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# Arboricultural Impact Assessment
# For
# Proposed Development
# At
# University of Technology
# Broadway Building
# Ultimo NSW

Prepared for:

**University of Technology, Sydney**
**c/o Denton Corker Marshall Pty Ltd**
**49 Exhibition Street**
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Ref: 2079AIA

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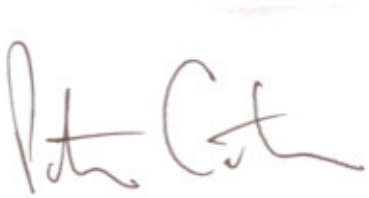

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# 1. BACKGROUND

## 1.1 INTRODUCTION

**1.1.1** This Arboricultural Impact Assessment (AIA) was prepared for University of Technology, Sydney in relation to proposed development of the Broadway Building at 81-117 Broadway, Ultimo (the subject site).

**1.1.2** The Architects for the project are Denton Corker Marshall Pty Ltd.

**1.1.3** The purpose of this AIA is to describe the existing trees adjacent to the subject site and to assess the impact of the proposed development on these trees.

**1.1.4** The Concept Plan for University of Technology Sydney (UTS) Broadway (including the Broadway Building) has been approved by The Minister for Planning on 23 December, 2009 (File no. S 08/01136), Major Project No. 08-0116. This AIA should be read in conjunction with this Approval and the Conditions of Approval contained at Schedule 4. The subject trees may be impacted with the *Erection of Hoardings* (Condition D9), *Loading and Work Zones* (Condition D14) and *Use of Mobile Cranes* (Condition D16).

**1.1.5** Australian Standard *AS4970-2009 Protection of trees on development sites* has been used as a benchmark in the preparation of this report.

## 1.2 THE SUBJECT SITE

**1.2.1** The subject site was bounded by a multi storey university building to the north, the main road, Broadway to the south, Jones Street to the east and Wattle Street to the west. Within the subject site were three buildings: a three storey brick building (The Bradshaw Building) along the eastern boundary, a two storey brick building (formerly the Regent Hotel) at the corner of Wattle Street and Broadway and a two storey brick building (formerly the Muzak building) adjacent to the former Regent Hotel on Broadway. There was a two metre high freestanding brick wall with a raised brick garden bed at the base running along the Broadway boundary frontage. The remainder of the site was a concrete car park area. There were a number of existing shrubs and trees within the site boundary and in the planter running along Broadway.

**1.2.2** Adjacent to the site were two trees located within the traffic island in Wattle Street to the west, five trees located in the verge along the Broadway frontage and three trees located in the verge east of Jones Street.

**1.2.3** We understand that all the existing buildings, including the wall and planter along Broadway are approved for demolition and that as part of these works, all existing shrubs and trees within the site boundary have been approved for removal. The street trees located adjacent to the site are the subject of this Report. Refer to City Broadway Survey Plan, UTS Facilities Management Unit, and dated November 2009 for further detail.

**1.2.4** For the purposes of this Report the Broadway frontage is referred to as the *southern* frontage.

**1.2.5** Site soils are likely to have been significantly altered due to earlier development. There was no remnant vegetation on the site.

## 1.3 THE SUBJECT TREES

**1.3.1** The general findings and data collected for each of the subject trees are contained in the Tree Schedule (Attachment A).

**1.3.2** There were ten (10) trees located adjacent to the site. Trees 1 and 2 were located within the traffic island on Wattle Street to the west, Trees 3, 4, 5, 6 and 7 were located in the verge along the Broadway frontage and Trees 8, 9 and 10 were located in the verge east of Jones Street. All trees are highly prominent within the existing streetscape. Many of the supplied plans showed four trees rather than five on the Broadway frontage. Refer to the Tree Protection Plan for correct tree location and numbering.

**1.3.3** Tree 1 is a Hills Fig, *Ficus microcarpa var. Hillii*, which is listed as a Significant Street Tree on the City of Sydney's Register of Significant Trees. The Statement of Significance states, in part:

> *"As an individual specimen, this Fig has local significance in terms of visual, aesthetic, cultural and social values and is comparable in age and structure to the Hills Weeping Fig Avenue in Hyde Park (c. 1930)."*

Tree 2, Kaffir Plum, *Harpephyllum caffrum* is noted as:

> *"Other tree components and associates".*

**1.3.4** There was evidence that Trees 3 - 7, London Plane Tree, *Platanus x hybrida* located along the Broadway street frontage are causing localised uplift of the adjacent footpath pavement and stone kerb. These semi-mature trees are likely to be 12-15 years old. Some contained trunk wounds caused by passing trucks. The canopies of Trees 3-7 overhung the subject site, while this was not the case for Trees 1, 2, 8, 9 and 10. Refer to the Comments column of the Tree Schedule for further details.

**1.3.5** All assessed trees are protected under the City of Sydney Tree Preservation Order (TPO).[1]

**1.3.6** It should be noted that all trees located within the subject site have been approved for removal as part of the redevelopment of the site.

## 1.4 THE PROPOSAL

**1.4.1** The proposed development is for demolition of all existing structures (Buildings 11, 12 and 13) and construction of a multi storey educational building and associated facilities with four levels of basement car parking. Refer to Denton Corker Marshall architecturals Job No. 7352, dated 22 June, 2010 for further detail.

**1.4.2** The recommendations and comments in this Report assume the existing streetscape character is to be retained where possible through the retention of the subject significant trees.

[1] City of Sydney Tree Preservation Order applies to any tree, with a height equal to or exceeding five (5) metres or a trunk circumference of 300mm at a height of one (1) metre above ground level for single trunk species or a trunk circumference exceeding 100mm at a height of one (1) metre above ground level for multi-trunk species.

# 2. METHODOLOGY

## 2.1 DATA COLLECTION

**2.1.1** In preparation of this Report a ground level, visual tree assessment (VTA)[2] was undertaken on 14th July, 2009. No aerial (climbing) inspections, woody tissue testing or tree root mapping were undertaken as part of these assessments.

**2.1.2** Attachment C provides definition of terms used in this Report.

**2.1.3** Tree heights were estimated. Trunk diameter at breast height (DBH) was measured at 1.4 metres above ground level and rounded to the nearest 0.1 metre. Structural Root Zones (SRZ) and Tree Protection Zones (TPZ) were also rounded to the nearest 0.5 metre.

**2.1.4** All tree offsets mentioned in this Report are to centre of trunk unless otherwise stated.

## 2.2 IDENTIFICATION OF SUBJECT TREES

**2.2.1** The ten (10) subject trees are those indicated on the Tree Protection Plan (adapted Level 00 Floor Plan, dated 22 June, 2010 prepared by Denton Corker Marshall).

**2.2.2** The subject trees were numbered and labelled on site with white plastic tags as per the Tree Schedule (Attachment A) and Tree Protection Plan (Attachment E).

## 2.3 DOCUMENTS AND PLANS REFERENCED

**2.3.1** The conclusions and recommendations in this Report are based on the *AS4970-2009 Protection of trees on development sites*, the findings from the site inspections, discussions with Denton Corker Marshall representatives and analysis of the following Plans:

- City Broadway Survey Plan, UTS Facilities Management Unit, dated November 2009;
- Denton Corker Marshall Architecturals Job No. 7352, dated 22 June 2010.
- Cardinal Hoarding Mark-up Plan (hand marked) by email from DCM 23.08.10, 1:03pm, showing arrangement of Type A + Type B hoarding.

The Level 00 Floor Plan prepared by Denton Corker Marshall has been used as a base map for the Tree Protection Plan (Attachment E).

**2.3.2** No services drawings were reviewed as part of this assessment. Where possible all services should be routed outside of the TPZ of assessed trees. All machine trenching must be prohibited within the SRZ offsets of retained trees to ensure retention.

[2] VTA – Visual Tree Assessment, undertaken by tree professionals, is a recognised (International Society of Arboriculture, Journal of Arboriculture, Vol. 22 No. 6, Nov. 1996) systematic method of identifying tree characteristics and hazard potential. VTA is also an assessment method described by Claus Mattheck in *The Body Language of Trees – A handbook for failure analysis*. The Stationary Office, London (1994)

## 2.4 AUSTRALIAN STANDARD AS4970-2009

**2.4.1** The Australian Standard *AS 4970–2009 Protection of trees on development sites* has been used as a benchmark in the preparation of this report and the terminology and impact assessment methodology have been adopted from this document. This AIA complies with *2.3.5 Arboricultural Impact Assessment* of AS4970-2009.

**2.4.2** Recommendations have been based on tree ©Retention Value, Vigour, Condition, SULE and construction offsets (refer to Attachment C). Trees with ©Retention Value "A" should be given greater priority for retention than trees with ©Retention Value "C". Trees with Long (40 years +) SULE should be given greater priority for retention than trees with Short (5-15 years) SULE (refer to Attachment C).

**2.4.3** Tree Protection Zone (TPZ) and Structural Root Zone (SRZ) are as per *Section 3* of AS 4970-2009 and are defined at Attachment C of this report.

**2.4.4** "Construction" for the purpose of this AIA means excavation (greater than 100mm), compacted fill or machine trenching[3]. "Excavation" includes cut batters, boxing–out for the various pavement types, trenching for utilities and footings for retaining walls.

**2.4.5** Trees within proposed construction footprints are recommended for removal (**Rm**).

**2.4.6** Where construction is proposed within Structural Root Zone (SRZ) offsets, those trees have been similarly recommended for removal (**Rm**). Fully elevated, pier and beam type construction or hand dug services trenches (or horizontal boring) is however possible within a SRZ.

**2.4.7** Trees with greater than 25% of the Tree Protection Zone (TPZ) impacted by construction are recommended for removal (**Rm**). There are however different types of construction incursions proposed (e.g. fill, cut, services, pavement type, retaining walls) with varying tree impacts likely. Existing constraints to root development also vary. Trees 3, 4, 5, 6 and 7 are likely have their roots confined to the south of the existing wall and planter running along the Broadway boundary. Compacted fill can be equally as damaging to tree longevity: root development is restricted within heavily compacted soils.

**2.4.8** Trees to be retained with construction impacting less than 25% of the TPZ area were rated as Retain Plus (**R+**). Specific construction monitoring will be required for the Retain Plus (**R+**) trees (refer to Recommendations).

**2.4.9** Where construction is proposed beyond the TPZ, those trees are rated as Retain (**R**) with no specific tree protection design or tree protection monitoring required (refer to Attachment D).

[3] "Construction" is equivalent to "works" as defined at 1.4.9 of AS4970-2009.

# 3. SUMMARY AND CONCLUSIONS

## 3.1 SUMMARY

**3.1.1** Of the ten (10) assessed trees adjacent to the subject site, all ten (10) can be retained in the context of the proposed development. Trees 3, 4, 5, 6 and 7 along the southern frontage may require crown pruning to accommodate Type B hoarding during excavation. These trees may also require further pruning to accommodate scaffolding and/or crane access during construction and to accommodate the new building facade. No crown pruning should be required for Type A hoarding for the demolition of existing structures as indicated on the Cardinal Hoarding Mark-up Plan (Attachment F).

**3.1.2** The layout proposed indicates that the existing streetscape amenity will be maintained, with the retention of all of the street trees adjacent to the site.

**3.1.3** The retention of all assessed street trees, in particular Trees 3, 4, 5, 6 and 7 directly adjacent to the site will provide significant vegetative screening of the new building. Tree protection measures will be required during the excavation and construction period.

**3.1.4** As no services plans have been reviewed, we cannot comment on the likely impacts of new or upgraded services within TPZs.

## 3.2 THE ©RETENTION VALUE OF SUBJECT TREES

**3.2.1** Using the TWM ©Retention Index, the subject trees were given a ®Retention Value as outlined in Table 1 below.

**Table 1: ©Retention Value of the Subject Trees**

| ©Retention Value A (Tree Number) | ©Retention Value B (Tree Number) | ©Retention Value C (Tree Number) | ©Retention Value D (Tree Number) |
|---|---|---|---|
| 1, 2, 3, 4, 5, 6, 7, 8, 9, 10 | - | - | - |
| **Total: 10** | **Total: 0** | **Total: 0** | **Total: 0** |

## 3.3 TREE RETENTION

**3.3.1** All of the ten (10) subject trees can be retained.

**3.3.2** The specific retention requirements for these trees are outlined at **4.2** and at Attachment D. These requirements will need to be implemented to facilitate the survival of the retained trees during excavation and construction.

## 3.4 TREE REMOVAL

**3.4.1** None of the assessed trees require removal to facilitate the development.

# 4. RECOMMENDATIONS FOR TREE MANAGEMENT

## 4.1 ARBORIST INVOLVEMENT

**4.1.1** An Arborist (the Project Arborist) experienced in tree protection on construction sites should be engaged prior to the commencement of excavation work on the site. If Type B hoarding is required adjacent to Trees 3-7 on the Broadway frontage, the Project Arborist is to be engaged prior to installation. The Project Arborist will monitor and report regularly to the Principle Certifying Authority (PCA) and the Applicant on the condition and protection of the retained trees. The Project Arborist is to monitor any excavation, machine trenching, compacted fill placed within the TPZ of any retained tree and any pruning works.

**4.1.2** The schedule of works for the development must acknowledge the role of the Project Arborist and the need to protect the retained trees. Sufficient notice must be given to the Arborist where his/her attendance is required. Should the proposed design change from that reviewed, additional arboricultural assessment will be required.

**4.1.3** The Project Arborist should certify tree protection measures at key stages of the excavation and construction. Copies of the certification should be sent to the PCA.

## 4.2 TREE RETENTION

**4.2.1** Trees 1 and 2 located in the traffic island of Wattle Street are to be retained. The extent of the crown spread of Tree 1 (Hills Fig, *Ficus microcarpa var. Hillii*) is approximately 3 - 4 metres from the existing facade of the former Regent Hotel. The canopy of Tree 2 (Kaffir Plum, *Harpephyllum caffrum*) skews away from the subject site to the southwest. As the proposed development does not extend past the existing facade, demolition, excavation and construction works, including the erection of hoarding and/or scaffolding, are not likely to impact upon or require canopy pruning of Trees 1 and 2.

Trees 8, 9 and 10 located in the verge east of Jones Street are to be retained and similarly, are not likely to be impacted upon the excavation and construction works, (including the erection of hoarding and/or scaffolding) and are not likely to require canopy pruning.

**4.2.2 TPZ Construction: Trees 3, 4, 5, 6 and 7**

Trees 3, 4, 5, 6 and 7 (London Plane Tree, *Platanus x hybrida*) are located along the Broadway street frontage. It is expected that these trees will have most of their roots confined to the south of the site boundary by the foundations of the existing wall and planter. Feeder roots will be concentrated in the bedding sand layer beneath the existing footpath and underlying services easement.

No services improvement works or landscape works are indicated on the plans within the road reserve of Broadway, however if works are proposed, care must be taken to minimise root disturbance of Trees 3 - 7. Where possible, existing services trenches are to be used and the soil available for tree root development should be increased. If excavation is proposed within the TPZ offsets of these trees, it should be undertaken by hand. It is recommended that any trip hazards resulting from existing pavement uplift caused by Trees 3 - 7 be rectified if any streetscape and/or pavement re-establishment works are proposed.

#### 4.2.3 Canopy Pruning: Trees 3, 4, 5, 6 and 7

Trees 3, 4, 5, 6 and 7 may require pruning to accommodate the piling at the southern boundary, the erection of hoarding, scaffolding, temporary crane access and the proposed building facade. As part of the approved demolition works, Type A Hoarding is required to be erected. Further, Type B Hoarding (overhead protective structure), scaffolding and possibly temporary crane access may be required to accommodate the construction and excavation works. To facilitate these works, consideration is to be given to minimising pruning of the crown of these trees.

Prior to the erection of any hoarding or scaffolding, the Project Arborist should be engaged to determine the extent of pruning required. The hoarding is to be compliant with City Of Sydney (CoS) *Policy for Design of Construction Hoardings*. As there is a requirement for Type B Hoarding along Broadway, conflicts exist with trunks and canopies of Trees 3 - 8. All possible efforts are to be made to minimise canopy pruning. The typical canopy spread of these trees is shown in Photo C.

The vertical structure and counterweight elements should be positioned clear of trees. The design of the horizontal overhead element and placement of sheds and offices should avoid the trees where possible.

If pruning is required, to one tree, consideration should be given to undertaking comparable pruning to the others, so as to maintain symmetry to the planting.

In the event that required hoarding cannot be erected without extensive canopy pruning, tree removal and replacement may be considered with consultation with CoS Tree Managers.

If crown pruning is required, it is to comply with Australian Standard AS4373-2007: *Pruning of Amenity Trees.* Limb removal should be minimised wherever possible. Wrapping limbs to reduce rubbing damage is to be undertaken where needed.

All canopy pruning is to be undertaken by suitably qualified (min. AQF Level 3) Arborists under the direction of the Project Arborist (min. AQF Level 5). All pruning works are to comply with WorkCover NSW Code of Practice for the Amenity Tree Industry, 1998.

There should be no canopy pruning undertaken unless approved by the DA Consent or by CoS Council Consent.

#### 4.2.4 Tree Protection Plan

Tree Protection Plan (Attachment E) should be kept in the site office during the construction period to guide the tree protection procedures..

## 4.3 TREE REMOVAL

**4.3.1** As all the subject trees are located outside of the site boundary and are not likely to be significantly impacted by construction activities or associated works, none require removal.

**4.3.2** All assessed trees were in Good to Fair condition with Medium (15-40 years) Safe Useful Life Expectancy (SULE).

## 4.4 SERVICES PLANS

**4.4.1** It should be noted that no hydraulics, stormwater, electrical, communications and other services plans were reviewed as part of this assessment. Any future trenching works associated with upgrading of services required by the proposed development will need to be reviewed with regard to protection of trees.

**4.4.2** If required, services trenching where possible are to be routed outside TPZ offsets. Where this is not possible, horizontal boring or hand digging will be required following arboricultural review. Trench openings within TPZ offsets should be minimised wherever possible.

## 4.5 LANDSCAPE PLANS

**4.5.1** No Landscape Plans were reviewed as part of this assessment. If undertaken, the proposed landscaping adjacent to the retained trees should aim, to maintain existing soil levels, moisture and nutrient status within the TPZ.

# Attachment A: Tree Schedule

## Tree Schedule - Broadway Building, Broadway

| TREE No. | COMMON NAME/ GENUS SPECIES | DBH (m) | HEIGHT (m) | CANOPY RADIUS (m) | No. BRANCHES X-ING BOUNDARY (mm) | AGE CLASS | VIGOUR | CONDITION | SRZ RADIUS (m) | TPZ RADIUS (m) | SULE | ©SIG RATING | ©RETENTION INDEX | RECOMMENDATION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Hills Fig, *Ficus microcarpa var. Hillii* | 1.3 | 17 | N14, S12, E16, W17 | N/A | M | G | G | 3.7 | 15.0 | M | 1 | A | R+ | *Listed on CoS register of Significant Trees. Crossing limb at 6m east side. Growing in narrow mulched bed within island. Canopy extends to building west side. Powerline through canopy SE. Bark wound south side.* |
| 2 | Kaffir Plum, *Harpephyllum caffrum* | 0.8 | 11 | N2, S6, E8, W10 | N/A | M | G | F | 3.0 | 9.2 | M | 1 | A | R+ | *Canopy skew to south west away from Tree 1. Growing in triangular planter 8 x 18m within island.* |
| 3 | London Plane Tree, *Platanus x hybrida* | 0.5 | 15 | 7 | 1x100, 5x50 | SM | G | G | 2.5 | 5.9 | M | 2 | A | R+ | *Trunk wound kerb side. Slight uplift of kerb stone. Root run to NW across bitumen path.* |
| 4 | London Plane Tree, *Platanus x hybrida* | 0.5 | 15 | 7 | 3x100, 4x50 | SM | G | G | 2.4 | 5.4 | M | 2 | A | R+ | *Slight pavement lift east side.* |
| 5 | London Plane Tree, *Platanus x hybrida* | 0.4 | 15 | 7 | 5x50 | SM | G | G | 2.2 | 4.7 | M | 2 | A | R+ | *Major trunk wound from 1.5m - 4m due to vehicle damage. Root run to NW.* |
| 6 | London Plane Tree, *Platanus x hybrida* | 0.4 | 15 | 7 | 3x100 | SM | G | G | 2.2 | 4.6 | M | 2 | A | R+ | *Root run to NE. Pavement uplift NW corner of tree opening.* |
| 7 | London Plane Tree, *Platanus x hybrida* | 0.5 | 16 | 8 | 4x50 | SM | G | G | 2.5 | 6.1 | M | 2 | A | R+ | *Tree pit opening 2m x 1m. Recent pavement repairs.* |
| 8 | London Plane Tree, *Platanus x hybrida* | 0.7 | 17 | 8 | N/A | SM | G | G | 2.8 | 8.3 | M | 2 | A | R+ | *Two benches at base in mounded, mulched triangular bed. Unit paving raised SE side. Recent pruning south side at 3m.* |
| 9 | London Plane Tree, *Platanus x hybrida* | 0.4 | 18 | 6 | N/A | SM | F | F | 2.3 | 5.3 | M | 2 | A | R+ | *Raised unit pavers east side. Form supressed by 2 adjoining trees.* |
| 10 | London Plane Tree, Platanus x hybrida | 0.6 | 18 | N8, S3, E7, W10 | N/A | SM | G | G | 2.7 | 7.3 | M | 2 | A | R+ | *Unit pavers raised east and north side. Tree within triangular bed.* |
| **10** | | | | | | | | | | | | | | | |

| TREE No. | COMMON NAME/ GENUS SPECIES | DBH (m) | HEIGHT (m) | CANOPY RADIUS (m) | No. BRANCHES X-ING BOUNDARY (mm) | AGE CLASS | VIGOUR | CONDITION | SRZ RADIUS (m) | TPZ RADIUS (m) | SULE | ©SIG RATING | ©RETENTION INDEX | RECOMMENDATION | COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|

| ©SIG. RATING | NO. OF TREES |
|---|---|
| 1 | 2 |
| 2 | 8 |
| 3 | 0 |
| 4 | 0 |

| ©RETENTION INDEX | |
|---|---|
| A | 10 |
| B | 0 |
| C | 0 |
| D | 0 |

| RECOMMENDATION | NO. OF TREES |
|---|---|
| R | 0 |
| R+ | 10 |
| T | 0 |
| Rm | 0 |

**COMMON NAME/GENUS SPECIES CULTIVAR -** Common names can vary with selected texts. Where species is unknown, "*sp*." indicated after genus. Where cultivar is unknown "*cv*" indicated after species. The number in brackets e.g. (x9) after the species indicates the number of trees in this tree group.

**DBH - Diameter at Breast Height.** Tree trunk diameter measured at breast height (1.4 metres above ground level). Fabric diameter tape is used which assumes a circular cross section. Multiple measurements indicate multiple trunks. More than three trunks are indicated as "multi". Where DBH measurement cannot be taken at 1.4m the height at which it has been taken is indicated in the Comments column.

**CANOPY RADIUS –** Average canopy radius (widest + narrowest ÷ 2). Circular canopy depictions on Tree Plan/Survey are indicative only. Where canopy spread was significantly skewed, all four cardinal point measurements were recorded.

**AGE CLASS** - **Immature (IM), Semi-mature (SM), Mature (M), Over-mature (OM).** Assessment of the tree's current Age. A **Mature (M)** tree has reached a near stable size (biomass) above and below ground. Trees can have a Mature age class for >90% of life span. **Over-mature (OM)** trees show symptoms of irreversible decline and decreasing biomass.

**VIGOUR - Good (G), Fair (F) or Poor (P).** The general appearance of the canopy/foliage of the tree at the time of inspection. Vigour can vary with the season and rainfall frequency. A tree can have Good vigour but be hazardous due to Poor condition. A tree in Good vigour has the ability to sustain its life processes. Vigour is synonymous with health.

**CONDITION** - **Good (G), Fair (F) or Poor (P).** The general form and structure of the trunk/s and branching. Trunk lean, trunk/branch structural defects, canopy skewness or other hazard features are considered.

**SRZ RADIUS - Structural Root Zone.** The area around a tree required for tree stability. Earthworks should be prohibited within the SRZ.. The area is calculated from the formula and graph at Figure 1 of AS4970-2009. The SRZ graph has been adapted from the work of Claus Mattheck (1994). DBH has been used instead of stem diameter above root buttress in the calculation of SRZ. 0.1m has been added to SRZ to allow for minor increases in stem diameter.

**TPZ RADIUS – Tree Protection Zone.** Radial offset (m) of twelve times (12X) trunk DBH measured from centre of trunk (for trees less than 0.3 metre DBH minimum TPZ is 2.0 metres). To satisfactorily retain the tree construction activity (both soil cut and fill) must be restricted within this offset. TPZ offsets are rounded to the nearest 0.1 metre. Existing constraints to root spread can vary TPZ. Generally an area equivalent to the TPZ should be available to the tree post development. Encroachment occupying up to 10% of the TPZ area is acceptable without detailed rootzone assessment. Encroachments greater than 10% require specific arboricultural assessment.

**SULE - Safe Useful Life Expectancy.** A systematic pre-development tree assessment procedure developed by Jeremy Barrell, Hampshire, England. The SULE method used in this assessment has been adapted for simplified use within the field. It gives a length of time that the Arborist feels a particular tree can be retained with an acceptable level of risk based on the information available at the time of the inspection. SULE ratings are **Long** (retainable for 40 years or more with an acceptable level of risk), **Medium** (retainable for 16-39 years), **Short** (retainable for 5-15 years) and **Removal** (tree requiring immediate removal due to imminent hazard or absolute unsuitability).

**©SIG. RATING - ©Significance Rating Scale (see Appendix C)**

**©RETENTION INDEX (see Appendix C)**

**RECOMMENDATIONS -** Retain ***(R)***, ***Retain Plus (R+)***, ***Transplant* (T)** or ***Remove (Rm)***.

**COMMENTS -** Comments relating to the location, surroundings and hazard potential of the trees at the time of inspection and where applicable the reason for removal.

# Attachment B: Site Photographs

**Photo A:** Looking south east towards Tree 1, Hills Fig, *Ficus microcarpa var. Hillii*, listed as a Significant Street Tree (Precinct 14: Ultimo). The subject site is to the LHS.

**Photo B:** Looking south towards Tree 1, showing the proximity of the crown spread in relation to the facade of the former Regent Hotel.

**Photo C:** Trees 3 - 7 along Broadway frontage located adjacent to the existing wall and planter along south boundary. Note canopy overhang of southern boundary and root runs and pavement uplifting.

**Photo D:** Looking south towards Trees 8, 9 and 10 showing the proximity of the crown spread in relation to the facade of the Bradshaw Building on RHS.

# Attachment C: Definition of Terms

**COMMON NAME/GENUS SPECIES CULTIVAR –** Common names can vary with selected texts. Where species is unknown, "*sp*." indicated after genus. Where cultivar is unknown "*cv*" indicated after species. The number in brackets e.g. (x9) after the species indicates the number of trees in this tree group.

**DBH – Diameter at Breast Height.** Tree trunk diameter measured at breast height (1.4 metres above ground level). Fabric diameter tape is used which assumes a circular cross section. Multiple measurements indicate multiple trunks. More than three trunks are indicated as "multi". Where DBH measurement cannot be taken at 1.4m the height at which it has been taken is indicated in the Comments column.

**CANOPY SPREAD RADIUS –** Average canopy radius (widest + narrowest ÷ 2). Circular canopy depictions on Tree Plan/Survey are indicative only. Where canopy spread was significantly skewed, all four cardinal point measurements were recorded.

**AGE CLASS – Immature (IM), Semi-mature (SM), Mature (M), Over-mature (OM).** Assessment of the tree's current Age. A **Mature (M)** tree has reached a near stable size (biomass) above and below ground. Trees can have a Mature age class for >90% of life span. **Over-mature (OM)** trees show symptoms of irreversible decline and decreasing biomass.

**VIGOUR – Good (G), Fair (F) or Poor (P).** The general appearance of the canopy/foliage of the tree at the time of inspection. Vigour can vary with the season and rainfall frequency. A tree can have Good vigour but be hazardous due to Poor condition. A tree in Good vigour has the ability to sustain its life processes. Vigour is synonymous with health.

**CONDITION – Good (G), Fair (F) or Poor (P).** The general form and structure of the trunk/s and branching. Trunk lean, trunk/branch structural defects, canopy skewness or other hazard features are considered.

**SRZ RADIUS – Structural Root Zone.** The area around a tree required for tree stability. Earthworks should be prohibited within the SRZ. The area is calculated from the formula and graph at Figure 1 of AS4970-2009. The SRZ graph has been adapted from the work of Claus Mattheck (1994). DBH has been used instead of stem diameter above root buttress in the calculation of SRZ. 0.1m has been added to SRZ to allow for minor increases in stem diameter.

**TPZ RADIUS – Tree Protection Zone.** Radial offset (m) of twelve times (12X) trunk DBH measured from centre of trunk (for trees less than 0.3 metre DBH minimum TPZ is 2.0 metres). To satisfactorily retain the tree construction activity (both soil cut and fill) must be restricted within this offset. TPZ offsets are rounded to the nearest 0.1 metre. Existing constraints to root spread can vary TPZ. Generally an area equivalent to the TPZ should be available to the tree post development. Encroachment occupying up to 10% of the TPZ area is acceptable without detailed rootzone assessment. Encroachments greater than 10% require specific arboricultural assessment.

**SULE – Safe Useful Life Expectancy.** A systematic pre-development tree assessment procedure developed by Jeremy Barrell, Hampshire, England. The SULE method used in this assessment has been adapted for simplified use within the field. It gives a length of time that the Arborist feels a particular tree can be retained with an acceptable level of risk based on the information available at the time of the inspection. SULE ratings are **Long** (retainable for 40 years or more with an acceptable level of risk), **Medium** (retainable for 16-39 years), **Short** (retainable for 5-15 years) and **Removal** (tree requiring immediate removal due to imminent hazard or absolute unsuitability).

**©SIG. RATING – ©Significance Rating Scale (see notes over)**

**©RETENTION INDEX (see notes over)**

**RECOMMENDATIONS –** Retain ***(R)***, ***Retain Plus (R+)***, ***Transplant* (T)** or ***Remove (Rm)***.

**COMMENTS –** Comments relating to the location, surroundings and hazard potential of the trees at the time of inspection and where applicable the reason for removal.

**©SIG. RATING – ©Significance Rating Scale.** A site specific qualitative evaluation of a tree relative to the existing landuse developed by Tree Wise Men® Australia Pty Ltd. Takes into consideration the impact of the tree on the surrounding landscape, streetscape and bushland. Rarity, habitat value, historical/cultural value and structural form of the tree are considered in this rating system. It is possible for a tree to have a Short SULE and a ©Significance Rating of 1. Likewise it is possible for a tree to be given a Long SULE and a ©Significance Rating of 4 (e.g. weed species). The ©Significance Ratings used in this Report are as outlined in Table 1.

**Table 2: ©Significance Rating Characteristics**

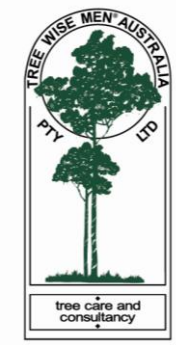
| Rating | Significance | Characteristics (some or all) |
|---|---|---|
| **©Sig. Rating 1** | **Exceptional** | ▪ Major contribution to site amenity<br>▪ Remnant specimen<br>▪ Heritage Listed<br>▪ Listed on Significant Tree Register<br>▪ Threatened Species<br>▪ Good vigour and condition<br>▪ Cultural significance<br>▪ Possible habitat for threatened fauna<br>▪ Excellent, well formed specimen<br>▪ Rare or unusual species<br>▪ Large above ground biomass<br>▪ Unique within the site and surrounds |
| **©Sig. Rating 2** | **High** | ▪ Considerable contribution to site amenity<br>▪ Remnant specimen<br>▪ Good vigour and condition<br>▪ Threatened Species<br>▪ Cultural significance<br>▪ Possible habitat tree for threatened fauna<br>▪ Well formed specimen<br>▪ Rare or unusual species<br>▪ Large or moderate above ground biomass<br>▪ Other specimens with similar characteristics within the site and surrounds |
| **©Sig. Rating 3** | **Moderate** | ▪ Minor contribution to site amenity<br>▪ Remnant or planted<br>▪ Fair or Poor vigour and condition<br>▪ Potential for growth<br>▪ Well formed or asymmetrical form<br>▪ Other specimens with similar characteristics within the site and surrounds |
| **©Sig. Rating 4** | **Low** | ▪ Small/poor specimen<br>▪ Poor vigour and condition<br>▪ Inappropriate for the location<br>▪ Minor contribution to landscape amenity<br>▪ Easily replaced<br>▪ Weed species or TPO Exempt<br>▪ Hazardous<br>▪ Previously ©Sig. Rating 5 tree |

**©RETENTION INDEX.** A site specific assessment of an individual tree's retention value developed by Tree Wise Men® Australia Pty Ltd. Incorporating SULE and ©Significance Rating each tree is allocated a retention value of A, B, C or D. The ©Retention Index values can be described as follows:

| | | |
|---|---|---|
| **©Retention Value A** | **Should be retained** | ▪ Major redesign may be required (e.g. movement of building footprint, re-alignment of roadway). |
| **©Retention Value B** | **Could be retained** | ▪ Minor redesign may be required (e.g. level changes, pavement detail). |
| **©Retention Value C** | **Could be removed** | ▪ Should not constrain proposed development. |
| **©Retention Value D** | **Should be removed or permanently fenced off (irrespective of development layout.)** | ▪ Imminently dangerous.<br>▪ In an irreversible state of decline. |

| **©Retention Index** | | **©Significance Rating** | | | |
|---|---|---|---|---|---|
| | | **1** | **2** | **3** | **4** |
| **SULE Rating** | **Long (40+ years)** | **A** | | **B** | **C** |
| | **Medium (15-40 years)** | | | | |
| | **Short (5-15 years)** | **B** | | | |
| | **Remove (< 5 years)** | **D** | | | |

# Attachment D: Tree Protection Requirements (Generic)

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## TREE PROTECTION REQUIREMENTS GENERIC

The following generic tree protection requirements (TWMP1-TWMP12) should be implemented to minimise the impact of the proposed redevelopment on the retained trees. These requirements shall be implemented during the construction period in the event that no tree–specific requirements are detailed. Tree Protection Requirements should comply with Section 4 Tree Protection Measures of AS4970-2009.

**TWMP1 – Arborist Involvement.** An Arborist (the project arborist) experienced in tree protection on construction sites shall be engaged prior to the commencement of work on the site. The Arborist's tasks will be to monitor and report regularly to the PCA and the Applicant on the condition of the retained trees. The Project Arborist shall be present to supervise any excavation, trenching or tunnelling within the TPZ of any retained trees.

The schedule of works for the development shall acknowledge the role of the Project Arborist and the need to protect the retained trees. Sufficient notice shall be given to the Arborist where his/her attendance is required. Should the proposed design change from that reviewed, additional arboricultural assessment will be required.

**TWMP2 – Tree Pruning and Removal.** All tree pruning (including root pruning) and tree removal shall be carried out by a qualified and experienced Arborist to Australian Standard AS4373-2007, "Pruning of Amenity Trees" and the WorkCover Code of Practice for the Amenity Tree Industry, 1998.

Stump grinding (rather than complete "grubbing") of rootballs shall be performed when those stumps are within the TPZ of retained trees. This will minimise unnecessary root damage. Unnecessary damage often occurs to retained trees when undertaken by earthmoving machinery.

**TWMP3 – Mulching.** If construction is proposed within TPZ offsets mulching is required. Mulch to a depth of 100 millimetres using composted green waste mulch. The mulch should be free of weed seeds and other contaminants. Should constant access be required within the trees' TPZs, outside the protective fencing, heavier mulch should be spread to a depth no greater than 100 millimetres to reduce soil compaction.

**TWMP4 – Temporary Irrigation.** Where construction related activity or root cutting is proposed within the TPZ of retained trees, temporary irrigation or water cart access shall be provided to the remaining unimpacted TPZ areas to maintain adequate soil moisture levels. Delivery volumes are to allow for mulch layer and recent rainfall.

**TWMP5 – Tree Protection Fencing.** The retained trees shall be protected by means of fencing prior to commencement of demolition (including tree removal) or bulk earthworks.

It should be constructed from 1.8 metre high chain link wire or welded mesh suspended by galvanised steel pipe or equivalent and enclose the TPZ or the equivalent area allowing for building alignments.

The location of the fence should be determined at a site meeting between the Civil Contractor and the site Arborist to prevent the need to move the fencing during construction. The area enclosed shall be mulched (TWMP3) and irrigated (TWMP4) and kept free from all building materials, contaminants and other debris and shall not be used for storage of any building materials. If scaffolding is required within a tree protection zone the ground is to be mulched.

**TWMP6 – Scaffolding.** If scaffolding or hoarding is required with TPZ.

**TWMP7 – Bulk Earthworks.** To prevent unnecessary root damage walk machinery within defined haul routes beyond TPZs wherever possible. The excavation shall be carried out under the supervision of the site Arborist. All roots within TPZ of retained trees are to be hand cut prior to machine cutting. Immediately following excavation the face of the cut within the TPZ shall be draped and maintained moist until backfilled. This should be done using a 10mm thick jute matting pinned at ground level and allowed to cover the full depth of the rootzone excavation.

There is to be no soil battering or unnecessary over excavation within TPZ offsets. Topsoil stripping should be restricted wherever possible within TPZ offsets by means of appropriate engineering solutions.

**TWMP8 – Prevention of Soil Compaction.** During the construction period there may be considerable traffic movement associated with general building activities. The resultant soil compaction and possible contamination of the soil can have an equally detrimental impact on the tree as does the severing and exposing of the roots during excavation.

Specific access tracks for machinery should be determined through consultation between the Civil Contractor and the Project Arborist. Should heavy vehicle movement be required within a retained tree's PRZ, a track should be formed at grade using large diameter (up to 100mm) recycled railway ballast (true basalt) over a geofabric or a corduroy of heavy timbers.

**TWMP9 – Trunk Protection.** Lengths of timber (75mm x 50mm x 2000mm) shall be used to protect a tree's trunk if construction or traffic is proposed within its SRZ and the tree cannot be fenced. The lengths of timber should be fastened around the trunk at 200 millimetre centres with hoop iron strapping or similar.

**TWMP10 – Prevention of Soil Inversion.** Care shall be taken to avoid inversion of the soil layers on the site and particularly within TPZs, as clays placed over coarse textured soils will reduce water infiltration, creating a perched water table. Decline and/or death of underlying tree roots are expected due to moisture stress.

**TWMP11 – Services.** Trenching for services is to be regarded as "construction". Trenching within TPZ offsets should be avoided wherever possible to ensure <20% root loss (of TPZ) occurs on retained trees. Directional ("trenchless") boring or suspension of services should be used wherever possible. Where trenching is to occur within TPZ offsets, it is to be undertaken by hand to rock with no roots >50mm to be cut, under supervision of the Project Arborist.

**TWMP12 – Signs.** Signs as indicated below should be placed at regular intervals (min. 15 metres) on tree protection fencing.

# Attachment E: Tree Protection Plan

**Notes:**
1. Tree impact assessment has been considered in relation to *AS4970-2009 Protection of trees on development sites*.

2. This Tree Protection Plan is equivalent to the Development Submission identified in Table 1, AS4079-2009.

3. Tree impact assessment includes likely impacts from development including: building platforms, driveways/accessways and services/infrastructure installation.

4. A ***Project Arborist*** with minimum AQF Level 5 qualifications is to be engaged to monitor and report regularly on works adjacent to trees.

5. This ***Tree Protection Plan*** should be incorporated into the site Construction Management Plan and the Sediment Control Plan.

6. ***Tree Protection Fencing*** to be installed prior to demolition of existing structures or other site preparation works. Tree Protection Fencing should comprise of chainlink wire or wire mesh panels as per Figure 3 of AS4970-2009. The following activities are to be prohibited within tree protection fencing: topsoil stripping, excavation, placement of soil fill, stockpiling of any materials, placement of site sheds/offices, parking of heavy machinery, placement of machinery haul roads.

7. If ***scaffolding*** or hoarding is required within TPZ, install as shown in Figure 3 of AS4970-2009.

8. Services installation to be supervised by a AQF Level 5 qualified Arborist. No roots greater than 50mm diameter are to be cut or damaged.

9. ***Trunk battening*** to be installed to trees within and adjacent to the proposed sewer easement or where works are required within Tree Protection Fencing. Battening to comply with Figure 4 of AS4970-2009.

10. All ***tree pruning*** is to comply with AS4373-2007, Pruning of Amenity Trees. All approved tree removal is to comply with Work Cover Code of Practice for the Amenity Tree Industry.

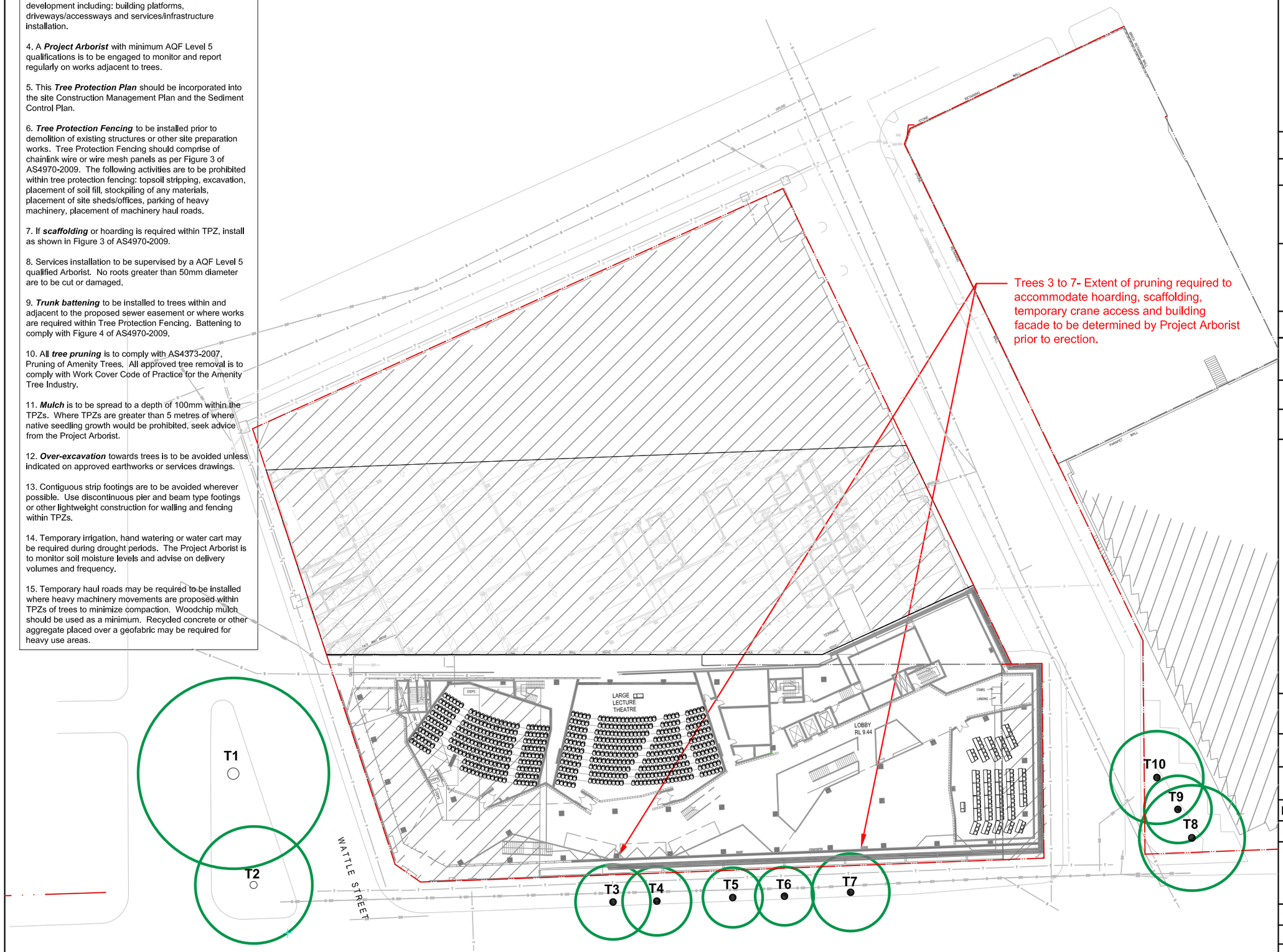
11. ***Mulch*** is to be spread to a depth of 100mm within the TPZs. Where TPZs are greater than 5 metres of where native seedling growth would be prohibited, seek advice from the Project Arborist.

12. ***Over-excavation*** towards trees is to be avoided unless indicated on approved earthworks or services drawings.

13. Contiguous strip footings are to be avoided wherever possible. Use discontinuous pier and beam type footings or other lightweight construction for walling and fencing within TPZs.

14. Temporary irrigation, hand watering or water cart may be required during drought periods. The Project Arborist is to monitor soil moisture levels and advise on delivery volumes and frequency.

15. Temporary haul roads may be required to be installed where heavy machinery movements are proposed within TPZs of trees to minimize compaction. Woodchip mulch should be used as a minimum. Recycled concrete or other aggregate placed over a geofabric may be required for heavy use areas.





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## LEGEND

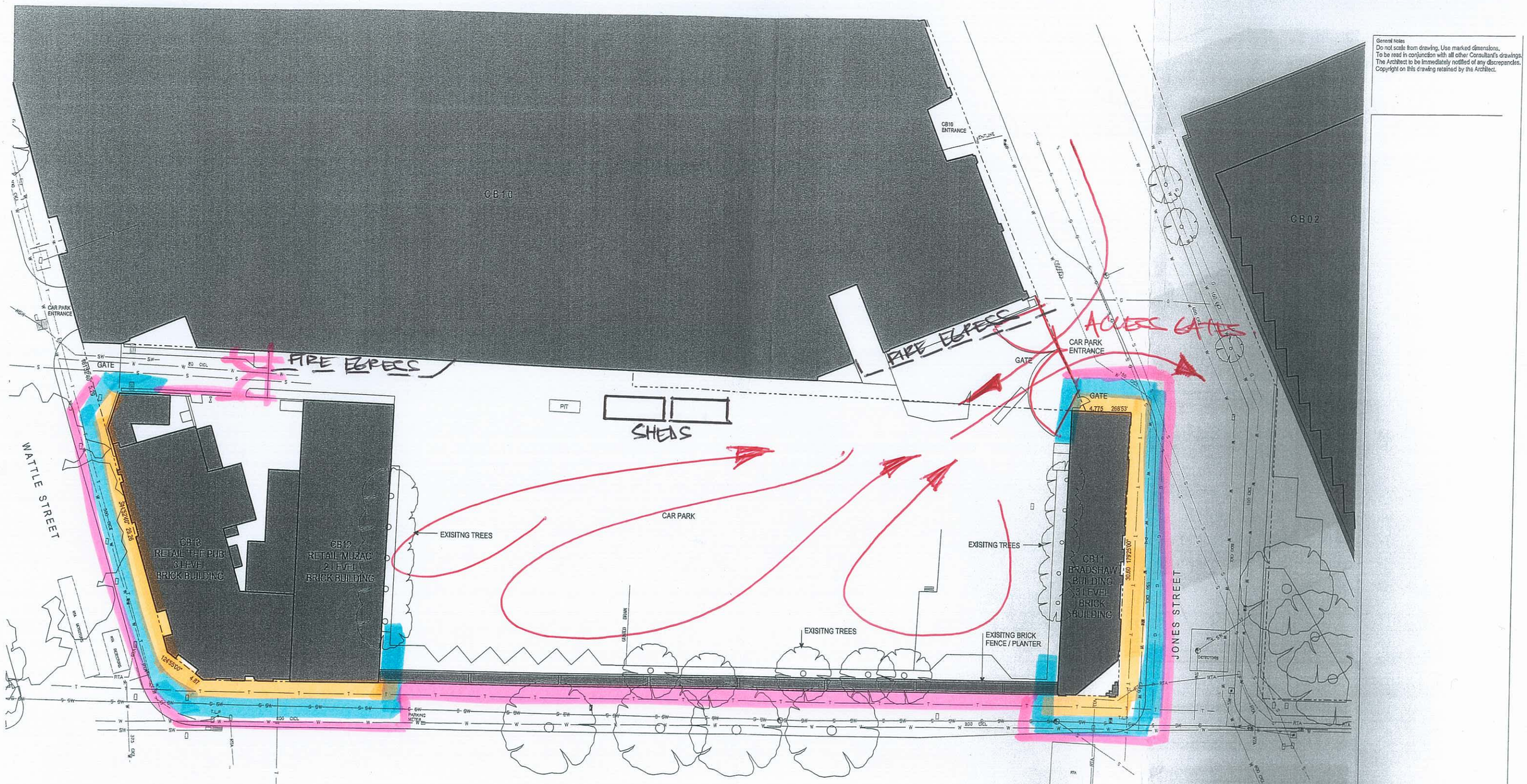
| | |
|---|---|
| Site boundary: | |
| Tree number with trunk as plotted on Site Survey: | T5 ● |
| Tree number with trunk not plotted on Site Survey (approximate location shown): | T2 ○ |
| ©Retention Value A TPZ: | |
| Arborist supervision required: | |
| Protective fencing: | |
| Crown protection: | |

| | |
|---|---|
| TITLE: | **©TREE PROTECTION PLAN** |
| CLIENT: | UNIVERSITY OF TECHNOLOGY, SYDNEY |
| PROJECT: | UTS BROADWAY BUILDING, BROADWAY |
| DRAWING NO: | 2079TPP |
| DRAWN BY: | RF |
| BASED ON: | CITY BROADWAY SURVEY PLAN, UTS FACILITIES MANAGMENT UNIT, DATED NOVEMBER 2009 |
| DATE: | 30.07.10 REV: A |
| SCALE: | 1:600@A3 |

5 20 30 meters

N

# Attachment F: Cardinal Hoarding Mark-up Plan (undated) (Supplied by DCM 23.08.10)




LEGEND.

B CLASS HOARDING.

SCAFFOLD ONTOP OF B CLASS HOARDING

A CLASS HOARDING ON COMPLETION & REMOVAL OF B CLASS

ATF FENCING.

TRUCK MOVEMENTS.

General Notes
Do not scale from drawing. Use marked dimensions.
To be read in conjunction with all other Consultant's drawings.
The Architect to be immediately notified of any discrepancies.


Deniz Bekir
Project Manager

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| No. | Date | Dwn | Chk | App | Revision or reason for issue |
|---|---|---|---|---|---|

| No. | Date | Dwn | Chk | App | Revision or reason for issue |
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| No. | Date | Dwn | Chk | App | Revision or reason for issue |
|---|---|---|---|---|---|

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Project Title
**UTS BROADWAY BUILDING**
UNIVERSITY OF TECHNOLOGY, SYDNEY

Drawing Title
**EXISTING SITE PLAN**

Drawing File Name
**CB11EXAP**
Project Number
**7352**
Drawing File Number
**20002**
CAD Reference
0_A_PLS1
Revision
**A**
Date

Key Plan

Scale / North Point
1:200 @ A1
1:400 @ A3
0 2 4 6 10M