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ARBORICULTURAL ASSESSMENT – BUILDING A

S75W Proposal for Approved Development:

Stage 1 Works, 120-128 Herring Road, Macquarie Park, NSW

Prepared for Toga Macquarie Developments Pty Ltd

45 Jones Street, Ultimo. NSW

Prepared by Catriona Mackenzie

10 August, 2012

INTRODUCTION

1. The development approval for Building A issued by the NSW Department of Planning and Infrastructure on 25 January, 2012 to develop land for residential purposes at 120-128 Herring Road, Macquarie Park ("Site"), includes the retention of a number of trees ("the trees") identified on an approved Tree Management Plan, as per the Concept Plan Approval MP09_0195.

2. Prior to the commencement of approved works on the site, conflicts between the retention of the trees and the construction of the approved buildings and ancillary structures were identified by members of the project management team of Toga Group.

3. An on-site meeting was arranged between consulting arboriculturist Catriona Mackenzie of Urban Forestry Australia ("UFA") and Toga Group Design Manager Donna Pye and Project Manager Stephen Jakubiw, to consider the issues raised regarding construction and tree retention.

4. UFA undertook limited, ground level inspections of the potentially affected trees, a general assessment of the current site features, and reviewed documentation pertaining to the approved site development.

5. This report assesses the approved development in relation to concerns raised by Toga Group in regards to the impacts on four (4) trees to be retained. This report provides recommendations for the removal or retention of the trees based on the findings of UFA. These issues can be briefly summarised as;

   5.1 Impacts of works on the safe and viable retention of Trees 25, 26 and 27,
   5.2 Impacts of excavation for on-site detention basin ("OSD") on the safe and viable retention of Tree 28.

6. UFA has also identified a tree (Tree 24) that affects the safety of future residents and provides advice on that matter in this report.

7. This report is not intended to replace or supersede the recommendations for protection of trees in the Tree Report by Treescan ("TS"), March 2010, prepared for the initial development application. However, this report does provide additional tree protections recommendations where deemed appropriate and these are intended to be adopted in conjunction with those of the TS report.

DOCUMENT REVIEW

8. I have reviewed the following documentation in preparation of this Report:
   - 8.1 Instrument of Approval MP09_0218, 25 January, 2012, NSW Department of Planning & Infrastructure,
   - 8.2 Tree Management Plan ("TMP"), Dwg. L5, Rev. E, dated 24/09/10, prepared by Turf Design Landscape Architects,
   - 8.3 TMP. Dwg LP-3, Rev. C, dated 09.08.12, prepared by Turf Design Landscape Architects,
   - 8.4 Tree Report, dated March, 2010, prepared by Treescan,
   - 8.5 Marked up excerpts of Set-out plans for works near the subject trees, provided by Donna Pye of Toga Group.

OBSERVATIONS AND DISCUSSION

9. Tree 24 – *Erythrina x sykesii* (Common Coral-tree)

   During the site inspection and review of the TMP, UFA noted this tree is to be retained. This tree was not raised as an issue at the site meeting between UFA and Toga Group. However, it is my opinion the tree is an unsuitable specimen for retention in this development for the reasons set out below.
   - 9.1 The species is well known for its soft, brittle wood and proneness to branch drop.
   - 9.2 The branches and twigs of the species are covered in hard, sharp thorns.
   - 9.3 This specimen is currently buffered from strong westerly winds by several trees that are to be removed.
   - 9.4 This specimen is proposed to be retained within 2m of the approved swimming pool.

10. Tree 24 will be suddenly exposed to unaccustomed wind forces after the removal of trees protecting it, and the risk of brittle branch failures will increase. The pool will be a high use area, particularly in the warmer months. The proximity of the tree to the pool and the species propensity for branch failures raises safety concerns in regards to personal injury.

11. For the above reasons, UFA believes the tree is unsuitable for retention in this residential development.

12. Tree 25 – *Angophora costata* (Smooth-barked Apple)
Note: The tree is identified as *Eucalyptus scoparia* (Wallangarra White Gum) in the TMP.
This tree has a *Diameter at Breast Height* ("DBH")[1] of 300mm. Using the formula in s.3.3.5 of AS4970-2009 *Protection of trees on development sites* ("AS4970")[2], the notional *Structural Root Zone* ("SRZ")[3] is a radial offset of 2.2m from the centre of the tree. No works are identified in the SRZ.

13. The proposed pedestrian path to the south of the tree would result in a small encroachment into the notional 3.6m *Tree Protection Zone* ("TPZ")[4]. UFA estimates the encroachment to be slightly more than 3m2, or 7.75%. Under s.3.3.2 of AS4970, a 10% encroachment into the TPZ is considered to be minor. The proposed works are unlikely to have any long term impact on the tree's vigour and viability on the site.

14. Tree 26 – *Eucalyptus racemosa* (Scribbly Gum)
Note: The tree is identified as *E. haemastoma* (Scribbly Gum) in the TMP.
This tree has a DBH of 800mm. Its SRZ is a radial offset of 3.2m. Works identified in the SRZ are a strip footing for a planter at the east side of the building and a pedestrian path providing access to Herring Road (Figure 1, page 7).

15. Despite the very small portion of the notional SRZ that projects into the planter wall footprint, it is possible *woody roots*[5] are present and would be severed or damaged for the wall construction. Given the base RL of the wall is similar to the RL of the tree, there is scope to retain significant roots by bridging them with a lintel supported on the footings. An arboriculturist will need to supervise this work to ensure anchor roots are not damaged during initial investigation to locate important roots and the subsequent method of footing construction used to avoid damage to those roots.

16. The proposed path is well inside the SRZ. It is most likely this path will need to be constructed to avoid any excavation into the root zone. The existing ground is relatively level in the tree's vicinity, so it appears the path could be installed to sit on top of the ground, with very minor depth of fill to camber up to the path edge. Even if the path is of an impermeable surface, if installed on the existing ground the impact will be minor, avoid cutting of woody roots and allow generation of smaller roots beneath it.

17. I have estimated the terrace and planter will be a TPZ encroachment of approximately 42m^2 (14.5%), which, provided the tree is appropriately protected in accordance with the TS report, would be an acceptable level of encroachment that is unlikely to lead to tree decline.

18. The pedestrian path encroachment is not included in the above calculations as, if constructed over the existing ground, will have little, if any, impact on the tree.

19. Tree 27 – *Cupressus macrocarpa* (Monterey Cypress)
This tree has a DBH of 900mm. Its SRZ is a radial offset of 3.4m. Works identified in the SRZ are a strip footing for a planter at the east side of the building (Figure 1, page 7).

20. The proposed footing extends more than 1m into the tree's SRZ, and for a distance of 5m or so across the SRZ. There is a distinct possibly that woody anchor roots would be present in the SRZ area projecting into the planter wall footprint.

21. As discussed for Tree 26, there appears to be scope to utilise bridged footing construction to avoid the significant anchor roots, however, UFA has estimated the TPZ encroachment is approximately 137m2, or around 37% of the total TPZ area. This is a significant encroachment and, due to the proportion of *non-woody roots*[6] likely to be removed, subsequent decline and removal of the tree is likely.

22. The tree will also require excessive pruning to lift the crown of the tree on its north, west and south sides to enable pedestrian access around the building and to clear the terraces of units facing the east. The terraces are approximately 2.2m from the centre of the tree. Construction scaffolding will reduce this setback to the tree to a point almost directly over the main stem. See Plate 1, page 8 for a schematic estimate of crown loss from pruning.

23. Pruning of the tree will potentially remove up to 60% of the current foliage, expose the bare, 'internal' frame of the tree, which is highly unlikely to generate new growth, and drastically affect the natural form of the tree.

24. Tree 28 – *Eucalyptus racemosa* (Scribbly Gum)
Note: The tree is identified as *E. haemastoma* (Scribbly Gum) in the TMP.
This tree has a DBH of 900mm (i.e. two stems 400mm + 800mm x 0.75). The SRZ is calculated as a 3.4m radial offset from the centre of the tree.

25. Figure 2, page 7 illustrates the amended footprint of the approved OSD (as per arboricultural advice) to avoid bulk excavation within the tree's notional SRZ. The proposed elevated paving slab is, in theory, the only SRZ encroachment, although the slab could be constructed to avoid any conflict with woody roots encountered at construction stage. UFA notes an existing low concrete wall at the base of the tree on its east side has likely constrained woody root growth in this east direction to some degree. Subsequently, significant anchoring roots are likely to extend further west than the notional 3.4m offset and be well within the footprint of the proposed elevated slab and possibly within the proposed excavation for the OSD.

26. The TPZ of this tree is a 10.8m offset comprising a total 366m^2 protection area. UFA has calculated the proposed TPZ encroachment (including disturbance beyond the excavation footprint) to be in the vicinity of 41%, which is significant and could lead to irreversible decline in tree vigour and viability.

27. To retain a tree of this size, age and low tolerance to development impacts would require major design changes that separate excavation and any structures including footings from the tree by a minimum distance of 7m to decrease the encroachment to a more tolerable range of 15% – 18% of the entire TPZ area.

28. It is UFA's understanding that these major design changes at this stage of the project cannot be adopted. However, rather than removing the tree due to the estimated significant development impacts, a 'wait and see' approach is preferable. Based on how the tree responds to those immense changes to its growing environment, it is possible, subject to a very high level of care and management through the development program, the tree may tolerate those changes and remain viable as a safe amenity tree.

CONCLUSIONS

29. Tree 24 (Common Coral-tree) is an unsuitable species for retention next to the swimming pool due to the higher than normal risk of branch drop. This risk will be increased as the tree is exposed to wind forces after removal of several trees that currently protect it.
30. Tree 25 (Smooth-barked Apple) is unlikely to be affected by the proposal and can be retained.
31. Tree 26 (Scribbly Gum) can be retained, but will require appropriate construction methods to avoid cutting or damage to significant roots.

32. Tree 27 (Monterey Cypress) will become a very poor specimen of low amenity value as a result of significant root zone impacts and excessive pruning required to accommodate the approved building. The tree has no future as an amenity tree if retained in this approved development.

33. Tree 28 (Scribbly Gum) is proposed to be retained. Despite the redesign of the proposed OSD location to place it outside the notional SRZ, the tree might be adversely affected by the high loss of roots within its TPZ. Every reasonable effort will be taken to protect the tree from cumulative development impacts although the ultimate removal of the tree may be unavoidable if it enters into an irreversible decline after site development is completed.

RECOMMENDATIONS

34. Tree protection recommendations of the TS report apply.
35. Tree 24 (Common Coral-tree) – Remove for safety reasons.
36. Tree 25 (Smooth-barked Apple) – Retain and protect.
37. Tree 26 (Scribbly Gum) – Retain and protect.
    - Path construction above the existing ground level (no excavation for path within the SRZ).
    - Prior to construction the project arboriculturist is to investigate the location of significant roots potentially affected by planter wall construction (e.g. root mapping, via hand digging or Air-spade®).
    - Planter wall construction is to adopt appropriate methods to avoid cutting of any roots identified to be retained by the arboriculturist.
38. Tree 27 (Monterey Cypress) – Remove, due to unacceptable impacts on TPZ, crown structure and tree form.
39. Tree 28 (Scribbly Gum) – An AQF Level 5 arboriculturist is to supervise the OSD and elevated concrete slab works undertaken within 8m radius of the tree, and provide advice in regard to any other works (e.g. landscape hardworks, ground level changes, etc) that may have potential to harm the tree.
    - Specific tree protection devices are to be installed under the advice of an AQF5 arboriculturist.
    - Possible irrigation requirements under the elevated slab is to be investigated by the AQF 5 arboriculturist

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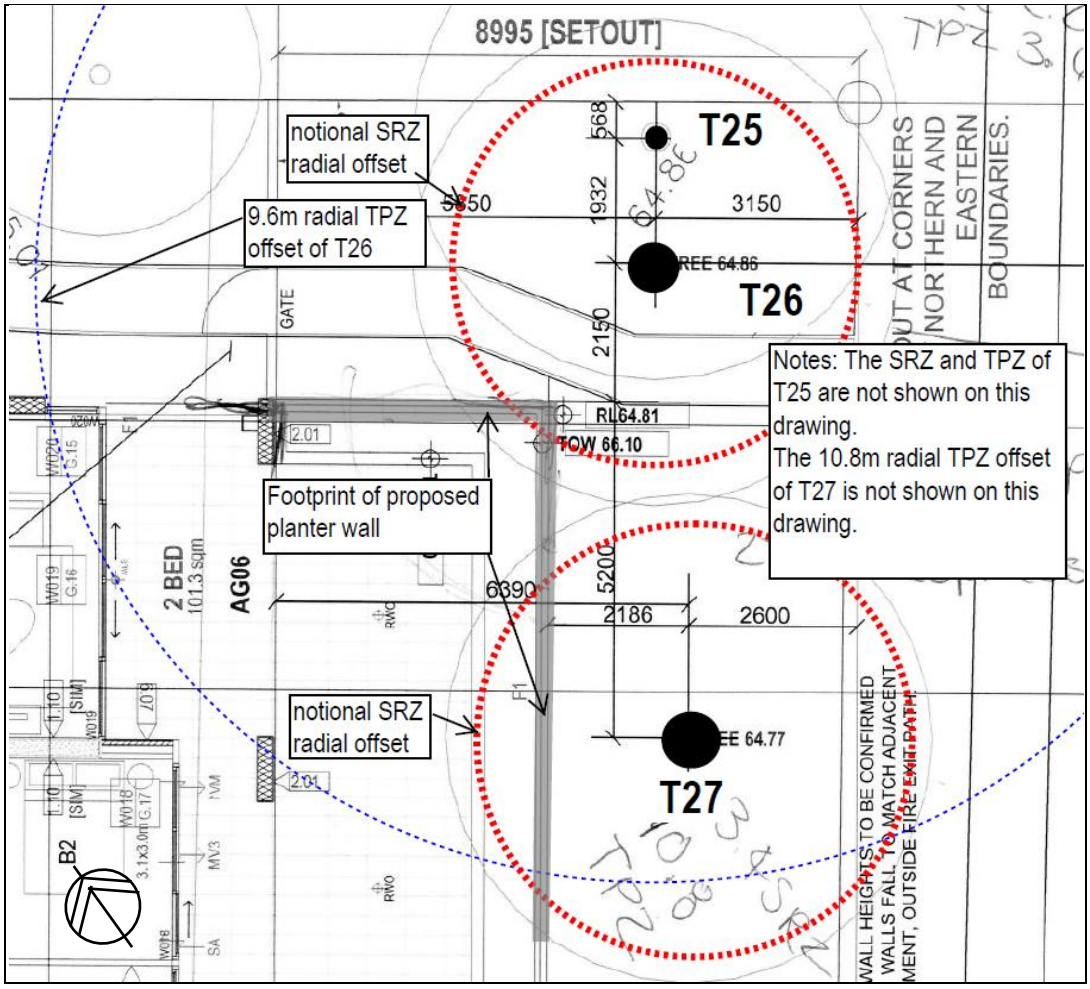

Figure 1 (above)
Shows the SRZ's (inner, red dashed circles) of T26 and T27 and the location of the approved planter wall. The TPZ of T26 is also shown (outer, blue dotted circle).
Drawing not to scale.

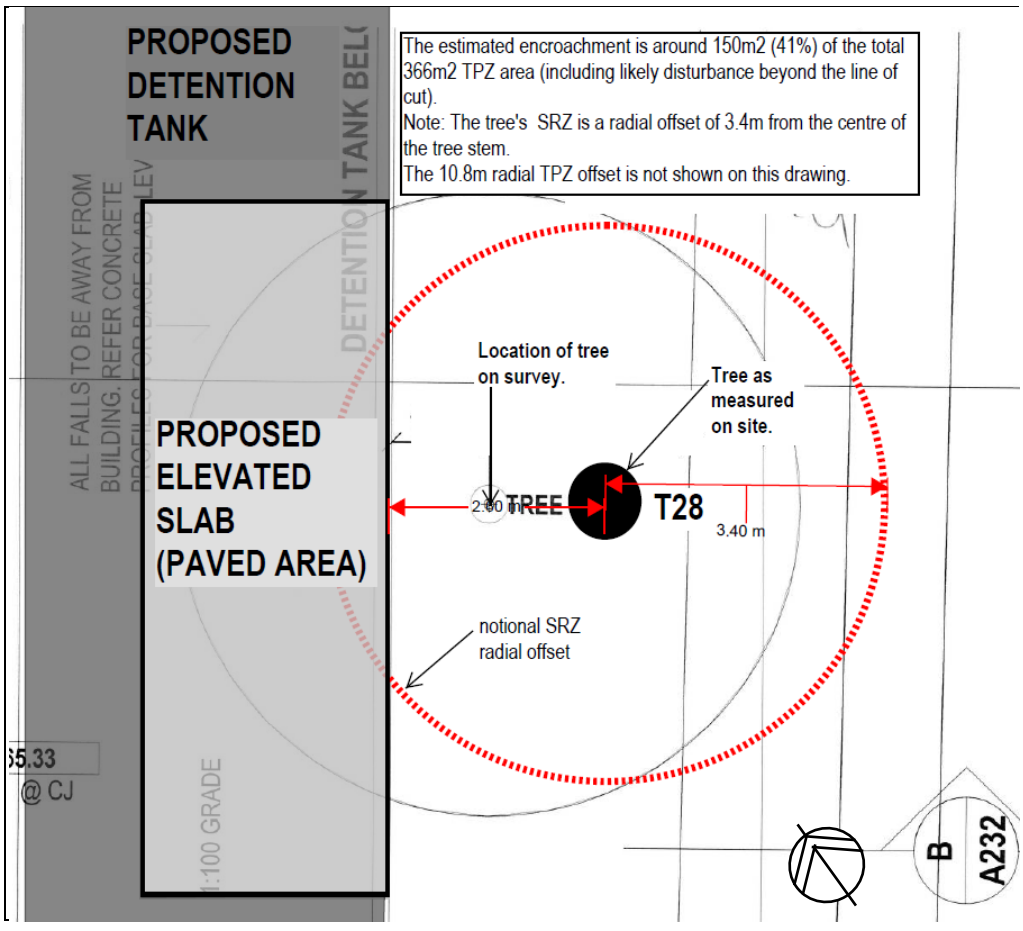

Figure 2 (left)
Shows the SRZ (red dashed circle) of T28, proximity of the excavation for the proposed amended OSD tank location and area of SRZ encroachment.
Drawing not to scale.

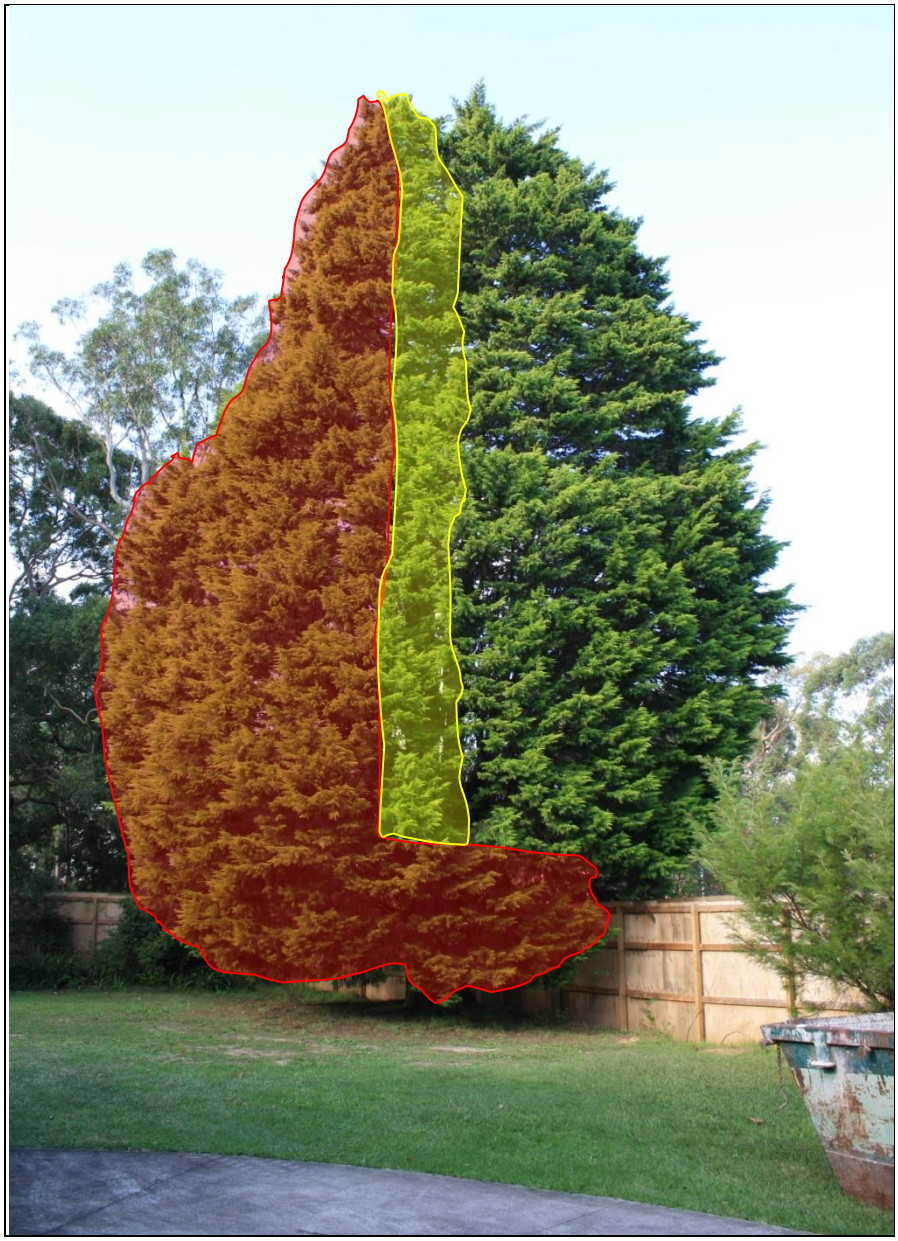

Plate 1 Looking NE to Tree 27, illustrating the estimated removal of crown to accommodate the unit terraces and pedestrian clearance beneath the tree (red shaded area). The projected removal is likely to be much greater if construction scaffolding is erected (yellow area).

End Notes -Terms and Definitions

[1] Diameter at Breast Height (DBH) refers to the tree trunk diameter at breast height, i.e. measured at 1.4 m above ground level.

[2] s.3.3.5 of AS4970 provides its formula for determining the SRZ radius as $R_{SRZ} = (D \times 50)^{0.42} \times 0.64$

[3] Structural Root Zone (SRZ) Refers to the radial distance in metres, measured from the centre of the tree stem, which defines 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.
Note: The SRZ is calculated on the diameter measured immediately above the root/stem buttress (DAB). Where this measurement is not taken in the field, it is calculated by adding 12.5% to the stem diameter at breast height (DBH).(Based on averages calculated from DBH and DAB measurements taken from 20 mature Brush Box and Camphor Laurel).
Note: The SRZ may not be symmetrical in shape/area where there is existing obstruction/confinement to lateral root growth, e.g. structures such as walls, rocky outcrops, etc).

[4] Tree Protection Zone (TPZ). Refers to the radial distance in metres, measured from the centre of the tree stem which defines the tree protection zone for a tree to be retained. The TPZ is a combination of the root area and crown area to be protected. This is 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. Note: In many circumstances the tree root zone does not occupy a symmetrically radial area from the trunk, but may be an irregular area due to the presence of obstructions to root or branch spread or inhospitable growing conditions.

[5] **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. Damage, disturbance to, or severing of these roots can compromise the stability of the tree.

[6] **Non-woody roots.** Roots where the primary function is the absorption of water and nutrients in solution. Smallest non-woody roots also referred to as 'fibrous' or 'fine' roots. Protection and retention of these roots is important to tree viability. Some non-woody root loss is tolerable, depending on the tree's age, vigour, species tolerance, growing conditions, etc.