EARTHSCAPE HORTICULTURAL SERVICES
Arboricultural, Horticultural and Landscape Consultants

ABN 36 082 126 027

PRELIMINARY TREE ASSESSMENT REPORT

WOLLONGONG HOSPITAL
348-352 CROWN STREET, WOLLONGONG

October 2010

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1 INTRODUCTION

1.1.1 This report was commissioned by Hassell on behalf of NSW Health, South East Sydney Illawarra Area Health Service (SESIAHS) to assess the health and condition of six (6) Fig trees located within the Wollongong Hospital site and to undertake a preliminary assessment of other trees within the site and within 42 Loftus Street, Wollongong. The report has been prepared to provide information on the constraints imposed by trees to any future development of the property assist in the layout and design of the site.

1.1.2 The purpose of this report is to identify the trees within the site, provide information on their current health and condition, determine their remaining life expectancy and assess their suitability for retention/preservation.

2 THE SITE

2.1.1 The subject property is a public hospital known as Lot 95, Section 3 of DP 1258, being Wollongong Hospital, 348-352 Crown Street, Wollongong. A separate residential property adjacent the Hospital known as 42 Loftus Street was also included in this assessment. For the purposes of this report the Hospital and grounds will be referred to as "the Site".

2.1.2 Soils of this area are typical of the Gwynneville Soil Landscape Group (as classified in the Soil Landscapes of the Wollongong-Port Hacking 1:100,000 Sheet), consisting of shallow (less than 500 -1000 mm) *Brown Podzolic soils* and *Xanthozems* on upper slopes, *Lithosols* on simple slopes and shallow (less than 500mm) *Brown Earths* on mid-slopes and lower slopes. The landscape is typical of the foothills of the Illawarra escarpment and isolated rises of the Wollongong Plain, with broad to moderately rounded ridges and gently to steeply inclined slopes of 3-25%. [1]

2.1.3 The original vegetation of the Wollongong coastal plain consisted of tall open forest (wet sclerophyll forest) and open forest (dry sclerophyll forest) which has been substantially cleared for urban development. Locally-indigenous tree species originally occurring in northern part of Wollongong where the coastal plain narrows include *Eucalyptus paniculata* (Grey Ironbark), *Eucalyptus pilularis* (Blackbutt) and *Syncarpia glomulifera* (Turpentine). *Corymbia maculata* (Spotted Gum) is also found in some areas on the coastal plain (Corrimal, Mt Saint Thomas) depending on local environmental factors (soil, microclimate, rainfall etc). Drier areas of the coastal plain to the south include *Eucalyptus tereticornis* (Forest Red Gum) and *Eucalyptus longifolia* (Woollybutt) with *Melaleuca decora* (White Feather Honey Myrtle), *Melaleuca styphelioides* (Prickly Paperbark), *Eucalyptus robusta* (Swamp Mahogany) and *Eucalyptus botryoides* (Bangalay) in low lying and poorly drained areas.[2]

3 SUBJECT TREES

3.1.1 The subject trees were inspected by Earthscape Horticultural Services (EHS) on the 13th October 2010. Each tree has been provided with an identification number for reference purposes denoted on the attached Tree Location Plan (**Appendix 5**), based on the Aerial Photo obtained from NearMap dated January 2010. The numbers used on this plan correlate with the Tree Assessment Schedule (**Appendix 4**).

4 HEALTH AND CONDITION ASSESSMENT

4.1 Methodology

4.1.1 An assessment of Trees 1, 2, 29, 30, 31 & 32 was made using the Visual Tree Assessment (VTA) procedure.[3] All of the trees were assessed in view from the ground. No aerial inspection or diagnostic testing has been undertaken as part of this assessment. Photographs of the subject trees are shown in **Appendix 2**.

4.1.2 The following information was collected for each tree:-

- Tree Species (Botanical & Common Name);
- Approximate height;
- Canopy spread; measured in four cardinal directions using a metric tape and an average taken.
- Trunk Diameter measured at 1.4 metres from ground level;
- Live Crown Size; (measured by subtracting the total height of the tree from the lowest point of the crown and multiplying by the average crown spread to give a value in square metres).
- Health & vigour; using foliage size, colour, extension growth, presence of disease or pest infestation, canopy density, presence of deadwood, dieback and epicormic growth as indicators,
- Condition; using visible evidence of structural defects, instability, evidence of previous pruning and physical damage as indicators.
- Suitability of the tree to the site and its existing location; in consideration of damage or potential damage to services or structures, available space for future development and nuisance issues.

4.1.3 A cursory visual assessment was also carried out on the remaining trees within the site to identify their species and evaluate their general health and condition. This information is presented in a tabulated form in **Appendix 4**.

4.2 Safe Useful Life Expectancy (SULE)

4.2.1 The remaining Safe Useful Life Expectancy [4] of the tree is an estimate of the sustainability of the tree in the landscape, calculated based on an estimate of the average age of the species in an urban area, less its estimated current age. The life expectancy of the tree has been further modified where necessary in consideration of its current health and vigour, condition and suitability to the site. The estimated SULE of each tree is shown in **Appendix 4.**

4.2.2 The following ranges have been allocated to each tree:-

- Greater than 40 years (Long)
- Between 15 and 40 years (Medium)
- Between 5 and 15 years (Short)
- Less than 5 years (Transient)
- Dead or immediately hazardous (defective or unstable)

4.3 Visual Tree Assessment - Observations

T1 - *Ficus macrophylla* (Moreton Bay Fig)

4.3.1 This tree is a mature specimen of approximately18 metres in height and 30 metres canopy spread with a trunk diameter of 2100mm.

4.3.2 The tree exhibits a single trunk, dividing into two secondary trunks at 2 metres with a broad rounded crown with ascending branching habit (refer Plate 3). The tree has a typical buttressed basal area and visible woody surface roots (refer Plate 8). The tree is also located in a ‘garden’ area, close to T1. There is some evidence of soil disturbance on the south side of the tree, possibly associated with previous construction work, but no obvious evidence of root damage or injury.

4.3.3 The stability of the tree is suspect with sound branching structure. The crown is somewhat suppressed on the north side due to crowding with T1 (the crowns are intertwined). Some primary and secondary branches have been reduced, resulting in multiple wounds and some Elite Epicormic sprouts emanating from old pruning wounds. A clump of Fishbone Fern is growing from an old branch collar on the south side of the tree, together with a large Sydney Rock Orchid growing at the junction of the secondary trunks. Given the existence of the Fishbone Fern, there may be decay and a cavity and at the old branch collar.

4.3.4 The tree displays fair health and vigour with thinning crown and some dieback with approx 5% to 10% deadwood and some epicormic growth (mainly from old pruning wounds). The foliage is small (stunted) for the species with fairly poor extension growth (refer Plate 4). Two large fruiting bodies of a pathogenic decay fungus (*Ganoderma sp.)* are located on the northern side of the trunk close to ground level (refer Plates 1 & 2). Ganoderma is a butt rot disease affecting the butt (lower trunk) and root crown of a tree. Environmental stress and injuries to the roots or basal area of a tree can pre-dispose it to infection. Infection may occur from root to root contact and fruiting bodies may not form for several years after infection. As the fruiting bodies are large, the original infection probably occurred many years ago (more than a decade).

4.3.5 Given the presence of this disease, T1 has estimated Safe Useful Life Expectancy of less than 5 years.

T2 - *Ficus macrophylla* (Moreton Bay Fig)

4.3.6 This tree is a mature specimen of approximately16 metres in height and 25 metres canopy spread with a trunk diameter of 2000mm.

4.3.7 The tree exhibits a single trunk, dividing into several primary limbs at 2-3 metres with a broad rounded crown with ascending branching habit. The tree has a typical buttressed basal area and visible woody surface roots, some of which show small wounds due to previous mechanical injuries. The tree is located in a ‘garden’ area, but is located close to a masonry retaining wall & asphalt roadway on the northern side of the tree.

4.3.8 The tree appears stable with fair branching structure. The crown is somewhat suppressed on the south side due to crowding with T2 (the crowns are intertwined). A number of primary and secondary branches have been removed and a few reduced, resulting in multiple wounds at the branch collars. Some of the older pruning wounds exhibit signs of decay at the branch collar. A number of tertiary limbs on the west side over the roadway have also been reduced. There is a moderate bark inclusion between the trunk and primary limb at 1.5 -2 metres (refer to Plate 5). The tree exhibits a moderate wound on a primary limb at 4-6 metres due to previous branch loss (tear wound) with some decay evident (refer Plate 7). There is also an axial wound on a primary limb at approximately 8 metres on the west side over the roadway (possibly due to a sunscald injury). Two small cavities in branch collars on the northern side of the tree have been previously filled with expanding polyurethane foam (refer Plate 5).

4.3.9 The tree displays fair health and vigour with thinning crown and some dieback with approx 5% to 10% deadwood (especially on the western side) and 5% epicormic growth. The foliage is small (stunted) for the species with fairly poor extension growth (refer to Plate 6). There is no visible evidence of any disease or pest infestation, however the tree has a suspected fungal infection in the root crown. Given the proximity to T1 and the common symptoms of both trees (sparse crowns, undersized foliage, poor shoot extension & dieback in some terminal branches especially on more exposed sides), it is probable that T2 is also infected with Ganoderma, but fruiting bodies have not yet formed.

4.3.10 Further diagnostic testing is required to confirm the presence of Ganoderma, but if existing as suspected, T2 would have an estimated Safe Useful Life Expectancy of less than 5 years.

T29 - *Ficus sp.*[*obliqua*] (Small-leaf Fig)

4.3.11 This tree is a mature specimen of approximately14 metres in height and 30 metres canopy spread with a trunk diameter of 1800mm.

4.3.12 The tree exhibits a single trunk, dividing into multiple extended lateral primary limbs at 1-2 metres forming a broad rounded crown (refer Plate 9). The tree has a typical buttressed basal area and is located within an open lawn area, but surrounded by a low masonry retaining wall (approx 4-5 metres radius) (refer Plate 12).

4.3.13 The tree appears stable with fair branching structure. There are a number of small wounds throughout the crown at branch collars due to previous pruning, mainly from the removal of tertiary branches. There is also a moderate axial wound on the underside of a primary limb on the north side, possibly associated with an old mechanical injury (refer Plate 11). The upper crown exhibits minor branch loss due to storm damage.

4.3.14 The tree displays fair health and vigour with slightly thinning crown and some dieback on the western side of the tree (refer Plate 10). The foliage is normal size and colour for the species with normal extension growth. There is no visible evidence of any disease or pest infestation.

4.3.15 The tree has an estimated remaining life expectancy of 15-40 years

T30 - *Ficus macrophylla* (Moreton Bay Fig)

4.3.16 This tree is a mature specimen of approximately 13 metres in height and 20 metres canopy spread with a trunk diameter of 1700mm.

4.3.17 The tree exhibits a twin trunk, with an irregular vase-shaped crown and ascending branching habit. The tree appears stable with sound branching structure (refer Plate 13). The crown is suppressed on the east and west side due to crowding. There are a number of moderate wounds at branch collars due to previous pruning, mainly from the removal of primary and secondary branches. There is also multiple small wounds on primary and secondary limbs due to sunscald. This may have occurred after a period of defoliation, possibly due to previous Fig Psyllid infestation.

4.3.18 The tree displays fair health and vigour with slightly thinning crown and about 30% Epicormic growth emanating from primary scaffold limbs. The foliage is normal size and colour for the species with normal extension growth. There is no visible evidence of any disease or pest infestation.

4.3.19 The tree has an estimated remaining life expectancy of 15-40 years

T31 - *Ficus macrophylla* (Moreton Bay Fig)

4.3.20 This tree is a mature specimen of approximately 10 metres in height and 13 metres canopy spread with a trunk diameter of 630mm.

4.3.21 The tree exhibits a single trunk dividing into two secondary trunks at 1.5 metres with an irregular vase-shaped crown and ascending branching habit. The tree appears stable with sound branching structure. The crown is suppressed on the east and west side due to crowding and the upper crown is suppressed due to overshadowing from T30 (refer Plate 13). There is a moderate bark inclusion at 1.5 metres (refer Plate 15) and a small axial wound and cavity on a primary limb at 4-5 metres. The tree has been previously selectively crown thinned and deadwooded.

4.3.22 The tree displays fair health and vigour with slightly thinning crown and about 20% Epicormic growth emanating from primary scaffold limbs. The foliage is normal size and colour for the species with normal extension growth. There is no visible evidence of any disease or pest infestation.

4.3.23 The tree has an estimated remaining life expectancy of 5-15 years.

T32 - *Ficus macrophylla* (Moreton Bay Fig)

4.3.24 This tree is a mature specimen of approximately 15 metres in height and 16 metres canopy spread with a trunk diameter of 900mm.

4.3.25 The tree exhibits a single trunk, with rounded crown and ascending branching habit (refer to Plate 16). The tree appears stable with sound branching structure. There are multiple small wounds on primary and secondary limbs due to sunscald. This may have occurred after a period of defoliation, possibly due to previous Fig Psyllid infestation. The tree has been previously selectively crown thinned and deadwooded. The tree is located close to the roadway and footpath and the root crown is partially exposed on the eastern side of the tree due to a steep embankment (refer Plate 17 & 18). The exposed roots exhibit some minor injuries but generally appear to be intact.

4.3.26 The tree displays good health and vigour with normal foliage size and colour for the species with normal extension growth. There is no visible evidence of any disease or pest infestation.

4.3.27 The tree has an estimated remaining life expectancy of 15-40 years.

4.4 Visual Tree Assessment – Discussion of results

4.4.1 The presence of Ganoderma on the lower trunk of T1 (Moreton Bay Fig) is a significant issue. This disease causes dysfunction in the root system which explains the general poor appearance of the tree. Ganoderma also affects the structural integrity of the butt and root plate, which may lead to structural failure under wind loading at or close to ground level. The extent of infection in T1 could not be verified by external visual examination, but the size of the fruiting bodies suggests that the infection has been present for many years, perhaps a decade or more. As such, the decay associated with the infection is likely to be extensive. The ability of the disease to spread from root to root contact, and similar symptoms apparent in T2 would suggest the disease may also be present to some extent in this tree also. This is exacerbated by proximity of the trees and the possibility of root grafting. Ganoderma attacks live tissue, is very aggressive and cannot be treated. If decay in the lower trunk and root crown is extensive, the trees should be removed for safety reasons.

4.4.2 Given the heritage significance of the trees, further diagnostic testing and site investigation is suggested to verify the extent of decay in the lower trunk and root plate of both trees. Diagnostic testing of the lower trunk using a Picus Sonic Tomograph would be useful to determine the extent of decay in the lower trunk. The Sonic Tomograph emits sound waves through emitters placed around the trunk to generate a cross-sectional image of the tree, indicating the extent of internal hollows or decay compared with remaining sound wood. This can then be evaluated against available data to determine the failure potential of the trunk. It is recommended that two points be tested the first as close to ground level as possible, the second at 1.2-1.5 metres above ground level. As the decay may be limited to the root crown, removing some of the soil from around the buttress and major roots using a non-destructive method would also allow visual examination of portions of the root plate to determine the extent of decay. This could be undertaken using an Airspade device. The Airspade uses compressed air to displace soil particles from around roots, without damage to the root system.

4.4.3 T29 (Hills Fig) whilst showing some signs of environmental stress, exhibits no serious structural defects. This tree should be retained and the health improved by a program of aeration and fertilising (as recommended following). Any new works in the vicinity of this tree should designed in consideration of the recommended Tree Protection Zone, without any incursion to the canopy. No diagnostic testing on this is recommended.

4.4.4 T30, T31 & T32 (Moreton Bay Figs) likewise exhibit no serious structural defects, but show some signs of environmental stress. Improvement ion the cultural conditions will assist in improving the overall health and longevity of these trees.

5 LANDSCAPE SIGNIFICANCE

5.1 Environmental Significance

5.1.1 Section E17 of the Wollongong Development Control Plan (DCP) 2009 (Preservation and Management of Trees and Vegetation) applies to all land within the City of Wollongong Local Government Area (LGA), made under Clause 5.9 of the Wollongong Local Environment Plan (LEP) 2009. The TPO generally protects all trees of a height of three (3) metres or greater or with a crown spread of three (3) metres or greater or trunk diameter of 200mm or greater. Some exemptions apply. The following trees are exempt (not protected) under the provisions of Wollongong Council's Tree Preservation Order:-

Tree No.	Species	Exemption
T47	*Grevillea robusta* (Silky Oak)	Environmental Weed Species
T51	*Liquidambar styraciflua* (Liquidambar)	Environmental Weed Species
T52, T53	*Cinnamomum camphora* (Camphor Laurel)	Environmental Weed Species

5.1.2 The remainder of the trees are protected under Council's TPO.

5.1.3 *Corymbia maculata* (Spotted Gum) [T35 & T38] and *Eucalyptus paniculata* (Grey Ironbark) [T36], are both locally-indigenous species, representative of the original vegetation of the area and would be of benefit to native wildlife. However, none of the trees contain cavities suitable as nesting hollows for arboreal mammals or birds or other visible signs of wildlife habitation.

5.1.4 None of the trees assessed are scheduled as Noxious Weeds under the meaning of *Noxious Weeds Act* (NSW) 1993.

5.1.5 *Eucalyptus nicolii* (New England Peppermint) [T18, T49 & T51] is listed as Vulnerable Species in Schedule 2 of the *Threatened Species Conservation Act* 1995 (NSW) and listed as a Vulnerable Species under the *Environmental Protection and Biodiversity Conservation Act* 1999. Whilst this species is listed as vulnerable in its native habitat, it is a commonly planted ornamental tree in parks, gardens and streetscapes. The species is not endemic to this area and therefore does not have any ecological significance in this context.

5.1.6 None of the other trees are listed as Threatened or Vulnerable Species or form part of Endangered Ecological Communities under the provisions of the *Threatened Species Conservation Act* 1995 (NSW) or the *Environmental Protection and Biodiversity Conservation Act* 1999.

5.2 Heritage Significance

5.2.1 Trees 1, 2, 30, 31 & 32 (Moreton Bay Figs) and T29 (Small-leaf Fig) are listed as Heritage Items of Local Significance (Item No. 5955) of under Schedule 5 of the Wollongong LEP 2009. The Wollongong District Hospital was established in 1908. The subject trees were probably planted in association with the construction of the original hospital on the site.

5.2.2 A number of trees located along the northern boundary are uncommon species but fairly typical of the Federation era and may have been planted in association with the early development of the

hospital. These include T12, T13, T14, T16 & T18 (all *Syzygium leuhmannii*) and T19, a *Syzygium jambos* (Rose Apple).

5.2.3 The Nurses Home is listed as a Heritage Item of State Significance (Item No. 5959) under Schedule 5 of the Wollongong LEP 2009 and is also listed as a Heritage Item on the State Heritage Register (s.170 *Heritage Act*). This is a three storey brick building (forming part of the Hospital) designed by Government Architect Cobden Parkes & constructed c.1937.

5.2.4 Several trees around this building including T11 (Maidenhair Tree), T5 (Dawn Redwood), T11 (Crepe Myrtle) T10 (Brown Pine) and T7 (Bullbay Magnolia) are fairly typical of the post war period era and were probably planted c. 1950-1960. Several *Phoenix canariensis* (Canary Island Palms) [T9, T27 & T42] on the site may have also been planted about this time.

6 RETENTION VALUES

6.1.1 The Retention Values shown in **Appendix 4** have been determined on the basis of the estimated longevity of the trees and their landscape significance rating, in accordance with **Table One**. Together with guidelines contained in **Section 7** (Tree Protection Zones) this information should be used to determine the most appropriate position of building footprints and other infrastructure within the site, with due consideration to other site constraints, to minimise the impact on trees considered worthy of preservation.

TABLE 1 – TREE RETENTION VALUES – ASSESSMENT METHODOLOGY

	Landscape Significance Rating						
Estimated Life Expectancy	**1**	**2**	**3**	**4**	**5**	**6**	**7**
Long - Greater than 40 Years	High Retention Value						
Medium- 15 to 40 Years			Moderate Retention Value				
Short - 5 to 15 years				Low Ret. Value			
Transient - Less than 5 Years				Very Low Retention Value			
Dead or Potentially Hazardous							

TABLE 2 – TREE RETENTION PRIORITES.

6.1.2 The following table describes the implications of the retention values on site layout and design.

RETENTION VALUE	RECOMMENDED ACTION
"High"	• These trees considered worthy of preservation, as such careful consideration should be given to their retention as a priority. • Proposed site design and placement of buildings and infrastructure should consider the recommended setbacks as discussed in the following section to minimise any adverse impact. • In addition to Minimum Setback Distances, the extent of the canopy should also be considered, particularly in relation to high rise developments. Significant pruning of the trees to accommodate the building envelope is generally not acceptable.
"Moderate"	• The retention of these trees is desirable, but not critical. • These trees should be retained as part of any proposed development if possible, however they trees are considered less critical for retention. • If these trees must be removed, replacement planting should be considered in accordance with Council's Tree Replenishment Policy to compensate for any loss of amenity.
"Low"	• These trees are not considered worthy of any special measures to ensure their preservation, due to current health, condition and longevity. • These trees should not be considered as a constraint to the future development of the site.
"Very Low"	• These trees are considered potentially hazardous or very poor specimens, or may be environmental or noxious weeds. • The removal of these trees is therefore recommended regardless of the implications of any proposed development.

7 TREE PROTECTION ZONES

7.1.1 The Tree Protection Zone (TPZ) is a radial distance measured from the centre of the trunk of the tree as specified in the following table. These have been calculated in accordance with AS 4970-2009 (Protection of Trees on Development Sites).[5]

7.1.2 The intention of the TPZ is to ensure protection of the root system and canopy from the potential damage from construction works and ensure the long-term health and stability of each tree to be retained. Incursions to the root zone may occur due to excavations, changes in ground levels, (either lowering or raising the grade), trenching or other forms or soil disturbance such as ripping, grading or inverting the soil profile. Such works may cause damage or loss of part of the root system, leading to an adverse impact on the tree.

7.2 Structural Root Zone (SRZ)

7.2.1 The Structural Root Zone (SRZ) provides the bulk of mechanical support and anchorage for a tree. This is also a radial distance measured from the centre of the trunk as specified in the following table. The SRZ has been calculated in accordance with AS 4970-2009 (Protection of Trees on Development Sites).

7.2.2 Incursions within the SRZ are not recommended as they are likely to result in the severance of woody roots which may compromise the stability of the tree or lead to its decline and demise.

7.3 Acceptable Incursions to the Tree Protection Zone.

7.3.1 Where encroachment to the TPZ is unavoidable, an incursion to the TPZ of not exceeding 10% of the area of the TPZ and outside the SRZ may be acceptable. Examples of acceptable incursions are shown in **Appendix 3**. Greater incursions to the TPZ may result in an adverse impact on the tree.

7.3.2 Where incursions greater than 10% of the TPZ are unavoidable, exploratory excavation using non-destructive methods may be required to evaluate the extent of the root system affected and determine whether or not the tree can remain viable.

7.3.3 The Tree Protection Zone (TPZ), Minimum Setback Distance (MSD) and Structural Root Zone (SRZ) for the subject trees (Figs) are shown in the following table:-

Tree No.	Species	TPZ (m Radius)	MSD (m –tangent to root plate)	SRZ (m Radius
1	*Ficus macrophylla* (Moreton Bay Fig)	15 metres	10.2 metres	4.45 metres
2	*Ficus macrophylla* (Moreton Bay Fig)	15 metres	10.2 metres	4.50 metres
29	*Ficus obliqua* (Small-leaf Fig)	15 metres	10.2 metres	4.25 metres
30	*Ficus macrophylla* (Moreton Bay Fig)	15 metres	10.2 metres	4.15 metres
31	*Ficus macrophylla* (Moreton Bay Fig)	7.6 metres	5.1 metres	2.8 metres
32	*Ficus macrophylla* (Moreton Bay Fig)	10.8 metres	7.3 metres	3.2 metres

7.3.4 Both species is considered to have a moderate tolerance to construction impacts.

7.3.5 The soil depth in this area is variable, but it is estimated to be approximately 0.5-1.0 metres to weathered shale/sandstone. It is likely that the majority of the roots of the subject trees will be located above this layer (i.e. in the top 0.5-1.0 metres).

7.4 Legal Protection

7.4.1 Notwithstanding the above recommendations, Council may require a greater setback from certain types of structures to ensure the on-going legal protection of the tree (i.e. its legal status under Council's DCP). In Wollongong City LGA, a tree located within three (3) metres of the wall of a 'habitable building' is not protected under the Tree Preservation Order (TPO). As such, if a tree is considered worthy of preservation, Council is unlikely to approve the construction of a habitable building within three (3) metres of the tree (regardless of whether this can be undertaken without having an adverse impact on its health or longevity). Note that this ruling may not apply to other types of structures.

8 CONCLUSIONS:-

8.1.1 The site contains a mixture of native and exotic species, most of which are in good health and condition. Some of the trees within the site including several Moreton Bay Figs a Small leaf Fig and several Lillypillys appear to date back to the early development of the Hospital c.1908. Both groups of Fig trees are listed as Heritage Items under the Wollongong LEP 2009. A number of other trees on the site date back to the post war period 1950's or '60's, including Bullbay Magnolia, Brown Pine, Crepe Myrtle, Maidenhair Tree and Dawn Redwood. There are also some locally indigenous species within the site, but these all appear to have been planted.

8.1.2 T1, a large Moreton Bay Fig on the northern side of the site has Ganoderma Butt Rot disease. This disease affects the structural integrity of the butt and root crown and will eventually lead to the failure of the tree. The disease cannot be treated. T2 whilst showing no external signs of infection exhibits similar symptoms of root dysfunction, including sparse foliage cover, undersized leaves, and poor shoot extension. It is probable given the proximity of the trees and the nature of the disease that both trees have been infected through root grafting. Given the significance of the trees, further site investigation and diagnostic testing has been recommended to verify the extent of decay in the butt and root crown area. Subject to the results of these tests, consideration should be given to the removal of these trees

8.1.3 The remaining Fig trees near the south east corner of the site are in fair health and condition and would benefit from aeration and fertilising of the root zone to improve their overall health and vigour. No diagnostic testing is required for these trees.

8.1.4 There are no trees of any special ecological or heritage significance within 42 Loftus street.

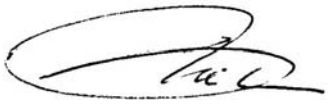
9 RECOMMENDATIONS:-

1. Trees nominated in **Appendix 4** as high retention value are considered worthy of preservation. Careful consideration should be given to their retention. Proposed site design and placement of buildings and infrastructure should consider the recommended Tree Protection Zones (**Section 7**) to minimise any adverse impact. Trees nominated in **Appendix 4** as being of moderate retention value should be retained wherever possible. These trees are considered to be worthy of preservation but are less critical for retention. Trees nominated in **Appendix 4** as being of low or very low retention value are not considered to be worthy of any special measures to ensure their preservation. These trees should not be viewed as a constraint to the development

2. Further diagnostic testing of T1 & T2 is recommended using a Picus Sonic Tomograph to evaluate the structural integrity of the trunk. Two tests should be undertaken, one close to ground level and the other at approximately 1.2-1.5 metre from round level to enable extrapolation of the data. The Picus Sonic Tomograph can be carried out by Australian Tree Consultants (refer to www.australiantreeconsultants.com.au for more information) or Moore Trees (www.mooretrees.com.au).

3. Further investigation of the root crown area of T1 & T2 is recommended using an Airspade device. This should be used to expose selected areas of the root crown and underside of major primary roots to evaluate the extent of decay in the root crown area. This work can be can be carried out by Glochidion Arboriculture (contact Mr Ken Cantor on 0408 821 177)

4. Soil testing is recommended to be undertaken in the main lawn area in the south-east corner of the site in the vicinity of T29-T32 to determine any specific problems (chemical and physical) within this area in order to develop a program for soil amendment, fertilising and decompaction (where required to improve the cultural conditions for these trees and improve their long term survival prospects. This work can be carried out by Sydney Environmental Soil Laboratories (SESL). For more information go to www.sesl.com.au.



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The Body Language of Trees – A Handbook for Failure Analysis
The Stationery Office, London, England

[4] Barrell, Jeremy (1996)
Pre-development Tree Assessment
Proceedings of the International Conference on Trees and Building Sites (Chicago)
International Society of arboriculture, Illinois, USA

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AS 4970 – 2009 – Protection of Trees on Development Sites
Standards Australia, Sydney

APPENDIX ONE
CRITERIA FOR ASSESSMENT OF LANDSCAPE SIGNIFICANCE

The level of landscape significance has been determined using the following key criteria as a guide:

1. SIGNIFICANT

- The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance; or
- The subject tree forms part of the curtilage of a Heritage Item (building /structure /artefact as defined under the LEP) and has a known or documented association with that item; or
- The subject tree is a Commemorative Planting having been planted by an important historical person (s) or to commemorate an important historical event; or
- The subject tree is scheduled as a Threatened Species as defined under the *Threatened Species Conservation Act* 1995 (NSW) or the *Environmental Protection and Biodiversity Conservation Act* 1999; or
- The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species; or
- The subject tree is a Remnant Tree, being a tree in existence prior to development of the area; or
- The subject tree has a very large live crown size exceeding 300m² with normal to dense foliage cover, is located in a visually prominent in the landscape, exhibits very good form and habit typical of the species and makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity; or
- The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance.

2. VERY HIGH

- The tree has a strong historical association with a heritage item (building/structure/artefact/garden etc) within or adjacent the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site; or
- The subject tree is listed on Council's Significant Tree Register; or
- The tree is a locally-indigenous species, representative of the original vegetation of the area and forms part of the assemblage of species of an Endangered Ecological Community;
- The subject tree has a very large live crown size exceeding 200m²; a crown density exceeding 70% Crown Cover (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area.

3. HIGH

- The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence; or
- The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link / Wildlife Corridor or has known wildlife habitat value;
- The subject tree has a large live crown size exceeding 100m²; and
- The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (eg crown distortion/suppression) with a crown density of at least 70% Crown Cover (normal); and
- The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area.

4. MODERATE

- The subject tree has a medium live crown size exceeding 40m²; and
- The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crown density of more than 50% Crown Cover (thinning to normal); and
- The tree makes a fair contribution to the visual character and amenity of the area; and
- The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms.
- The tree has no known or suspected historical association

5. LOW

- The subject tree has a small live crown size of less than 40m² and can be replaced within the short term with new tree planting; or
- The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% Crown Cover (sparse); and
- The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area.

6. VERY LOW

- The subject tree is listed as an Environment Weed Species in the relevant Local Government Area, being invasive, or is a known nuisance species.
- The subject tree is scheduled as exempt (not protected) under the provisions of the local Council's Tree Preservation Order due to its species, nuisance or position relative to buildings or other structures.

7. INSIGNIFICANT

- The tree is a declared Noxious Weed under the *Noxious Weeds Act* (NSW) 1993; or
- The tree is completely dead and has no visible habitat value.

APPENDIX 2 - PHOTOGRAPHS

Plate 1 - T1 (Moreton Bay Fig) showing large fruiting bodies of *Ganoderma sp* (Ganoderma Butt Rot) on lower trunk.

Plate 2 – T1 – Close up of fungal fruiting body

Plate 3 - T1 & T2 (Moreton Bay Figs) showing thinning crowns & low vigor

Plate 4 – T1 – View of upper crown showing sparse foliage cover

Plate 5 - T2 (Moreton Bay Fig) showing moderate bark inclusion at junction of trunk and primary limb.

Plate 6 – T2 showing dieback and sparse foliage cover in western crown

Plate 7 - T2 showing wound on primary limb

Plate 8 – Showing general area surrounding base of T1 & T2

Plate 9 – T29 (Small leaf Fig)

Plate 11 - T29 showing wound on primary limb

Plate 10 – T29 showing thinning crown on western side

Plate 12 – Showing general area surrounding base of T29

Plate 13 – T30 (right) & T31 (left) (Moreton Bay Figs). Note suppressed crown of T31.

Plate 14 – Showing basal area of T30, note wounds from previous pruning

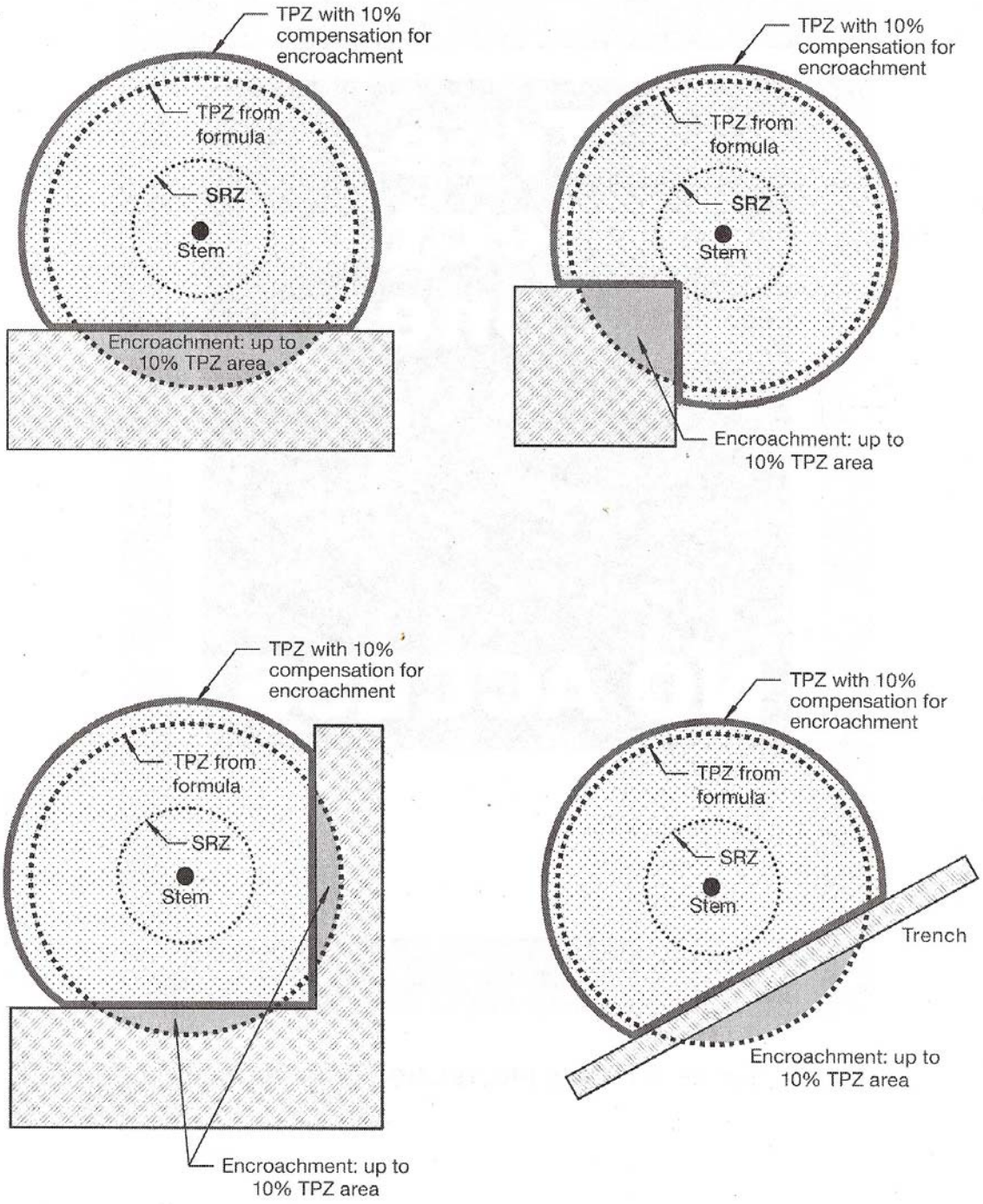
Plate 15 - basal area of T31 showing moderate bark inclusion

Plate 16 – T32 (Moreton Bay Fig)

Plate 17 –showing basal area of T32

Plate 18 – showing basal area of T32. Note exposed roots and proximity to path

APPENDIX 3 – ACCEPTABLE INCURSIONS TO THE TREE PROTECTION ZONE (TPZ)



NOTE: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.

REF:- Council of Standards Australia (August 2009)
AS 4970 – 2009 – Protection of Trees on Development Sites
Standards Australia, Sydney

1.1

APPENDIX 4 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Maturity Class	Condition	Health / Vigour	Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
1	***Ficus macrophylla*** (Moreton Bay Fig)	M	Stability suspect with sound branching structure.	Fair with slight thinning crown	Transient (less than 5 years)	1	**Moderate**	On-site
2	***Ficus macrophylla*** (Moreton Bay Fig)	M	Appears stable with fair branching structure.	Fair with slight thinning crown	Transient (less than 5 years)	1	**Moderate**	On-site
3	***Eucalyptus robusta*** (Swamp Mahogany)	SM	Appears stable with sound branching structure.	Good	Long - more than 40 years	4	**Moderate**	On-site
4	***Ginko biloba*** (Maidenhair Tree)	M	Appears stable with fair branching structure.	Very Good	Long - more than 40 years	4	**Moderate**	On-site
5	***Metasequoia glyptostroboides*** (Dawn Redwood)	M	Appears stable with sound branching structure.	Good	Medium 15-40 Years	4	**Moderate**	On-site
6	***Metasequoia glyptostroboides*** (Dawn Redwood)	SM	Appears stable with fair branching structure.	Good	Medium 15-40 Years	5	**Low**	On-site
7	***Magnolia grandiflora*** (Bullbay Magnolia)	M	Appears stable with sound branching structure.	Good	Long - more than 40 years	4	**Moderate**	On-site
8	***Eucalyptus nicholii*** (New England Peppermint)	M	Appears stable with sound branching structure.	Good	Medium 15-40 Years	3	**Moderate**	On-site
9	***Phoenix canariensis*** (Canary Island Palm)	SM	Appears stable with sound branching structure.	Good	Long - more than 40 years	4	**Moderate**	On-site
10	***Podocarpus elatus*** (Brown Pine)	M	Appears stable with fair branching structure.	Very Good	Long - more than 40 years	3	**High**	On-site
11	***Lagerstroemia indica*** (Crepe Myrtle)	M	Appears stable with sound branching structure.	Very Good	Long - more than 40 years	4	**Moderate**	On-site
12	***Syzygium leuhmannii*** (Small-leaf Lillypilly)	M	Appears stable with fair branching structure.	Very Good	Medium 15-40 Years	3	**Moderate**	On-site
13	***Syzygium leuhmannii*** (Small-leaf Lillypilly)	M	Appears stable with fair branching structure.	Fair with slight thinning crown	Medium 15-40 Years	3	**Moderate**	On-site
14	***Syzygium leuhmannii*** (Small-leaf Lillypilly)	M	Appears stable with fair branching structure.	Good	Medium 15-40 Years	3	**Moderate**	On-site
15	***Cotoneaster lacteus*** (Cotoneaster)	M	Appears stable with fair branching structure.	Fair	Medium 15-40 Years	6	**Moderate**	On-site
16	***Syzygium leuhmannii*** (Small-leaf Lillypilly)	M	Appears stable with fair branching structure.	Fair	Medium 15-40 Years	3	**Moderate**	On-site

APPENDIX 4 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Maturity Class	Condition	Health / Vigour	Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
17	***Callistemon viminalis*** (Weeping Bottlebrush)	SM	Appears stable with fair branching structure.	Fair	Short 5-15 Years	5	**Low**	On-site
18	***Syzygium leuhmannii*** (Small-leaf Lillypilly)	M	Appears stable with sound branching structure.	Fair with slight thinning crown	Medium 15-40 Years	3	**Moderate**	On-site
19	***Syzygium jambos*** (Rose Apple)	M	Appears stable with fair branching structure.	Good	Long - more than 40 years	3	**High**	On-site
20	***Callistemon citrinus*** (Bottlebrush)	M	Appears stable with fair branching structure.	Fair with thinning crown	Short 5-15 Years	5	**Low**	On-site
21	***Callistemon salignus*** (Willow Bottlebrush)	SM	Appears stable with fair branching structure.	Very Good	Short 5-15 Years	5	**Low**	On-site
22	***Callistemon salignus*** (Willow Bottlebrush)	SM	Appears stable with fair branching structure.	Very Good	Short 5-15 Years	5	**Low**	On-site
23	***Platanus orientalis*** (Oriental Plane Tree)	SM	Appears stable with fair branching structure.	Very Good	Long - more than 40 years	4	**Moderate**	On-site
24	***Platanus orientalis*** (Oriental Plane Tree)	SM	Appears stable with fair branching structure.	Very Good	Long - more than 40 years	4	**Moderate**	On-site
25	***Platanus orientalis*** (Oriental Plane Tree)	SM	Appears stable with fair branching structure.	Very Good	Long - more than 40 years	4	**Moderate**	On-site
26	***Platanus orientalis*** (Oriental Plane Tree)	SM	Appears stable with fair branching structure.	Very Good	Long - more than 40 years	4	**Moderate**	On-site
27	***Phoenix canariensis*** (Canary Island Palm)	M	Appears stable with sound branching structure.	Good	Long - more than 40 years	3	**High**	On-site
28	***Leptospermum petersonii*** (Lemon-scented Tea Tree)	M	Appears stable with fair branching structure.	Good	Short 5-15 Years	5	**Low**	Nature Strip
29	***Ficus microcarpa var. hillii*** (Hill's Weeping Fig)	M	Appears stable with fair branching structure.	Fair with slight thinning crown	Medium 15-40 Years	1	**High**	On-site
30	***Ficus macrophylla*** (Moreton Bay Fig)	M	Appears stable with fair branching structure.	Fair with slight thinning crown	Medium 15-40 Years	1	**High**	On-site
31	***Ficus macrophylla*** (Moreton Bay Fig)	M	Appears stable with fair branching structure.	Fair with slight thinning crown	Short 5-15 Years	1	**High**	On-site
32	***Ficus macrophylla*** (Moreton Bay Fig)	M	Appears stable with sound branching structure.	Good	Medium 15-40 Years	1	**High**	On-site

APPENDIX 4 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Maturity Class	Condition	Health / Vigour	Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
33	***Lophostemon confertus*** (Brushbox)	M	Appears stable with sound branching structure.	Good	Long - more than 40 years	4	**Moderate**	On-site
34	***Lophostemon confertus*** (Brushbox)	M	Appears stable with sound branching structure.	Fair with slight thinning crown	Medium 15-40 Years	4	**Moderate**	On-site
35	***Corymbia maculata*** (Spotted Gum)	M	Appears stable with fair branching structure.	Fair with slight thinning crown	Medium 15-40 Years	4	**Moderate**	On-site
36	***Eucalyptus paniculata*** (Grey Ironbark)	SM	Appears stable with fair branching structure.	Good	Long - more than 40 years	4	**Moderate**	On-site
37	***Eucalyptus microcorys*** (Tallowwood)	M	Appears stable with fair branching structure.	Very Good	Medium 15-40 Years	3	**Moderate**	On-site
38	***Corymbia maculata*** (Spotted Gum)	M	Appears stable with sound branching structure.	Good	Long - more than 40 years	3	**High**	On-site
39	***Corymbia citriodora*** (Lemon scented Gum)	I	Appears stable with fair branching structure.	Good	Short 5-15 Years	5	**Low**	On-site
40	Group of 4 x ***Eucalyptus sideroxylon*** (Mugga Ironbark)	SM	Appears stable with fair branching structure.	Fair	Short 5-15 Years	5	**Low**	On-site
41	Group of 4 x ***Lophostemon confertus*** (Brushbox) and 2 x ***Eucalyptus sideroxylon*** (Mugga Irobark)	SM	Appears stable with fair branching structure.	Good	Medium 15-40 Years	5	**Low**	On-site
42	***Phoenix canariensis*** (Canary Island Palm)	M	Appears stable with sound branching structure.	Very Good	Long - more than 40 years	3	**High**	On-site
43	***Gordonia axillaris*** (Gordonia)	SM	Appears stable with fair branching structure.	Fair with thinning crown	Short 5-15 Years	5	**Low**	On-site
45	Group of ***Livistona australis*** (Cabbage Tree Palm) and ***Howea forsteriana*** (Kentia Palm)	M	Appears stable with sound branching structure.	Very Good	Long - more than 40 years	4	**Moderate**	On-site
46	***Eucalyptus saligna*** (Sydney Blue Gum)	SM	Appears stable with poor branching structure.	Good	Transient (less than 5 years)	4	**very low**	On-site
47	***Grevillea robusta*** (Silky Oak)	I	Appears stable with sound branching structure.	Good	Long - more than 40 years	6	**Low**	On-site
48	***Pistacia chinensis*** (Chinese Pistachio)	SM	Appears stable with sound branching structure.	Good	Long - more than 40 years	5	**Moderate**	On-site
49	***Eucalyptus nicholii*** (New England Peppermint)	M	Appears stable with fair branching structure.	Good	Short 5-15 Years	3	**Low**	On-site

APPENDIX 4 - TREE HEALTH AND CONDITION ASSESSMENT SCHEDULE

Tree Identification No.	Species	Maturity Class	Condition	Health / Vigour	Remaining Safe Useful Life Expectancy (SULE)	Landscape Significance Rating	Retention Value	Location
50	***Eucalyptus nicholii*** (New England Peppermint)	M	Stability suspect with sound branching structure.	Good	Short 5-15 Years	3	**Low**	On-site
51	***Liquidambar styraciflua*** (Liquidamber)	M	Appears stable with fair branching structure.	Good	Medium 15-40 Years	6	**Low**	On-site
52	***Cinnamomum camphora*** (Camphor Laurel)	M	Appears stable with sound branching structure.	Good	Long - more than 40 years	6	**Low**	Adjoining property
53	***Cinnamomum camphora*** (Camphor Laurel)	M	Appears stable with sound branching structure.	Good	Long - more than 40 years	6	**Low**	Adjoining property

APPENDIX 5
TREE LOCATION PLAN

Wollongong Hospital
348-352 Crown Street, WOLLONGONG

Earthscape Horticultural Services
Arboricultural and Horticultural Consultants
PO Box 364
BEROWRA NSW 2081
Ph: 02 9456 4787
Fax: 02 9456 5757 e: earthscape@iinet.net.au

Based on the Aerial Photography
sourced from NearMap
Dated January 2010

DWG No. TLP 10_2871

DATE: 14/10/2010

APPENDIX 5
TREE LOCATION PLAN

42 Loftus Street
WOLLONGONG

Earthscape Horticultural Services
Arboricultural and Horticultural Consultants
PO Box 364
BEROWRA NSW 2081
Ph: 02 9456 4787
Fax: 02 9456 5757 e: earthscape@iinet.net.au

Based on the Aerial Photography
sourced from NearMap
Dated January 2010

DWG No. TLP 10_2872

DATE: 14/10/2010