

Updated Arborist Report

*Waverley Campus Redevelopment
Prepare for Uniting*

Taylor Brammer Landscape Architects Pty Ltd

20/10/2016

Uniting
Level 4 /222 Pitt Street, Sydney NSW 2000
Attention: Fiona Logge

Dear Madam,

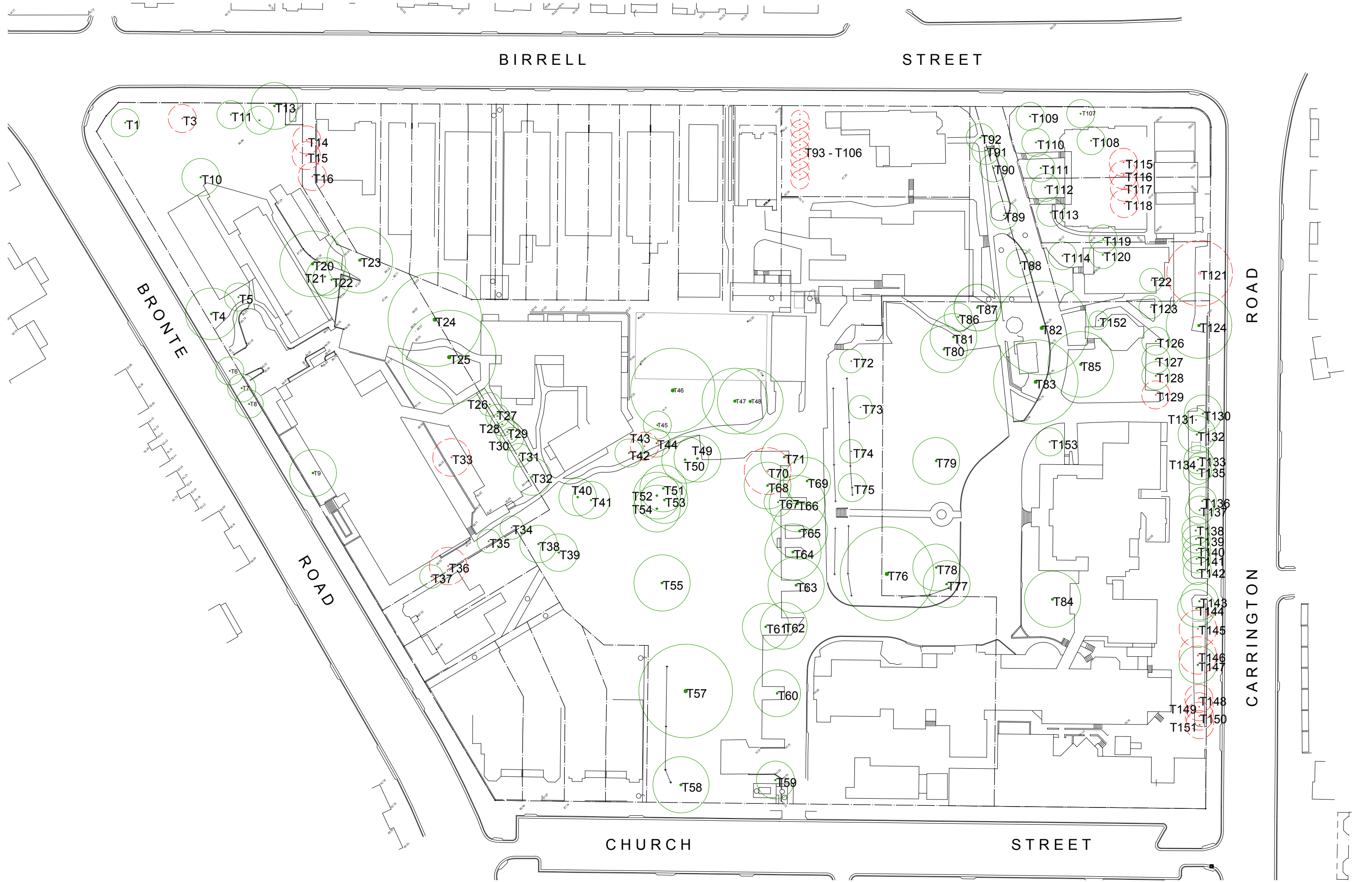
UPDATED ARBORIST REPORT WAVERLEY CAMPUS

Please find attached the updated report for the above. A site visit was undertaken on the 16 October to review the existing tree inventory. This inventory, plan and 2005 Arborist report form the contents of this summary document. It has been established that the outcomes of the 2005 Arborist report prepared by Hugh Taylor and Julia Sullivan and dated 24/11/2016 Stand. The findings of the report remain current and relevant to the site. The changes since 2005 reflect the removal of some trees over time. The trees removed in general reflect the recommendations of the 2005 Arborist report where plantings from the 1970s onwards had not thrived and were removed from the site. The principal trees that contribute to the heritage values of place are retained and exhibit a health and maturity that are consistent with their age and type. The exception to this are the Cottonwood tree (No. T132) and the Kurrajong (No. T61) that are not thriving and the recommendation is that there be removed.

Yours faithfully




D Matthew Taylor BLArch MBEnv (Cons) AAILA
Registered Landscape Architect
Director




NOTES:
1. Figured dimensions shall be taken in preference to scaling.
2. The contractor shall check all dimensions on site before commencing work.

LEGEND:




EXISTING TREE



TREE REMOVED SINCE 2005

Tree numbers relate to ARBORIST REPORT prepared by Hugh Taylor and Julia Sullivan, Australian Tree Consultants Pty Ltd, Date 24/11/2005

PROJECT: Waverley Campus Redevelopment			
DRAWING TITLE: KEY PLAN EXISTING TREE LAYOUT		SCALE: 1:400 @ A1 CREATED: 20/10/2016 DRAWN:	CHECKED: JOB NO: 15-162s DESIGNED:
CLIENT: UNITING		Copyright of Taylor Brammer Landscape Architects Pty Ltd. ABN 61 098 724 988	
ISSUE	DESCRIPTION	DATE	

EXISTING VEGETATION SCHEDULE - Taylor Brammer Landscape Architect 16.10.2016

ID	BOTANICAL NAME	COMMON NAME	HEIGHT (m)	TRUNK DIAMETER (mm)	CANOPY SPREAD	MATURITY	VIGOUR	RETENTION CATEGORY	NOTE
T1	<i>Cupressus torulosa</i>	Butan Cypress	11	300	2	M	N	A	
T2	<i>Eriobotrya japonica</i>	Japanese Plum	6	200	5	M	L	A	
T3	<i>X Cupressocyparis leylandii</i>	Leyland Cypress	9	MULTI	4	M	N	A	REMOVED
T4	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	17	1680	11	M	N	Z6	
T5	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	10	395	6	M	N	Z10	
T6	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	7	145	1.5	SEMI-M	N	A1	
T7	<i>Cupressus sempervirens 'Stricta'</i>	Italian Cypress	8	160	1	M	N	A1	
T8	<i>Cupressus sempervirens 'Stricta'</i>	Italian Cypress	8	170	1	M	N	Z11	
T9	<i>Eucalyptus sideroxylon</i>	Red Ironbark	12	610	8	M	N	A2	
T10	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	10	760	6	M	N	A1	
T11	<i>Jacaranda mimosifolia</i>	Jacaranda	9	MULTI	8	M	N	A	
T12	<i>Castanospermum australe</i>	Black Bean	8	190	1.5	SEMI-M	N	Z11	
T13	<i>Erithrina sp.</i>	Coral Tree	9	375	8	M	N	A	
T14	<i>Bauhinia variegata</i>	Orchid Tree	9	310	8	M	L	A2	REMOVED
T15	<i>Bauhinia variegata</i>	Orchid Tree	9	280	4	M	L	A2	REMOVED
T16	<i>Bauhinia variegata</i>	Orchid Tree	9	330,210	7	M	L	A2	REMOVED
T17	<i>Malus floribunda</i>	Crab Apple	5	195	4	M	N	Z10	
T18	<i>Callistemon viminalis</i>	Weeping Bottlebrush	8	210,230	6	M	L	Z10	
T19	<i>Podocarpus elatus</i>	Illawarra Pine	12	910	10	M	N	AA3	
T20	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	14	625	5	M	N	A	
T21	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	14	460	7	M	N	A	
T22	<i>Callistemon viminalis</i>	Weeping Bottlebrush	7	230	9	M	N	Z1	
T23	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	17	480 MULTI	11	M	N	Z1	
T24	<i>Ficus macrophylla</i>	Moreton Bay Fig	19	3000	25*20	M	N	AA3	
T25	<i>Ficus macrophylla</i>	Moreton Bay Fig	17	1900	18*14	M	N	A2	
T26	<i>Murraya paniculata</i>	Mock Orange	5	MULTI	6	M	N	A	
T27	<i>Melia azedarach</i>	White Cedar	6	100	3	SEMI-M	N	Z1	
T28	<i>Camellia sasanqua</i>	Camelia	4	MULTI	3	M	N	Z1	
T29	<i>Camellia sasanqua</i>	Camelia	4	MULTI	4	M	N	Z1	
T30	<i>Persea sp.</i>	Avacado	14	260	6	M	N	Z11	
T31	<i>Persea sp.</i>	Avacado	13	240	8	M	N	A2	
T32	<i>Lagunaria patersonia</i>	Norfolk Island Hibiscus	14	220,150	8	M	N	A	
T33	<i>Eucalyptus sideroxylon</i>	Red Ironbark	9	425	9	M	N	A2	REMOVED
T34	<i>Eucalyptus sideroxylon</i>	Red Ironbark	10	320	7	M	N	A2	
T35	<i>Eucalyptus sideroxylon</i>	Red Ironbark	9	310	5.5	M	N	A2	
T36	<i>Melaleuca armillaris</i>	Bracelet Honey myrtle	7	360	5	M	L	Z3	REMOVED
T37	<i>Eucalyptus sideroxylon</i>	Red Ironbark	9	620	7	M	N	A2	
T38	<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	7	275	4	M	N	A	
T39	<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	8	270	4	M	N	A	
T40	<i>Casuarina sp.</i>	Casuarina	15	270 MULTI	7	M	N	A	
T41	<i>Casuarina sp.</i>	Casuarina	15	350	6	M	N	A2	
T42	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	11	240	2.5	SEMI-M	N	Z4	
T43	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	8	100	1	SEMI-M	N	Z1	REMOVED
T44	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	10	170	1.5	SEMI-M	N	Z1	
T45	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	9	180	3.5	SEMI-M	N	Z1	
T46	<i>Ficus macrophylla</i>	Moreton Bay Fig	17	480	10	M	N	A2	
T47	<i>Casuarina sp.</i>	Casuarina	14	480	10	M	N	A2	
T48	<i>Casuarina sp.</i>	Casuarina	14	510	10	M	N	A2	
T49	<i>Casuarina sp.</i>	Casuarina	14	490	11	M	N	A2	
T50	<i>Casuarina sp.</i>	Casuarina	13	560	9	M	N	A2	
T51	<i>Casuarina sp.</i>	Casuarina	15	520	10	M	N	A2	
T52	<i>Casuarina sp.</i>	Casuarina	15	340	6	M	N	A2	

ID	BOTANICAL NAME	COMMON NAME	HEIGHT (m)	TRUNK DIAMETER (mm)	CANOPY SPREAD	MATURITY	VIGOUR	RETENTION CATEGORY	NOTE
T53	<i>Casuarina sp.</i>	Casuarina	15	280	4	M	N	A2	
T54	<i>Casuarina sp.</i>	Casuarina	15	500	8	M	N	A2	
T55	<i>Magnolia grandiflora</i>	Bull Bay Magnolia	12	480 380 320	8	OVER M	N	A2	
T56	<i>Lophostemon confertus</i>	Brush Box	12	500	4	OVER M	L	Z10	
T57	<i>Ficus macrophylla</i>	Moreton Bay Fig	18	2330	22*20	M	N	A2	
T58	<i>Ficus macrophylla</i>	Moreton Bay Fig	13	1220	18*16	OVER M	L	A2	
T59	<i>Lagunaria patwesonii</i>	Norfolk Island Hibiscus	12	530	8	M	N	A1	
T60	<i>Magnolia grandiflora</i>	Bull Bay Magnolia	9	415	8	M	N	A1	
T61	<i>Brachychiton populneum</i>	Kurrajong	12	560	7	OVER M	L	Z3	
T62	<i>Stenocarpus sinuatus</i>	Wheel of Fire	16	390	4	M	N	A	
T63	<i>Cedrus deodara</i>	Himalayan Cedar	14	510	11	M	N	A2	
T64	<i>Cinnamomum camphor</i>	Camphor Laurel	14	620	12	M	N	A2	
T65	<i>Cinnamomum camphor</i>	Camphor Laurel	13	500	6	M	N	Z10	
T66	<i>Cinnamomum camphor</i>	Camphor Laurel	13	380 390	9	M	N	A	
T67	<i>Quercus palustris</i>	Pin Oak	12	330	9	M	N	A	
T68	<i>Quercus robur</i>	English Oak	11	330	5	M	L	A2	
T69	<i>Harpephyllum caffrum</i>	Kaffir Plum	9	550	6	M	L	Z3	
T70	<i>Chamaecyparis sp.</i>	False Cypress	9	MULTI	4.5	M	L	A	REMOVED
T71	<i>Cinnamomum camphor</i>	Camphor Laurel	12	840	10	M	L	Z3	
T72	<i>Ulmus parvifolia</i>	Chinese Weeping elm	5	200	5.5	M	N	A	
T73	<i>Pinus radiata</i>	Radiata pine	7	570	6	M	L	Z3	
T74	<i>Phoenix canariensis</i>	Canary Island Date Palm	14	740	6	M	N	AA	
T75	<i>Phoenix canariensis</i>	Canary Island Date Palm	15	650	6	M	N	AA	
T76	<i>Ficus macrophylla</i>	Moreton Bay Fig	17	2250	18*18	M	N	A2	
T77	<i>Araucaria heterophylla</i>	Norfolk Island Fig	29	1050	9	M	N	Z4	
T78	<i>Ficus macrophylla</i>	Moreton Bay Fig	15	990	12	M	L	Z4	
T79	<i>Araucaria heterophylla</i>	Norfolk Island Fig	29	940	10	M	N	AA	
T80	<i>Cinnamomum camphor</i>	Camphor Laurel	15	610	9	M	L	Z3	
T81	<i>Cinnamomum camphor</i>	Camphor Laurel	15	700	6	M	L	Z3	
T82	<i>Ficus macrophylla</i>	Moreton Bay Fig	17	1710	19*18	OVER M	N	A2	
T83	<i>Ficus macrophylla</i>	Moreton Bay Fig	15	1180	9	M	L	Z6	
T84	<i>Jacaranda mimosifolia</i>	Jacaranda	14	60	12	M	N	A2	
T85	<i>Ficus macrophylla</i>	Moreton Bay Fig	15	2700	14*15	M	N	A1	
T86	<i>Syagrus romanzoffiana</i>	Queen Plum	11	315	5	M	N	A	
T87	<i>Phoenix canariensis</i>	Canary Island Date Palm	10	560	5	M	N	AA	
T88	<i>Syagrus romanzoffiana</i>	Queen Plum	9	320	4	M	N	A	
T89	<i>Phoenix canariensis</i>	Canary Island Date Palm	9	490	5	M	N	AA	
T90	<i>Phoenix canariensis</i>	Canary Island Date Palm	13	390	5	M	N	AA	
T91	<i>Camellia sasanqua</i>	Camellia	5	MULTI	5	M	N	A	
T92	<i>Callistemon viminalis</i>	Weeping Bottlebrush	5	MULTI	3	M	N	A	
T93	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	4	MULTI	2	M	L	Z3	
T94	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	4	MULTI	2	M	L	Z3	
T95	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	5	MULTI	3	M	L	Z3	REMOVED
T96	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	5	MULTI	2	M	L	Z3	REMOVED
T97	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	6	MULTI	3	M	L	Z3	REMOVED
T98	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	6	MULTI	2	M	L	Z3	REMOVED
T99	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	5	MULTI	2	M	L	Z3	REMOVED
T100	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	5	MULTI	2	M	L	Z3	REMOVED
T101	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	4	MULTI	3	M	L	Z3	REMOVED
T102	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	4	MULTI	2	M	L	Z3	REMOVED
T103	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	5	MULTI	4	M	L	Z3	REMOVED
T104	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	5	MULTI	4	M	L	Z3	REMOVED
T105	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	5	MULTI	4	M	L	Z3	REMOVED
T106	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	4	MULTI	3	M	L	Z3	REMOVED
T107	<i>Livistona australis</i>	Australia Cabbage Palm	14	400	3	M	N	A	
T108	<i>Cotoneaster salicifolia</i>	Cotoneaster	4	110	4	M	N	A	
T109	<i>Phoenix canariensis</i>	Canary Island Date Palm	14	670	6*6	M	N	AA	

ID	BOTANICAL NAME	COMMON NAME	HEIGHT (m)	TRUNK DIAMETER (mm)	CANOPY SPREAD	MATURITY	VIGOUR	RETENTION CATEGORY	NOTE
T110	<i>Phoenix canariensis</i>	Canary Island Date Palm	13	620	6*6	M	N	AA	
T111	<i>Phoenix canariensis</i>	Canary Island Date Palm	13	690	6*6	M	N	AA	
T112	<i>Phoenix canariensis</i>	Canary Island Date Palm	14	670	6*6	M	N	AA	
T113	<i>Phoenix canariensis</i>	Canary Island Date Palm	14	580	6*6	M	N	AA	
T114	<i>Phoenix canariensis</i>	Canary Island Date Palm	14	590	6*6	M	N	AA	
T115	<i>Chamaecyparis sp.</i>	False Cypress	4	120 190	2	M	L	Z1	REMOVED
T116	<i>Chamaecyparis sp.</i>	False Cypress	4.5	120	3	M	L	Z1	REMOVED
T117	<i>Callistemon viminalis</i>	Weeping Bottlebrush	6.5	120 130	2	M	L	Z8	REMOVED
T118	<i>Callistemon viminalis</i>	Weeping Bottlebrush	6	121 130	2	M	L	Z8	REMOVED
T119	<i>Hibiscus rosasinensis</i>	Chinese Hibiscus	4.5	MULTI	5	M	N	A	
T120	<i>Mangolia michelia figo</i>	Port Wine Magnolia	6	MULTI	5	M	L	A2	
T121	<i>Cupressus torulosa</i>	Butan Cypress	7	MULTI	3	M	L	Z4	REMOVED
T122	<i>Populus deltoides</i>	Cottonwood	14	1180	12	M	N	A	
T123	<i>Lophostemon confertus</i>	Brush Box	10	180	6	OVER M	N	A2	
T124	<i>Phoenix canariensis</i>	Canary Island Date Palm	11	700	6*6	M	N	AA	
T125	<i>Populus deltoides</i>	Cottonwood	13	720	10*12	M	N	A2	
T126	<i>Lagunaria patwesonii</i>	Norfolk Island Hibiscus	10	280	4	M	N	A	
T127	<i>Camellia sasanqua</i>	Camelia	7	240	5	M	N	A2	
T128	<i>Agonis flexuosa</i>	Willowmyrtle	5	270 230 340	7	M	N	A2	
T129	<i>Chamaecyparis sp.</i>	False Cypress	11	240	4	M	N	A2	REMOVED
T130	<i>Lophostemon confertus</i>	Brush Box	10	400	8	M	N	A2	
T131	<i>Phoenix canariensis</i>	Canary Island Date Palm	11	560	6*6	M	N	A	
T132	<i>Populus deltoides</i>	Cottonwood	15	690	8	M	N	A	
T133	<i>Casuarina sp.</i>	Casuarina	14	480	4	M	N	A2	
T134	<i>Casuarina sp.</i>	Casuarina	14	510	3	M	N	A2	
T135	<i>Casuarina sp.</i>	Casuarina	14	490	4	M	N	A2	
T136	<i>Casuarina sp.</i>	Casuarina	8	560	2	M	N	Z4	
T137	<i>Casuarina sp.</i>	Casuarina	6	150	2	M	N	Z4	
T138	<i>Casuarina sp.</i>	Casuarina	15	340	6	M	N	A2	
T139	<i>Casuarina sp.</i>	Casuarina	15	280	4	M	N	A2	
T140	<i>Casuarina sp.</i>	Casuarina	15	500	3	M	N	A2	
T141	<i>Casuarina sp.</i>	Casuarina	15	280	4	M	N	A2	
T142	<i>Casuarina sp.</i>	Casuarina	15	500	3	M	N	A2	
T143	<i>Banksia integrifolia</i>	Coast Banksia	10	360	4	M	N	A	
T144	<i>Banksia integrifolia</i>	Coast Banksia	8	150 50	2.5	M	N	A	
T145	<i>Banksia integrifolia</i>	Coast Banksia	8	125	5	M	N	A	REMOVED
T146	<i>Callistemon viminalis</i>	Weeping Bottlebrush	4	MULTI	3	M	N	A	REMOVED
T147	<i>Eucalyptus spp</i>	Gum	14	500	7	M	N	A	
T148	<i>Eucalyptus nicholii</i>	Narrow leaf peppermint	15	450	7	M	L	Z3	REMOVED
T149	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	6	MULTI	4	M	L	Z3	REMOVED
T150	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	6	MULTI	4	M	L	Z3	REMOVED
T151	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	6	MULTI	4	M	L	Z3	REMOVED
T152	<i>Bhutan cypress</i>	Bhutan Cypress		240	3	SEMI-M	N	A1	
T153	<i>Eucalyptus sp.</i>	Gum Trees		240	4	SEMI-M	N	A1	

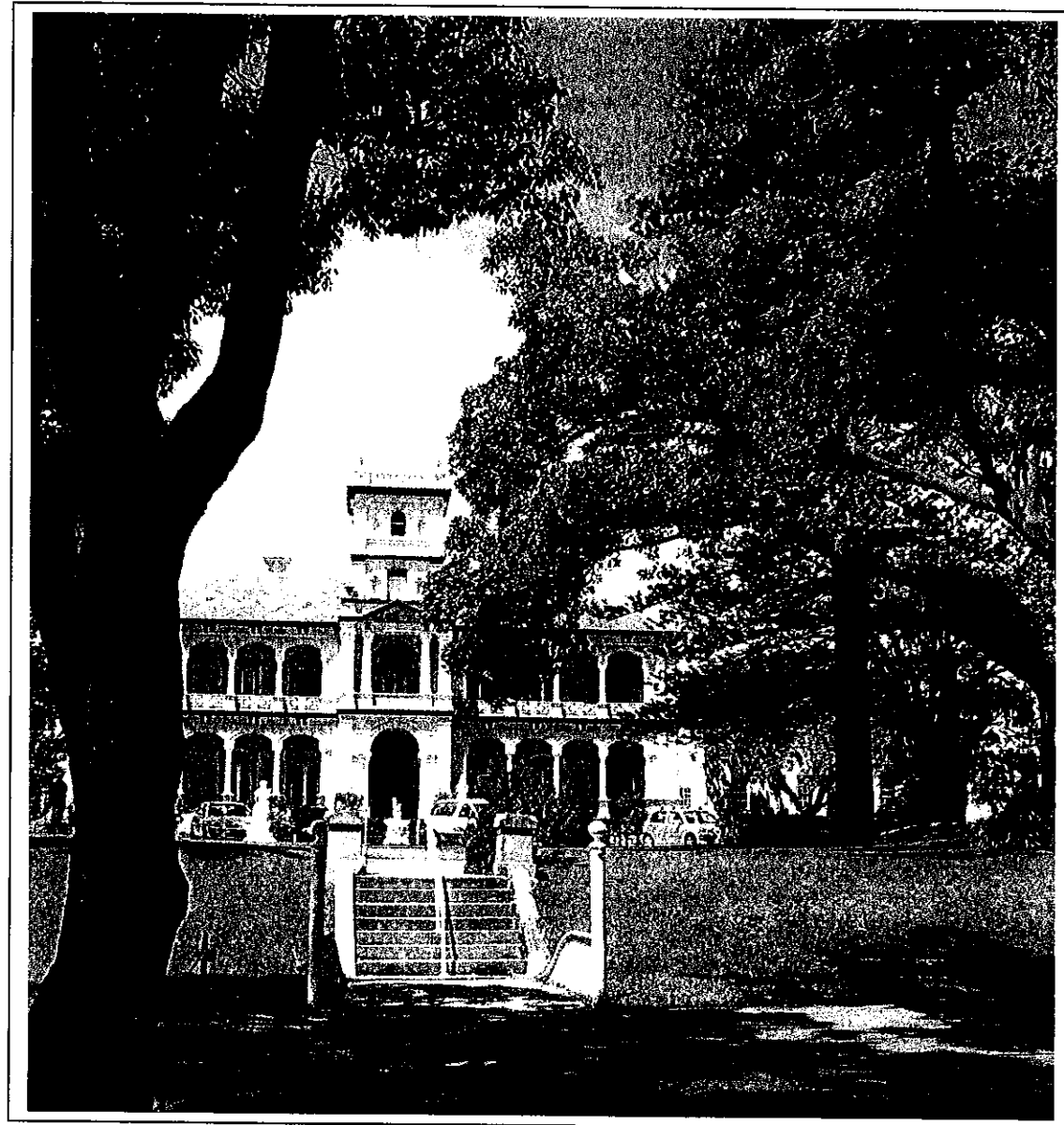
Addendum

Arborist Report

*Australian Tree Consultants Pty Ltd
Arborist: Hugh Taylor and Julia Sullivan*

22/11/2005

ARBORIST REPORT



Site Address 125 Birrell St Waverley

Report Prepared By Australian Tree Consultants Pty Ltd

Arborist Hugh Taylor, Julia Sullivan



Australian Tree Consultants Pty. Ltd.

ABN 35 104 636 535
23 Powell Street, Blackland NSW 2774

Tel: (02) 4739 8004
Mobile: 0417 874 796
Fax: (02) 4739 6713

Date 22 November 2005

To: Clouston Associates
64 Wetherill St
Leichhardt
NSW 2040

Re – Arboricultural survey at War Memorial Hospital, Birrell St Waverley.

I refer to your request to undertake an assessment of trees on site at the War Memorial Hospital and Edina Aged Care, 125 Birrell St Waverley.

Australian Tree Consultants Pty Ltd undertook the site inspection and tree assessment on the 10th November 2005. A Visual Tree Inspection was conducted at ground level to ascertain the current condition of the trees on site and the suitability for their retention within a proposed part redevelopment of the site. Our findings are included in the following pages of this document.

If you require any further information in relation to this report, please do not hesitate to contact myself at your earliest convenience on 0418 474796.

Yours sincerely

Hugh Taylor - Consultant

BA (Leisure) Major in Wilderness Management / Outdoor Education
Diploma Horticulture – Arboriculture

Arborist/ Tree Surgeon/ Horticulturist
Vice President National Arborist Association of Australia
Executive Board Member International Society of Arboriculture Australian Chapter.



EXECUTIVE SUMMARY

The report used the TreeAZ system of assessing trees on this proposed development site. Explanatory notes are tabled in the appendix of this report.

Our investigations identified and surveyed 151 trees.

Our findings showed that the following 16 trees (categorised as AA) were considered to be of special significance, and should be retained within the proposed redevelopment of this site.

- 19 *Podocarpus elatus*
- 24 *Ficus macrophylla*
- 74 *Phoenix canariensis*
- 75 *Phoenix canariensis*
- 77 *Araucaria heterophylla*
- 79 *Araucaria heterophylla*
- 87 *Phoenix canariensis*
- 89 *Phoenix canariensis*
- 90 *Phoenix canariensis*
- 109 *Phoenix canariensis*
- 110 *Phoenix canariensis*
- 111 *Phoenix canariensis*
- 112 *Phoenix canariensis*
- 113 *Phoenix canariensis*
- 114 *Phoenix canariensis*

Trees that have been given a rating of Z (Blue) are considered as trees not worthy of being a material constraint for the redevelopment and could be removed.

Trees that could be retained for the next 10 years (Green) have been given a rating of A. Trees within this category may have to be removed for the redevelopment of the site. (For more detail please see appendices)

SITE LOCATION

The site commissioned for the tree inspections is known as the War Memorial Hospital and Edina Retirement Home bounded by Birrell Street, Carrington Road, Church Street and Bronte Road, Waverley. (Plate 2)

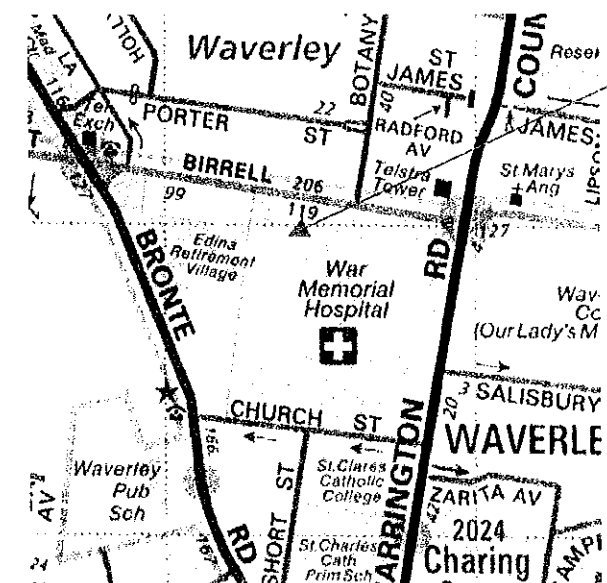


Plate 2: Site location of study area.
(Sydney 8th Edition 2003 p23)

BRIEF & INSPECTION METHODOLOGY

Clouston Associates has commissioned Australian Tree Consultants Pty Ltd to undertake an assessment of trees on the site at the War Memorial Hospital, 125 Birrell St Waverley. Part of this site is proposed for redevelopment.

The survey and assessment was undertaken in accordance with Waverley City Council's Tree Preservation Order.

Site inspections and assessments were conducted between the 10th and of November 2005. No aerial inspections were undertaken.

A site plan showing the location of existing buildings and surveyed trees is Appendix 1. Trees assessed have been numbered and tabulated in Appendix 2.

Trees assessed were rated using Burrell's Tree AZ system (explanation notes see Appendix 3).



Site Assessment /Observations

The site is located at 125 Birrell St Waverley, bordered by Carrington Rd on the east, Bronte Rd on the west and Church St on the South.

The site consists of several buildings used as hospital and aged care facilities. All trees and other vegetation have been planted during various stages of the sites' re development and expansion. There were no remnant trees or local native vegetation identified on site.

A number of plantings appear to have been established probably at the time when the two oldest, original buildings on site were constructed. An avenue of *Phoenix canariensis* situated along the Birrell St entrance, two large *Araucaria heterophylla*, a large *Ficus heterophylla* and two *Phoenix canariensis* are situated in the lawn area in front of the formal entrance to the Vicary Building. Several other large, mature *Ficus heterophylla* are located throughout the site.

The remaining trees on site are situated, predominantly, in close proximity to buildings and the site boundaries. These appear to be ad hoc plantings that occurred during the course of the continual re development of the site. The area currently used as a car park near the Church St entry is an example of these random plantings. A variety of tree species has been used.



Mixed tree planting around car park near Church St.



Discussion/Conclusions

Trees on site are in various stages of health and vigour, due to a combination of factors; random and inappropriate planting distances and locations and species selection eg, (*Melaleuca quinquenervia*). This species should not be considered for use in close proximity to buildings or services due to their invasive and aggressive root systems.

The assessment has identified those trees that are considered retainable for at least ten years from the time of assessment. These have been assessed as A categories, (identified by a triangle on the site map). However, if these trees are to be compromised by development constraints they should be considered for removal.

Z categories are trees not worthy of being a material constraint or suitable for retention for more than ten years within a redevelopment of the site. These trees should be removed if development is to occur within their critical root zone.

The 16 trees with an AA category (identified in the site map by circle) were identified as significant to the site for a number of reasons. These trees are considered to be capable of retention for a minimum of ten years, of historical and site specific significance and should be retained and protected within the redevelopment.

No trees were assessed as hazardous or needing urgent or immediate removal or remedial work at the time of the site inspection.

Recommendations

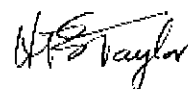
Protection measures for trees to be retained in any future redevelopment should be established before construction occurs. These protection zones should be in accordance with the set back distances for the protection of trees on development sites. Guidelines for minimum distances are calculated and modified from the British Standards Institute (1991).

Protective fencing distances should be calculated and established by a Consulting Arborist before construction. (Normally 10 times trunk diameter) A copy of Protection of Trees on Construction Sites is contained in the report (see appendix 4.). All arboricultural works associated with redevelopment of the site, removal or pruning,



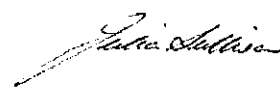
should be done in accordance with the Australian Standard, Pruning of Amenity Trees, AS4373- 1996.

Should you have any further questions please feel free to contact us at our office on 02 4739 8004 or on the mobile 0418 474796 - 0417 874796.



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Limitation of Liability

This report has been prepared by the Arborist and has been prepared on the basis that all reasonable attempts have been made to identify factors and features relevant to the tree(s) specified. Unless otherwise stated observations have been made by eye and from ground level.

Trees are a living system and do not remain static over time. Information in this report is correct on the basis of known facts and industry knowledge at the time of observation. If future management of the content of this report is required then the preferred frequency of further inspections must be stated at the time. Otherwise advice about such future management has not been considered in the compilation of this report and no reliance can be placed on this report in that regard.

The Arborist does not accept any liability for the rate or degree of future deterioration of the subject matter of this report owing to the effect of future circumstances beyond the control of the Arborist such as adverse weather conditions or adverse localized tree management strategies and the Arborist will not be responsible for any loss arising in the future which is not reasonably foreseeable at the date of this report.

This report has been prepared solely for you and cannot be relied upon by anyone else in any way and the Arborist will not accept any responsibility for the content of this report to anyone else.

It must be noted that any opinions given by the Arborist relating to the health, desirability, or significance of any tree will not necessarily coincide with the opinions of the relevant council authorities or their Tree Management Officers.





APPENDIXES:

- Appendix 1. Site Plan
Appendix 2. Tree Assessment
Appendix 3. TreeAZ Explanatory Notes
Appendix 4. Protection of Trees on Development Sites

NOTE: Double letters in the retention category, i.e. AA or ZZ indicate exceptionally good or exceptionally poor respectively. AA (Very good) A (Good) Z (Poor) and ZZ (Very poor). All A's are worthy of retention; All Z's are not.

Tree No	Species	Common name	Height (m)	Trunk diameter (cm)	Canopy spread	Maturity	Vigour	Retention category	Notes
1	<i>Cupressus torulosa</i>	Bhutan Cypress	11	300	2	M	N	A	
2	<i>Eriobotrya japonica</i>	Loquat	6	200	5	M	L	A	
3	X <i>Cupressocypariss leylandii</i>	Leyland Cypress	9	MULTI	4	M	N	A	
4	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	17	1680	11	M	N	Z6	REMOVE Girdled roots pushing out retaining wall, prune off building
5	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	10	395	6	M	N	Z10	REMOVE
6	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	7	145	1.5	SEMI-M	N	A1	
7	<i>Cupressus sempervirens</i> 'Stricta'	Italian Cypress	8	160	1	M	N	A1	
8	<i>Cupressus sempervirens</i> 'Stricta'	Italian Cypress	8	170	1	M	N	Z11	REMOVE
9	<i>Eucalyptus sideroxylon</i>	Red Ironbark	12	610	8	M	N	A2	
10	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	10	760	6	M	N	A1	
11	<i>Jacaranda mimosifolia</i>	Jacaranda	9	MULTI	8	M	N	A	
12	<i>Castanospermum australe</i>	Black Bean	8	190	1.5	SEMI-M	N	Z11	REMOVE
13	<i>Erithrina sp</i>	Coral Tree	9	375	8	M	N	A	
14	<i>Bauhinia variegata</i>	Orchid Tree	9	310	8	M	L	A2	REMOVE Lopped, - over pruned
15	<i>Bauhinia variegata</i>	Orchid Tree	9	280	4	M	L	A2	REMOVE Lopped, - over pruned
Tree	Species	Common	Height	Trunk	Canopy	Maturity	Vigour	Retention	Notes

No	Species	name	Height (m)	diameter (cm)	spread	Maturity	Vigour	Retention category	Notes
16	<i>Bauhinia variegata</i>	Orchid Tree	9	330, 210	7	M	L	A2	REMOVE Lopped - over pruned
17	<i>Malus floribunda</i>	Crab-apple	5	195	4	M	N	Z10	REMOVE
18	<i>Callistemon viminalis</i>	Weeping Bottlebrush	8	210, 230	6	M	L	Z10	REMOVE
19	<i>Podocarpus elatus</i>	Brown Pine	12	910	10	M	N	AA3	Lopping wounds to be pruned
20	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	14	625	5	M	N	A	
21	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	14	460	7	M	N	A	
22	<i>Callistemon viminalis</i>	Weeping Bottlebrush	7	230	9	M	N	Z1	REMOVE
23	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	17	480 MULTI	11	M	N	Z1	REMOVE
24	<i>Ficus macrophylla</i>	Moreton Bay Fig	19	3000	25x20	M	N	AA	Aerial inspection and remove dead wood.
25	<i>Ficus macrophylla</i>	Moreton Bay Fig	17	1900	18x14	M	N	A2	Decay, aerial inspection required, remove dead wood, weight reduction.
26	<i>Murraya paniculata</i>	Mock Orange	5	MULTI	6	M	N	A	
27	<i>Melia azederach</i>	White Cedar	6	100	3	SEMI - M	N	Z1	REMOVE
28	<i>Camellia sasanqua</i>	Camellia	4	MULTI	3	M	N	Z1	REMOVE
29	<i>Camellia sasanqua</i>	Camellia	4	MULTI	4	M	N	Z1	REMOVE
30	<i>Persea sp.</i>	Avacado	14	260	6	M	N	Z11	REMOVE
31	<i>Persea sp.</i>	Avacado	13	240	8	M	N	A2	
32	<i>Lagunaria patersonia</i>	Norfolk Island Hibiscus	14	220 150	8	M	N	A	
33	<i>Eucalyptus sideroxylon</i>	Red Ironbark	9	425	9	M	N	A2	Deadwood, crown raise off roof
Tree No	Species	Common name	Height (m)	Trunk diameter (cm)	Canopy spread	Maturity	Vigour	Retention category	Notes

34	<i>Eucalyptus sideroxylon</i>	Red Ironbark	10	320	7	M	N	A2	Deadwood
35	<i>Eucalyptus sideroxylon</i>	Red Ironbark	9	310	5.5	M	N	A2	Deadwood
36	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	7	360	5	M	L	Z3	REMOVE
37	<i>Eucalyptus sideroxylon</i>	Red Ironbark	9	620	7	M	N	A2	Deadwood, crown raise off roof
38	<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	7	275	4	M	N	A	
39	<i>Brachychiton acerifolius</i>	Illawarra Flame Tree	8	270	4	M	N	A	
40	<i>Casuarina sp.</i>	Casuarina	15	270 MULTI	7	M	N	A	
41	<i>Casuarina sp.</i>	Casuarina	15	350	6	M	N	A2	
42	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	11	240	2.5	SEMI - M	N	Z4	REMOVE
43	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	8	100	1	SEMI - M	N	Z1	REMOVE
44	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	10	170	1.5	SEMI - M	N	Z1	REMOVE
45	<i>Melaleuca quinquenervia</i>	Broad - leaved Paperbark	9	180	3.5	SEMI - M	N	Z1	REMOVE
46	<i>Ficus macrophylla</i>	Moreton Bay Fig	17	480	10	M	N	A2	Lopping wounds to be pruned
47	<i>Casuarina sp.</i>	Casuarina	14	480	10	M	N	A2	Deadwood
48	<i>Casuarina sp.</i>	Casuarina	14	510	10	M	N	A2	Deadwood
49	<i>Casuarina sp.</i>	Casuarina	14	490	11	M	N	A2	Deadwood
50	<i>Casuarina sp.</i>	Casuarina	13	560	9	M	N	A2	Deadwood
51	<i>Casuarina sp.</i>	Casuarina	15	520	10	M	N	A2	Deadwood
52	<i>Casuarina sp.</i>	Casuarina	15	340	6	M	N	A2	Deadwood
53	<i>Casuarina sp.</i>	Casuarina	15	280	4	M	N	A2	Deadwood
54	<i>Casuarina sp.</i>	Casuarina	15	500	8	M	N	A2	Deadwood
55	<i>Magnolia grandiflora</i>	Bull Bay Magnolia	12	480 380 320	8	OVER M	N	A2	Deadwood, decay in upper canopy
Tree No	Species	Common name	Height (m)	Trunk diameter (cm)	Canopy spread	Maturity	Vigour	Retention category	Notes

56	<i>Lophostemon confertus</i>	Brush Box	12	500	4	OVER M	L	Z10	REMOVE SUPPRESSED
57	<i>Ficus macrophylla</i>	Moreton Bay Fig	18	2330	22X20	M	N	A2	Lopping wounds to be pruned
58	<i>Ficus macrophylla</i>	Moreton Bay Fig	13	1220	18X16	OVER M	L	A2	Thinning canopy
59	<i>Lagunaria patersonii</i>	Norfolk Is Hibiscus	12	530	8	M	N	A1	
60	<i>Magnolia grandiflora</i>	Bull Bay Magnolia	9	415	8	M	N	A1	
61	<i>Brachychiton populneus</i>	Kurrajong	12	560	7	OVER M	L	Z3	REMOVE
62	<i>Stenocarpus sinuatus</i>	Wheel of Fire	16	390	4	M	N	A	
63	<i>Cedrus deodar</i>	Deodar	14	510	11	M	N	A2	Remove deadwood
64	<i>Cinnamomom camphor</i>	Camphor Laurel	14	620	12	M	N	A2	
65	<i>Cinnamomom camphor</i>	Camphor Laurel	13	500	6	M	N	Z10	REMOVE
66	<i>Cinnamomom camphor</i>	Camphor Laurel	13	380 390	9	M	N	A	
67	<i>Quercus palustris</i>	Pin Oak	12	330	9	M	N	A	
68	<i>Quercus robur</i>	English Oak	11	330	5	M	L	A2	
69	<i>Harpephyllum caffrum</i>	Kaffir Plum	9	550	6	M	L	Z3	REMOVE
70	<i>Chamaecyparis sp</i>	False Cypress	9	MULTI	4.5	M	L	A	
71	<i>Cinnamomom camphor</i>	Camphor Laurel	12	840	10	M	L	Z3	REMOVE
72	<i>Ulmus parvifolia</i>	Chinese Weeping Elm	5	200	5.5	M	N	A	
73	<i>Pinus radiata</i>	Radiata pine	7	570	6	M	L	Z3	REMOVE
74	<i>Phoenix canariensis</i>	Canary Is Date Palm	14	740	6	M	N	AA	
75	<i>Phoenix canariensis</i>	Canary Is Date Palm	15	650	6	M	N	AA	
Tree No	Species	Common name	Height (m)	Trunk diameter (cm)	Canopy spread	Maturity	Vigour	Retention category	Notes
76	<i>Ficus</i>	Moreton Bay	17	2250	18X18	M	N	A2	Remove small phoenix at

	<i>macrophylla</i>	Fig							base. - Limb reduction required.
77	<i>Araucaria heterophylla</i>	Norfolk Is Pine	29	1050	9	M	N	AA	
78	<i>Ficus macrophylla</i>	Moreton Bay Fig	15	990	12	M	L	Z4	REMOVE
79	<i>Araucaria heterophylla</i>	Norfolk Is Pine	29	940	10	M	N	AA	
80	<i>Cinnamomom camphor</i>	Camphor Laurel	15	610	9	M	L	Z3	REMOVE
81	<i>Cinnamomom camphor</i>	Camphor Laurel	15	700	6	M	L	Z3	REMOVE
82	<i>Ficus macrophylla</i>	Moreton Bay Fig	17	1710	19X18	OVER M	N	A2	
83	<i>Ficus macrophylla</i>	Moreton Bay Fig	15	1180	9	M	L	Z6	REMOVE Severely lopped
84	<i>Jacaranda mimosifolia</i>	Jacaranda	14	60	12	M	N	A2	Crown raise off building
85	<i>Ficus macrophylla</i>	Moreton Bay Fig	15	2700	14x15	M	N	A1	
86	<i>Syagrus romanzoffiana</i>	Queen Palm	11	315	5	M	N	A	
87	<i>Phoenix canariensis</i>	Canary Is Date Palm	10	560	5	M	N	AA	
88	<i>Syagrus romanzoffiana</i>	Queen Palm	9	320	4	M	N	A	
89	<i>Phoenix canariensis</i>	Canary Is Date Palm	9	490	5	M	N	AA	
90	<i>Phoenix canariensis</i>	Canary Is Date Palm	13	390	5	M	N	AA	
91	<i>Camellia sasanqua</i>	Camellia	5	Multi	5	M	N	A	
92	<i>Callistemon viminalis</i>	Weeping Bottlebrush	5	Multi	3	M	N	A	
93	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	4	Multi	2	M	L	Z3	REMOVE
Tree No	Species	Common name	Height (m)	Trunk diameter (cm)	Canopy spread	Maturity	Vigour	Retention category	Notes
94	<i>Melaleuca armillaris</i>	Bracelet Honeymyrtle	4	Multi	2	M	L	Z3	REMOVE

95	Melaleuca armillaris	Bracelet Honeymyrtle	5	Multi	3	M	L	Z3	REMOVE
96	Melaleuca armillaris	Bracelet Honeymyrtle	5	Multi	2	M	L	Z3	REMOVE
97	Melaleuca armillaris	Bracelet Honeymyrtle	6	Multi	3	M	L	Z3	REMOVE
98	Melaleuca armillaris	Bracelet Honeymyrtle	6	Multi	2	M	L	Z3	REMOVE
99	Melaleuca armillaris	Bracelet Honeymyrtle	5	Multi	2	M	L	Z3	REMOVE
100	Melaleuca armillaris	Bracelet Honeymyrtle	5	Multi	2	M	L	Z3	REMOVE
101	Melaleuca armillaris	Bracelet Honeymyrtle	4	Multi	3	M	L	Z3	REMOVE
102	Melaleuca armillaris	Bracelet Honeymyrtle	4	Multi	2	M	L	Z3	REMOVE
103	Melaleuca armillaris	Bracelet Honeymyrtle	5	Multi	4	M	L	Z3	REMOVE
104	Melaleuca armillaris	Bracelet Honeymyrtle	5	Multi	4	M	L	Z3	REMOVE
105	Melaleuca armillaris	Bracelet Honeymyrtle	5	Multi	4	M	L	Z3	REMOVE
106	Melaleuca armillaris	Bracelet Honeymyrtle	4	Multi	3	M	L	Z3	REMOVE
107	Livistona australis	Australian Cabbage Palm	14	400	3	M	N	A	
108	Cotoneaster salicifolia	Cotoneaster	4	110	4	M	N	A	
109	Phoenix canariensis	Canary Is Date Palm	14	670	6x6	M	N	AA	
110	Phoenix canariensis	Canary Is Date Palm	13	620	6x6	M	N	AA	
111	Phoenix canariensis	Canary Is Date Palm	13	690	6x6	M	N	AA	
Tree No	Species	Common name	Height (m)	Trunk diameter (cm)	Canopy spread	Maturity	Vigour	Retention category	Notes
112	Phoenix canariensis	Canary Is Date Palm	14	670	6x6	M	N	AA	
113	Phoenix	Canary Is	14	590	6x6	M	N	AA	

114	canariensis Phoenix	Date Palm Canary Is Date Palm	14	590	6x6	M	N	AA	
115	Chamaecyparis sp	False Cypress	4	120 190	2	M	L	Z1	REMOVE
116	Chamaecyparis sp	False Cypress	4.5	120	3	M	L	Z1	REMOVE
117	Callistemon viminalis	Weeping Bottlebrush	6.5	120 130	2	M	L	Z8	REMOVE
118	Callistemon viminalis	Weeping Bottlebrush	6	130 130	2	M	L	Z8	REMOVE
119	Hibiscus rosa- sinensis	Chinese Hibiscus	4.5	Multi	5	M	N	A	
120	Magnolia michelia figo	Port Wine Magnolia	6	Multi	5	M	L	A2	
121	Cupressus torulosa	Bhutan Cypress	7	Multi	3	M	L	Z4	REMOVE
122	Populus Deltoides	Cottonwood	14	1180	12	M	N	A	
123	Lophostemon confertus	Brush Box	10	180	6	OVER M	L	A2	
124	Phoenix canariensis	Canary Is Date Palm	11	700	6x6	M	N	AA	
125	Populus Deltoides	Cottonwood	13	720	10x12	M	N	A2	
126	Lagunaria patersonii	Norfolk Is Hibiscus	10	280	4	M	N	A	
127	Camellia sasanqua	Camellia	7	240	5	M	N	A2	
128	Agonis flexuosa	Willow- myrtle	5	270 230 340	7	M	N	A2	
129	Chamaecyparis sp	False Cypress	11	240	4	M	N	A2	
130	Lophostemon confertus	Brush Box	10	400	8	M	N	A2	Soil compaction from cars
Tree No	Species	Common name	Height (m)	Trunk diameter (cm)	Canopy spread	Maturity	Vigour	Retention category	Notes
131	Phoenix canariensis	Canary Is Date Palm	11	560	6x6	M	N	A	
132	Populus Deltoides	Cottonwood	15	690	8	M	N	A	
133	Casuarina sp.	Casuarina	14	480	4	M	N	A2	Deadwood

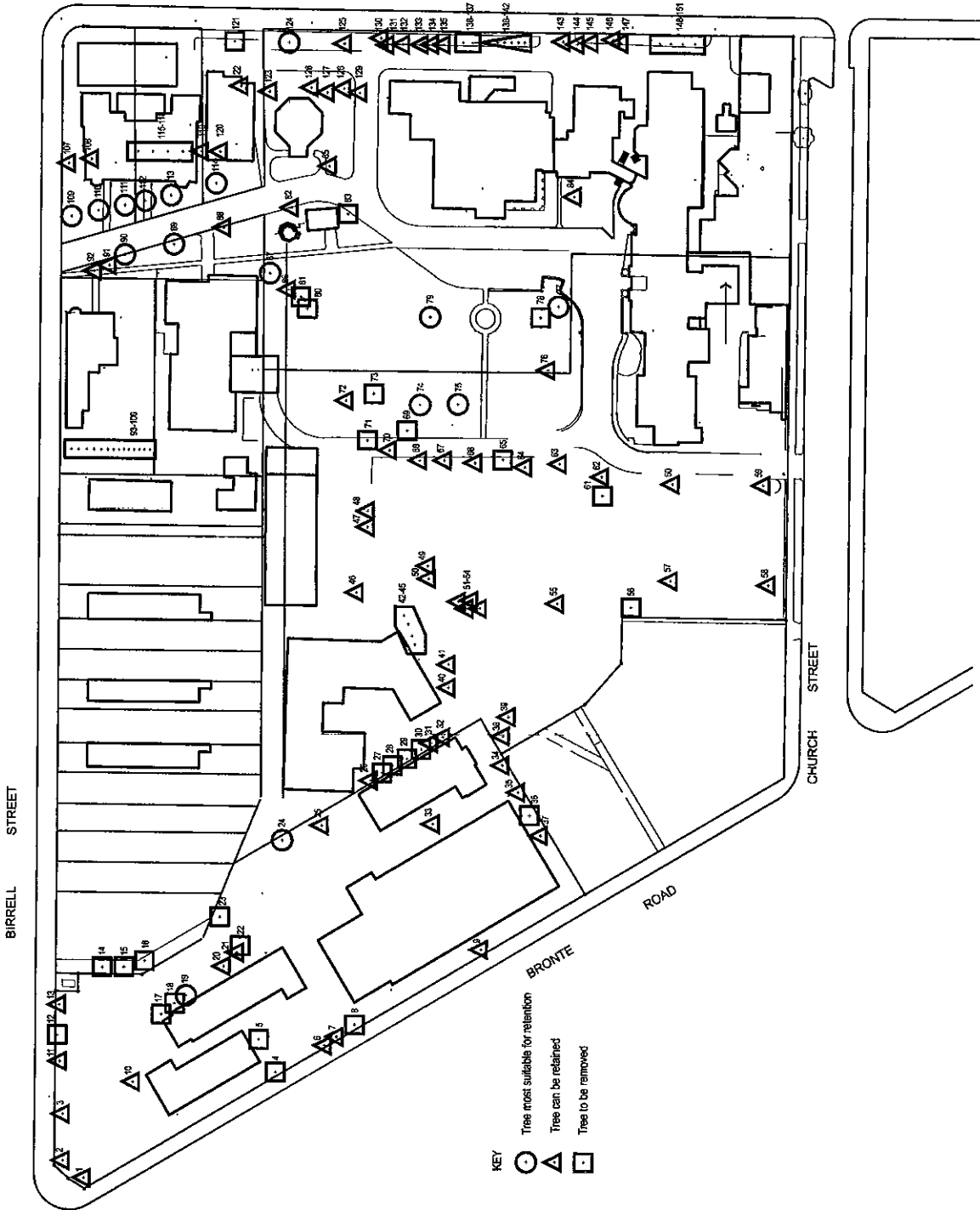
134	Casuarina sp.	Casuarina	14	510	3	M	N	A2	Deadwood
135	Casuarina sp.	Casuarina	14	490	4	M	N	A2	Deadwood
136	Casuarina sp.	Casuarina	8	560	2	M	N	Z4	REMOVE suppressed
137	Casuarina sp.	Casuarina	6	150	2	M	N	Z4	REMOVE suppressed
138	Casuarina sp.	Casuarina	15	340	6	M	N	A2	Deadwood
139	Casuarina sp.	Casuarina	15	280	4	M	N	A2	Deadwood
140	Casuarina sp.	Casuarina	15	500	3	M	N	A2	Deadwood
141	Casuarina sp.	Casuarina	15	280	4	M	N	A2	Deadwood
142	Casuarina sp.	Casuarina	15	500	3	M	N	A2	Deadwood
143	Banksia integrifolia	Coast Banksia	10	360	4	M	N	A	
144	Banksia integrifolia	Coast Banksia	8	150 50	2.5	M	N	A	
145	Banksia integrifolia	Coast Banksia	8	125	5	M	N	A	
146	Callistemon viminalis	Weeping Bottlebrush	4	Multi	3	M	N	A	
147	Eucalyptus spp	Gum	14	500	7	M	N	A	
148	Eucalyptus nicholii	Narrow leaf peppermint	15	450	7	M	L	Z3	REMOVE
149	Melaleuca armillaris	Bracelet Honeymyrtle	6	Multi	4	M	L	Z3	REMOVE
150	Melaleuca armillaris	Bracelet Honeymyrtle	6	Multi	4	M	L	Z3	REMOVE
151	Melaleuca armillaris	Bracelet Honeymyrtle	6	Multi	4	M	L	Z3	REMOVE

Symbols on Site Plan

○ MOST SUITABLE FOR RETENTION

▲ CAN BE RETAINED

■ REMOVAL



Appendix 3

TreeAZ Explanatory Notes:

We have applied Burrell's TreeAZ system of tree assessment on redevelopment sites which has evolved from Burrell's SULE system.

Trees have been assessed for their suitability for retention and categorised either as suitable, calling them 'A' trees, or unsuitable, calling them 'Z' trees. Trees that are very good examples of the A category are shown as AA and trees that are very poor examples of the Z category are shown as ZZ.

These categories are divided into further numbered subcategories that clarify the reason for allocation to the main category. The assessment of whether a tree is suitable or not for retention is based on whether it has a safe useful life expectancy (SULE) of more or less than 10 years. Ten years is the cut off point because it is generally accepted that a tree should have a SULE in excess of 10 years if it is suitable for inclusion in a TPO.

After compilation of a TreeAZ assessment, an overall review of each development site is undertaken. For example, trees that have been assessed as an A category may need to be removed for the redevelopment of the site, or to ensure the healthy retention of an AA category tree. Additionally trees that are in the Z category can sometimes be retained if there is sufficient space and maintenance resources.

Trees not worthy of being a material constraint: Not suitable for retention for more than 10 years <small>Small, young or regularly pruned trees/hedges: Trees that could be easily/realistically replaced in the short term</small>	
Z1	Small – young – Poor Form
Z2	Weed Trees <small>High risk: Trees that would be removed within 10 years because of declining health or poor structural condition</small>
Z3	Dead, dying, diseased or declining
Z4	Severe damage/structural defects that cannot be properly addressed by remedial care including cavities, decay, included bark, wounds and excessively unbalanced
Z5	Present or future instability because of poor anchorage or increased exposure <small>Good management: Trees that would be severely pruned or removed within 10 years through responsible management</small>
Z6	Severe damage/structural defects that can be temporarily addressed by remedial care including cavities, decay, included bark, wounds and excessively unbalanced
Z7	Poor trees with no realistic potential to improve
Z8	Adversely interfering with adjacent trees
Z9	Overgrown hedge or row of trees vulnerable to adverse weather events
Z10	Causing unreasonable inconvenience to existing properties (light, dominance, debris, interference, etc)
Z11	Causing damage to existing structures
Z12	Unacceptably expensive to retain

Trees worthy of being a material constraint: Suitable for retention for more than 10 years (Note: This excludes small and young trees)	
A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by limited remedial care or work to adjacent trees
A3	Special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may have legislative protection for ecological reasons (Advisory and will require specialist investigation)

- NOTES**
- 1 Trees that are very good examples of category A can be noted as AA and trees that are the worst examples of category Z can be noted as ZZ summarised as follows:-
- AA *Most suitable for retention*
 - A Suitable for retention
 - Z Not particularly suitable for retention
 - ZZ Unsuitable for retention



PROTECTION OF TREES ON CONSTRUCTION SITES

INTRODUCTION

Construction activities usually have an adverse or detrimental affects on trees. Well meaning individuals usually cause serious damage to trees during construction. This can sometimes result in death, severe short and long term decline or physical failure of the tree.

Frequently the damage is not apparent until after construction has been completed and the typical defects liability period of 12 months is over. Often the damage only becomes apparent several years later.

The desire to retain trees but the failure to obtain advice from an Arborist and to make adequate allowance for their retention is also another common cause for problems with Protection of Trees on Construction Sites.

In almost all cases the problem with trees on construction sites arises from:

- Lack of understanding of trees and how they function.
- Lack of knowledge regarding the value and benefit of trees.
- Failure to obtain proper advice from an Arborist during the planning stage.
- Lack of a systematic approach to prevent damage by the use of active protection techniques and maintenance (e.g. fencing and irrigation).
- Failure to seek sufficient expertise and intervention over the long term.

The involvement of an Arborist is an essential component to successfully managing trees.

The purpose of this document is to provide consistent and uniform standards and minimum guidelines for the retention, protection and care of trees on construction sites. Whilst it will provide a valuable reference for builders and developers it is not a "self help" book and will require active and ongoing involvement of a qualified Arborist.



Developers, architects, engineers, building inspectors, town planners/builder, landscape architect or planner will however be able to clearly define and quantify the level of professional advice and tree protection that will be required.

SCOPE

This document describes the role of an Arborist in the Protection of Trees on Construction Sites and the methods and materials required as a minimum to protect trees on construction sites. It also gives valuable guidelines to the activities that should and should not be carried out adjacent to tree(s).

AIM

To provide documentation and an action plan that can be readily adapted for the process of protecting trees on construction sites.

APPLICATION

These guidelines apply to the protection of all woody plants and trees on construction sites. They cover issues to be addressed during the design process right through to post construction maintenance.

It is intended for use by those who are involved in the design, planning approval stage, construction industries and by the Arborists responsible for the protection of the trees.

DEFINITIONS

The terms listed below are incomplete. They are to be supplemented wherever required by Australian Standard AS 4373-1996 Pruning of Amenity Trees, and NATSPEC Guide to "Purchasing Landscape Trees"

- **Arborist:** one who is formally qualified or certified in Arboriculture with at least 3 years documented experience in Arboriculture.
- **Arboriculture:** The care of trees and wood trees in the urban environment.
- **Barricade:** A temporary structure usually made from star pickets and barricading tapes or rolls.



- **Critical Root Zone (CRZ):** This is the most critical root area. It can be defined as the area 10 times the diameter of the trunk.
- **Primary Root Zone (PRZ):** This is the area to the drip-line or outer edges of the canopy or a circle the radius of the height of the tree whichever is greater.
- **Auxiliary Root Zone (ARZ):** The Auxiliary Root Zone is the area one and a half times the canopy or a radius one and a half times the height of the tree whichever is greater.
- **Root Graft Zone (RGZ):** This is an area 5 times the height of the tree or 5 times the canopy of the tree which ever is greater. The zone only exists if another tree of the same Genus falls within this.
- **EC meter:** A device measuring the level of dissolved salts used to indicate levels of fertilizers etc.
- **Drip line:** The area under the canopy of a tree.
- **D.B.H:** Diameter of the tree at Breast height (i.e. 1.2 meters.)
- **Fence (rigid):** A solid structure that prevents free access by people and machinery.
- **Field Capacity:** The maximum water storage capacity of soil after free gravity drainage has occurred.
- **Mulch:** a layer of organic or inorganic matter placed on the surface of the soil intended to reduce soil moisture loss, weed growth and on occasions limit soil compaction.
- **Mycorrhizae:** A beneficial root-fungi association where the fungi aids in the absorption of water and minerals by the roots in exchange for carbohydrates.
- **Nitrogen drawdown:** the rapid uptake of nitrogen by micro-organisms during the sudden rapid initial decay of un-decomposed organic material in an aerobic environment (usually at or near the surface).
- **Non Woody Root:** A tee root that contains little to no lignin and no corky outer bark that is responsible for the uptake of water and dissolved elements. These are usually less than 1 mm in diameter and never any thicker than several millimetres.
- **Palm:** A woody perennial monocotyledon with one or more stems from the order *Arecaceae*.
- **Palm Roots:** Unlike tree roots, these are branch less, do not grow in thickness with age and have no bark or meristematic zone surrounding the root.
- **Penetrometer:** A device used to measure the destiny / compaction of soil.
- **Root zone.** The area where tree roots can be found.



- **Tensiometer:** A device that gives a quantitative reading of the amount of available water in the soil.
- **Tree:** A woody, perennial, dicotyledon, with one or several stems that potentially grows to a height of more than 3 meters.
- **Trunk flare:** the zone at the base of a tree trunk where it rapidly becomes wider and enters the ground as well as the area up to approximately 2m from the trunk where large structural roots are close to the ground surface.
- **Wilt Point:** The level of soil moisture at which no free moisture is available for uptake by the tree. This results in wilting and or other stresses and strain.
- **Tree Root Spread:** The diameter of tree root spread is commonly 3-7 times the diameter of the canopy and is well beyond the periphery of the canopy.
- **Root system:** Three main parts –
- **Primary Roots:** or 1st order woody roots (for support and storage).
- **Secondary Roots:** For transport.
- **Non Woody Roots:** For water and nutrient absorption. Most extensive)



FIGURE 1 - TYPICAL ROOT SYSTEM
(Source : International Society of Arboriculture)



THE TREE AS A SYSTEM:

Trees are, in themselves, complex organisms. Equally, they have developed complex associations with many other organisms.

Put simply, trees are woody plants with two main absorptive parts (leaves and non woody roots) at either end of a conductive system (branches stems and woody roots). Surprisingly there are usually far more absorptive tips below ground than there is above ground i.e. there are more roots than leaves. Those absorptive parts above ground are called leaves, needles or fronds and the portion below ground are the roots.

Damage one part of the tree and you damage the system as a whole.

The leaves absorb carbon dioxide and sunlight and through a process called photosynthesis produce carbohydrates, the energy required for growth and respiration. Non-woody roots, on the other hand, absorb water and all the dissolved elements also required by the tree for healthy growth.

The conductive parts are woody. They include branches, trunks and woody roots. Wood is a highly ordered arrangement of cells that are living, dying or dead. These cells have walls of cellulose, hemicelluloses, and lignin.

Wood is the part of the tree used for storage and in particular the storage of energy reserves. Woody roots store more energy than branches. Woody roots are also responsible for providing anchoring and support of the tree.

All the living cells in the tree utilize (or metabolise) carbohydrates. To do this they require not just carbohydrates but also OXYGEN in a process known as 'respiration'. All living parts of the tree need to respire and will SUFFOCATE if the levels of oxygen falls below a critical level. It can sometimes take months or even years for this damage to manifest itself.

In the area around the roots is called the Rhizosphere, which is both complex and vital to the survival of the tree. It is in this zone that we find Mycorrhizae.

Mycorrhizae are the interdependent relationship between a fungus and non-woody roots that acts as a single organ of the tree. There are also important bacteria, decay fungi and microflora.



Much of the important activity of trees occurs underground from roots to the Rhizosphere. Construction frequently involves extensive changes at and below ground. Because of this, construction can have both short and long term adverse affects on a tree.

PRE PLANNING & PLANNING:

Prior to site planning, existing trees on the site should be inspected by a consulting Arborist to determine their health, vigour and structural integrity.

A site survey accurately indicating the location of all trees.

A tree list and survey shall be supplied indicating genus and species, where possible along with DBH, height and spread of canopy. Also any important observations such as health and structural problems or special considerations as well as any recommended works i.e. pruning, removal, soil amelioration should be noted.

Any information supplied by an Arborist must satisfy local council requirements.

Where appropriate an estimation of age, life expectancy, and tolerance to construction activities may also be provided.

A tree valuation may be required for the purposes of determining bonds or the value of the amenity that may need to be replaced in the event of tree removal.

Trees that can be transplanted should be noted so that consideration can be given to their use in the future landscape.

PRE CONSTRUCTION:

Prior to the commencement of construction a consulting Arborist shall issue a report outlining the following:

1. The trees that have been protected, the maintenance activities (if any) for each tree, the size of the protection zone for each tree and type of protective fencing installed.



2. A statement that the physical protection of the trees has been performed to the above standards or if not, any non-conformance and the reason for the non-conformance, e.g. the fencing around tree are incomplete due to the presence of a boundary fence.

TREE PROTECTION ZONES

The protection zone can be divided into 5 basic classes.

The **Critical Root Zone (CRZ)**: This is the most critical root area. It can be defined as the area 10 times the diameter of the trunk. It is the base area that should be designed to remain unaltered by cut, fill, trenching or liquid chemical overland flow throughout the construction phase.

The **Primary Root Zone (PRZ)**: This is the area to the drip-line or outer edges of the canopy or a circle the radius of the height of the tree whichever is greater. Activity in this area should be limited. The area can be altered with the guidance of an Arborist in conjunction with these standards.

The **Auxiliary Root Zone (ARZ)**: The Auxiliary Root Zone is the area one and a half times the canopy or a radius one and a half times the height of the tree whichever is greater. Activities in this area have less affect on the tree. There are still some activities that are not permitted in this area.

Soil amelioration

Bio-stimulants such as rooting hormones, humic acids, soil microflora and Mycorrhizae should be applied by an Arborist in accordance with the manufacturer's instructions.

Chemical fertilizers should only be used after laboratory testing, of either the soil or the soil and the foliage, and in accordance with those test results.

Nitrogenous fertilizers must not be used where *Phytophthora* is suspected or has been diagnosed.

The use of fertilizers with phosphorous should be avoided around natives, particularly *Proteaceae sp.* The use of phosphate liberating bacteria is preferred.



Mulching

Mulch, when applied, will be free of weeds and shall be applied at no greater thickness than 100mm. Mulch should be applied to the surface and not mixed with the soil. Mulch with an appropriate carbon to nitrogen ratio should be selected as recommended by the Arborist.

Weed Control

Weed control shall be by hand pulling, wiping or spraying with a Glyphosate based or other appropriate herbicide. Weed control shall never be performed by mechanical cultivation or by scraping or back burning.

Aeration

Decompaction: An Arborist should perform soil decompaction only after testing with a penetrometer or similar device indicates it is necessary. Decompaction may include the use of a Grow Gun, vertical mulching or radial trenching.

The Arborist performing decompaction activities should carefully evaluate the soil structure and the pattern of root activity prior to choosing and implementing a decompaction program.

Crown cleaning

Crown cleaning (AS4373-1996, Pruning of Amenity Trees) shall be performed in accordance with the standard by an Arborist and in compliance with the appropriate occupational health and safety regulations.

Any concerns about health or safety that are observed by the Arborist on the site should be reported in writing within 7 days to the superintendent/principal/client and/or head contractor.

The use of spurs on live trees and internodal cutting should be prohibited.



Tree removal and stump grinding

Sectional felling and stump grinding shall be used to remove trees. Care shall be taken not to damage any adjacent trees that are to remain.

The extent and depth of grinding of stumps shall be determined and agreed upon by the Arborist and the contractor prior to grinding. Consideration shall be given to the location of trees that are to remain and the pattern and location of their roots. The ground out stump is to be filled with planting soil to finish flush with the adjacent ground levels.

Fencing

The **Tree Protection Zone** (Primary root zone at minimum) should be determined by an Arborist and fenced prior to the commencement of ANY work, including demolition and land clearing by earth moving machinery but may be erected after maintenance activities.

The fencing surrounding the CRZ and PRZ must be a rigid fence not less than 1.8m high.

If the protection zone extends into the ARZ or further, the portion of fence protecting this zone may be barricading.

OTHER PROTECTION TECHNIQUES:

Site-specific design solutions should be developed in consultation with an Arborist. Due to site variations prescriptive solutions cannot be given.

Temporary roadways should be designed to minimise soil compaction and to avoid changes of the grade. These designs may use geo-textile fabrics, structurally gapped aggregate, mulch, and metal plates.

Service installation should avoid trenching through the primary and critical root zone. The use of horizontal boring is preferable.



Siltation and water inundation should be avoided by the use of silt traps and appropriate drainage.

Where construction is required within the CRZ techniques such as pier and suspended slabs, canter levering, decking and other systems should be considered.

SIGNS:

A minimum of two signs should be attached to all tree protection areas at no greater than 20 meter intervals. The signs should be a minimum of 600mm x 600mm, bearing the following phrase in red letters on white background at least 50mm in height:

TREE PROTECTION ZONE - KEEP OUT.

On the same sign above or on a separate sign attached adjacent, in red lettering on white background not less than 25mm in height is to be the following

PROHIBITED ACTIVITIES:

- Entry of machinery or people.
- Storage of building materials.
- Parking of any kind.
- Erection or placement of site facilities.
- Removal or stockpiling of soil or site debris.
- Disposal of liquid waste including paint and concrete wash.
- Excavation or trenching of any kind (including irrigation or electrical connections)
- Attaching any signs or any other objects to the tree.
- Placement of waste disposal or skip bins.
- Pruning and removal of branches, except by a qualified Arborist.

The name of the supervising Arborist or Arboricultural company and a contact phone number should be displayed on the sign in letters not less than 25mm in height.

ROOT SEVERANCE:

All roots greater than 25mm in diameter that are required to be removed shall be cleanly cut and kept moist at all times and shall not be left exposed to the air.



MAINTENANCE REPORTS:

Inspection period. Where the trees on a site and their primary root zone are retained, a monthly inspection and report by an Arborist is required.

Where construction activity is to occur within the primary root zone, weekly inspections and monthly reports shall be provided until the end of construction.

Where construction activity is to occur within the critical root zone, a consulting Arborist shall be on site during the performance of such work and shall document and report on that work along with performing weekly inspections and monthly reports until the completion of construction activities on site.

Site Log

A site log shall be maintained and include the date of each inspection, the person who performed the inspection, the items inspected or tested, the maintenance activities performed, any repairs undertaken or required to be undertaken, and any substantial breaches or non-conformances.

The entries in the log book shall be signed by the Arborist performing the inspection.

The log shall be maintained on site or alternative copies of the log entries for the month shall be submitted each month with the monthly report.

NON CONFORMANCE REPORTS:

- The removal of all or part of any protective fence.
- The performing of any activity noted as prohibited on protection zone signage.
- The failure to maintain adequate soil moisture.
- Mechanical damage to the trunk, stems, branches or retained roots.
- Sudden abnormal or premature limb shedding or decline of the tree.
- Substantial breaches and non conformances.



Any breach or non-conformance of the tree protection zone, by any party, shall be notified in writing within 2 working days of it being first observed.

Notification may be made to the following as directed in the contract. The Arborist, builder, contractor / subcontractor or person responsible for the breach. Any council officer required as a condition of the DA or BA, any other parties required by the contract.

LANDSCAPE CONSIDERATIONS:

The installation of landscaping during the finishing stages of construction requires careful planning and implementation.

The landscape construction often requires that all tree protection fencing be removed. This can leave all trees vulnerable to landscape construction damage. Tree protection fencing should only be removed after consultation with the supervising Arborist.

An Arborist must approve all landscape installations that are likely to impact on the tree. These may include: installation of irrigation, paths, access roads, lights and fittings, signs, turf, ponds, cuts and fills.

