Arboricultural Assessment Report

Prepared 8th July 2010

Site Location

132-138 Killeaton Street
St Ives 2075

Client

Meriton Apartments P/L

DISCLAIMER

The author and Tree & Landscape Consultants take no responsibility for actions taken and their consequences, contrary to those expert and professional instructions given as recommendations pertaining to safety by way of exercising our responsibility to our client and the public as our duty of care commitment, to mitigate or prevent hazards from arising, from a failure moment in full or part, from a structurally deficient or unsound tree or a tree likely to be rendered thus by its retention and subsequent modification/s to its growing environment either above or below ground contrary to our advice.

Peter Richards
Tree & Landscape Consultants

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Site Analysis, Arboricultural Assessments

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8th July 2010

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Our reference: 1520-4-10

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St Ives 2075

1. INTRODUCTION

This report has been prepared by Tree & Landscape Consultants for Meriton Apartments P/L. The site was inspected by the author and the subject trees and their general growing environment evaluated on the 3rd , 17th & 23rd June 2010. The site is to be subject to a Development Application and this report and any works recommended, that require approval from the consenting authority is provided to form part of that development application and its consent conditions where appropriate.

The land is located in the Ku-ring-gai Council (the Council) Local Government Area (LGA) and a Tree Preservation Order applies.

This report assesses 135 trees the location of which is indicated in Appendix F and details their current health & condition and determines from the assessment, recommendations for their retention or removal. The current design and its configuration were arrived at prior to undertaking this assessment.

2.0 AIMS & OBJECTIVES

Aims

Detail the condition of the trees on the site or on adjoining sites where such trees may be affected by the proposed works, by assessment of individual specimens or stands, and indicate remedial works or protection measures for their retention in a safe and healthy condition, or a condition not less than that at the time of initial inspection for this report, or in a reduced but sustainable condition due to the impact of the development but ameliorated through tree protection measures able to be applied, and will consider the location and condition of the trees in relation to the proposed building works, or recommend removal and replacement where appropriate.

Provide as an outcome of the assessment, the following: a description of the trees, observations made, discussion of the effects the location of the proposed building works may have on the trees, and make recommendations required for remedial or other works to the trees, if and where appropriate.

Determine from the assessment a description of the works or measures required to ameliorate the impact upon the trees to be retained, by the proposed building works or future impacts the trees may have upon the new building works if and where appropriate, or the benefits of removal and replacement if appropriate for the medium to long term safety and amenity of the site.

Objectives

Assess the condition of the subject trees.

Determine impact of development on the subject trees.

Provide recommendations for removal or management of the subject trees.

3. METHODOLOGY

3.1 The method of assessment of tree/s is applied from the ongoing knowledge and development of the author and considers but is not confined to:

- Tree health and subsequent stability, both long and short term
- Sustainable Retention Index Value (S.R.I.V.)© IACA 2009)
- Amenity values
- Significance

3.2 This assessment is undertaken using a standard tree assessment criteria for each tree based on the values above and is implemented as a result of at least one comprehensive and detailed site inspection.

3.3 In this report the dimensions of the tree recorded by the author for the trunk *diameter at breast height* (DBH) measurement is calculated at 1.4m above ground from the base of the tree. Where a tree is trunkless or branches at or near ground such as a mallee formed tree, an average diameter is determined by recording the radial extent of the stem mass at its narrowest and widest dimensions, adding the two dimensions together and dividing them by 2 to record an average.

3.4 Crown spreads are expressed as length by breadth measurements to accurately record their dimensions. Where appropriate, *crown spread orientation* is described along the length of the crown spread e.g. North/South, or as *radial* if the crown is distributed at an approximately even radius from the trunk e.g. 6x6m.

3.5 The Australian Standard AS 4970-2009 "Protection of trees on development sites, where applicable is applied to trees to be retained in this report as a point of reference and guide for the recommended minimum clearances from the centre of tree trunks to development works and is applied as a generalised benchmark and the distances may be increased or decreased by the author as a result of other factors providing mitigating circumstances or constraints as indicated by but not restricted to the following:

- *Tolerance of individual species to disturbance,*
- *Geology e.g. physical barriers in soil, floaters, bedrock to surface*
- *Topography e.g. slope, drainage,*
- *Soil e.g. depth, drainage, fertility, structure,*
- *Microclimate e.g. due to landform, exposure to dominant wind,*
- *Engineering e.g. techniques to ameliorate impact on trees such as structural soil, lateral boring,*
- *Construction e.g. techniques to ameliorate impact on trees such as pier and beam, bridge footings, suspended slabs*
- *Arboriculture e.g. exploration trenches to map location of roots,*
- *Physical limitations - existing modifications to the environment and any impact to tree/s by development e.g. property boundaries, road reserves, previous impact by excavation in other directions, soil level changes by cutting or filling, existing landscaping works within close proximity, modified drainage patterns.*

4. TREE ASSESSMENTS

Table 1

Tree No.	Genus, Species (Common Name)	Age S-Sapling Y-Young M-Mature O-Overmature	Condition D-Dead P-Poor F-Fair G-Good	Pest & Diseases N = No or Y = Yes (If yes see comments)	Canopy Orientation A-Asymmetrical Sy-Symmetrical N,S,E,W-Orientation	Height (metres)	Canopy Spread (metres)	DBH(mm)@ 1.4 metres from ground	Trunk Lean X-Straight or Slightly Leaning A-Acaulescent M-Moderate	Vigour L-Low G-Good	SRIV Age,Vigour,Condition/ Index Rating (See Appendix A)	Comments
1	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	F	N	A/NW	9	7	230 Ave	A	L	OLVF2	Extensive dieback and evidence of branch failure. Displays signs of instability. .
2	*Melaleuca styphelioides (Prickly Paperbark)*	M	F	N	Sy	10	6	260 Ave	X	G	MGVF9	Three trunks from near ground level - Tree appears structurally sound.
3	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	N	A/NE	9	3	200 Ave	M	L	OLVP0	Extensive dieback present and distinct trunk lean.
4	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	F	Y	Sy	9	5	200 Ave	X	L	OLVF2	Extensive dieback present and old termite damage evident .
5	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	N	A/SE	8	6	200 Ave	A	L	OLVF2	Extensive dieback present - tree is a poor specimen, over mature and in decline - remove and replace.
6	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	Y	Sy	9	6	220 Ave	M	L	OLVF2	Codominant trunks have split in the past revealing past termite activity in main trunk from ground to 1 metre. Extensive dieback .
7	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	F	Y	Sy	9	5	220 Ave	A	L	OLVF2	Extensive dieback present. Displays signs of instability with termite damage
8	*Melaleuca styphelioides (Prickly Paperbark)*	M	F	N	A/E	5.5	5	150 Ave	A	G	MGVF9	Tree suppressed by adjacent trees.
9	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	F	N	Sy	9	6	180 Ave	A	L	OLVF2	Extensive dieback. The trunk has split with a large hollow and decay present.
10	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	Y	A/N	9	6	190 Ave	A	L	OLVP0	Extensive dieback There is old termite damage evident within a basal cavity
11	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	Y	A/NE	9	4	190	M	L	OLVP0	Extensive dieback present and the tree is growing on a distinct lean .
12	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	Y	Sy	9	4	220 Ave	A	L	OLVP0	Extensive dieback There is old termite damage evident.
13	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	Y	A/N	9	6	220 Ave	M	L	OLVP0	It appears the main trunk has split in the past with half of the tree now growing on a distinct lean. Signs of old termite activity.
14	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	N	A/NE	9	6	220 Ave	A	L	OLVP0	Extensive dieback and failure in part has occurred
15	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	N	Sy	9	5	200 Ave	X	L	OLVP0	Extensive dieback and failure in part has occurred. Numerous fruiting bodies present
16	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	F	N	A/N	9	5	200 Ave	X	L	OLVF2	Extensive dieback and failure in part has occurred. Numerous fruiting bodies present
17	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	Y	A/NE	9	6	200 Ave	X	L	OLVP0	Extensive dieback There is old termite damage evident within a basal cavity
18	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	F	N	A/W	9	4	200 Ave	A	L	OLVF2	Extensive dieback evident- tree is in decline.
19	*Melaleuca styphelioides (Prickly Paperbark)*	M	F	N	Sy	11	6	340	X	G	MGVF9	Signs of past termite activity evident.
20	*Melaleuca armillaris (Bracelet Honey Myrtle)*	O	P	N	A/NW	9	5	180 Ave	A	L	OLVP0	Extensive dieback evident- tree is in decline.
21	*Melaleuca styphelioides (Prickly Paperbark)*	M	F	N	A/E	10	5	180 Ave	X	G	MGVF9	Included bark present - Canopy development suppressed by adjacent trees.
22	*Melaleuca armillaris (Bracelet Honey Myrtle)*		D									Dead Tree
23	*Pinus radiata (Monterey Pine)*	M	F	N	A/S	17	8	860	X	G	MGVF9	Some dieback of lower branches. The crown is somewhat suppressed by the adjacent tree.
24	*Pinus radiata (Monterey Pine)*	M	F	N	A/N	17	8	670	X	G	MGVF9	Dieback of lower branches is evident. The crown is somewhat suppressed by the adjacent tree.
25	*Eucalyptus elata (Weeping Peppermint)*	O	P	N	A/N	10	9	580	X	L	OLVP0	Tree is almost completely dead with the only live foliage comprising epicormic shoots from the basal region of the trunk.
26	*Eucalyptus elata (Weeping Peppermint)*	M	F	N	A/N	7	7	150 Ave	A	G	MGVF9	Tree appeared structurally sound.
27	*Eucalyptus robusta (Swamp Mahogany)*	M	P	N	Sy	11	4	270	X	L	MLVF4	Crown comprises predominately epicormic regrowth

Table 2 cont.

Tree No.	*Genus, Species (Common Name)*	Age S-Sapling Y-Young M-Mature O-Overmature	Condition D-Dead P-Poor F-Fair G-Good	Pest & Diseases N = No or Y = Yes (If yes see comments)	Canopy Orientation A-Asymmetrical Sy-Symmetrical N,S,E,W-Orientation	Height (metres)	Canopy Spread (metres)	DBH(mm)@ 1.4 metres from ground	Trunk Lean X-Straight or Slightly Leaning A-Acaulescent M-Moderate	Vigour L-Low G-Good	SRIV Age,Vigour,Condition/ Index Rating (See Appendix A)	Comments
28	*Eucalyptus elata (Weeping Peppermint)*	M	P	Y	Sy	9	12	300	X	G	MGVP6	The tree has dieback throughout its crown and epicormic growth present - Borer predation evident
29	*Eucalyptus elata (Weeping Peppermint)*	O	F	Y	A/W	12	14	850	X	L	OLVF2	Extensive evidence of borer feeding activity to lower trunk sapwood evident.
30	*Eucalyptus elata (Weeping Peppermint)*	O	F	N	Sy	14	13	900	X	G	OGVF5	Dieback evident and tree appears to be in decline.
31	*Eucalyptus elata (Weeping Peppermint)*	M	F	N	A/SW	7	2	230	X	L	MGVF9	Crown comprises predominately epicormic growth
32	*Eucalyptus elata (Weeping Peppermint)*	O	F	Y	Sy	15	15	1300	X	L	OLVF2	Borer predation evident and tree in decline
33	*Eucalyptus elata (Weeping Peppermint)*	M	F	N	A/N	12	4	400	M	G	MGVF9	Extensive epicormic growth -tree is in decline
34	*Eucalyptus elata (Weeping Peppermint)*	M	F	N	A/N	7	3	120 Ave	A	G	MGVF9	Tree appears to be epicormic growth from previous removal.
35	*Pittosporum undulatum (Sweet Pittosporum, Native Daphne)*	O	F	N	Sy	5.5	4	150 Ave	A	G	OGVF5	Dieback through crown. Tree is in decline
36	*Pittosporum undulatum (Sweet Pittosporum, Native Daphne)*	O	F	Y	Sy	5	6	120 Ave	A	L	OLVF2	Extensive dieback evident- leaf minor predation evident
37	*Eucalyptus elata (Weeping Peppermint)*	O	F	Y	Sy	15	17	620 Ave	A	G	OGVF5	Borer damage evident and the tree appears to be in decline.
38	*Acacia baileyana (Cootamundra Wattle)*		D									The tree is dead .
39	*Eucalyptus elata (Weeping Peppermint)*	M	F	N	A/SW	9	5	380	M	L	MLVF4	Extensive dieback and high levels of epicormic growth on the main trunk and scaffolds. The tree is a poor specimen with suppressed crown
40	*Eucalyptus elata (Weeping Peppermint)*	O	F	N	A/S	14	10	760	X	L	OLVF2	Dieback and epicormic growth on the trunk and first order leaders - it is in the initial stages of decline.
41	*Acacia sp (Wattle - (possibly A binerva - Coast Myall)*	O	P	N	Sy	9	6	240	X	L	OLVP0	Short lived species at the end of its life cycle - poor specimen in declining condition .
42	*Eucalyptus saligna (Sydney Blue Gum)*	M	F	N	Sy	17	14	900	X	G	MGVF9	Some epicormic growth is present but generally the tree appeared free of insect predation or disease
43	*Pistacia chinensis (Pistacia)*	M	F	N	A/N	5	5	100	X	G	MGVF9	Canopy development suppressed by adjacent trees - poor form .
44	*Cupressus torulosa (Bhutan Cypress)*	M	F	N	Sy	10	3	260	A	G	MGVF9	Codominant trunks with included bark present.
45	*Brachychiton populneus (Kurrajong)*	M	P	N	A/N	7	5	300	X	G	MGVP6	Poor specimen - Crown suppressed.
46	*Eucalyptus saligna (Sydney Blue Gum)*	M	F	N	Sy	17	14	1050	X	G	MGVF9	Some evidence of past branch failure and dieback present in outer canopy areas.
47	*Cupressus torulosa (Bhutan Cypress)*		D									Dead Stump
48	*Cupressus torulosa (Bhutan Cypress)*	M	F	Y	Sy	10	2	150 Ave	A	G	MGVF9	Borer predation evident
49	*Cupressus torulosa (Bhutan Cypress)*	M	F	Y	Sy	14	4	500	X	G	MGVF9	Borer predation evident
50	*Cupressus torulosa (Bhutan Cypress)*	M	F	N	Sy	15	4	300 Ave	A	G	MGVF9	Borer predation evident
51	*Thuja plicata (Giant Arborvitae)*	M	F	N	Sy	15	6	300 Ave	A	G	MGVF9	Cavity at branch union present
52	*Pittosporum undulatum (Sweet Pittosporum, Native Daphne)*	O	F	Y	Sy	10	7	300 Ave	A	G	OGVF5	Extensive dieback evident through the crown - Leaf minor predation present
53	*Lophostemon confertus (Brushbox)*	M	F	Y	Sy	12	7	300 Ave	A	G	MGVF9	Borer predation evident.
54	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	14	10	400 Ave	A	G	MGVF9	Minor dieback evident
55	*Pittosporum undulatum (Sweet Pittosporum, Native Daphne)*	M	F	Y	A/S	5.5	5	150 Ave	A	L	MGVF9	Extensive dieback evident. Leaf minor predation present
56	*Leptospermum petersonii (Lemon Scented Tea tree)*	O	F	Y	Sy	8	5	150 Ave	A	L	OLVF2	The tree is in decline with extensive dieback evident .
57	*Flindersia australis (Crows Foot Ash)*	M	F	N	A/S	10	5	240	X	L	MGVF9	Old borer predation evident

Table 2 cont.

Tree No.	Genus, Species (Common Name)	Age S-Sapling Y-Young M-Mature O-Overmature	Condition D-Dead P-Poor F-Fair G-Good	Pest & Diseases N = No or Y = Yes (If yes see comments)	Canopy Orientation A-Asymmetrical Sy-Symmetrical N,S,E,W-Orientation	Height (metres)	Canopy Spread (metres)	DBH(mm)@ 1.4 metres from ground	Trunk Lean X-Straight or Slightly Leaning A-Acaulescent M-Moderate	Vigour L-Low G-Good	SRIV Age,Vigour,Condition/ Index Rating (See Appendix A)	Comments
58	*Leptospermum petersonii (Lemon Scented Tea tree)*	M	F	Y	Sy	11	6	200 Ave	A	L	MLVF4	Extensive dieback and past branch failure is evident. Multiple fruiting bodies are present.
59	*Pittosporum undulatum (Sweet Pittosporum, Native Daphne)*	M	F	Y	A/S	10	8	260 Ave	A	G	MGVF9	Tree generally appeared structurally sound
60	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	9	780	X	G	MGVF9	The tree is exhibiting some signs of stress but generally appeared structurally sound
61	*Pittosporum undulatum (Sweet Pittosporum, Native Daphne)*	M	F	Y	Sy	6	5	150 Ave	A	L	MLVF4	Extensive dieback and deadwood - tree is in poor health and in decline
62	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	9	500 Ave	X	G	MGVF9	Tree has been subject to some past lopping but generally appeared structurally sound
63	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	7	620	X	G	MGVF9	Some dieback present but generally appeared structurally sound
64	*Pinus radiata (Monterey Pine)*	M	F	N	A/NW	18	10	740	X	L	MLVF4	Tree has been subject to some past failure in part
65	*Pinus radiata (Monterey Pine)*	M	F	N	A/NE	18	5	430	X	G	MGVF9	Tree has been subject to some past failure in part with a reduced crown foliage area
66	*Pinus radiata (Monterey Pine)*	M	F	N	Sy	20	8	650	X	G	MGVF9	Some dieback present. No live branches for lower 8 metres of trunk.
67	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	13	9	630	X	G	MGVF9	Tree has been subject to some past failure in part with a reduced crown foliage area
68	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	13	4	330	X	G	MGVF9	Canopy development suppressed by adjacent trees but generally appeared structurally sound.
69	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	13	8	480	X	G	MGVF9	There is miner root girdling present on the SW side and a small amount of dieback is present.
70	*Lophostemon confertus (Brushbox)*	M	F	N	A/NW	13	8	250 Ave	A	L	MLVF4	Dieback through crown - tree is exhibiting drought stress.
71	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	13	8	310 Ave	X	G	MGVF9	Small amount of dieback and epicormic growth present - minor root girdling on the north west side.
72	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	12	670	X	G	MGVF9	Small amount of dieback and epicormic growth.
73	*Lophostemon confertus (Brushbox)*		D			12	5	580				The tree is dead .
74	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	12	820	X	G	MGVF9	Small amount of dieback and epicormic growth present. Minor root girdling at NW side.
75	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	12	670	X	G	MGVF9	Small amount of dieback and epicormic growth present.
76	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	12	500 Ave	X	G	MGVF9	Small amount of dieback and epicormic growth present.
77	*Lophostemon confertus (Brushbox)*	M	F	N	A/S	15	11	500 Ave	X	G	MGVF9	Small amount of dieback and epicormic growth present.
78	*Callistemon viminalis (Weeping Bottlebrush)*	M	F	N	A/NE	5	2.5	100 Ave	A	G	MGVF9	Smaller specimen appearing structurally sound
79	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	11	820	X	G	MGVF9	Small amount of dieback and epicormic growth present.
80	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	8	500	X	G	MGVF9	Small amount of dieback and epicormic growth present.
81	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	14	9	500	X	L	MLVF4	Moderate amount of dieback and epicormic growth present.
82	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	5	440	X	L	MLVF4	Minor root girdling on north side. Tree appeared structurally sound at time of inspection.
83	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	8	590	X	L	MLVF4	Small amount of dieback and epicormic growth present.
84	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	8	720	X	G	MGVF9	Moderate amount of dieback and epicormic growth present.
85	*Lophostemon confertus (Brushbox)*	M	F	Y	Sy	14	4	320	X	G	MGVF9	Tree somewhat suppressed but appeared structurally sound.
86	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	10	620	X	G	MGVF9	Small amount of dieback and epicormic growth present.

Table 2 cont.

Tree No.	Genus, Species (Common Name)	Age S-Sapling Y-Young M-Mature O-Overmature	Condition D-Dead P-Poor F-Fair G-Good	Pest & Diseases N = No or Y = Yes (If yes see comments)	Canopy Orientation A-Asymmetrical Sy-Symmetrical N,S,E,W-Orientation	Height (metres)	Canopy Spread (metres)	DBH(mm)@ 1.4 metres from ground	Trunk Lean X-Straight or Slightly Leaning A-Acaulescent M-Moderate	Vigour L-Low G-Good	SRIV Age,Vigour,Condition/ Index Rating (See Appendix A)	Comments
87	*Lophostemon confertus (Brushbox)*	M	P	N	Sy	15	3	460	X	L	MLVF4	Moderate amount of dieback and epicormic growth present.
88	*Lophostemon confertus (Brushbox)*	M	P	N	Sy	15	7	470	X	G	MGVP6	Moderate amount of dieback and epicormic growth present.
89	*Lophostemon confertus (Brushbox)*	M	P	N	Sy	15	8	490	X	G	MGVP6	Small amount of dieback and epicormic growth present.
90	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	8	3	200	X	G	MGVF9	Moderate amount of dieback and epicormic growth present.
91	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	10	900	X	G	MGVF9	Moderate amount of dieback and epicormic growth present. Appears structurally sound.
92	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	8	600	X	G	MGVF9	Low levels of dieback and epicormic growth present.
93	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	10	590	X	G	MGVF9	Some dieback present.
94	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	10	1020	X	G	MGVF9	Appears structurally sound.
95	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	5	470	X	G	MGVF9	Canopy sparse with low levels of dieback.
96	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	15	10	650	X	G	MGVF9	Moderate amount of dieback and epicormic growth present.
97	*Lophostemon confertus (Brushbox)*	M	F	N	A/W	12	4	220	X	G	MGVF9	Low levels of dieback and epicormic growth. Crown somewhat suppressed .
98	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	11	5	210	X	G	MGVF9	Low levels of dieback present.
99	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	9	600	X	G	MGVF9	Low levels of dieback present.
100	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	9	4	240	X	G	MGVF9	Crown somewhat suppressed by adjacent trees. Moderate levels of dieback present.
101	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	10	1050	X	G	MGVF9	Moderate levels of dieback present.
102	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	8	480	X	G	MGVF9	Low levels of dieback present.
103	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	13	6	400	X	G	MGVF9	Extensive dieback and epicormic growth present . It appears the tree may have been poisoned in the past with old drill holes evident
104	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	14	9	510	X	G	MGVF9	Low levels of dieback present. It appears the tree may have been poisoned in the past with old drill holes evident
105	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	14	8	500	X	G	MGVF9	Moderate levels of dieback and epicormic growth present. It appears the tree may have been poisoned in the past with old drill holes evident
106	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	9	620	X	G	MGVF9	Moderate levels of dieback and epicormic growth present. It appears the tree may have been poisoned in the past with old drill holes evident
107	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	12	6	420	X	G	MGVF9	Low levels of dieback and epicormic growth present. It appears the tree may have been poisoned in the past with old drill holes evident
108	*Lophostemon confertus (Brushbox)*	M	F	N	Sy	16	10	590	X	G	MGVF9	Low levels of dieback and epicormic growth present. It appears the tree may have been poisoned in the past with old drill holes evident
109	*Lophostemon confertus (Brushbox)*	M	F	N	A/SW	16	12	930	X	G	MGVF9	Moderate levels of dieback and epicormic growth.
110	*Eucalyptus scoparia (Willow Gum)*		D									The tree is dead .
111	*Eucalyptus robusta (Swamp Mahogany)*	M	F	N	Sy	13	9	450	X	G	MGVF9	Low levels of dieback and epicormic growth
112	*Schinus areira (Peppercorn Tree)*	M	P	N	Sy	7	7	200 Ave	A	L	MLVF4	Crown thinning and extensive dieback.
113	*Acacia elata (Cedar Wattle)*	O	P	N	Sy	5	5	200	X	L	OLVP0	Almost dead - short lived species .
114	*Acacia elata (Cedar Wattle)*	O	P	N	A/NW	7	7	300	X	L	OLVP0	Almost dead - short lived species .
115	*Harpephyllum caffrum (Kaffir Plum)*	M	P	N	A/N	5	8	280 Ave	A	G	MGVP6	Tree likely to fail as it matures.

Table 2 cont.

Tree No.	Genus, Species (Common Name)	Age S-Sapling Y-Young M-Mature O-Overmature	Condition D-Dead P-Poor F-Fair G-Good	Pest & Diseases N = No or Y = Yes (If yes see comments)	Canopy Orientation A-Asymmetrical Sy-Symmetrical N,S,E,W-Orientation	Height (metres)	Canopy Spread (metres)	DBH(mm)@ 1.4 metres from ground	Trunk Lean X-Straight or Slightly Leaning A-Acaulescent M-Moderate	Vigour L-Low G-Good	SRIV Age,Vigour,Condition/ Index Rating (See Appendix A)	Comments
116	*Eucalyptus scoparia (Willow Gum)*		D									The tree is dead .
117	*Eucalyptus scoparia (Willow Gum)*	M	P	N	Sy	15	10	530	X	L	MLVF4	Crown thinning and extensive dieback.
118	*Eucalyptus scoparia (Willow Gum)*	M	P	N	A/SE	10	6	250 Ave	X	L	MLVF4	Crown thinning and extensive dieback.
119	*Eucalyptus scoparia (Willow Gum)*	M	F	N	Sy	16	12	500	X	G	MGVF9	Moderate levels of dieback and epicormic growth.
120	*Eucalyptus saligna (Sydney Blue Gum)*	M	P	N	A/NE	11	5	220	X	G	MGVP6	Moderate levels of dieback and epicormic growth.
121	*Syncarpia glomulifera (Turpentine)*	M	F	N	A/E	10	6	280 Ave	X	G	MGVF9	Tree appears to be structurally sound.
122	*Syncarpia glomulifera (Turpentine)*	M	F	N	Sy	10	6	350	X	G	MGVF9	Some included bark but generally appeared structurally sound.
123	*Fraxinus griffithii (Evergreen Ash)*	M	F	N	Sy	7	6	100 Ave	A	G	MGVF9	Generally appeared structurally sound.
124	*Harpephyllum caffrum (Kaffir Plum)*	M	F	N	Sy	7	3	160	X	G	MGVF9	Canopy development suppressed by adjacent trees.
125	*Harpephyllum caffrum (Kaffir Plum)*	M	F	N	A/NE	6	4	130 Ave	A	G	MGVF9	Canopy development suppressed by adjacent trees.
126	*Harpephyllum caffrum (Kaffir Plum)*	M	P	N	A/E	5	6	280	X	G	MGVP6	Generally appeared structurally sound.
127	*Hakea salicifolia (Willow-leaved Hakea)*	O	P	N	Sy	5	6	200 Ave	A	L	OLVP0	Small amount of dieback and epicormic growth.
128	*Pittosporum undulatum (Sweet Pittosporum, Native Daphne)*	O	F	Y	Sy	5.5	6	380	X	L	OLVF2	Extensive epicormic growth and broken branches with decay present.
129	*Eucalyptus leucoxylon* (Yellow Gum)	M	P	N	Sy	18	16	1100	X	L	MLVF4	Extensive dieback and significant levels of epicormic growth - the tree is in an irreversible state of decline.
130	*Agonis flexuosa (Willow Myrtle)*	O	P	Y	Sy	5	6	320 Ave	A	L	OLVP0	Extensive dieback and epicormic growth present - tree is in decline and unstable
131	*Eucalyptus resinifera (Red Mahogany)*	M	P	N	Sy	16	12	600	X	L	MLVF4	The tree has moderate to high levels of dieback and epicormic growth.
132	*Eucalyptus leucoxylon* (Yellow Gum)	M	F	N	Sy	18	13	900	X	L	MLVF4	The tree has moderate to high levels of dieback and epicormic growth.
133	*Phoenix canariensis (Date Palm)*	M	F	N	Sy	9	5.5	700	X	G	MGVF9	Tree appears structurally sound
134	*Eucalyptus saligna (Sydney Blue Gum)*	Y	F	N	Sy	9	3	150	X	G	MGVF9	Tree appears structurally sound
135	*Ligustrum lucidum(Broad-leafed Privet)*	M	F	N	Sy	9	4	150	X	G	MGVF9	Weed species

Table 2 Setbacks for tree protection zones

This table only applies to trees being retained and potentially impacted upon by the proposed works to be included within a Tree Protection Zone. Tree Protection Zone fencing locations where required as measured from the centre of each tree and the recommended distances for the side closest to the building construction works e.g. excavation. (see explanatory notes below).

A	B	C	D	E	F	G
Tree No.	**A=Trunk Diameter** in millimetres at 1.4m above ground, **B=Trunk Diameter** in millimetres above root buttress .	**Age of tree Y** = Young **M** = Mature **O** = Over-mature (senescent)	**Tree Vigour Good Vigour=** GV Or **Low Vigour=** LV	**Australian Standard AS 4970-2009 "Protection of trees on development sites (See appendix)** Calculated Structural Root Zone (SRZ) in metres being Radius=(Dx50)0.42 x0.64	**Distance of Tree Protection Zone (TPZ) , in metres**. Australian Standard AS 4970-2009 "Protection of trees on development sites" TPZ=DBH x 12	**Recommended distance of tree protection fence /zone on the side closest to building /construction in metres.** (See explanatory notes below & report recommendations)
2	A=260 B=270	M	GV	2	3.1	3.1(1)
8	A=150 B=160	M	GV	1.6	1.8	1.8(1)
26	A=150 B=160	M	GV	1.6	1.8	1.8(1)
42	A=900 B=920	M	GV	3.2	10.8	10.8(1)
46	A=1050 B=1070	M	GV	3.5	12.6	12.6(1)
53	A=300 B=320	M	GV	2.1	3.6	3.6(1)
54	A=400 B=420	M	GV	2.3	4.8	4.8(1)
55	A=150 B=170	M	GV	1.6	1.8	1.8(1)
57	A=240 B=260	M	GV	1.9	2.9	2.9(1)
60	A=780 B=800	M	GV	3.1	9.4	9.4(1)
62	A=500 B=520	M	GV	2.6	6	6(1)
63	A=620 B=640	M	GV	2.8	7.4	7.4(1)
64	A=740 B=760	M	GV	3	8.9	8.9(1)
65	A=430 B=450	M	GV	2.4	5.2	5.2(1)
67	A=630 B=650	M	GV	2.8	7.6	7.6(1)
68	A=330 B=350	M	GV	2.2	4	4(1)
69	A=480 B=500	M	GV	2.5	5.8	5.8(1)
70	A=250 B=270	M	GV	2	3	3(1)
71	A=310 B=330	M	GV	2.1	3.7	3.7(1)
72	A=670 B=690	M	GV	2.9	8	8(1)
74	A=820 B=840	M	GV	3.1	9.8	9.8(1)
75	A=670 B=690	M	GV	2.9	8	8(1)
76	A=500 B=520	M	GV	2.6	6	6(1)
77	A=500 B=520	M	GV	2.6	6	6(1)
79	A=820 B=840	M	GV	3.1	9.8	9.8(1)
80	A=500 B=520	M	GV	2.6	6	6(1)
81	A=500 B=520	M	GV	2.6	6	6(1)
82	A=440 B=460	M	GV	2.4	5.3	5.3(1)
83	A=590 B=560	M	GV	2.7	7.1	7.1(1)
84	A=720 B=740	M	GV	3	8.6	8.6(1)
85	A=320 B=360	M	GV	2.2	3.8	3.8(1)
86	A=620 B=640	M	GV	2.8	7.4	7.4(1)
87	A=460 B=480	M	GV	2.5	5.5	5.5(1)
88	A=470 B=490	M	GV	2.5	5.6	5.6(1)
89	A=490 B=510	M	GV	2.5	5.9	5.9(1)
90	A=200 B=220	M	GV	1.8	2.4	2.4(1)
91	A=900 B=920	M	GV	3.2	10.8	10.8(1)
92	A=600 B=620	M	GV	2.8	7.2	7.2(1)
93	A=590 B=600	M	GV	2.7	7.1	7.1(1)
94	A=1020 B=1040	M	GV	3.4	12.2	12.2(1)
95	A=470 B=490	M	GV	2.5	5.6	5.6(1)
96	A=650 B=670	M	GV	2.8	7.8	7.8(1)
97	A=220 B=240	M	GV	1.9	2.6	2.6(1)
98	A=210 B=230	M	GV	1.8	2.5	2.5(1)

Table 2 (Cont.)

99	A=600 B=620	M	GV	2.8	7.2	7.2(1)
100	A=240 B=260	M	GV	1.9	2.9	2.9(1)
101	A=1050 B=1070	M	GV	3.5	12.6	12.6(1)
102	A=480 B=500	M	GV	2.5	5.8	5.8(1)
103	A=400 B=420	M	GV	2.3	4.8	4.8(1)
104	A=510 B=530	M	GV	2.6	6.1	6.1(1)
105	A=500 B=520	M	GV	2.6	6	6(1)
106	A=620 B=640	M	GV	2.8	7.4	7.4(1)
107	A=420 B=440	M	GV	2.4	5	5(1)
108	A=590 B=610	M	GV	2.7	7.1	7.1(1)
111	A=450 B=470	M	GV	2.5	5.4	5.4(1)
120	A=220 B=240	M	GV	1.9	2.6	2.6(1)
121	A=280 B=290	M	GV	2	3.4	3.4(1)
133	A=700 B=750	M	GV	3	8.4	1.5(1,11)

Explanatory notes for Table 2.0.

This table is based upon Australian Standard AS 4970-2009 "Protection of trees on development sites." and identifies SRZ & TPZ near to trees to be retained when the age, and vigour of each tree is considered. However, if the prescribed setback from the trunk of the tree for the location of the Tree Protection Zone, is unable to accommodate the location of building works nearby in accordance with "Protection of trees on development sites section 3.3 of that Standard provides the following:

	3.3.4 TPZ encroachment considerations When determining the potential impacts of encroachment into the TPZ, the project arborist should consider the following:(a) Location and distribution of the roots.(b) The potential loss of root mass resulting from the encroachment: number and size of roots.(c) Tree species and tolerance to root disturbance.(d) Age, vigour and size of the tree. (e) Lean and stability of the tree. .(f) Soil characteristics and volume, topography and drainage. (g) The presence of existing or past structures or obstacles affecting root growth.(h) Design factors.
*	Average diameter.
1	Special conditions apply to protect the roots of trees generally, see recommendations
2	Additional protective fencing and works as detailed in appendix D & E.
3	Acceptable due to the good relative tolerance of the species to development impacts
4	Range of set backs for the trees at each end of a linear stand.
5	Acceptable as fence located at a substantial distance beyond dripline, or may also include the location of a smaller tree in proximity to a larger tree to be retained and the smaller tree being protected well within the protective fencing for that larger tree.
6	Acceptable due to additional special protection works, see appendix E & recommendations for this tree.
7	Acceptable as pre-existing site conditions were conducive to having restricted the development of root growth in this direction.
8	Street tree with protective fencing of minimal width to allow for pedestrian access along road reserve.
9	Acceptable as tree transplanted reducing the area of the root zone.
10	Acceptable as not effected by development.
11	Palm species or young tree not expected to have established a substantially expansive root system and able to re-establish or modify growth to be sustainable due to age and normal vigour.
12	Set back prescribed by the consent authority.
13	Acceptable as tree growing on a lean and encroachment on compression wood side where root growth is of reduced structural importance.
14	Acceptable as root mapping has indicated extent of structural woody roots with a diameter of 40mm or more.
15	Acceptable as pre-existing conditions would have aided in the deflection of roots away from the proposed development site.

5. DISCUSSION

The tree and site assessment finds that a majority are located around the boundaries of the land enabling the retention of 58 trees. This occurrence reduces impacts upon the amenity of the area enabling their retention with the design in its current format.

Many of the tree crowns have been previously lifted to accommodate the previous use of the area. Further minor lifting should be undertaken to avoid accidental damage occurring during construction and to remove dead and diseased wood where required.

It is considered that the proposed design can be undertaken without detrimentally impacting upon the trees and protection works detailed here are considered satisfactory for the trees retained to remain viable and stable.

6. RECOMMENDATIONS

a. That trees 2, 8, 26, 42, 46, 53, 54, 55, 57, 60, 62, 63, 64, 65, 67, 68, 69, 70, 71, 72, 74, 75, 76, 77, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100,101,102,103,104,105,106,107,108,111,120,121, & 133 identified in table 2 be retained and protected. Tree protection zones are to be established within the development site boundaries only at setbacks identified in table 2 column G from trunk centres in accordance with appendix E prior to commencement of any site works. Directions are to be given on site as to the final location of fencing so as to encompass single or multiple trees where applicable.

b. That palm 133 be retained in situ or relocated to an alternate location on the site. A transplant method statement is to be prepared and submitted with CC documentation if relocation is required.

c. Any excavation within prescribed Tree Protection Zones is to be undertaken by hand to depths of 750mm. Below this depth mechanical excavation is permissible.

d. All excavation works within prescribed Tree Protection Zones (see table 2 column G) is to be supervised by the consulting Arboriculturist. Any roots encountered are to be cut cleanly with a final cut to undamaged woody tissue. This will prevent tearing damage to the roots from excavation equipment which can extend beyond the point of excavation back towards the tree. Severed roots are to be treated with a root growth hormone stimulant.

e. That crown cleaning to remove any dead or diseased wood. and minor lifting be undertaken prior to commencement of any site works. All pruning works are to be undertaken in accordance with AS 4373- 2007- Pruning of Amenity Trees. Any pruning required to accommodate the elevation of the proposed works is to be undertaken in accordance with the Australian Standard AS4373-2007 “Pruning of Amenity Trees”.

f. All proposed new ground re-surfacing, including driveways and pathways, within prescribed Tree Protection Zones (see table 2 column G) from trees to be retained should be of a porous nature to maintain the transfer of air between tree roots, the soil and the atmosphere.

g. All services where possible are to be located outside the area of the dripline from trees to be retained. Any services to be located within the area of the dripline of the trees or within the Tree Protection Zones indicated within table 2 are to be installed by the use of lateral or thrust boring equipment or some other type of Trenchless Technology considered appropriate by the Consulting Arboriculturist. Tunneling for such services

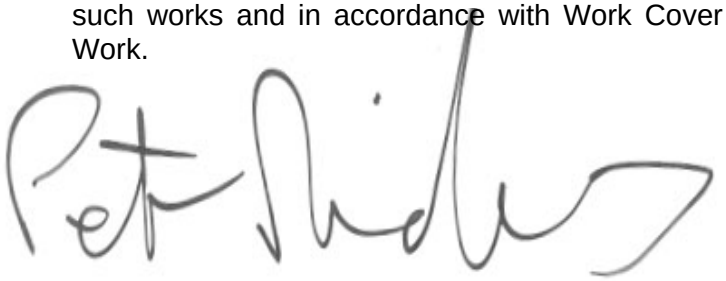
should not occur less than 750mm in depth below existing ground level. See also Appendix D section 1.2.6.

h. Ground protection as identified within “Appendix D section 1.2.7” is to be installed upon ground areas if the erection of scaffolding or site movement is required within prescribed tree protection zones identified within table 2 column G in consultation with the site Arborist .

i. Certification reports regarding tree management are to be provided at key points of the development as follows:
-Establishment of tree protection zones prior to commencement of any site works
-Following supervision of any excavation works within Tree Protection Zones.
-At three monthly intervals throughout the development.
-Following completion of all construction works.

j. All remaining trees not identified within table 2 are to be removed and replaced with alternate plantings as part of landscape works for the development in accordance with landscape documentation prepared by OCULUS.

k. That all removal works be undertaken by a qualified Arboriculturist with appropriate competencies recognised within the Australian Qualification Framework, with a minimum of 5 years of continual experience within the industry of operational amenity arboriculture, and covered by appropriate and current types of insurance to undertake such works and in accordance with Work Cover NSW 2007, Code of Practice Tree Work.



Peter Richards
Tree & Landscape Consultants

Appendix A
Matrix - Sustainable Retention Index Value (S.R.I.V.)©

Developed by IACA – Institute of Australian Consulting Arboriculturists www.iaca.org.au (2009)

To be used with the values defined in the Glossary.
An Index value as indicated where ten (10) is the highest value.

Age Class	Vigour Class and Condition Class					
	Good Vigour & Good Condition (GVG)	Good Vigour & Fair Condition (GVF)	Good Vigour & Poor Condition (GVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to high vigour. Retention potential - Medium – Long Term.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work may be required or improvement to growing environment may assist. Retention potential - Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Remedial work unlikely to assist condition, improvement to growing environment may assist. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required, but improvement to growing environment may assist vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential - Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition or vigour. Retention potential - Likely to be removed immediately or retained for Short Term. Potential for longer with remediation or favourable environmental conditions.
Young (Y)	Index Value 9 Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height <5m. High potential for future growth and adaptability. Retain, move or replace.	Index Value 8 Retention potential - Short – Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Medium-high potential for future growth and adaptability. Retain, move or replace.	Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Medium potential for future growth and adaptability. Retain, move or replace.	Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Low-medium potential for future growth and adaptability. Retain, move or replace.	Index Value 1 Retention potential - Likely to be removed immediately or retained for Short Term. Likely to provide minimal contribution to local amenity if height <5m. Low potential for future growth and adaptability.
Mature (M)	Index Value 10 Retention potential - Medium - Long Term.	Index Value 9 Retention potential - Medium Term. Potential for longer with improved growing conditions.	Index Value 6 Retention potential - Short Term. Potential for longer with improved growing conditions.	Index Value 5 Retention potential - Short Term. Potential for longer with improved growing conditions.	Index Value 4 Retention potential - Short Term. Potential for longer with improved growing conditions.	Index Value 2 Retention potential - Likely to be removed immediately or retained for Short Term.
Over-mature (O)	Index Value 6 Retention potential - Medium - Long Term.	Index Value 5 Retention potential - Medium Term.	Index Value 4 Retention potential - Short Term.	Index Value 3 Retention potential - Short Term. Potential for longer with improved growing conditions.	Index Value 2 Retention potential - Short Term.	Index Value 0 Retention potential - Likely to be removed immediately or retained for Short Term.

Appendix B

Definitions & Terminology

From

Dictionary for Managing Trees in Urban Environments

Institute of Australian Consulting Arboriculturists (IACA) 2009.

Condition of trees

Condition A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk and structural branches (first (1^{st}) and possibly second (2^{nd}) order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour* and it is possible for a tree to be of *normal vigour* but in *poor condition*. Condition can be categorized as *Good Condition*, *Fair Condition*, *Poor Condition* and *Dead*.

Good Condition Tree is of good habit, with *crown form* not severely restricted for space and light, physically free from the adverse effects of *predation* by pests and diseases, obvious instability or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from, or contributed to by vigour.

Fair Condition Tree is of good habit or *misshapen*, a form not severely restricted for space and light, has some physical indication of *decline* due to the early effects of *predation* by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the *environment* essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent from, or contributed to by vigour.

Poor Condition Tree is of good habit or *misshapen*, a form that may be severely restricted for space and light, exhibits symptoms of advanced and *irreversible decline* such as fungal, or bacterial infestation, major die-back in the branch and *foliage crown*, *structural deterioration* from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local *environment* that would normally be sufficient to provide for its basic survival if in *good* to *fair* condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and *predation* by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from, or contributed to by vigour..

Dead Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms;

Processes

Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves);

Osmosis (the ability of the root system to take up water);

Turgidity (the ability of the plant to sustain moisture pressure in its cells);

Epicormic shoots or *epicormic strands* in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a *lignotuber*);

Symptoms

Permanent leaf loss;

Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots);

Abscission of the *epidermis* (bark desiccates and peels off to the beginning of the sapwood).

Removed No longer present, or tree not able to be located or having been cut down and retained on a site, or having been taken away from a site prior to site inspection.

Description of Tree Dimensions

Height The distance measured vertically between the horizontal plane at the lowest point at the base of a tree, which is immediately above ground, and the horizontal plane immediately above the uppermost point of a tree.

Spread The furthest expanse of the crown when measured horizontally from one side of the tree to the other, generally through the centre of the trunk. Where the crown is not circular a measurement should be an average of the narrowest and widest diameters and this is dependent upon crown form and to a lesser extent its symmetry.

Crown Cover Percent of the homogenous distribution of foliage across the entire crown based upon that expected for a specimen of that species in good condition and of normal vigour, depending on form in situ, e.g. this may be influenced by crown die-back, proximity to other trees or structures, moisture stress, or overshadowing.

Vigour

Vigour Ability of a tree to sustain its life processes. This is independent of the *condition* of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g. *dormant*, deciduous or semi-deciduous trees. Vigour can be categorized as *Normal Vigour, High Vigour*, *Low Vigour* and *Dormant Tree Vigour*.

Normal Vigour Ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

High Vigour *Accelerated growth* of a tree due to incidental or deliberate artificial changes to its growing *environment* that are seemingly beneficial, but may result in *premature aging* or failure if the favourable conditions cease, or promote *prolonged senescence* if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous *pollarding* practices over the life of the tree.

Low Vigour Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance

to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

Dormant Tree Vigour Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last extension growth is distinct from those most recently preceding it, evident by bud scale scars. Normal vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.
Poor Vigour See low vigour
Good Vigour See Normal Vigour

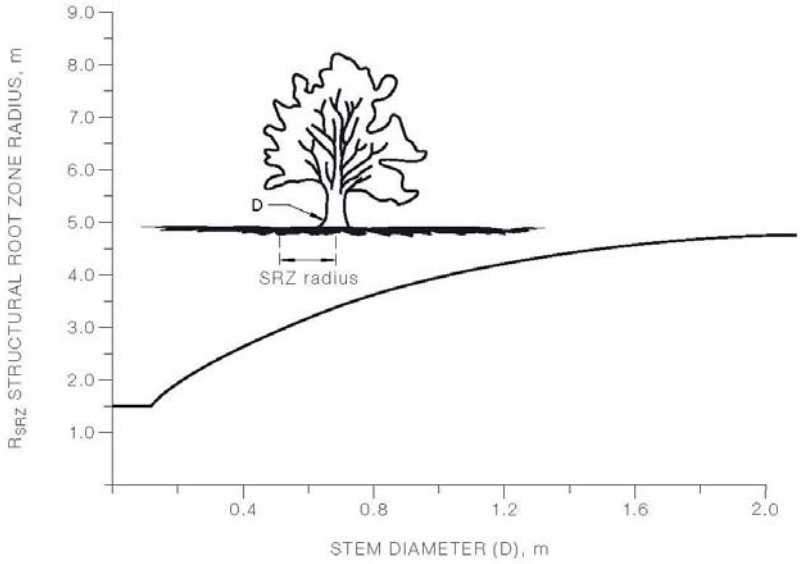
Age of Trees

Age of Trees Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown. These increments are Young, Mature and Overmature.
Young Tree aged less than 20% of life expectancy.
Mature Tree aged 20-80% of life expectancy.
Over-mature Tree aged greater than 80% of life expectancy tending to senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.
Sapling A young tree, early in its development with small dimensions.
Senescent Advanced old age, over-mature.

General Terms

Significant Important, weighty or more than ordinary.
Significant Tree A tree considered important, weighty or more than ordinary. Example: due to prominence of location, or in situ, or contribution as a component of the overall landscape for *amenity* or aesthetic qualities, or *curtilage* to structures, or importance due to uniqueness of taxa for species, subspecies, variety, form, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as remnant vegetation, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.
Substantial A tree with large dimensions or proportions in relation to its place in the landscape.
Excurrent Tree where the crown is comprised of one (1) dominant first order structural branch which is usually an extension of the trunk, erect, straight and continuous, tapering gradually, with the main *axis* clear from base to apex, e.g. *Araucaria heterophylla* - Norfolk Island Pine. Note: some tree species of *typical* excurrent habit may be altered to deliquescent by physical damage of the *apical meristem*, or from top lopping, or from the propagation of inferior quality stock. However, *formative pruning* may be able to correct a *crown* to excurrent if undertaken when a tree is *young*.
Sustainable Retention Index Value (SRIV) A visual method of rating the viability of urban trees for development sites and management, based on general tree and landscape assessment criteria. SRIV© is for the professional manager of urban trees to consider the tree in situ with an assumed knowledge of the taxa and its growing environment and is based on the physical attributes of the tree and its response to its environment considering its age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property and the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. (IACA 2005)
Crown Spread Orientation Direction of the *axis* of *crown spread* which can be categorized as *Orientation Radial* and *Orientation Non-radial*.
Diameter at Breast Height (DBH) Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4 m. The trunk of a tree is usually not a circle when viewed in cross section, due to the presence of *reaction wood* or *adaptive wood*, therefore an average diameter is determined with a *diameter tape* or by recording the trunk along its narrowest and widest axes, adding the two dimensions together and dividing them by 2 to record an average and allowing the orientation of the longest axis of the trunk to also be recorded. Where a tree is growing on a lean the distance along the top of the trunk is measured to 1.4m and the diameter then recorded from that point perpendicular to the edge of the trunk. Where a *leaning* trunk is *crooked* a vertical distance of 1.4m is measured from the ground. Where a tree branches from a trunk that is less than 1.4m above ground, the trunk diameter is recorded perpendicular to the length of the *trunk* from the point immediately below the base of the flange of the *branch collar* extending the furthest down the trunk, and the distance of this point above ground recorded as *trunk* length. Where a tree is located on sloping ground the DBH should be measured at half way along the side of the tree to average out the angle of slope. Where a tree is *acaulescent* or *trunkless* branching at or near ground an average diameter is determined by recording the radial extent of the trunk at or near ground and noting where the measurement was recorded e.g. at ground.
Structural Root Zone (SRZ) The minimal area around the base of a tree, generally circular, required for its *stability* in the ground. The section of *root plate* within this area and subsequent soil cohesion necessary to hold the tree upright against *wind throw*, therefore the entire depth of the *root zone* must be included.

Appendix C
Extract from Australian Standard AS 4970-2009
"Protection of trees on development sites
"Calculating the Structural Root Zone"



The curve can be expressed by the following formula:
$R_{SRZ} = (D \times 50)^{0.42} \times 0.64$

NOTES:

1 R_{SRZ} is the structural root zone radius.
2 D is the stem diameter measured immediately above root buttress.
3 The SRZ for trees less than 0.15 m diameter is 1.5 m.
4 The SRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns.
5 This does not apply to trees with an asymmetrical root plate.

FIGURE 1 STRUCTURAL ROOT ZONE

Appendix D

TREE PROTECTION GUIDELINES

1.1 GENERAL NOTES

1.1.1 The application of measures for the protection of trees on development sites is determined by the species characteristics, and the existing physical constraints of the growing environment on site both above and below ground.

1.1.2 This report considers where applicable, Australian Standard AS 4970-2009 “Protection of trees on development sites.” as a guide for the management of trees on development sites.

1.1.3 This report applies the ***Tree Protection Zone - Standard Procedure*** as developed and continually improved by the Consultant Arboriculturist for the effective protection of trees on development sites over time. (See Appendix E) Additional or alternative conditions are applied where it is deemed appropriate by the author for the protection of trees. Such additional or alternative conditions may be founded upon professional judgement based on:

- the experience of the Consulting Arboriculturist
- scientific research
- new technology
- industry best practice
- consideration of the individual tree species and its relative tolerance to development impacts
- the individual or cumulative factors present or proposed to impact upon the growing environment essential for the trees’ survival

1.2 PRECAUTIONS TO PROTECT TREES

1.2.1 ***Demolition of landscape structures***

The demolition of walls, driveways, paths etc. near trees to be retained should be undertaken manually using hand tools. Use of light machinery can occur by utilising the driveway or a paved area as a stable platform to prevent soil compaction. The volume of space previously occupied by the driveway or paved area must be replaced with local top soil from the site or otherwise a loamy sand, to replace the mass on the root plate which may be critical to the ballast and centre of mass for the stability of the tree. If the tree becomes unstable immediately contact the Consultant Arboriculturist.

1.2.2 ***Demolition of existing buildings***

The demolition of the buildings should be undertaken with access restricted to the driveway and the building platform for each of the existing buildings, or to areas of the land where no trees are growing within 6m of any tree to be retained. Where access or space for a safe working environment is restricted, or where the area of the 6m set back must be compromised, a 100mm layer of Eucalyptus wood mulch must be laid over the area of encroachment. Where vehicular access is required across the mulch layer further root protection should be provided by laying a temporary pathway over the mulch. The temporary pathway should be constructed of a grated steel material capable of supporting the vehicles used during demolition e.g. similar to ramps used to load vehicles onto the backs of trucks. Trunks of trees are to be protected from vehicular damage as per appendix E section 4 of this report.

1.2.3 ***Removal of trees near to trees to be retained***

Removal of a tree within 6m of a tree to be retained should be undertaken only by cutting down such a tree without damaging the trees to be retained, and by grinding out its stump. Where possible the structural roots of 20mm diameter or greater of the tree to be cut down should not be removed, to minimise soil disturbance and to reduce the impact on the roots of any tree to be retained nearby. Where structural roots are to be removed this should be

undertaken manually by the use of non-motorized hand tools after the stump has been ground out when such roots are often easier to locate from the site of the stump from which they have been severed.

1.2.4 ***Structural Soil to accommodate compacted subgrade and root growth***

To further protect woody roots with a diameter of 40mm or greater outside the area of the tree protection zone (see table 2), structural soil as a fill material or a subgrade should be used where appropriate and as detailed in the report recommendations. Structural soil addresses the issue of how to increase soil rooting volume whilst maintaining structural support for pavement. Structural soil maximises rock to rock contact utilising durable rock. Pore spaces are on average 8mm in size of which approximately 60% is taken up by the filler soil - the horticultural component, depending on the product utilised. The product is used for new tree planting in pavements, courtyards, carparks and kerbsides,planter boxes and raising levels around existing trees providing increased available soil volume to trees in pavements, structural properties for pavement support, increased root depth and high permeability for both air and water.

1.2.5 ***Root location and protection where structures are to be positioned near a retained tree***

A: If walls, driveways or other structures are to be constructed near a protected tree or within a tree protection zone (see table 2 column G), careful excavation is to be undertaken manually by using hand tools or light machinery to determine the location of structural woody roots with a diameter of 40mm or greater, without damaging them. These roots are to be protected from physical damage by utilising pier & beam type footings to reduce excessive disturbance of existing soil profile supporting tree roots. Placement of piers are to be positioned so as to clear any structural root by at least 100mm to allow for future radial expansion of the tree root within the soil profile. Any roots 40mm or less may be clean cut with final cuts to undamaged woody tissue.

B: Where structural woody roots outside of the Tree Protection Zone or as otherwise indicated are to be pruned they are to be excavated manually first by using hand tools to adequately expose the root. Once located those roots to be severed are to be cut cleanly with a final cut to undamaged woody tissue. This will prevent tearing damage to the roots from excavation equipment which can extend beyond the point of excavation back towards the tree. Severed roots are to be treated with a root growth hormone stimulant.

1.2.6 ***Location of Services***

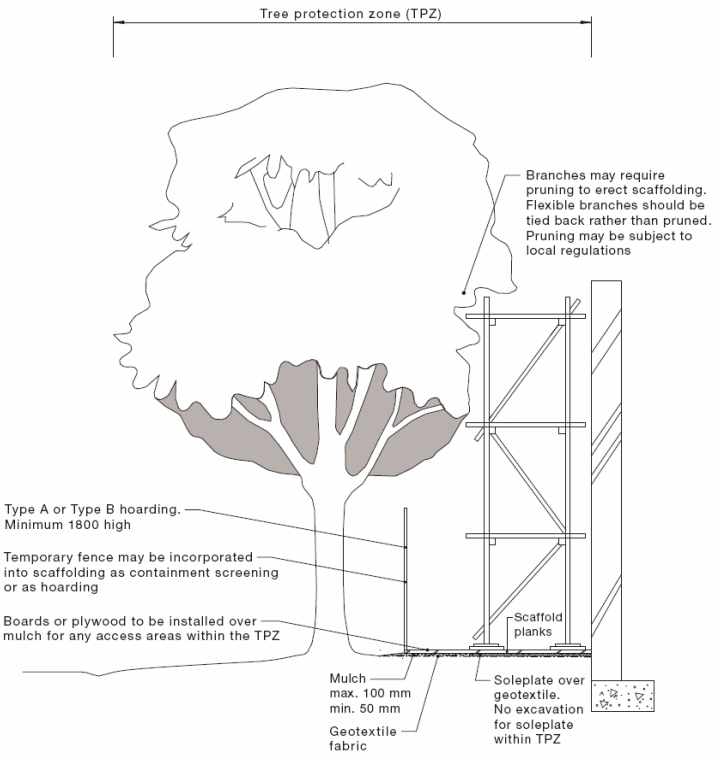
If a utility service is to be located within the area of the dripline of a protected tree or within the Tree Protection Zone, the Australian Standard AS 4970-2009 “Protection of trees on development sites provides the following:

“4.5.5. If underground services must be routed within the TPZ , they should be installed by directional drilling or in manually excavated trenches. The direction drilling bore should be at least 600mm deep . The project arborist should assess the likely impacts of boring and bore pits on retained trees. For manual excavation of trenches the project arborist should advise on roots to be retained and should monitor the works. Manual excavation may include the use of pneumatic and hydraulic tools.

1.2.7 ***Precautions in respect of temporary work***

For Precautions in respect of temporary work, Australian Standard AS 4970-2009 “Protection of trees on development sites.” provides the following:
4.5.6 Scaffolding

Where scaffolding is required it should be erected outside the TPZ. Where it is essential for scaffolding to be erected within the TPZ, branch removal should be minimized. This can be achieved by designing scaffolding to avoid branches or tying back branches. Where pruning is unavoidable it must be specified by the project arborist in accordance with AS 4373.NOTE: Pruning works may require approval by determining authority. Ground below the scaffolding should be protected by boarding (e.g. scaffold board or plywood sheeting) as shown in Figure 5. Where access is required, a board walk or other surface material should be installed to minimize soil compaction. Boarding should be placed over a layer of mulch and impervious sheeting to prevent soil contamination. The boarding should be left in place until the scaffolding is removed. NOTE: Excavation required for the insertion of support posts for tree protection fencing should not involve the severance of any roots greater than 20 mm in diameter, without the prior approval of the project arborist.

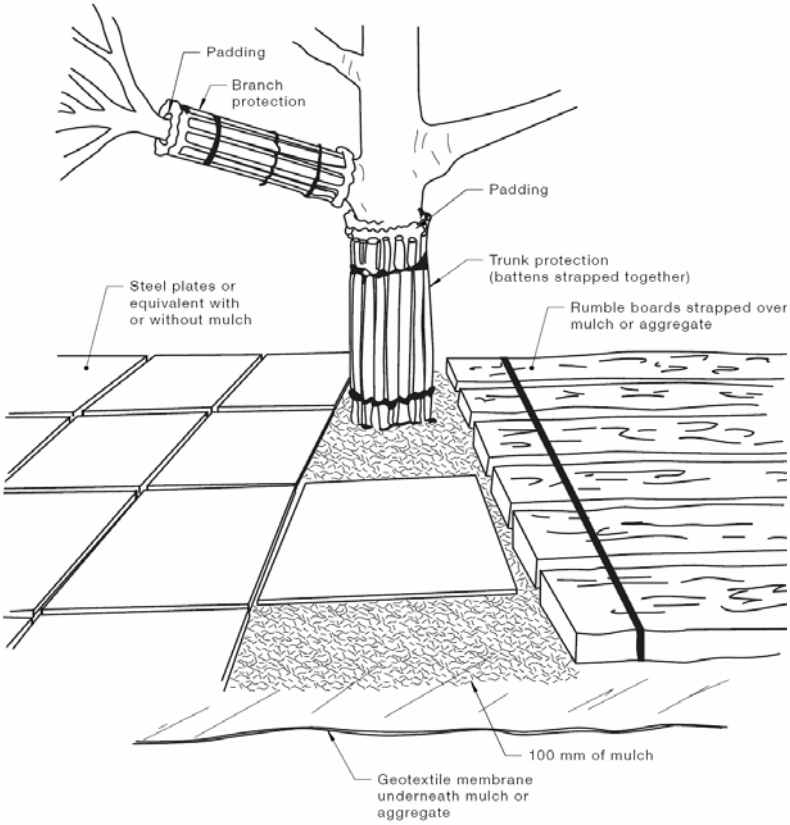


NOTE: Excavation required for the insertion of support posts for tree protection fencing should not involve the severance of any roots greater than 20 mm in diameter, without the prior approval of the project arborist.

FIGURE 5 INDICATIVE SCAFFOLDING WITHIN A TPZ

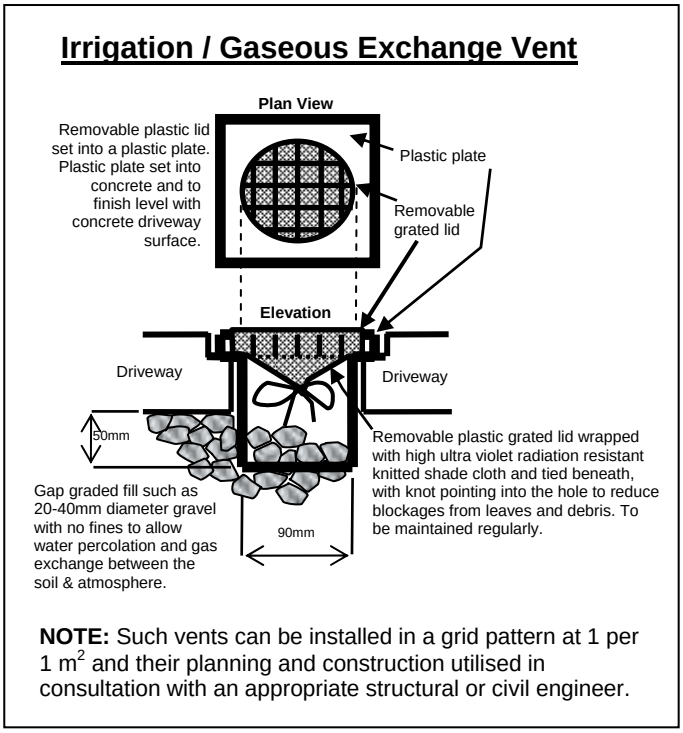
"4.5.3 Ground protection

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards as per Figure 4. These measures may be applied to root zones beyond the TPZ."



1.2.9 *Water / Gaseous Exchange Vents*

Watering / Gaseous exchange vents are to be installed in the area of the driveway that passes within the dripline of the tree or the prescribed Tree Protection Zone area and the number and location are to be determined by a Consultant Arboriculturist and the driveway design approved by a Certified Engineer. Exposed edges of the path are to be concealed with the finished level beside the path equivalent to the top of the path by minimal filling with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation, or other landscape treatments as appropriate.



1.2.10 *Pruning/Removal Guidelines*

- Any pruning recommended in this report is to be to the Australian Standard® AS4373 'Pruning of amenity trees', and conducted in accordance with the NSW Work Cover Authority Code of Practice for the Amenity Tree Industry, 1998
- All pruning or removal works are to be in accordance with the appropriate Tree Management Policy where applicable, or Tree Management Order (TMO), or Tree Preservation Order (TPO), or applicable consent conditions.
- Tree maintenance work is specialised and in order to be undertaken safely and to ensure the works carried out are not detrimental to the survival of the tree or surrounding vegetation, all works should be undertaken by a qualified Arboriculturist with appropriate competencies recognised within the Australian Qualification Framework, with a minimum of 5 years of continual experience within the industry of operational amenity arboriculture, and covered by appropriate and current types of insurance to undertake such works.
- Any pruning near electricity wires should be undertaken in accordance with relative Electrical Safety Rules and be performed by persons individually authorised by Energy Australia

Appendix E

TREE PROTECTION ZONE STANDARD PROCEDURE

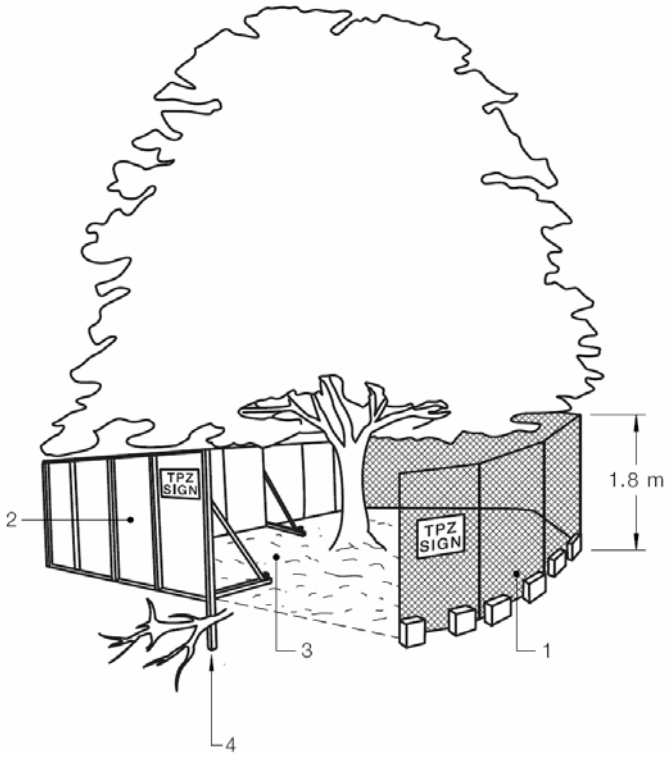
1. Each tree to be retained is to have its dripline fenced off, except where otherwise indicated, to create a Tree Protection Zone, and this may include one enclosure to protect a single or multiple tree/s, or multiple enclosures separated over the site. The area contained is the Tree Protection Zone, and is to exclude any activity, except where otherwise stated. The Tree Protection Zone is to exclude: modification of existing soil levels, storage of materials, site sheds and machinery; preparation of building materials e.g. concrete, or chemical treatments; the movement of pedestrian or vehicular traffic; or the temporary or permanent location of services, or the works required for their installation, e.g. trenches, holes or canals. The above list is not meant to be exhaustive, and is intended as a guide to the types of activities that are excluded from within the Tree Protection Zone, except where otherwise stated.

2. The Protective fencing where required may delineate the ***TPZ*** and should be located as determined by the project arborist in accordance with AS4970 *Protection of trees on development sites*, Section 4, 4.3. *"Fencing should be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the project arborist. The TPZ must be secured to restrict access. AS4687 Temporary fencing and hoardings specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids into the protected area. Fence posts and supports should have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of the protective fencing."*

   AS4970 Section 4, Tree protection measures, Figure 3 Protective fencing shows examples of such fencing.

   "Legend:

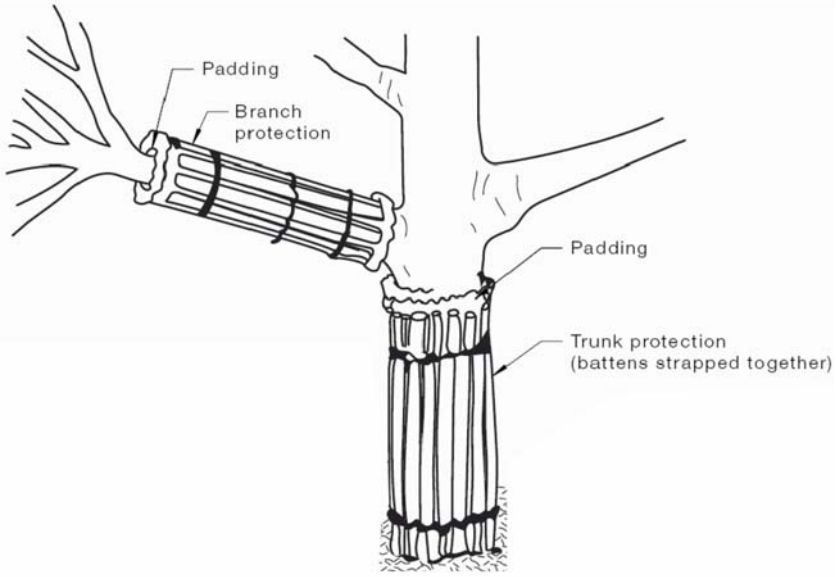
   1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
   2 Alternative plywood or wooden paling fence panels. The fencing material also prevents building materials or soil entering the TPZ.
   3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
   4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots."



3. Tree Protection signage is to be attached to each ***Tree Protection Zone*** and displayed from within the development site in accordance with AS4970 2009 *Protection of trees on development sites*, Section 4.4 and example Appendix C1 (as shown) and lettering to comply with AS1319.

FIGURE C1 TREE PROTECTION ZONE SIGN

4 Where a tree is to be retained and a ***Tree Protection Zone*** cannot be adequately established due to restricted access e.g. tree located along side an access way, the trunk and branches in the lower crown will be protected by wrapping 2 layers of hessian or carpet underfelt around the trunk and branches for a minimum of 2 m or as lower branches permit, then wire or rope secures 75x50x2000 mm hardwood battens together around the trunk (do not nail or screw to the trunk or branches). The number of battens to be used is as required to encircle the trunk and the planks are to extend to the base of the tree (AS4970 2009 *Protection of trees on development sites*, Figure 4 Examples of Trunk, Branch and ground protection).



5. If a tree is growing down slope from an excavation, a silt fence located along the contours of the site in the area immediately above the ***Tree Protection Zone*** fencing may need to be installed and regularly maintained to prevent burial and asphyxiation of the roots of the tree. To allow for the maintenance of both fences, the silt fence must be constructed separately to the tree protection fence and the 2 fences must be constructed independently of each other and standalone. To reduce competition with the tree the area within the ***Tree Protection Zone*** is to be kept free of weeds. These are best removed by the application of foliar herbicide with Glyphosate as the active constituent. This is the preferred method rather than removal by cultivation of the soil within the dripline, to minimise root disturbance to the tree. The removal of woody weeds such as Privet should use the cut and paint method of herbicide application. Weeds to be controlled within the ***Tree Protection Zone***, for the duration of the project.

6. The area of the ***Tree Protection Zone*** to be mulched to a depth of 100 millimetres with organic material being 75% leaf litter and 25% wood, and this being composted material preferably from the same genus and species of tree as that to where the mulch is to be applied, i.e. species specific mulch. The depth of mulch and type as indicated, to be maintained for the duration of the project.

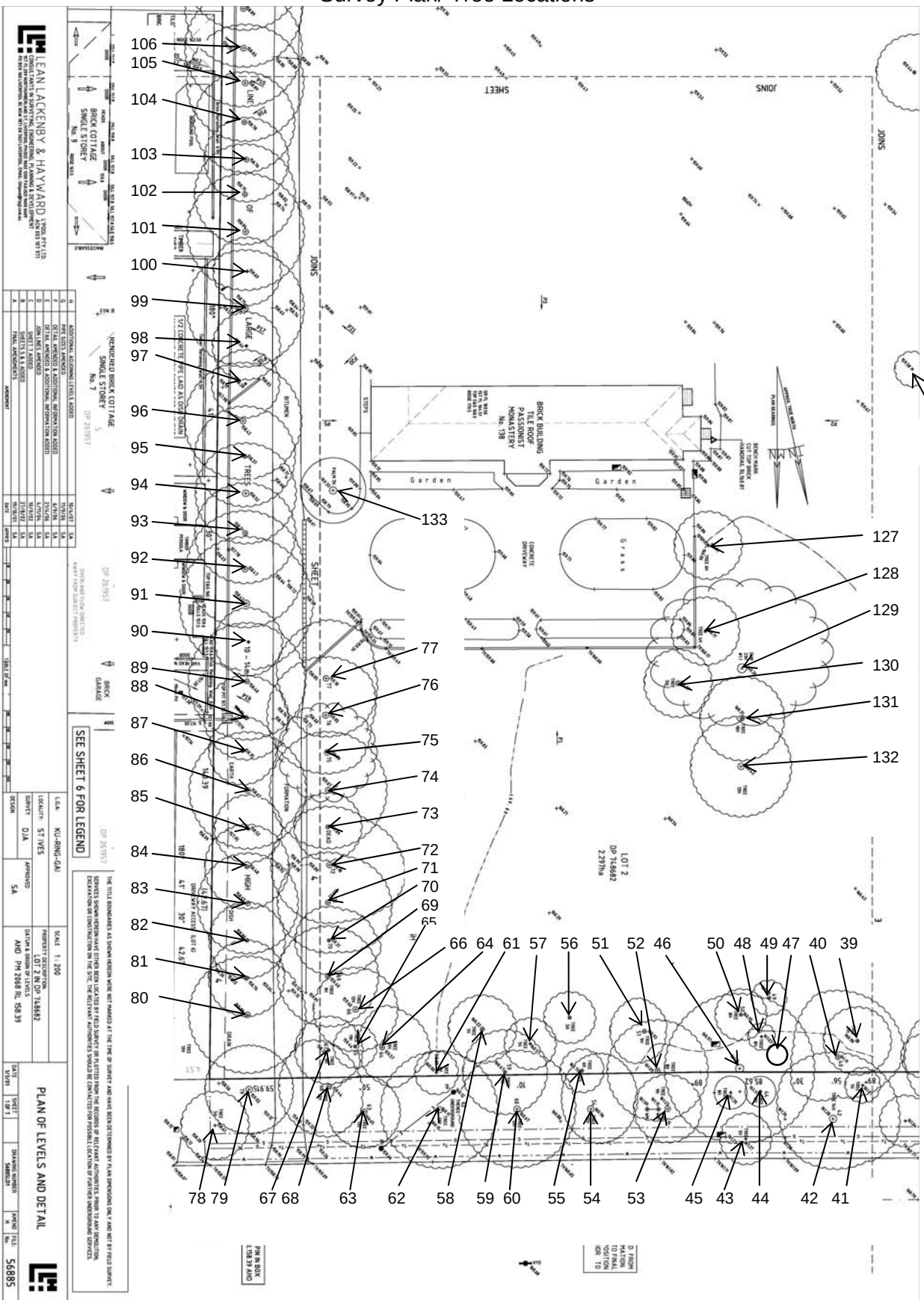
7. No services either temporary or permanent are to be located within the ***Tree Protection Zone***. If services are to be located within the ***Tree Protection Zone***, special details will need to be provided by a qualified Consulting Arboriculturist for the protection of the tree regarding the location of the service/s.

8. A tree will not be fertilised during its protection within the ***Tree Protection Zone***, as this may hasten its decline if it were to decline. If a tree is to be fertilised this should be in consultation with a qualified Consulting Arboriculturist.

9. In the event of prolonged dry periods, or where a tree has been transplanted, or where excavation nearby, especially up slope, leads to drying out of soil profiles closest to the tree/s, the tree/s is to be deep root watered thoroughly at least twice a week. The need for such watering is determined readily by observing the dryness of the soil surface within the dripline of the tree by scraping back some mulch. Mulch to be reinstated afterwards. In the event of disrupted ground or surface water flows to the tree due to excavation, filling or construction, an irrigation system may be required to be installed within the ***Tree Protection Zone***. If an irrigation system is to be installed, consideration must be given to volume, frequency, and drainage of water delivered, and this should be in consultation with a qualified Consulting Arboriculturist.

Appendix F

Survey Plan/ Tree Locations



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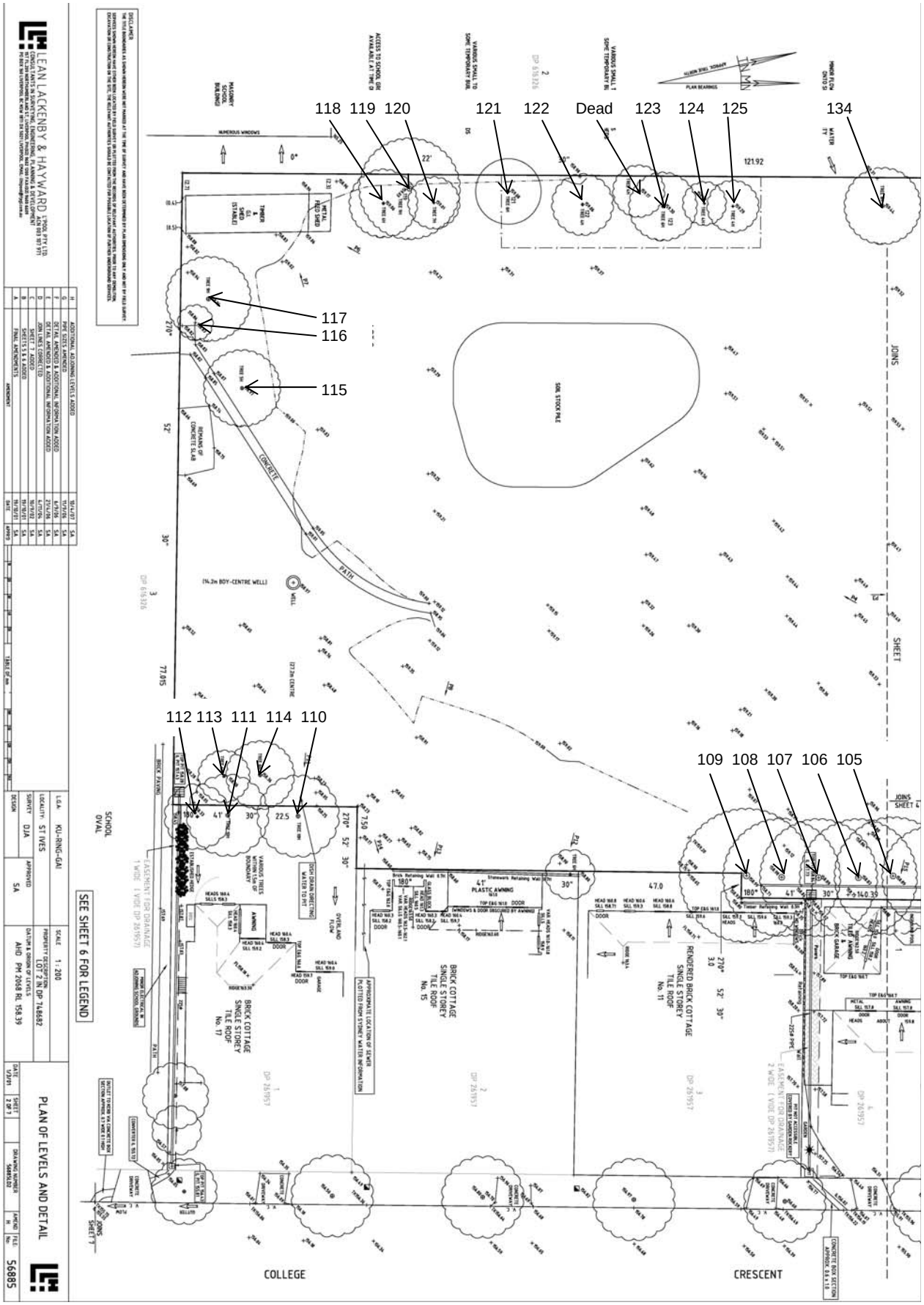

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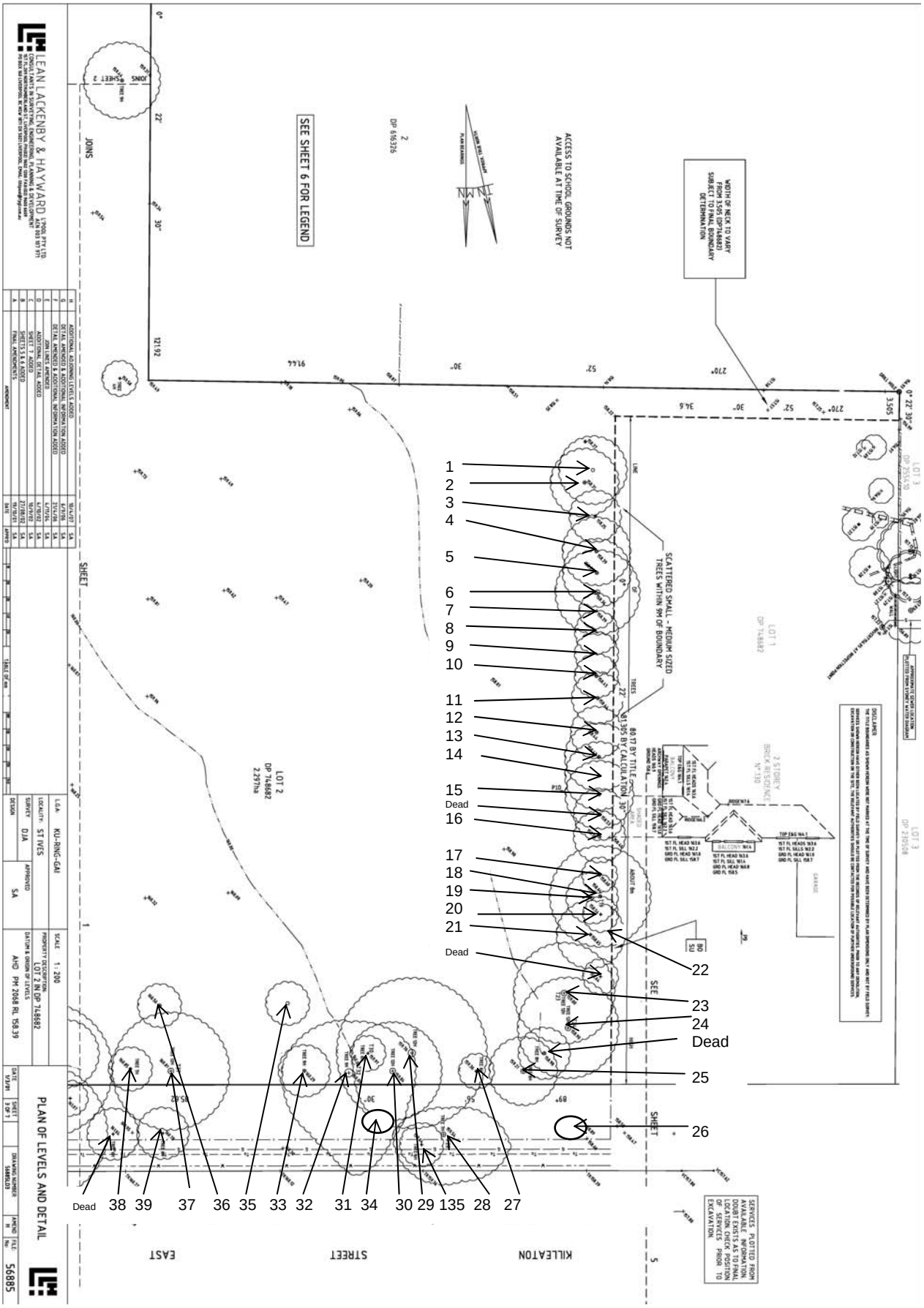
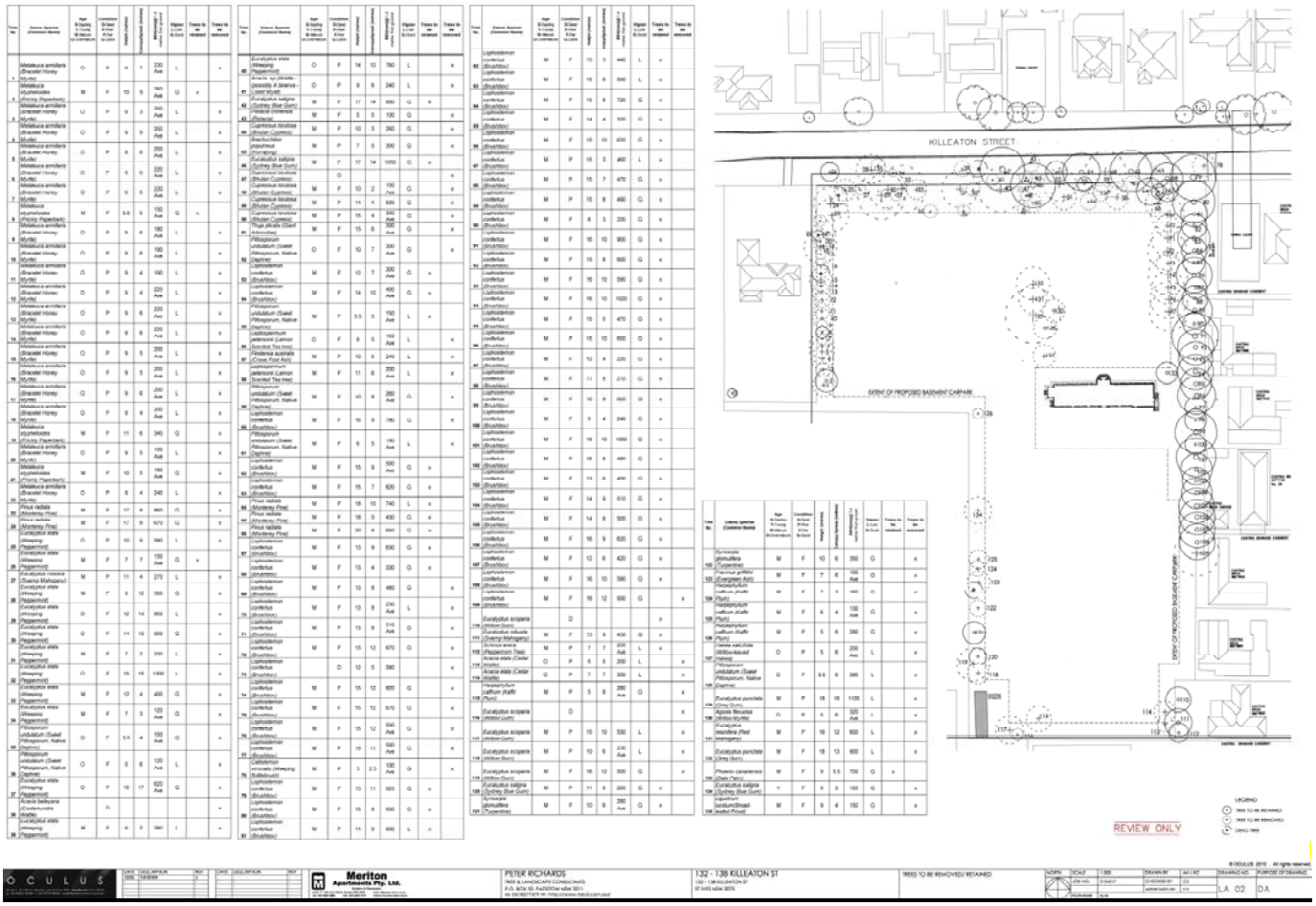


Appendix G

Tree Removal/Retention Plan



Appendix H
References

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