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Arborist Report

Project – University of Newcastle – Anatomy Building

project no: 8692.5
date: September 2011
revision: B

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date: 27/09/2011
project no: 8692.5
site: University of Newcastle, University Drive, Callaghan
council: Newcastle City Council
proposal: Additions to Anatomy Building

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1 introduction

The University of Newcastle have engaged Terras Landscape Architects to undertake an inspection of 19 trees located within and around the footprint of the proposed addition to the Anatomy Building.

2 assessing arborist

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Qualifications: Diploma of Horticulture (Landscape Design)
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Certificate No. C0045006, ISAAC

3 client

Client: University of Newcastle C/O EJE Architecture
412 King Street Newcastle, NSW.
Phone 4929 2353

4 methodology

The site was visited on the afternoon of the 4th of November 2010. The following methods have been employed in preparing this report

- Visual Tree Inspection (VTA) (Mattheck & Breloer, 1994) was undertaken. Nineteen trees were inspected and assessed from the ground. The visual tree inspection included all visible above ground parts of the tree including exposed roots, trunk, branches and foliage.
- An assessment of Useful Life Expectancy (ULE) (Barrell 1993). ULE categories give an indication of the useful life expectancy of a tree. Several factors are taken into consideration in determining ULE ratings such as, location, species, age, health and structure of the tree. Refer to Appendix 3.
- Retention value of trees was determined using the steps outlined in the "Newcastle Urban Forest", Technical Manual July 2008. Refer to table "Retention Value of Trees" below on page 4.
- Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) were calculated from the Australian Standard 4970-2009 Protection of Trees on Development.

No below ground inspections or analyses was undertaken in the rootzone or on soil depths.
No internal inspections or tissue analyses was undertaken on the subject trees.

5 site

Located on The University of Newcastle's Callahan Campus, the subject site is located in the north western corner of the campus between the Ring Road and Anatomy Building. The subject trees are located on a north facing, moderate slope. Several paved pedestrian walkways pass through the area.

Figure 1: Site shown red

6 assessment of retention values

Using Newcastle City Councils methodology for assessing the retention value of trees (NCC, 2008) the following results were determined.

Retention Value of Trees Using Newcastle Urban Forest Technical Manual July 2008				
Tree No.	Species	Sustainability Period (Years)	Landscape Significance Rating	Retention Value
1	*Corymbia maculata*	15-40	4 Moderate	**Moderate**
2	*Corymbia maculata*	15-40	4 Moderate	**Moderate**
3	*Corymbia maculata*	>40	5 Low	**Moderate**
4	*Corymbia maculata*	>40	5 Low	**Moderate**
5	*Eucalyptus punctata*	5-15	5 Low	**Low**

6	*Eucalyptus sp*	5-15	5 Low	Low
7	*Corymbia maculata*	15-40	3 High	Moderate
8	*Eucalyptus sp*	<5	5 Low	Very Low
9	*Eucalyptus sp*	5-15	5 Low	Low
10	*Eucalyptus punctata*	5-15	5 Low	Low
11	*Corymbia maculata*	15-40	4 Moderate	Moderate
12	*Eucalyptus punctata*	15-40	5 Low	Low
13	*Eucalyptus punctata*	5-15	5 Low	Low
14	*Corymbia maculata*	15-40	4 Moderate	Moderate
15	*Eucalyptus punctata*	<5	5 Low	Very Low
16	*Corymbia maculata*	>40	5 Low	Moderate
17	*Corymbia maculata*	5-15	5 Low	Low
18	*Eucalyptus sp*	>5	5 Low	Very Low
19	*Corymbia maculata*	15-40	5 Low	Low

7 tree assessment

A visual tree assessment was undertaken on the afternoon of the 4th of November 2010. Refer to appendix 2 for further statistical information.

Tree 1 *Corymbia maculata* Spotted Gum ULE Rating 2A,
A large tree located next to the Ring Road. Some medium to small sized dead wood throughout the canopy.

Tree 2 *Corymbia maculata* Spotted Gum ULE Rating 2A,
A large tree located near the Ring Road upslope from Tree 1. Some medium to small sized dead wood throughout the canopy.

Tree 3 *Corymbia maculata* Spotted Gum ULE Rating 1A,
Small semi mature tree located in a clump of 4 trees.

Tree 4 *Corymbia maculata* Spotted Gum ULE Rating 1A,
As for Tree 3.

Tree 5 *Eucalyptus punctata* Grey Gum ULE Rating 3A,
Decay in lower trunk, possible termite infestation indicated by swollen trunk.

Tree 6 *Eucalyptus sp* Ironbark ULE Rating 3A
Small tree, relatively sparse canopy.

Tree 7 *Corymbia maculata* Spotted Gum ULE Rating 2A,
Large tree, excellent specimen, exhibits excellent vigour and structure.

Figure 2: Tree 1 left, tree 2 on right

Figure 3: Trees 3, 4, 5 & 6.

Figure 4: Large canopy of Tree 7

Tree 8 *Eucalyptus sp* Ironbark ULE Rating 4B

Trees 8, 9 & 10 are located along a concrete path. All 3 trees exhibit poor vigour and look to have suffered storm damage. Tree 8 exhibits small crown and foliage size, dead wood, epicormic growth.

Tree 9 *Eucalyptus sp* Ironbark ULE Rating 3A

As for tree 8.

Tree 10 *Eucalyptus punctata* Grey Gum ULE Rating 3A

Severely pruned tree which has epicormic growth and a small crown size. This is possibly due to storm damage.

Tree 11 *Corymbia maculata* Spotted Gum ULE Rating 2D

Large tree with co-dominant leaders, large amount of small to medium sized dead wood throughout the canopy.

Tree 12 *Eucalyptus punctata* Grey Gum ULE Rating 2A

Tree located next to the Ring Road in close proximity to Tree 11

Figure 5: Sparse canopies of Trees 8 & 9.

Figure 6: Sparse, severely pruned canopy of Tree 10.

Figure 7: Trees 11 & 12.

Figure 8: Decay in lower trunk of Tree 13.

Tree 13 *Eucalyptus punctata* Grey Gum ULE Rating 3D
Swollen lower trunk possibly due to termite activity. Area of lower trunk has decay.

Tree 14 *Corymbia maculata* Spotted Gum ULE Rating 2D
Tree of fair vigour and structure with an asymmetrical crown.

Tree 15 *Eucalyptus punctata* Grey Gum ULE Rating 4B
Tree 15 has extensive decay in the lower and upper trunk areas.

Tree 16 *Corymbia maculata* Spotted Gum ULE Rating 1A
Healthy young tree.

Tree 17 *Corymbia maculata* Spotted Gum ULE Rating 2D
Exhibits poor structure with a highly asymmetrical crown.

Tree 18 *Eucalyptus sp* Ironbark ULE Rating 4B
Severely pruned possibly due to past storm damage. Tree 18 has co-dominant leaders with included bark present at the union of these branches. Epicormic growth also present.

Tree 19 *Corymbia maculata* Spotted Gum ULE Rating 2A
Young healthy tree, however it is located approximately 800mm from the edge of a car park. Damage to kerbing and pavement may eventuate as the tree matures.

Figure 9: Extensive decay in Tree 15.

Figure 10: Tree 18, severely pruned.

8 impacts of development

Based on the currently proposed building footprint the works will directly impact upon 18 of the 19 subject trees. Trees 2, 3, 4, 5, 6, 7, 8, 9 10, 13, 14, 15, 16, 17 and 18 are all located within the proposed building footprint.

Trees 1 and 11, although located outside of the building footprint will have a substantial amount of their root system compromised. According to AS 4970 Protection of Trees on Development Sites, Tree 1 will lose a minimum of 26% of its Tree Protection Zone (TPZ), Tree 11 will lose a minimum of 37% of its TPZ. This is very likely to be unsustainable for these large mature trees.

Construction tolerances will also affect the Structural Root Zone (SRZ) of Trees 1 and 11. Interference with the trees SRZ can lead to complete tree failure.

Of the 18 trees earmarked for removal, 7 trees have a moderate retention value, 9 have a low retention value and 2 have a very low retention value.

Tree 12 a relatively small tree could be retained, however due to the practicalities involved in removing nearby tree 11 and the likelihood of damage to tree 12 during the removal operation, removal and replacement planting is recommended.

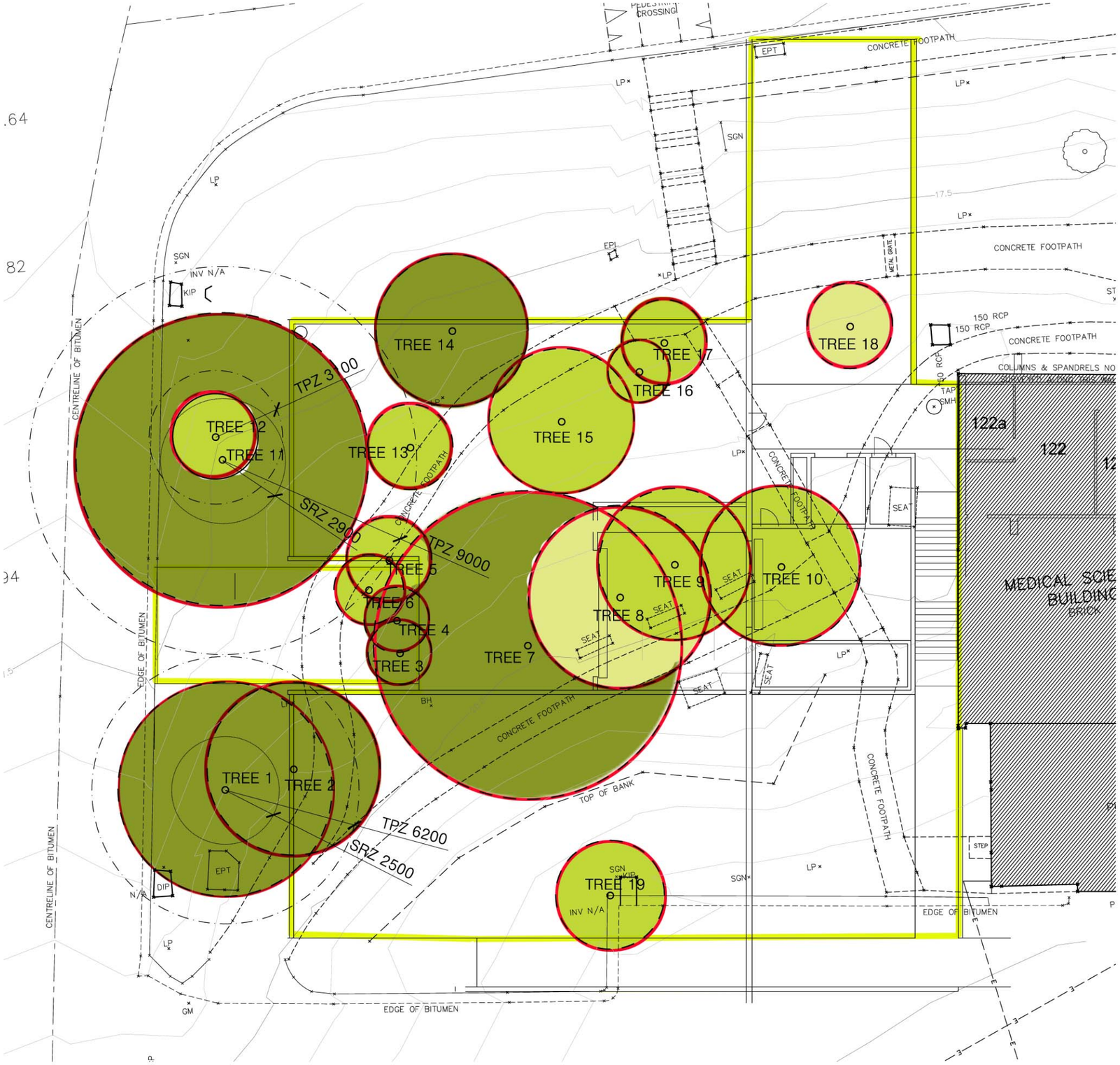
9 recommendations

- Remove trees 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19.
- Ensure all tree removal work is carried out by or supervised by a qualified tree worker (AQF Level 3 or equivalent) in accordance with the NSW WorkCover Code of Practice for the Amenity Tree Industry, 1998.
- Trees to be dismantled and mulched with the mulch being applied in a 75mm deep layer to existing garden beds. Any residual mulch to be disposed of in an appropriate manner offsite.
- Utilise deep soil areas around the proposed building to plant replacement trees that are in keeping with the bush land surrounds. Any Asset Protection Zone requirements must be considered when selecting species and planting densities.

10 references

Barrell, J.	*Pre-Development Tree Assessment*, (in Watson/Neely 1995) [Modified]
Costello, L.R. Jones, K. S.	*Reducing Infrastructure Damage By Tree Roots (A Compendium of Strategies)* WCISA, Porterville, 2003.
Draper, D. Richards, P.A.	*Dictionary for Managing Trees in Urban Environments.* CSIRO, Collingwood Vic, 2009.
Link Tree System Ltd. Barrell, J.	Arboricultural Journal 1993, Vol. 17pp. 33-46, 01/03/98
Matheck, C. Breloer, H.	*The Body Language of Trees: A Handbook for Failure Analysis.*TSO, London, England.
Matheny, N. Clark, J.R.	*Trees and Development (A Technical Guide to Preservation of Trees During Land Development)* ISA, Illinois, 1998
Newcastle City Council	*Newcastle Urban Forest Technical Manual,* (July 2008)
Newcastle City Council	*Newcastle City Centre Local Environment Plan 2008*
Standards Australia	Australian Standard *AS 4970 Protection of Trees on Development Sites.* (July 2009)

11 appendix 1 retention values drawing



LEGEND

- RETAINABLE TREE
- TREES TO BE REMOVED
- OPTIMAL TREE PROTECTION ZONE RADIUS (TPZ) — R1600
- STRUCTURAL ROOT ZONE (SRZ) — R1600
- PROPOSED BUILDING FOOTPRINT
- EXISTING BUILDING

LEGEND - RETENTION VALUES

- HIGH RETENTION VALUE
- MODERATE RETENTION VALUE
- LOW RETENTION VALUE
- VERY LOW RETENTION VALUE

rev no:	date:	comments:	by:	verified:	rev no:	date:	comments:	by:	verified:
A	01-02-10		SGK						

0 25mm 100mm 200mm 300mm ON ORIGINAL A1

PROJECT:
UNIVERSITY OF NEWCASTLE
ANATOMY BUILDING

CLIENT:
UNIVERSITY OF NEWCASTLE

SITE:
UNIVERSITY DRIVE, CALLAGHAN

DRAWING:
ARBORIST - SITE PLAN

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WORK TO FIGURED DIMENSIONS IN PREFERENCE TO SCALE. CHECK DIMENSIONS, LEVELS ON SITE PRIOR TO ORDERING MATERIALS OR COMPLETION OF WORKSHOP DRAWINGS.

drawn:	scale:	no in set:	date:
SGK	1/200@A3	1 OF 1	DEC 10

phase:	project no:	DWG no:	revision no:
DA	8692.5	ARB01	A

12 appendix 2 tree assessment schedule

FIELD ASSESSMENT SHEET

No	BOTANICAL NAME	COMMON NAME	AGE CLASS	HEIGHT [M]	DBH [MM]	SPREAD [M]				ULE	STRUCT -URE	HEALTH	COMMENTS
						NORTH	EAST						
1	*Corymbia maculata*	Spotted Gum	M	25	520	4	2	6	7	2A	AV	AV	LARGE TREE, SOME MEDIUM TO SMALL SIZED DEAD WOOD
2	*Corymbia maculata*	Spotted Gum	M	25	590	9	6	6	4	2A	AV	AV	LARGE TREE, SOME MEDIUM TO SMALL SIZED DEAD WOOD
3	*Corymbia maculata*	Spotted Gum	SM	7	175	0	4	4	1	1A	AV	AV	SMALL SEMI MATURE TREE
4	*Corymbia maculata*	Spotted Gum	SM	7	175	2	4	2	3	1A	AV	AV	SMALL SEMI MATURE TREE
5	*Eucalyptus punctata*	Grey Gum	M	8	395	5	3	3	4	3A	F	F	DECAY IN LOWER TRUNK, POSSIBLE TERMITE ACTIVITY IN LOWER TRUNK
6	*Eucalyptus sp*	Iron Bark	M	6	235	4	3	3	4	3A	E	E	SMALL TREE SPARSE CANOPY
7	*Corymbia maculata*	Spotted Gum	M	25	755	11	4	10	5	2A	P	P	EXCELLENT SPECIMEN
8	*Eucalyptus sp*	Iron Bark	M	18	440	1	1	1	1	4B	P	F	POOR VIGOUR, SMALL CROWN AND FOLIAGE SIZE. DEAD WOOD, EPICORMIC GROWTH – POSSIBLY DUE TO STORM DAMAGE
9	*Eucalyptus sp*	Iron Bark	M	18	490	4	4	4	2	3A	P	P	POOR VIGOUR, SMALL CROWN AND FOLIAGE SIZE. DEAD WOOD, EPICORMIC GROWTH – POSSIBLY DUE TO STORM DAMAGE
10	*Eucalyptus punctata*	Grey Gum	M	15	475	4	3	1	1	3A	F	A	POOR VIGOUR, SMALL CROWN AND FOLIAGE SIZE. DEAD WOOD, EPICORMIC GROWTH – POSSIBLY DUE TO STORM DAMAGE
11	*Corymbia maculata*	Spotted Gum	M	25	750	10	8	12	12	2D	F	F	LARGE TREE, CO-DOMINANT LEADERS, LARGE AMOUND OF SMALL TO MEDIUM SIZED DEAD WOOD THROUGHOUT CANOPY
12	*Eucalyptus punctata*	Grey Gum	M	14	260	4	3	2	3	2A	F	F	SMALL TREE LOCATED NEXT TO TREE 11
13	*Eucalyptus punctata*	Grey Gum	M	15	345	3	4	3	4	3D	F	F	DECAY IN LOWER TRUNK, POSSIBLE TERMITE ACTIVITY IN LOWER TRUNK
14	*Corymbia maculata*	Spotted Gum	M	15	330	9	4	2	4	2D	F	F	ASYMMETRICAL CROWN
15	*Eucalyptus punctata*	Grey Gum	M	16	660	6	6	2	2	4B	P	F	EXTENSIVE DECAY IN UPPER AND LOWER AREAS OF TRUNK
16	*Corymbia maculata*	Spotted Gum	M	8	165	3	2	1	1	1A	A	A	HEALTHY TREE
17	*Corymbia maculata*	Spotted Gum	M	15	365	5	4	0	0	2D	P	F	POOR STRUCTURE, HIGHLY ASYMMETRICAL CROWN
18	*Eucalyptus sp*	Iron Bark	M	9	410	2	5	3	2	4B	P	F	SEVERELY PRUNED, EPICORMIC GROWTH – POSSIBLY DUE TO STORM DAMAGE
19	*Corymbia maculata*	Spotted Gum	SM	9	190	2	2	2	2	2A	A	A	HEALTHY TREE LOCATED NEAR KERBING AND CAR PARK.

** MULTI TRUNKED. BASAL DIAMETER MEASURED IMMEDIATELY ABOVE ROOT FLARE*

LEGEND

AGE CLASS	Y	YOUNG SAPLING/HAS NOT REACHED 1st ADULT FORM	SM	SEMI-MATURE DBH < 300mm/APPROACHING FULL HEIGHT	M	MATURE DBH BET. 300 -700/APPROACH. MAX HT & SPREAD	OM	OVER-MATURE/SENESCENT LGE DBH, LGE BRANCH FAILURES/STRUCT FAULTS
STRUCTURE	P	POOR NUMEROUS STRUCTURAL FAULTS/HIGH RISK OF SEVERE FAILURE	F	FAIR STRUCTURAL FAULTS PRESENT /MODERATE RISK OF SEVERE FAILURE	Av	AVERAGE SOME MINOR FAULTS /MODERATE RISK FOR MAJOR FAILURE	Ex	EXCELLENT SOME MINOR FAULTS/LOW-MOD RISK OF MINOR FAILURES
HEALTH	P	POOR SIG. SIGNS OF LOST VIGOUR EG DIEBACK, REDUCED CANOPY	F	FAIR SIGNS OF REDUCED VIGOUR EG LEAF UNDER STRESS, STUNTING	Av	AVERAGE LOCALISED PATCHES OF LOST VIGOUR/NOT WIDESPREAD	Ex	EXCELLENT NO EVIDENCE OF STRESS/SIGNS OF NEW GROWTH/WIDESPREAD
RETENTION	TREES TO BE RETAINED		TREES TO BE REMOVED		THREATENED TREE			

13 appendix 3 useful life expectancy (ule) categories

ULE CLASSIFICATIONS

1	**LONG ULE : GREATER THAN 40 YEARS [>40]** TREES THAT APPEAR TO BE RETAINABLE WITH AN ACCEPTABLE LEVEL OF RISK FOR MORE THAN 40 YEARS
A	Structurally sound trees located in positions that can accommodate future growth.
B	Storm damaged or defective trees that could be made suitable for retention by remedial tree surgery.
C	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

2	**MEDIUM ULE : MORE THAN 15 YEARS, LESS THAN 40 YEARS [15 - 40]** TREES THAT APPEAR TO BE RETAINABLE WITH AN ACCEPTABLE LEVEL OF RISK FOR 15 TO 40 YEARS
A	Trees that may only live between 15 and 40 more years
B	Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals
C	Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons
D	Storm damaged or defective trees that can be made suitable for retention by remedial work

3	**SHORT ULE : MORE THAN 5 YEARS, LESS THAN 15 YEARS [5 -15]** TREES THAT APPEAR TO BE RETAINABLE WITH AN ACCEPTABLE LEVEL OF RISK FOR 5 TO 15 YEARS
A	Trees that may only live between 5 and 15 more years
B	Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals
C	Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons
D	Storm damaged or defective trees that require substantial remedial work to make safe, and are only suitable for retention in the short term

4	**REMOVE : LESS THAN 5 YEARS [<5]** TREES WITH A HIGH LEVEL OF RISK THAT WOULD NEED REMOVING WITHIN THE NEXT 5 YEARS
A	Dead trees
B	Dying or suppressed and declining trees through disease or inhospitable conditions
C	Dangerous trees through instability or recent loss of adjacent trees
D	Dangerous trees through structural defects, including cavities, decay, included bark, wounds or poor form
E	Damaged trees that are considered unsafe to retain
F	Trees that will become dangerous after removal of others for the reasons given in A to E

REFERENCE: **LINK TREE SYSTEM LTD. JEREMY BARRELL, ARBORICULTURAL JOURNAL 1993, VOL. 17PP. 33-46, 01/03/98**

14 appendix 4 extract from AS 4970-2009

Extract from AS 4970:2009

3.1 Tree Protection Zone (TPZ)

The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

3.2 Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12

DBH = trunk diameter measured at 1.4 metres above ground.

Radius is measured from the centre of the stem at ground level.

A TPZ should not be less than 2m nor greater than 15m (except where crown protection is required).

The TPZ of palms and other monocots, cycads and tree ferns should not be less than 1 metre outside of the crown projection.

3.3 Variations to the TPZ

3.31 General

It may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill and machine trenching.

3.3.2 Minor Encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. Variations must be made by the project arborist considering relevant factors listed in clause 3.3.4.

3.3.2 Major Encroachment

If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree would remain viable. The area lost to the encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non destructive methods and consider relevant factors listed in clause 3.3.4.

3.3.5 Structural Root Zone

The SRZ is the area required for tree stability. A larger area is required to maintain a viable tree.

The SRZ only needs to be calculated when major encroachment into the TPZ is proposed.

There are many factors that affect the size of the SRZ (e.g. tree height, crown area, soil type, soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks or footings. An indicative SRZ radius can be determined from the trunk

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diameter measured immediately above the root buttress using the following formula. Root investigation may provide more information on the extent of these roots

SRZ radius = $(D \times 50)^{0.42} \times 0.64$
where
D = trunk diameter, in metres, measured above the root buttress
The SRZ for trees with trunk diameters less than 0.15 will be 1.5 metres.

15 appendix 5 glossary of arboricultural terminology

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Glossary of Arboricultural Terminology

Basal:	The lower trunk area of the tree.
Bracket:	Generally rigid bracket shaped fruiting body of wood decaying fungi.
Branch Collar:	The swollen ring of growth formed around the base of the branch by the successive layers of each growth increment of the branch and the supporting branch or trunk to which it is connected growing and intertwining around its edges.
Canopy:	An area of connected crowns, plural for crown.
Chloritic:	Yellowing of leaves due to some macro or micro nutrients such as Nitrogen or Iron.
Co-dominant Branch:	Stems or trunks of similar proportions eminating from the same position on the main stem or trunk.
Compaction:	Compaction of soils causing roots to die because of lack of pore space needed for oxygen or water storage within the soil.
Crown:	The part of the tree containing leaves and branches.
Crown Clean:	Pruning that preserves the size and structure of the tree while maintaining crown volume.
Decay:	Degeneration of of tissue by pathogens or micro-organisms
Decurrent:	Trees that lack a central leader, the crown being made up of numerous branches.
Decline:	Diminishing vitality of a tree.
Dripline:	The area formed by the width of the crown projected directly onto the ground beneath it, forming an imaginary line.
DBH:	Diameter of the trunk at Breast Height, measured at 1.4 metres above ground level.
Epicormic Growth:	A survivial response, shoots occuring from latent or adventitious buds as a result of stress. Generally have a weaker form of attachment.
Excurrent:	Trees that have a strong central leader.
Girdling Root:	A root that encircles the trunk, impeding growth and support.
Included bark:	Inwardly formed bark imbedded between the union of branches, branches and trunk or co-dominant branches.
Kino:	A dark brown or red exudate produced by trees particularly Eucalypts. Kino forms when cells are injured or infected.
Leader:	Dominant stem, particularly found on excurrent trees.
pH:	A measure of the acidity (0-7) or alkalinity (7-14) of the soil. 7 is neutral.
Phloem:	Outer conductive tissue located just beneath the bark, carries sugars and other nutrtients.
Phototropic:	Directional growth movement towards light.
Root Crown:	Area where trunk and root plate meet generally just around ground level.

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Scaffold Branches:	Structural or main branches connected to the trunk.
Secondary Branching:	Branch network connected to scaffold branches.
Senescence:	The ageing process, the changes that occur between maturity and death.
Structural Roots:	Large woody roots that support and anchor the tree.
Structural Root Zone (SRZ):	Minimum radial distance around a tree and its root plate providing strength and stability to the tree.
Tree Protection Zone:	An area of protection around the tree generally used on construction sites.
Windthrow:	Uplifting of the entire tree and rootplate as a result of strong winds.
Xylem:	Woody conductive tissue located inside the Phloem that translocates water and other solutes in an upward direction to the crown.