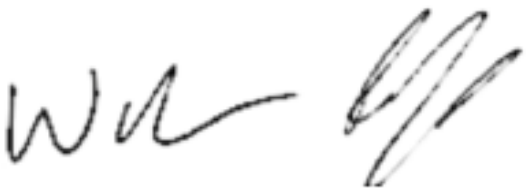
# Table of Contents

# List of Maps and Figures

**DISCLAIMER**

The preparation of this report is for the use of the property owners at 45 Earl Street, Beacon Hill and the project designers (*Rapid Plans Pty Ltd*) to assess the impact on one tree within this property that is within 5 metres of a proposed development. The author of this report is *Temporal Tree Management Pty Ltd.* This report is not designed for any other purpose. The author accepts no responsibility for the use of this report for purposes other than as an arboricultural impact assessment or if used by any other person / party.

All observations, recommendations and advice expressed within this report are based on *the Australian Standard for the Protection of Trees on Development Sites (AS 4970 2009),* the professional experience of the author, information gathered during the site assessments and information provided by the clients. Trees are dynamically growing organisms that change over time. No guarantee is implied with respect to future tree safety beyond the advice and recommendations within the report.



William Dunlop

**Director** of *Temporal Tree Management Pty Ltd.*

B.Sc (Adv.), Grad. Dip(Arb) (AQF Level 8), M.UrbHort.
30 July 2019.

## 1. Summary

The purpose of this report is to provide an Arboricultural Impact Assessment (AIA) for the trees located within 5 metres of a proposed development at number 45 Earl Street, Beacon Hill. There are a small number of established tree specimens within and adjacent to the property boundaries of this site. Only one tree specimen was measured to be within 5 metres of the proposed development envelope.

An assessment of one Smooth-barked Apple (*Angophora costata* subsp. *costata*) specimen was undertaken by William Dunlop of *Temporal Tree Management Pty Ltd* on 20/07/2019. The tree was located, identified and its retention value assessed using the TreeAZ model (10.10 NZ), which was created by Barrell Tree Consultancy in 2012. Tree protection measures are drawn from and relating to the *Australian Standard for the Protection of Trees on Development Sites* (AS 4970 2009).

The tree was determined to be of High retention value due to its size, condition and species value. To facilitate the design of the exterior deck on the new southern side of the dwelling five lateral limbs within the northern portion of the tree's canopy will require pruning. The total live canopy reduction associated with the recommended pruning will be approximately 15%.

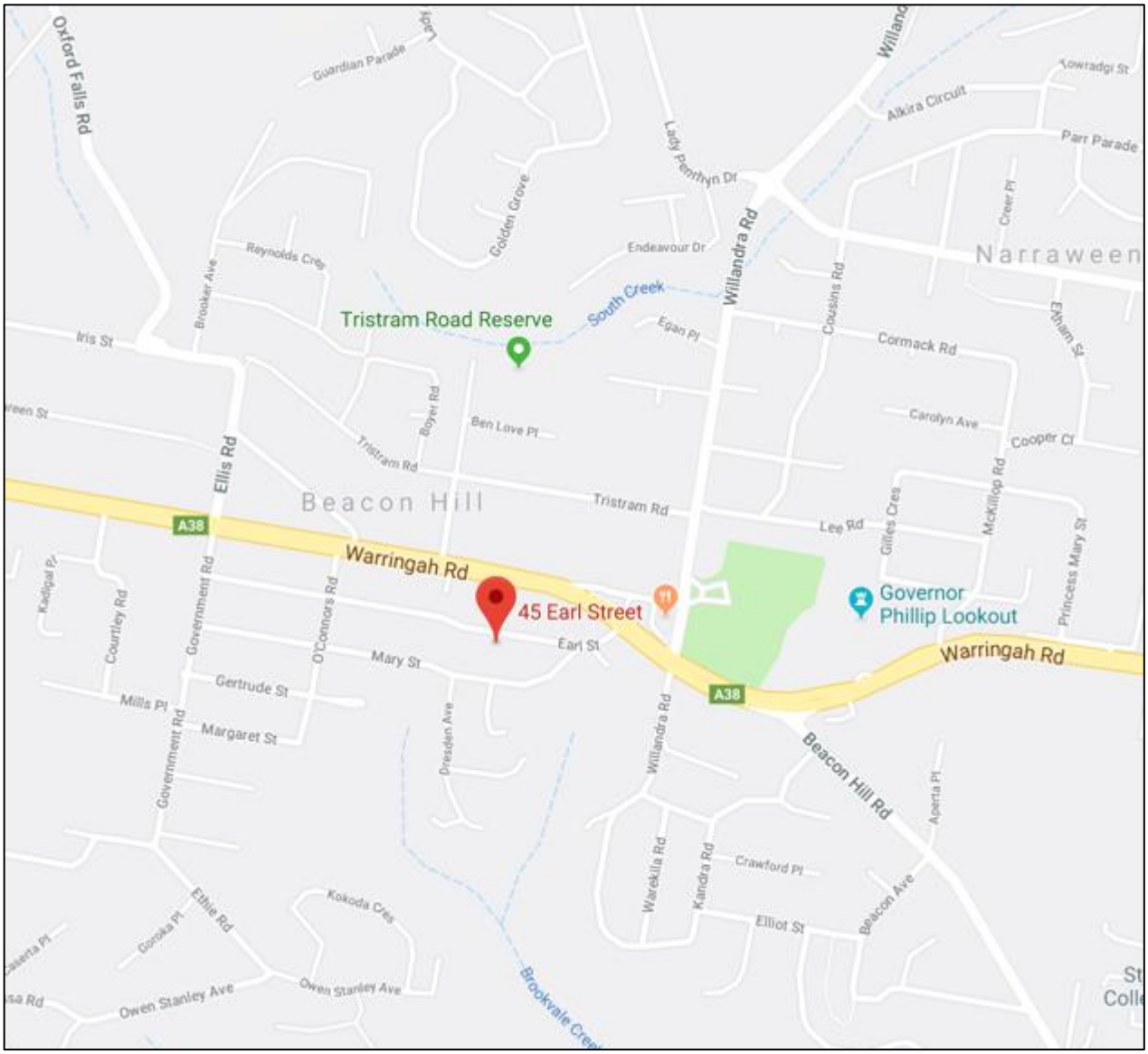
Stem protection measures compliant with AS 4970 (2009) must be established around this tree's stem prior to the commencement of works. Mulch should also be applied to a depth of 60mm to the area of the tree's Tree Protection Zone (TPZ) that is not covered by hard surfacing.

The information provided in this report may be used to assist in planning, design and construction for future development on this site.

## 2. Location

### 2.1. Site Location

The subject site for this Arboricultural Impact Assessment is 45 Earl Street, Beacon Hill (Map 1). The land use surrounding this property is primarily residential. The property is positioned within close proximity of Tristram Road Reserve, Brookvale Creek Park and Beacon Hill Reserve. The role played by the trees inside and adjacent to the subject site in maintaining ecological connectivity within this local area will be an important consideration for this Arboricultural Impact Assessment.




Map 1. Site location is 45 Earl Street, Beacon Hill. Image sourced from Google 2019

### 2.2. Relevant Policy Context

This property is located within the Northern Beaches Council. The environmental policy regulations relevant to the trees within the subject site are drawn from Part 3 of the NSW State Environmental Planning Policy (SEPP) (Vegetation in Non-rural Areas). The policy controls governing the management of the trees are outlined in Part E3 'Preservation of Trees or Bushland Vegetation' of the former Warringah Development Control Plan (2011), which the Northern Beaches Council has adopted for this area (Northern Beaches Council

2019). The property itself is part of an R2 Low-Density Residential development overlay (Planning NSW 2016).

### 2.3. Tree Locations

All trees within 5 metres of any proposed development activity were included in this Arboricultural Impact Assessment. As outlined in Part E3 of the Warringah DCP (2011) vegetation was classed as a tree if it was taller than 5 metres and included (Northern Beaches Council 2019).

The tree relevant to the proposed renovation activity at the house and garage located at 45 Earl Street, Beacon Hill was identified and briefly assessed during the site visit on 20/07/2019. The Smooth-barked Apple (*Angophora costata* subsp. *costata*) that was included in this assessment is positioned within the southern portion of the subject site close to the southern wall of the existing dwelling (Map 2).


Map 2. Location of one tree within 5 metres proposed development activity within 45 Earl Street, Beacon Hill (property boundaries in red). Image sourced from SixMaps 2019.

## 3. Site Development Plans

Development plans for this property are currently at the final design and submission stages.

The plans for this development involve an extension of the southern portion of the existing house. The driveway and existing garage are also proposed to be refurbished within their existing footprint (Figure 1). The extension of the existing southern wall of the first and second level of the dwelling and the planned location of the first and second-storey deck are positioned adjacent to Tree 1 (Figure 2). At the closest point the new southern wall will extend to the edge of an existing concrete path that is positioned 0.9 metres from the tree's stem.

Hand excavation has been undertaken by the property owner within the southern portion of the property adjacent to Tree 1 to uncover a service inspection cap (Figure 3). The hand excavation of the heavy-clay soil has non-destructively uncovered four large structural roots extending from the stem of Tree 1 towards the southern boundary.

Tree 1 may certainly be directly or indirectly impacted upon due to its very close proximity to the proposed renovation of the southern portion of the dwelling. It is therefore important that an accurate evaluation of this tree's retention value be made and if required the implementation of an effective tree protection plan.

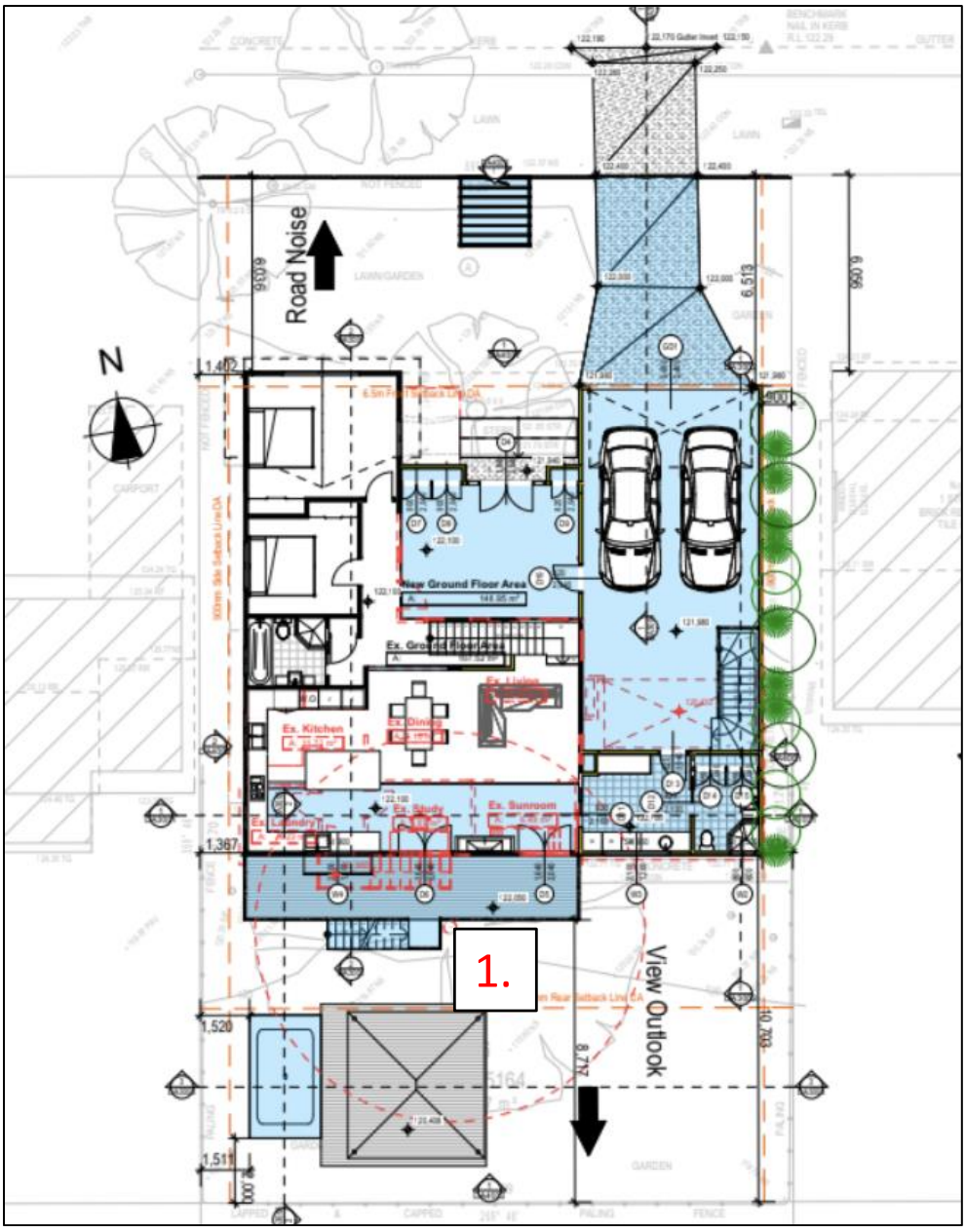



Figure 1. Position of the planned development works (blue) in relation to Tree 1 at 45 Earl Street, Beacon Hill. Site Plan (DA1003) drawn by *Rapid Plans Pty Ltd.* (2019) annotated by *Temporal Tree Management Pty Ltd* (2019).

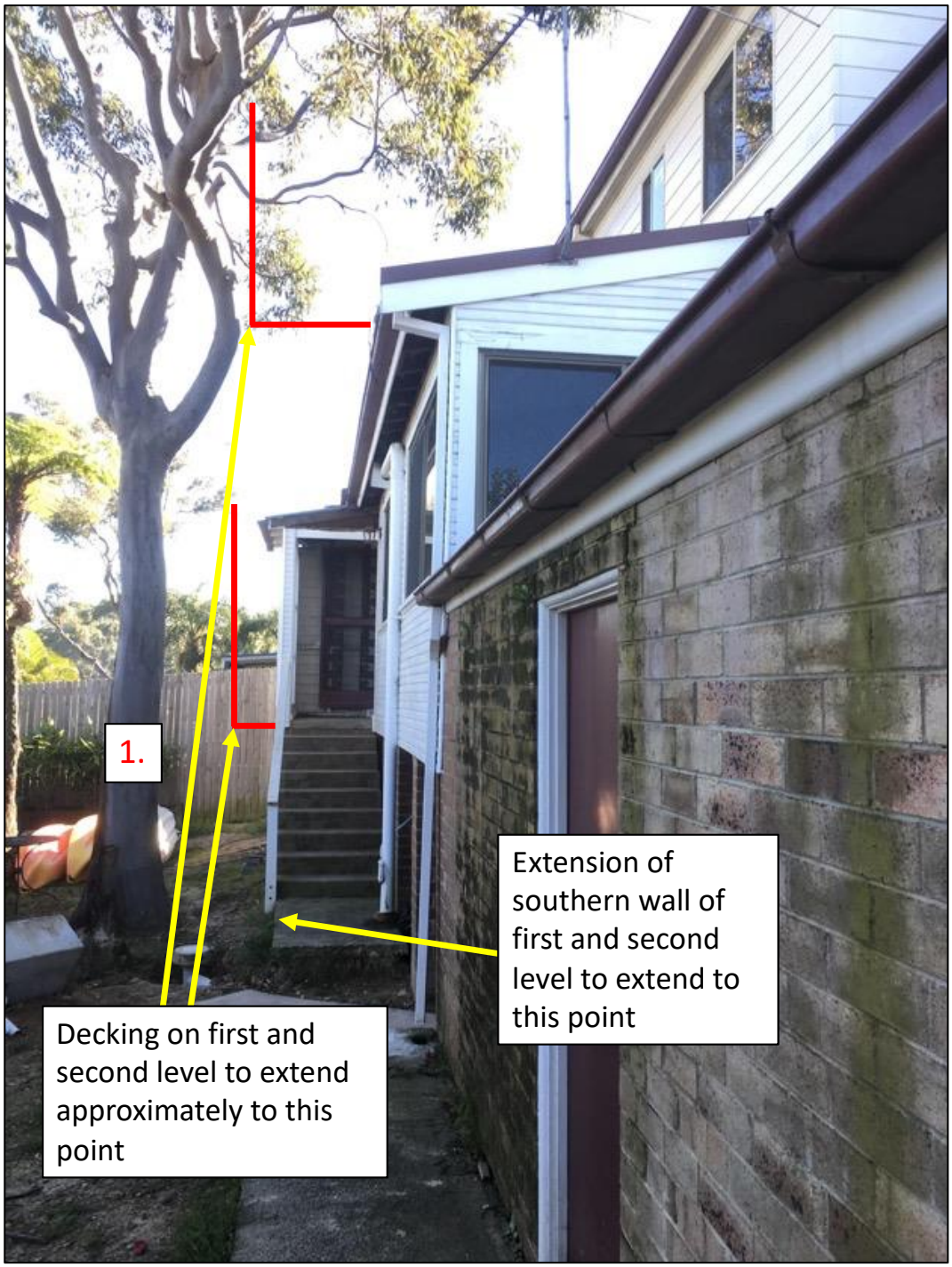



Figure 2. Development plans within the eastern portion of the subject site.

Figure 3. Hand excavation to uncover plumbing has exposed structural roots within heavy clay soil.

## 4. Preliminary Assessment

### 4.1 Assessment Methodology

After being located and numbered a visual assessment was carried out for each tree. Visual assessments of trees' health and structure were underpinned by the Visual Tree Assessment method established by Mattheck and Breloar (1994) and the Visual Vitality Index method established by Johnston et al. (2012). The data collected for each individual was used in simple characterisation models for age, origin, health, structure, life expectancy and retention value. Simple characterisations were used to ensure outcomes remained clear and consistent. The format for data collection included:

- Tree Number: Determined in Map 2 and Figure 1.

- Botanical Name: Vegetation was identified and described using botanical names to avoid confusion associated with common name descriptions.

- Common Name: Only one common name was used. This information is included in Appendix A.

- Age: Juvenile, Semi – mature, Mature or Over Mature. Judgement on these four categories was determined by professional knowledge and research on the species present.

- Origin: Exotic, Native or Indigenous. It was important to differentiate between Australian native vegetation and locally indigenous vegetation, as native trees are not necessarily protected by the Northern Beaches Council tree preservation order while many indigenous species are. Similarly some native trees may become invasive in non – indigenous areas.

- Diameter at Breast Height (DBH): An important tree measurement used in arboriculture. DBH was described in mm and used to determine the Tree Protection Zone for each tree. This information is included in Appendix A.

- Diameter at Root Flare (DRF): An important tree measurement used in arboriculture. DRF was described in mm and used to determine the Structural Root Zone for each tree. This information is included in Appendix A.

- Height: Estimated in metres using professional experience. This information is included in Appendix A.

- Canopy Width: Estimated in metres from north– south x east – west. This information is included in Appendix A.

- Health: Dead, Poor, Fair, Good or Excellent. Professional experience along with the visual vitality index established by Johnston et al. (2012) was used to underpin these categories (Appendix B).

- Structure: Failed, Very Poor, Poor, Fair, Good or Excellent. Professional experience along with VTA method established by Mattheck and Breloar (1994) was used to underpin these categories.

- Useful Life Expectancy (ULE): Long (greater than 40 years), Medium (40 years – 15 years), Short (15 – 5 years) or Remove (less than 5 years). These categories were established by Barrell Tree Consultancy (2010) and provide an important estimate of a tree's remaining safe life span based on species knowledge and an individual's structure and health.

- Retention Value: Retention value was split into two categories as defined by the TreeAZ method; A or Z (Barrell Tree Consultancy 2012). Category A stipulates that a tree should be retained and efforts made in the design planning and construction to ensure its survival. Category Z determines that a tree's retention is not a priority and it need not constrain design, planning or construction. Categories were determined using the tree assessment data and TreeAZ model criteria (Figure 4) (Barrell Tree Consultancy 2012).

- Tree Protection Zone (TPZ): This measure provides the principle means of protecting trees on construction sites. A TPZ radius may be calculated using the equation from the Australian Standard for the Protection of Trees on Development Sites (AS 4970 2009):

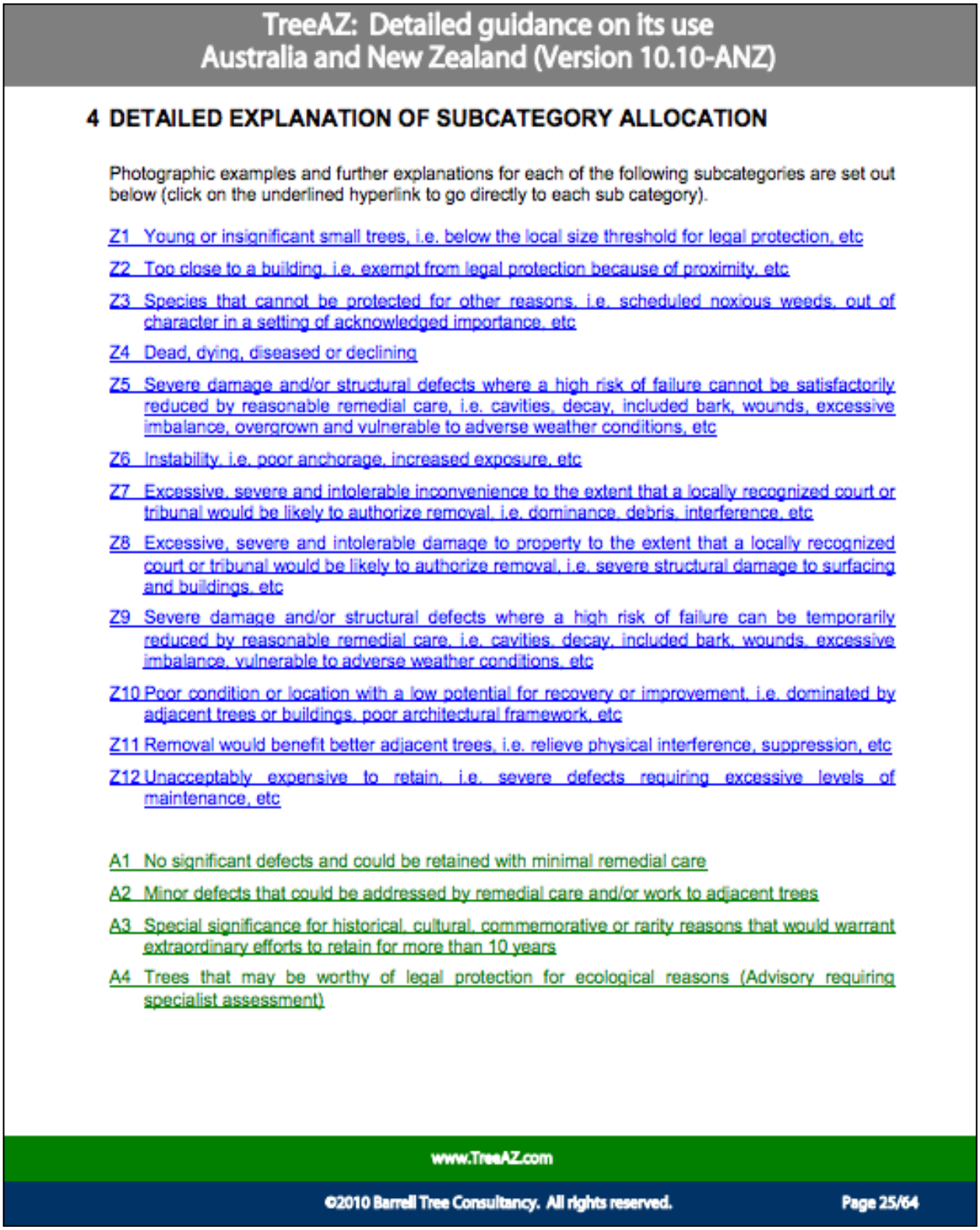
**TPZ = DBH x 12**

A TPZ was established for trees determined to be suitable for retention. Once a TPZ is established all construction activity should be excluded from within its borders. Encroachments may occur under further arboricultural assessment and advice.

Ø Structural Root Zone (SRZ): This measure provides an indication of the portion of a tree's root plate that is considered fundamentally important for the maintenance of structural integrity. An SRZ radius may be calculated using the equation from the *Australian Standard for the Protection of Trees on Development Sites* (AS 4970 2009):

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

Ø Comments: Any additional information explaining an individual's health, structure, ULE or retention value categorization. This information is included in Appendix A.



TreeAZ: Detailed guidance on its use
Australia and New Zealand (Version 10.10-ANZ)

## 4 DETAILED EXPLANATION OF SUBCATEGORY ALLOCATION

Photographic examples and further explanations for each of the following subcategories are set out below (click on the underlined hyperlink to go directly to each sub category).

Z1 Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc

Z2 Too close to a building, i.e. exempt from legal protection because of proximity, etc

Z3 Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc

Z4 Dead, dying, diseased or declining

Z5 Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc

Z6 Instability, i.e. poor anchorage, increased exposure, etc

Z7 Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc

Z8 Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc

Z9 Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc

Z10 Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc

Z11 Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc

Z12 Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

A1 No significant defects and could be retained with minimal remedial care

A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees

A3 Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years

A4 Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

www.TreeAZ.com

 Page 25/64

Figure 4. TreeAZ model 10.10.NZ criteria as used by Barrell Tree Consultancy (2012). (Access via http:/www.treeaz.com/downloads/Document-06-311210.pdf 2017).

### 4.2. Tree Data

Table 1. Summarised tree data for one tree assessed at 45 Earl Street, Beacon Hill. Trees determined to be of High retention value (A1-4) are annotated in Blue while trees of Low retention value are annotated in Red (Z1-12).

| Tree# | Botanical Name | Health | Structure | ULE | Retention | TPZ(m) | SRZ(m) |
|---|---|---|---|---|---|---|---|
| 1 | *Angophora costata* subsp. *costata* | Fair | Fair | Long | A1 | 5.4 | 2.63 |

## 5. Summary and Recommendations

Tree 1 is a large tree that was determined to be in fair condition and with a long ULE estimate of 25+ years. Its value as an indigenous species further elevates this tree's importance. While very close to the proposed location of the renovation of the southern wall of the dwelling this tree's retention is determined to be an important aspect of the proposed development (Figure 1).

For these reasons this tree was determined to be of A1 High retention value in this assessment. Planning and resources should therefore be allocated to the protection of this tree as part of the proposed development for this site.

## 6. Tree Protection Plan

The key tree protection measures outlined in *AS 4970 (2009)* have been included for the purpose of providing an effective tree protection plan for the proposed development.

### 6.1. Pre – Construction Vegetation Management

The northern canopy of Tree 1 will require reduction pruning to facilitate the planned construction of the deck extending from the southern wall of the second-storey. Three third-order lateral branches should be removed from the northern canopy. A maximum pruning cut of 90mm should not be exceeding during the removal of these four branches (Figure 5). The removal of two second-order lateral limbs is also required to facilitate the proposed renovation (Figure 6). A maximum pruning cut of 150mm should not be exceeded during the removal of these two limbs.

An estimated total live canopy reduction of 15% is estimated for the recommended pruning. The fair health that was observed during the assessment of this tree suggests that it will adequately respond to the recommended works without a detrimental impact on its Long ULE estimate. All pruning works should be carried out prior to the commencement of renovation works within the subject site.

All pruning must be carried out by a suitably qualified arborist (minimum AQF Level 3) in accordance with *the Australian Standard for Pruning Amenity Trees* (AS 4373 2007).


Figure 5. Recommended pruning of three third-order branches.


Figure 6. Recommended pruning of two second-order branches.

### 6.2. Tree Protection Measures

All tree protection measures have been established in accordance with the *Australian Standard for the Protection of Trees on Construction Sites* (AS4970 2009). Tree protection zones (TPZs) and structural root zones (SRZs) have been calculated for all trees in section 3.2. These zones are aimed at preventing soil compaction, contamination and physical damage to trees above and below ground (Matheny and Clark 1994). As such all construction activity is excluded from designated TPZ areas. The TPZ and SRZ measurements are provided as a radial measurement that determines the circular areas of above and below ground exclusion (Figure 7).

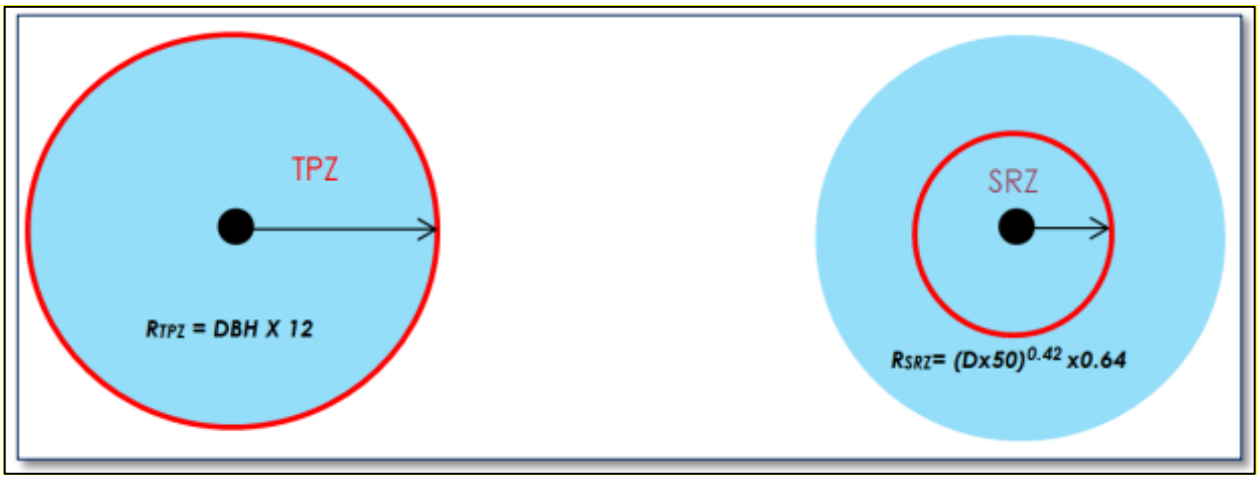



Figure 7. TPZ and SRZ radial measurement equations.

### 6.3. Tree Protection Zones

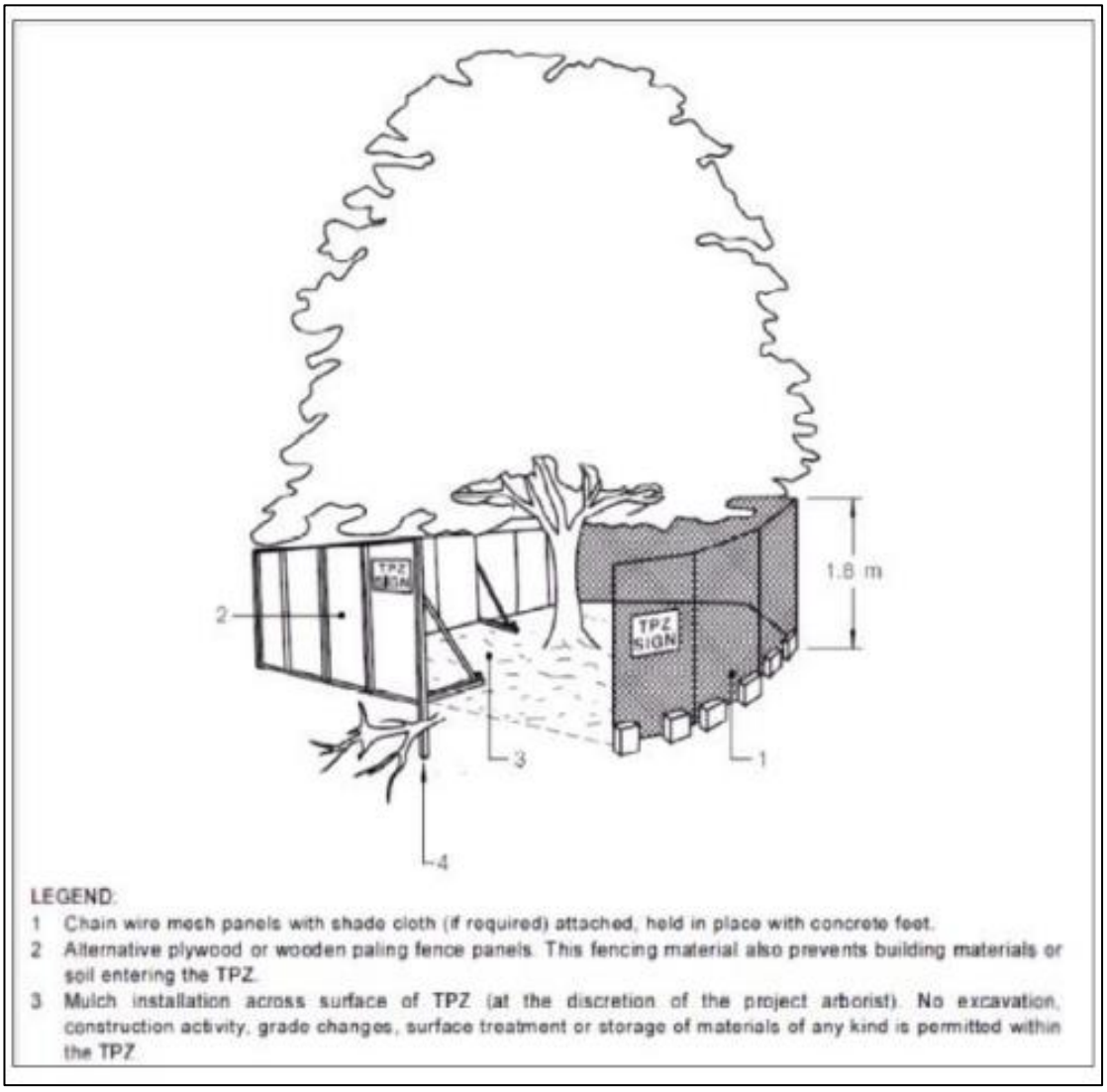
The tree protection zone is an above and below – ground area that excludes any construction activity and is the principal means of protecting trees on construction sites (Matheny and Clark 1994). The area contained within the TPZ is fundamentally important in trees' long – term survival (Matheny and Clark 19994).

The area established by the radial measurement should be enclosed by 1.8 metre steel fencing that is securely fixed to the ground as stated in section 4.3 of the *Australian Standard for the Protection of Trees on Construction Sites* (AS4970 2009) (Figure 8). Signage

stating the purpose of these exclusion zones should be fixed to the fencing so that it is visible from all points within the site.

The structural root zone is the predicted area in which roots that ensure a trees' stability are located (Day et al. 2009). The SRZ is typically located within the TPZ. Under no circumstances should construction activity occur within the SRZ without the presence and consultation of the project arborist.

Encroachments of construction activity may only occur with the consultation and permission of the project arborist. As defined in section 5 of the *Australian Standard for the Protection of Trees on Construction Sites* (AS4970 2009) encroachments of less than 10% of the total TPZ area may occur without the site presence of the project arborist providing there is an equal compensation of area elsewhere within the TPZ. Major encroachments of more the 20% require added consultation from the project arborist. Suitability for major encroachments are site specific and depend on the vitality of the tree and extent of the encroachment. A root mapping report may be required to determine if the tree will be able to sustain the level of encroachment. The presence of the project arborist during all such construction activity is required. An equal amount of compensated area should also be added to the TPZ elsewhere.




LEGEND:

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

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

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

Figure 8. Steel fencing should be erected around the perimeter of TPZs in accordance with AS4970.

### 6.4 Site Specific Protection Measures

There will be an encroachment within the TPZ and SRZ of Tree 1 to facilitate the proposed development due to its very close proximity to the planned renovation of the southern portion of the dwelling. The existing southern wall (2.3 metres from stem) and the adjacent concrete path (0.9 metres) are both already within the tree's northern TPZ and SRZ. The extension of the southern portion of the dwelling will be done on brick piers, which will considerably reduce the direct disturbance of any roots.

It is considered likely that as it has matured the tree's structural and secondary root growth has been directed away from the compacted clays below the existing dwelling (Day et al. 2009). Observations of the tree's exposed structural roots reinforce this notion (Figure 3). The encroachment that Tree 1 will sustain within its northern root-zones during the proposed development is therefore considered to be acceptable. The tree's fair health suggests that it will adequately respond to possible disturbances associated with this encroachment (Matheny and Clark 1994).

To mitigate any major disturbances occurring it is a key recommendation of this report that all excavation within 5.4 metres of the tree's stem be carried out by hand. During hand excavation no major tree roots (diameter exceeding 40mm) should be damaged. The project arborist must be notified if a major root must be severed to facilitate the development. Major root cutting must be carried out by a suitably qualified consulting arborist (minimum AQF Level 5) using a handsaw in accordance with AS4970 2009.

To reduce compaction within the northern portion of the tree's root plate that is not covered by hard surfacing, it is a recommendation of this report that mulch be applied within the TPZ radius (5.4 metres) to a depth of 60 mm (Figure 9). Mulch should only be applied to the portions of the root plate that with a permeable soil-surface.

It is a key recommendation of this report that stem protection measures be installed around the stem of Tree 1. As stipulated in AS 4970 (2009) hessian padding should be wrapped around the tree's stem and timber slats should be spaced no wider than 200mm and fixed using hessian or steel strapping (Figure 10). Stem protection measures for Tree 1

must be established prior to the commencement of works and be removed only once all work has been completed.

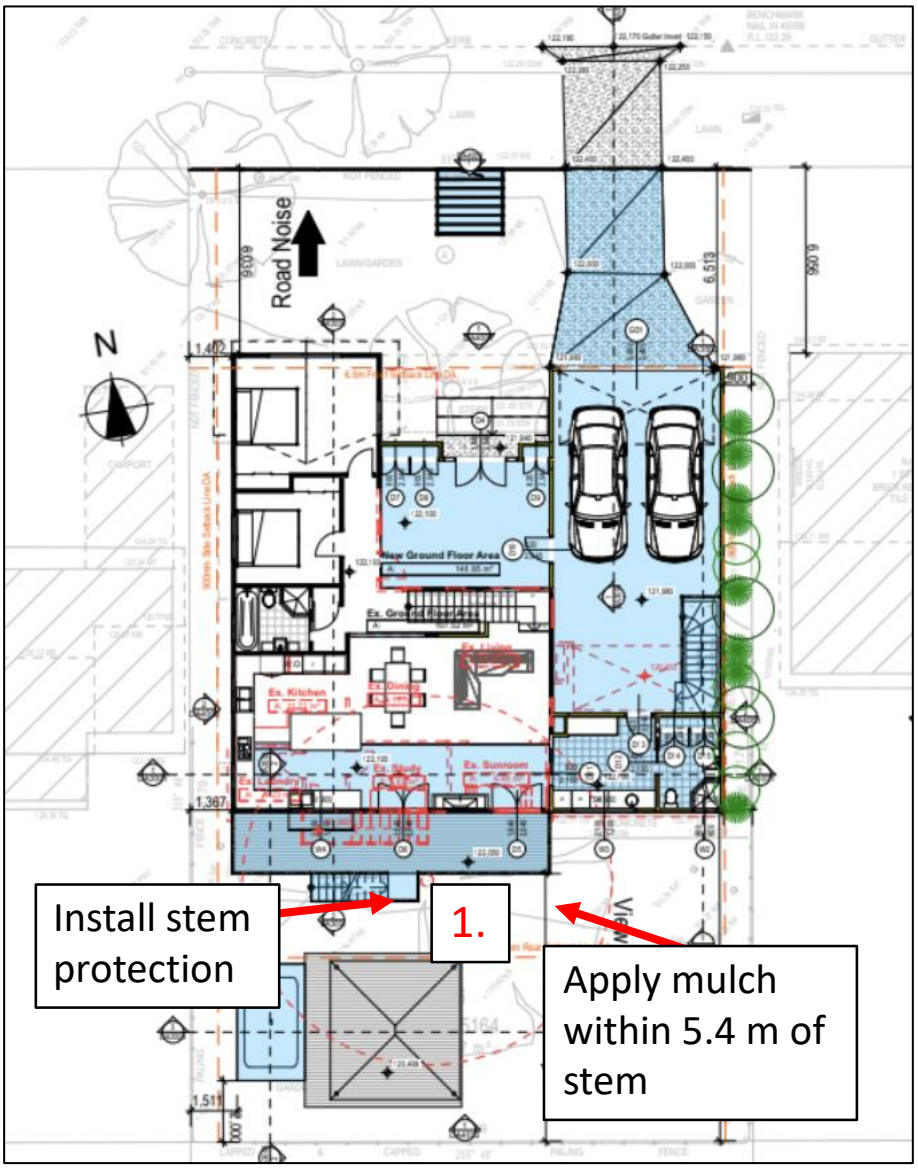



Figure 9. TPZ arrangement for one tree identified as suitable for retention within close proximity of proposed works within 45 Earl Street, Beacon Hill. Site drawing DA1003 by *Rapid Plans Pty Ltd.* (2019) annotated by *Temporal Tree Management Pty Ltd* (2019).

Figure 10. Stem protection measures established in the City of Sydney Council.

### 6.5. Certifications

To ensure that the protection of retained vegetation is carried out to meet the objectives of the Arboricultural Impact Assessment and the planning permit, the following monitoring and certification process will be followed in line with AS 4970 (2009).

Monitoring, reporting and certification should be carried out at the following critical stages of construction:

- Site establishment – Installation of stem protection and mulch around Tree 1..
- Practical completion – Successful implementation of the tree protection plan for the duration of the development.

Once approved, this tree management plan must be available onsite prior to the commencement of, and during works. Due to the importance of this site from a biodiversity perspective monitoring and certification should be undertaken by both the project arborist and/or a suitably qualified ecological consultant (ecologist)

To ensure the survival of the trees defined in this report as result of the stipulated TPP measures a final certification will be required once construction activity has been completed at this site. In line with AS4970 (2009) this certification should determine if the TPP measures were adequately followed and whether the relevant trees were successfully protected. This certification may be given by either the project arborist or separate arborist who must hold an AQF Qualification of level 5 or higher.

**References:**

Australian Standard AS 4970 (2009) Protection of trees on development sites. Standards Australia.

Australian Standard AS 4373 (2007) Pruning of amenity trees. Standards Australia.

Barrell Tree Consultancy (2012) Tree AZ model 10.10.NZ. Accessed via: www.TreeAZ.com (19/7/2014).

Day, S. P., Watson, G., Wiseman, E. and Harris, R. J. (2009) Causes of deep structural roots in urban trees. Arboriculture and Urban Forestry, 35(4): 182 – 191.

Johnstone, D., Tausz, M., Moore, G. and Nicolas, M. (2012) Chlorophyll florescence of the trunk rather than leaves indicates visual vitality in *Eucalyptus saligna.* Published online via Springer; Trees.

Matheny, P. N. and Clark, J. R. (1994) A photographic guide to the evaluation of hazard trees in urban areas (2nd Ed). International Society of Arboriculture, Champaign (pp 5, 8, 22 and 32).

Northern Beaches Northern Beaches Council (2016) Part E1 'Preservation of Trees and Bushland Areas' of the Warringah DCP (2011). Accessed via: https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/pages/plan/book.aspx?exhibit=DCP (13/06/2019).

Planning New South Wales (2016). Accessed via http://www.planning.nsw.gov.au/ (23/1/2017).

Shigo, A. L. (1991) Modern arboriculture: A systems approach to the care of trees and their associates. Shigo and Trees Associates, New Hampshire (pp 114, 122, 151, 175).

**Appendix A: Tree Data**

Tree Nº: 1.
Botanical Name: *Angophora costata* subsp. *costata*
Common Name: Smooth-barked Apple
Age: Mature
Origin: Indigenous
DBH: 450 mm
DGL: 580 mm
Height: 13.5 metres
Width: 10 metres x 11 metres
Health: Fair
Structure: Fair
ULE: Long
Retention Value: A1
TPZ: 5.4 metres
SRZ: 2.63 metres
Comments: This specimen is positioned within the southern portion of the subject site. At the closest point its stem is 2.3 metres from the southern wall of the existing dwelling and 0.9 metres from a concrete path. This tree's size, fair condition. long ULE and high species value render it of high retention value within this landscape. Efforts should therefore be made to ensure it is adequately protected for the proposed development.

**Appendix B: Vitality using Visual Vitality Index (Johnstone et al. 2012).**

VVI = 3/3 (Upper crown exposed) + 5/5 (Good crown size) + 8/9 (Good crown density) + 4/5 (Very little deadwood) + 2/3 (Moderate epicormic growth) + 5/5 (Crown intact). =26/30.