REDGUM Horticultural
Arboriculture & Horticulture Consultants

REPORT

ARBORICULTURAL IMPACT ASSESSMENT

68-82 Stewart Avenue, Hammondville NSW

Prepared 5 October 2016
Revised 6 December 2016
Our Ref: 2534.1

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PREFACE

Redgum Horticultural has prepared this report for Integrated Design Group *(the architect)* on behalf of Hammond Care (*the applicant*), Level 2, 447 Kent Street, Sydney NSW.

Mr. Neville Shields (*the author*) attended 68-82 Stewart Avenue, Hammondville NSW (*the site*), on 30 September 2016, all the trees and their growing environment were examined. The site is subject to a Development Application and this report and any works recommended herein, that require approval from the consenting authority, forms part of that development application.

INTRODUCTION

The land is located in the Liverpool Council (*the Council)* Local Government Area (*LGA*) and the trees are protected under Councils Tree Preservation Order. The Council is the consenting authority for development works on the site. This report involves 33 trees (*the trees*), as indicated on Site Plan A - Survey of Subject Trees (Appendix E) and considers the removal of twenty (20) trees and the retention of thirteen (13) trees within the property. The trees will be considered as 2 stands to encompass all trees within and immediately adjacent to the site, where appropriate, as marked on Appendix E, Site Plan A – Survey of Subject Trees. ***Tree Protection Zone*** fencing or works are marked on the Appendix F, Site Plan B - Trees to be Retained and Tree Protection Zones.

The site is comprised of part of one parcel of land where some of the existing structures are to be demolished and are to be replaced with a proposed new residential aged care development, requiring the removal of twenty (20) existing trees within the site. As part of the Landscape Plan where appropriate, the tree cover on the site will be enhanced by planting with advanced specimens/s of appropriate tree species for the space available above and below ground being soil volumes available and to prevent future conflict between trees and built structures.

The proposed building design and its configuration and infrastructure were arrived at prior to the undertaking of an arboricultural assessment of the trees on the site to determine their significance by Redgum Horticultural.

Setbacks for the new works and associated infrastructure should provide sufficient space to protect the existing growing environments both above and below ground for trees to be retained, and so that trees within the property and on adjoining properties will not be adversely affected.

The proposed design has considered the spatial requirements for the trees to be retained based on the information available or provided at the time of compiling this report, and those areas to be protected will be discussed further. The Summary lists the general condition of trees and a summary of works in Table 1.0. In section 5.0 each individual tree is described in greater detail including protective or remedial works. Tree maintenance works including pruning, removal or transplantation are detailed in section 4.0.

SUMMARY

This report considers 33 trees located within the site with Trees 3, 4, 5, 6, 7, 12, 13, 14, 16, 17, 18, 19, & 21 to be retained and protected and Trees 1, 2, 8, 9, 10, 11, 15, 20, 22, 23, 24, 25, 26, 27^{x2}, 28, 29, 30, 31 & 32 are recommended to be removed. The impact of the proposed development to the specimens to be retained is as follows;

Tree 4, 12, 13, 14, 19 & 21; the corner of the closest building is sufficiently setback to not affect these specimens.

Tree 7; there are no proposed works within the Tree Protection Zone of this specimen and the buildings are sufficiently setback to not affect this specimen.

Tree 3, 16, 17 & 18 the alignment of the development is a minor encroachment to these specimens.

Tree 5 & 6; the alignment of the development is a major encroachment to this specimen.

Root Mapping is recommended for the section of the development within the TPZ of any retained specimen is to be constructed using tree sensitive excavation and construction techniques such as pier and beam construction with a suspended slab to reduce any impact on its stability. Piers are to be dug by hand with non-motorised machinery to further assist in its protection. Any crown raising of retained specimens are to be undertaken by a qualified arborist and supervised by the project arborist if required by Council

If associated infrastructure (pipe works) are to be installed within the Tree Protection Zone of any retained specimen, they are to be installed by hand with non-motorised machinery. If structural roots are found within the trench, they are to be left intact and dug around retaining this specimen's structural integrity. Works are to be undertaken in consultation with the project arborist.

There will be no impact to Tree 4, 12, 13, 14, 19 & 21, no change to the impact to Tree 7, a minor encroachment for Tree 3, 16, 17 & 18 while Tree 5 & 6 will be subject to major encroachment which are to be retained and protected as per AS 4970 (2009) Section 3, 3.3.3 Major Encroachments from development works within >10% of the area of the Tree Protection Zone. These excavations must be supervised and certified by the Project Arborist in accordance with AS4970 (2009).

Table 1.0 General condition of trees and Schedule of works. Trees described in greater detail in section 5.0.

Tree No.	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead	Description of work to be done
1	*Callistemon salignus*	Willow Bottlebrush	F	Remove and replace with by new plantings as per Landscape Plan
2	*Callistemon viminalis 'Hanna Ray'*	Hanna Ray Bottlebrush	F	Remove and replace with by new plantings as per Landscape Plan
3	*Corymbia maculata*	Spotted Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
4	*Corymbia maculata*	Spotted Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
5	*Corymbia maculata*	Spotted Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
6	*Corymbia maculata*	Spotted Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
7	*Eucalyptus microcorys*	Tallowwood	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
8	*Acer sp.*	Maple	F	Remove and replace with by new plantings as per Landscape Plan
9	*Platanus x hispanica*	London Plane Tree	F	Remove and replace with by new plantings as per Landscape Plan
10	*Platanus x hispanica*	London Plane Tree	F	Remove and replace with by new plantings as per Landscape Plan
11	*Fraxinus sp.*	Ash	F	Remove and replace with by new plantings as per Landscape Plan
12	*Platanus x hispanica*	London Plane Tree	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
13	*Platanus x hispanica*	London Plane Tree	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
14	*Platanus x hispanica*	London Plane Tree	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
15	*Fraxinus sp.*	Ash	F	Remove and replace with by new plantings as per Landscape Plan
16	*Melaleuca quinquenervia*	Broad Leafed Paperbark	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
17	*Melaleuca quinquenervia*	Broad Leafed Paperbark	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
18	*Melaleuca quinquenervia*	Broad Leafed Paperbark	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.

Tree / Stand No.	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead	Description of work to be done
19	*Melaleuca quinquenervia*	Broad Leafed Paperbark	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
20	*Callistemon salignus*	Willow Bottlebrush	G	Remove and replace with by new plantings as per Landscape Plan
21	*Triadica sebifera (syn. Sapium sebiferum)*	Chinese Tallowwood	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
22	*Robinia pseudoacacia "Frisia"*	Golden Locust	G	Remove and replace with by new plantings as per Landscape Plan
23	*Robinia pseudoacacia "Frisia"*	Golden Locust	G	Remove and replace with by new plantings as per Landscape Plan
24	*Triadica sebifera (syn. Sapium sebiferum)*	Chinese Tallowwood	F	Remove and replace with by new plantings as per Landscape Plan
25	*Eucalyptus fibrosa*	Broad-leaved Ironbark	G	Remove and replace with by new plantings as per Landscape Plan
26	*Corymbia maculata*	Spotted Gum	F	Remove and replace with by new plantings as per Landscape Plan
27/2	*Corymbia maculata x2*	Spotted Gum	F	Remove and replace with by new plantings as per Landscape Plan
28	*Corymbia maculata*	Spotted Gum	F	Remove and replace with by new plantings as per Landscape Plan
29	*Corymbia maculata*	Spotted Gum	F	Remove and replace with by new plantings as per Landscape Plan
30	*Corymbia maculata*	Spotted Gum	F	Remove and replace with by new plantings as per Landscape Plan
31	*Corymbia maculata*	Spotted Gum	F	Remove and replace with by new plantings as per Landscape Plan
32	*Corymbia maculata*	Spotted Gum	F	Remove and replace with by new plantings as per Landscape Plan

Table 2.0 This table only applies to trees being retained. Tree Protection Zone fencing locations 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). Tree Protection Zone fences and setbacks where applicable are indicated in Appendix F and are to be measured on site.

1. Redgum Tree No.	2. **S**tructural **R**oot **Z**one **SRZ (DARB)** From centre of trunk (COT) **D**iameter **A**bove **R**oot **B**uttress AS4970 2009 Section 3, 3.3.5 (see Appendix C) where applicable (Minimum 1.5 metres)	3. **T**runk **D**iameter at **B**reast **H**eight **DBH** 1.4m above ground, AS4970 2009, or mm or m above ground where indicated. # = average. g = ground	4. **T**ree **P**rotection **Z**one (**TPZ**) = **12 x DBH** From centre of trunk (COT) in metres AS4970 2009Section 3 (see Appendix C) (Minimum 2.0 metres)	5. Distance of fence with TPZ setback **(reduced by 10% of area of TPZ)** in metres as per AS4970 2009 Section 3, 3.3 (Minimum 2.0 metres)	6. Estimated distance of tree protection fence/works on the side closest to building construction[2], in metres by Redgum Horticultural.
3	2.8	700	8.4	7.6	6.0
4	2.0	300	3.6	3.2	3.6
5	3.3	1000	12.0	10.8	6.0 (19.6%)
6	3.0	800	9.6	8.6	6.0 (11.1%)
7	2.8	700	8.4	7.6	No change to impact
11	1.8	250	3.0	2.7	3.0
12	2.5	500	6.0	5.4	6.0
13	2.5	500	6.0	5.4	6.0
14	2.5	500	6.0	5.4	6.0
16	2.8	700	8.4	7.6	6.0
17	2.8	700	8.4	7.6	7.0
18	2.8	700	8.4	7.6	7.0
19	2.8	700	8.4	7.6	8.4
21	2.5	500	6.0	5.4	6.0

Descriptors for modified setbacks in Column 6.

1 Special conditions apply to protect the roots of trees generally, see discussion points.
2 Additional protective fencing information is detailed in discussion points.
3 Acceptable due to the good relative tolerance of the species to development impacts.
4 Range of setbacks for the trees at each end of a linear stand, see discussion points.
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 Section 5.0 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 works.
11 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 good 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 20 mm or more.
15 Acceptable as a specimen of palm taxa tolerant of encroachment.
16 Acceptable as excavation on down slope or across slope side of tree.
17 Acceptable as encroachment into growing area below ground minor, with one corner of building or excavation works extending to within the radius of the dripline.
18 Acceptable as encroachment by pier, including screw piles, with minimal disturbance.
19 Acceptable as encroachment above grade without excavation or sub-base compaction.
20 Acceptable as located within 0.5 m from edge of dripline.
21 Acceptable as encroachment with gap graded fill that can accommodate gaseous exchange between roots/soil and the atmosphere and ongoing root growth.
22 Minimum setback 2 m, AS4970 (2009) section 3, 3.2.
23 Maximum setback 15 m, AS4970 (2009) section 3, 3.2.
24 Tree is a palm, other monocot, cycad or tree fern TPZ is to be 1 m outside crown projection AS4970 (2009) section 3, 3.2.
25 Minimum Structural Root Zone (SRZ) for trees less than 0.15 m diameter is 1.5 m, AS4970 (2009) section 3, 3.5.

Explanatory notes for Table 2.0.

This table is based upon Australian Standard AS4970 2009 *Protection of trees on development sites*, Section 3 Determining the protection zone of the selected trees (see Appendix B), where the approved building works should be no closer, including excavation, than the dimensions stated above.

"3.3 Variations to the TPZ - 3.3.2 Minor Encroachment
If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.

3.3.3 Major Encroachment - *If the proposed encroachment is greater than 10% of the area of the TPZ or inside the SRZ the project arborist must demonstrate that the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ."*

1.0 AIMS

1.1 Detail the condition of the trees on the site, adjoining properties or adjacent road reserve where such trees may be affected by the proposed works, by assessment of individual trees or stands of trees, and indicate protection measures or remedial works for their retention and protection pre, during and post construction. Consider the location and condition of the trees in relation to the proposed building works and recommend retention and protection or removal and replacement where appropriate. The retained specimens are to remain in a safe and healthy condition, not less than 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 recommended to be applied.

1.2 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. *(See section 5 - Tree Assessment.)*

1.3 Determine from the assessment as detailed in 1.2 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.

2.0 OBJECTIVES

2.1 Assess the condition of the subject trees.

2.2 Determine impact of development on the subject trees.

2.3 Provide recommendations for retention or removal of the subject trees.

3.0 METHODOLOGY
Note: Individual methodologies applied as applicable.

3.1 The method of assessment of tree/s applied is adapted from the principles of visual tree assessment undertaken from the ground, which considers:

1. Tree health and subsequent stability, both long and short term
2. Sustainable Retention Index Value (SRIV) Version 4 (IACA 2010) ©
3. Hazard potential to people and property
4. Amenity values
5. Habitat values
6. Significance

3.2 This assessment is undertaken using 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 to undertake a visual tree assessment from the ground of each individual tree, or stand of trees, or a representative population sample. Any dimensions recorded as averages, or by approximation are noted accordingly.

3.3 This report adopts Australian Standard AS4970 2009 *Protection of trees on development sites* as a point of reference and guide for the recommended minimum setbacks (Appendix C) from the centre of a tree's trunk to development works and the distances may be increased or decreased by the author in accordance with AS4970 – Section 3.3.4 as a result of other factors providing mitigating circumstances or constraints as indicated by but not restricted to the following:

1. Condition of individual trees,
2. Tolerance of individual species to disturbance,
3. Geology e.g. physical barriers in soil, rock floaters, bedrock to surface
4. Topography e.g. slope, drainage,
5. Soil e.g. depth, drainage, fertility, structure,
6. Microclimate e.g. due to landform, exposure to dominant wind,
7. Engineering e.g. techniques to ameliorate impact on trees such as structural soil, gap graded fill, lateral boring,
8. Construction e.g. techniques to ameliorate impact on trees such as pier and beam, bridge footings, suspended slabs,
9. Root mapping,
10. Physical limitations - existing modifications to the environment and any impact to tree/s by development e.g. property boundaries, built structures, houses, swimming pools, road reserves, utility services easements, previous impact by excavation, or construction in other directions, soil level changes by cutting or filling, existing landscaping works within close proximity, modified drainage patterns,
11. Extraneous factors e.g. potential future impacts from development on adjoining land when the tree is located on or near to a property boundary.

3.4 Trees in groups may be referred to as stands and a stand may exclusively contain specimens to be either retained or removed or a combination of both. A stand may be used to discuss all the trees on a given site to expedite their assessment, or refer to trees growing proximate to one another or within a defined space. Stands may be comprised by mass boundary or screen plantings, to form a group of the same or a mixture of taxa. Each stand is considered as a single unit with each component tree assessed and expressed in tabular form, or indicated by a given percentage as a population sample of each stand. Where it is appropriate for a stand of trees to be retained in full or part, the location and setback of Tree Protection Zone fences or works, are prescribed to provide for the preservation of the stand or selected component trees, in a condition not less than that at the time of initial inspection for its incorporation into the landscape works for the site, or in a reduced but sustainable condition due to the impact of the development but ameliorated through tree protection measures.

3.5 The meanings for terminology used herein are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009. An extract from the IACA Dictionary forms a glossary of terms included as Appendix D.

4.0 PRUNING STANDARDS

4.1 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, Tree Work, 2007.

4.2 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).

4.3 Tree maintenance work is specialised and in order to be undertaken safely to ensure the works carried out are not detrimental to the survival of a tree being retained, and to assist in the safe removal of any tree, 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.

5.0 TREE ASSESSMENT – 5.1 - Assessment of a stand of Trees

Tree / Stand No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation R = Radial, or other	Crown Symmetry 1 = symmetrical 2 = asymmetrical / Orientation	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g. N/S g = ground # = average	Trunk Lean 1 = Upright-Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g. R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
1	*Callistemon salignus*	M	GV	F	MGVF - 9 2	D	9	6 R	1	60 70	300 R	1/R ST	1	YES	NO	G	2 3
	Willow Bottlebrush	Comment: Trunk to 1.8 metres, crown deliquescent, orientation radial, symmetrical. 20% dieback caused by path restoration.															
2	*Callistemon viminalis 'Hanna Ray'*	M	LV	F	MLVF - 4 2	D	9	6x3 E/W	2/N	60 60	300 R	1/R ST	1	NO	NO	G	2 2
	Hanna Ray Bottlebrush	Comment: Trunk to 500mm, crown deliquescent, orientation E/W, asymmetrical bias to the north.															
3	*Corymbia maculata*	M	GV	G	MGVG - 10 1	C	18	15 R	1	70 70	700 R	1/R ST	3	YES	NO	G	1 1
	Spotted Gum	Comment: Trunk to 3 metre, crown deliquescent, orientation radial, symmetrical. **Trunk wound north side at 1m, further investigate**															
4	*Corymbia maculata*	Y	GV	F	YGVF - 8 1	C	15	7 R	1	60 60	300 R	1/R ST	5 1-S/W	NO	NO	G	1 2
	Spotted Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
5	*Corymbia maculata*	M	GV	G	MGVG - 10 1	C	20	18 R	1	70 70	1000 R	1/R ST	3	YES	NO	G	1 1
	Spotted Gum	Comment: Trunk to 2 metre, crown deliquescent, orientation radial, symmetrical. **Remove dead first order structural branch to south back to branch collar and deadwood.**															
6	*Corymbia maculata*	M	GV	G	MGVG - 10 1	C	15	15 R	1	70 70	800 R	1/R ST	3	YES	NO	G	1 1
	Spotted Gum	Comment: Trunk to 2 metre, crown deliquescent, orientation radial, symmetrical. Deadwooding required.															
7	*Eucalyptus microcorys*	M	GV	G	MGVG - 10 1	D	18	12 R	1	70 70	700 R	1/R ST	3	NO	NO	G	1 1
	Tallowwood	Comment: Trunk to 4 metres, crown deliquescent, orientation radial, symmetrical.															
8	*Acer sp.*	M	GV	F	MGVF - 9 1	D	12	6 R	1	N/A D	500 R	1/R ST	1	NO	NO	G	2 2
	Maple	Comment: Trunk to 1 metre, crown deliquescent, orientation radial, symmetrical.															
9	*Platanus x hispanica*	Y	GV	F	YGVF - 8 1	D	6	7 R	1	50 70	300 R	1/R ST	1	YES	NO	G	2 3
	London Plane Tree	Comment: Trunk to 1 metre, crown deliquescent, orientation radial, symmetrical. 30% deadwood evident.															
10	*Platanus x hispanica*	Y	GV	F	YGVF - 8 1	D	6	7 R	1	70 70	300 R	1/R ST	1	NO	NO	G	2 2
	London Plane Tree	Comment: Trunk to 1 metre, crown deliquescent, orientation radial, symmetrical.															

Tree / Stand No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation R = Radial, or other	Crown Symmetry 1 = symmetrical 2 = asymmetrical / Orientation	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g. N/S g = ground # = average	Trunk Lean 1 = Upright-Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g. R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
11	*Fraxinus sp.*	M	GV	F	MGVF - 9 1	C	9	7x5 N/S	2/E	N/A D	250 R	1/R ST	1	NO	NO	G	2 2
	Ash	Comment: Trunk to 2 metres, crown deliquescent, orientation N/S, asymmetrical bias to the east.															
12	*Platanus x hispanica*	M	GV	G	MGVG - 10 1	C	15	12 R	1	70 70	500 R	1/R ST	3	YES	NO	G	2 1
	London Plane Tree	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical. 5% deadwooding evident.															
13	*Platanus x hispanica*	M	GV	G	MGVG - 10 1	C	15	12 R	1	70 70	500 R	1/R ST	3	YES	NO	G	2 1
	London Plane Tree	Comment: Trunk to 1 metre, crown deliquescent, orientation radial, symmetrical. 5% deadwooding evident.															
14	*Platanus x hispanica*	M	GV	G	MGVG - 10 1	C	15	12 R	1	70 70	500 R	1/R ST	3	NO	NO	G	2 1
	London Plane Tree	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical.															
15	*Fraxinus sp.*	M	LV	F	MLVF - 4 2	C	12	9x7 N/S	2/E	N/A D	400 R	1/R ST	3	YES	YES	G	2 3
	Ash	Comment: Trunk to 1 metre, crown deliquescent, orientation N/S, asymmetrical bias to the east. Becoming senescent, dropping branches, possibly due to path refurbishment.															
16	*Melaleuca quinquenervia*	M	GV	G	MGVG - 10 1	C	15	10 R	1	70 70	700 R	1/R ST	5 1-N	NO	NO	G	1 1
	Broad Leafed Paperbark	Comment: Trunk to 3 metres, crown deliquescent, orientation radial, symmetrical.															
17	*Melaleuca quinquenervia*	M	GV	G	MGVG - 10 1	C	15	10 R	1	70 70	700 R	1/R ST	3	NO	NO	G	1 1
	Broad Leafed Paperbark	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical.															
18	*Melaleuca quinquenervia*	M	GV	G	MGVG - 10 1	C	15	10 R	1	70 70	700 R	1/R ST	3	NO	NO	G	1 1
	Broad Leafed Paperbark	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical.															
19	*Melaleuca quinquenervia*	M	GV	G	MGVG -10 1	C	15	10 R	1	70 70	700 R	1/R ST	3	NO	NO	G	1 1
	Broad Leafed Paperbark	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical.															
20	*Callistemon salignus*	M	GV	G	MGVG - 10 1	D	12	8 R	1	70 70	500 R	1/R ST	1	NO	NO	G	2 2
	Willow Bottlebrush	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical.															

Tree / Stand No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation R = Radial, or other	Crown Symmetry 1 = symmetrical 2 = asymmetrical / Orientation	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g. N/S g = ground # = average	Trunk Lean 1 = Upright-Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g. R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
21	*Triadica sebifera* (syn. *Sapium sebiferum*)	M	GV	F	MGVF - 9 1	D	15	8 R	1	70 70	500 R	1/R ST	5 7-R	YES	NO	G	2 2
	Chinese Tallowwood	Comment: Trunk to 3 metres, crown deliquescent, orientation radial, symmetrical. Pollarded over building. Roots in exposed ground, possibly lawn area.															
22	*Robinia pseudoacacia "Frisia"*	M	GV	G	MGVG -10 1	D	6	6 R	1	70 70	300 R	1/R ST	1	NO	NO	G	2 2
	Golden Locust	Comment: Trunk to 500mm, crown deliquescent, orientation radial, symmetrical.															
23	*Robinia pseudoacacia "Frisia"*	M	GV	G	MGVG - 10 1	D	7	6x4 E/W	2/E	70 70	290 R	1/R ST	1	NO	NO	G	2 2
	Golden Locust	Comment: Trunk to 1 metre, crown deliquescent, orientation E/W, asymmetrical bias to the east.															
24	*Triadica sebifera* (syn. *Sapium sebiferum*)	M	GV	F	MGVF - 9 1	D	6	8 R	1	70 70	400 R	1/R ST	5 9-R	NO	NO	G	1 1
	Chinese Tallowwood	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical. With neat basal flare.															
25	*Eucalyptus fibrosa*	M	GV	G	MGVG - 10 1	D	18	12 R	1	70 70	600 R	1/R ST	1	NO	NO	G	1 1
	Broad-leaved Ironbark	Comment: Trunk to 7 metres then bifurcate, crown deliquescent, orientation radial, symmetrical.															
26	*Corymbia maculata*	M	GV	F	MGVF - 9 1	C	16	6 R	1	70 70	400 R	1/R ST	3	NO	NO	G	2 1
	Spotted Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
27/2	*Corymbia maculata x2*	M	GV	F	MGVF - 9 1	C	12	6 R	1	70 70	400 R	5/R ST	1	NO	NO	P	2 2
	Spotted Gum	Comment: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.															
28	*Corymbia maculata*	M	GV	F	MGVF - 9 1	C	20	7 R	1	70 70	500 R	/R ST	3	NO	NO	G	2 1
	Spotted Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
29	*Corymbia maculata*	Y	GV	F	YGVF - 8 1	C	10	6 R	1	70 70	300 R	1/R ST	3	NO	NO	G	2 1
	Spotted Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
30	*Corymbia maculata*	M	GV	F	MGVF - 9 1	C	18	7 R	1	70 70	500 R	1/R ST	3	NO	NO	G	2 1
	Spotted Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															

Tree No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation R = Radial, or other	Crown Symmetry 1 = symmetrical 2 = asymmetrical / Orientation	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g. N/S g = ground # = average	Trunk Lean 1 = Upright-Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g. R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
31	*Corymbia maculata*	M	GV	F	MGVF - 9 1	C	18	7 R	1	70 70	500 R	1/R ST	1	NO	NO	G	2 2
	Spotted Gum	Comment: Trunk to 7 metres then bifurcate, crown deliquescent, orientation radial, symmetrical.															
32	*Corymbia maculata*	M	GV	F	MGVF - 9 1	C	9	6 R	1	70 70	600#@g R	5/R ST	1	NO	NO	P	2 3
	Spotted Gum	Comment: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.															

Observations / Discussion

5.2 The site has a stand of young and mature, remnant and planted endemic and non-locally indigenous or exotic evergreen and deciduous taxa within the current proposal. The proposed design requires the retention and protection of thirteen (13) specimens within the site as they are considered significant for their contribution as landscape elements to the property and the retention of these trees allows them as components of the current curtilage to be transferred to the new proposal, maintaining elements of a continuous landscape, providing a more harmonious integration and transition of the use of the land. The other specimens located within the site were within or immediately adjacent to the proposed building footprints and are not able to be retained. They are recommended for removal and replacement with super advanced specimens in 75 or 100 litre bags size stock within more appropriate positions within the development. Replacement of these specimens needs to be mindful of their spatial requirements to allow them to grow to maturity and not be impeded by the built structure.

Tree Significance

5.3 Significant Trees as established by the Rating System for Tree Significance – IACA Stars (2010), Appendix A.

Significance Scale
1 – High
2 – Medium
3 – Low

Significance Scale	1	2	3
Redgum Tree No.	3, 4, 5, 6, 7, 16, 17, 18, 19, 25	1, 2, 8, 9, 10, 11, 12, 13, 14, 15, 20, 21, 22, 23, 24, 26, 27x2, 28, 29, 30, 31, 32	

Tree Retention Value

5.4 See Appendix A for Retention Value Matrix.

Retention Value
High – Priority for Retention
Medium – Consider for Retention
Low – Consider for Removal
Remove - Priority for Removal

Retention Value	High Priority for Retention	Medium Consider for Retention	Low Consider for Removal	Remove Priority for Removal
Redgum Tree No.	3, 5, 6, 7, 12, 13, 14, 16, 17, 18, 19, 25, 26, 28, 29,30	2, 4, 8, 10, 11, 20, 21, 22, 23, 24, 27x2, 31	1, 9, 15, 32	

5.5 AS4970 (2009) section 3, 3.3.3 requires the Project Arborist to demonstrate that where a retained tree is subject to a major encroachment (>10% of area of TPZ) it can be protected to remain viable

5.6 Tree 3 *Corymbia maculata* - Spotted Gum, this specimen was found in good health & vigour at time of assessment.

- *Trees viability to development; this specimen is impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. This specimen should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 8.4m from COT, the setback for the proposed development adjacent to these specimens is estimated at 6.0m from COT, which is an encroachment by the proposed development.*

The alignment of the development will be a minor encroachment to this specimen. The section of the development within the TPZ of this specimen is to be constructed using tree sensitive excavation and construction techniques such as pier and beam construction with a suspended slab to reduce any impact on its stability. Piers are to be dug by hand with non-motorised machinery to further assist in its protection.

5.7 Tree 4 *Corymbia maculata* - Spotted Gum, this young specimen was found in fair health & good vigour at time of assessment.

- *Trees viability to development; this specimen is not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. This specimen should remain viable beyond completion of development provided recommended installation & protection measures are adhered too.*

- *Development Impacts: AS4970 (2009) section 3 requires a Tree Protection Zone (TPZ) setback of 3.6 metres (m) from centre of trunk (COT), the setback for the proposed development adjacent to this specimen is estimated at 3.6m from COT, which is not an encroachment by the proposed development.*

5.8 Tree 5 *Corymbia maculata* - Spotted Gum, this specimen was found in good health & vigour at time of assessment.

- *Trees viability to development; this specimen is impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. This specimen should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 12.0m from COT, the setback for the proposed development adjacent to this specimen is estimated at 6.0m from COT, which is an encroachment by the proposed development.*

Root Mapping is recommended as the alignment of the development will be a major encroachment of 19.6% to this specimen. The section of the development within the TPZ of this specimen is to be constructed using tree sensitive excavation and construction techniques such as pier and beam construction with a suspended slab to reduce any impact on its stability. Piers are to be dug by hand with non-motorised machinery to further assist in its protection.

5.9 Tree 6 *Corymbia maculata* - Spotted Gum, this specimen was found in good health & vigour at time of assessment.

- *Trees viability to development; this specimen is impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. This specimen should remain viable beyond completion of development provided recommended installation & protection measures are adhered too.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 9.6m for T6 from COT, the setback for the proposed development adjacent to this specimen is estimated at 6.0m from COT, which is an encroachment by the proposed development.*

The alignment of the development will be a major encroachment to this specimen. The section of the development within the TPZ of this specimen is to be constructed using tree sensitive excavation and construction techniques such as pier and beam construction with a suspended slab to reduce any impact on its stability. Piers are to be dug by hand with non-motorised machinery to further assist in its protection. Minor crown raising of this specimen may be required to clear access over the proposed development. Works are to be undertaken by a qualified arborist and supervised by the project arborist if required by Council

5.10 Tree 7 *Eucalyptus microcorys* **-** Tallowwood, this specimen was found in good health & vigour at time of assessment.

- *Trees viability to development; this specimen is not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. This specimen should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 8.4m from COT, the setback for the proposed works closest to these specimens is estimated at >8.4m from COT. There should be no additional impact to this specimen as part of the proposed development. This specimen is sufficiently setback from the development to not be affected.*

5.11 Tree 12, 13, 14, 19 & 21 *Platanus x hispanica* - London Plane Tree, *Melaleuca quinquenervia* - Broad Leafed Paperbark & *Triadica sebifera (syn. Sapium sebiferum)* - Chinese Tallowwood; these specimens were found in fair and good health & good vigour at time of assessment.

- *Trees viability to development; these specimens are not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. These specimens should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 6.0m for Tree (T)12, T13, T14 & T21 & 8.4m for T19 from COT, the setback for the proposed development adjacent to these specimens is estimated at >6.0m for T12, T13, T14 & T21 & >8.4m for T19 from COT, which is not an encroachment by the proposed development. These specimens are sufficiently setback from the development to not be affected.*

5.12 Tree 16, 17 & 18 *Melaleuca quinquenervia* - Broad Leafed Paperbark, these specimens were found in good health & vigour at time of assessment.

- *Trees viability to development; these specimens are impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. These specimens should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts: AS4970 (2009) section 3 requires a TPZ setback of 8.4m from COT, the setback for the proposed development adjacent to these specimens is estimated at 6.0m, 7.0m & 7.0m respectively from COT, which is an encroachment by the proposed development.*

The alignment of the development will be a minor encroachment to these specimens. The section of the development within the TPZ of this specimen is to be constructed using tree sensitive excavation and construction techniques such as pier and beam construction with a suspended slab to reduce any impact on its stability. Piers are to be dug by hand with non-motorised machinery to further assist in its protection. Minor crown raising of these specimens may be required to clear access over the proposed development. Works are to be undertaken by a qualified arborist and supervised by the project arborist if required by Council.

If associated infrastructure (pipe works) are to be installed within the Tree Protection Zone of any retained specimen, they are to be installed by hand with non-motorised machinery. If structural roots are found within the trench, they are to be left intact and dug around retaining this specimen's structural integrity. Works are to be undertaken in consultation with the project arborist.

There will be no impact to Tree 4, 12, 13, 14, 19 & 21, no change to the impact to Tree 7, a minor encroachment for Tree 3, 16, 17 & 18 while Tree 5 & 6 will be subject to major encroachment which are to be retained and protected as per AS 4970 (2009) Section 3, 3.3.3 Major Encroachments from development works within >10% of the area of the Tree Protection Zone. These excavations must be supervised and certified by the Project Arborist in accordance with AS4970 (2009).

General – Tree Protection works – Prior to Demolition

5.13 *Tree Management Plan* – Prior to demolition works, a site arborist shall be appointed to supervise all tree protection procedures detailed in this specification. The Site Arborist shall have a minimum level 5 AQF qualification in Arboriculture. Milestones are to be adhered to throughout the duration of this development and all relevant documentation is to be submitted to the local authority.

5.14 The Tree Protection Zone for each tree/s is to be incorporated into the construction works for the site and the protection fencing or works to be located as indicated on the Appendix F – Tree Protection Plan. The setbacks from building works on the side closest to each tree are to be carried out as indicated in Table 2.0, and Tree Protection Zones be constructed as described here and detailed in Appendix C. The trees will be sustained within the constraints of the modifications to the site by the proposed development works.

5.15 Trees 3, 4, 5, 6, 7, 12, 13, 14, 16, 17, 18, 19 & 21 are to be retained and protected and incorporated into the landscape works for the site, and Tree Protection Zone fencing to be marked accordingly on the Landscape Plan, where appropriate and installed prior to any demolition or construction.

5.16 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. These measures may be applied to root zones beyond the TPZ.

5.17 Where applicable, any excavation for the establishment of a batter slope or benching for reasons of safety and to comply with Work Cover Authority safety regulations should be restricted as far as is safely possible near to trees to be retained to prevent root damage. If the excavations cannot be undertaken near to vertical the stability of these trees and their long-term viability may be compromised and their retention in a safe and healthy condition jeopardized and they may need to be revised and possibly removed.

Specific - Tree Protection Works - Prior to Demolition and Tree Removal

5.18 All other trees/shrubs; prior to demolition and tree removal works these tree/s are to be placed within a Tree Protection Zone with protective fencing and maintained and retained until the completion of all building works. Protective fencing is to be installed as shown in Appendix F - Tree Protection Plan.

- *The Protective fencing where required may delineate the **Tree Protection Zone (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" or similar.*

- *Tree Protection signage is to be attached to each **TPZ** and displayed from within the development site in accordance with AS4970 2009 Protection of trees on development sites*

- *The area of the Tree Protection Zone to be mulched to a depth of 100 mm 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. Where deep excavation will expose the soil profile to drying out the root plate is to be protected by pegging jute matting across the ground surface 2 m back from the edge of the profile and 2 m down the face of the profile and is to be in one continuous sheet or layers up to 5 mm thick and overlapped 300 mm and pegged. Pegs are to be a minimum length of 200 mm and spaced at 500 mm increments in a grid pattern. Once installed mulch is to be placed on top of the jute matting previously described.*

5.19 There is to be no storage of materials, rubbish, soil, equipment, structures or goods of any type to be kept or placed within 5 metres from the trunk or within the dripline of any tree for the duration of the development. This will ensure protection of the tree/s to be retained on or adjacent to site.

5.20 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens prior to demolition to inspect tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

Demolition and Tree Removal/s

5.21 Trees 1, 2, 8, 9, 10, 11, 15, 20, 22, 23, 24, 25, 26, 27x2, 28, 29, 30, 31 & 32 are to be removed as they are located within the site in a position where they cannot be retained due to the proposed building footprints and associated infrastructure where encroachment will have an adverse impact on its roots and crown for viability and stability. They are recommended for removal and replacement with super advanced specimens in 75 or 100 litre bags size stock within more appropriate positions within the development. Replacement of these specimens needs to be mindful of their spatial requirements to allow them to grow to maturity and not be impeded by the built structure.

- Tree 1, 2, 9, 10 & 11: *Callistemon salignus* - Willow Bottlebrush, *Callistemon viminalis 'Hanna Ray'* - Hanna Ray Bottlebrush, *Platanus x hispanica* - London Plane Tree & *Fraxinus sp.* - Ash; located within the front of the property and positioned within the proposed building footprint. These specimens are not able to be retained due to the proposed development.

- Tree 8 & 24: *Acer sp.* – Maple & *Triadica sebifera (syn. Sapium sebiferum)* - Chinese Tallowwood, located within the middle of the site and positioned within the proposed building footprint, these specimens are not able to be retained due to the proposed development.

- Tree 15: *Fraxinus sp.* - Ash; located within the centre of the property within the roadway and is not able to be retained due to the proposed development. The specimen is becoming senescent, dropping branches, possibly due to path refurbishment and is recommended to be removed as part of the proposed development.

- Tree 20, 22 & 23: *Callistemon salignus* - Willow Bottlebrush & *Robinia pseudoacacia "Frisia"* - Golden Locust; located within the Thomas Avenue frontage of the property, immediately adjacent to the proposed development in a positioned where they cannot be retained due to the proposed development.

- Tree 25: *Eucalyptus fibrosa* - Broad-leaved Ironbark; located within the front of the property, immediately adjacent to the proposed building footprint. This specimen is not able to be retained due to the proposed development.

- Tree 26, 27^{x2}, 28, 29, 30, 31 & 32: *Corymbia maculata* - Spotted Gum, these specimens located to the rear of the site are within the proposed car park and cannot be retained due to the proposed development.

5.22 Removal of a tree within 6 m 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 20 mm 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.

5.23 Ground protection in accordance with AS4970 section 4, 4.5.3 may require steel plates to protect the ground surface from compaction to protect roots between the stages of demolition and construction of the new pavement.

Specific - Tree Protection works – Post Demolition and Prior to Construction

5.24 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens prior to construction in relation to tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

5.25 Location of underground utilities within a Tree Protection Zone of a retained specimen.
Any utility services to be located underground within the TPZ are to be undertaken utilising excavation techniques that prevent or minimise damage to structural roots (roots greater than >20 mm diameter). To prevent soil compaction and root damage these works should be conducted with non-motorised hand tools, air knife or directional drilling.

5.26 Re-grading of site near retained trees; Grading &/or re-grading of sites/slopes within Tree Protection Zones or near retained specimens is to be undertaken **only** if at all, after consultation with the Project Arborist. This is to protect all structural roots systems from damage or compaction from machinery.

5.27 Placement of relocatable buildings; consideration should be given to tree sensitivity such as the buildings being placed on pier and beam or skids construction as they are to be positioned now on the eastern side of their driplines within the Tree Protection Zone (TPZ). The area of the Tree Protection Zone under the buildings is to be mulched to a depth of 200 mm (*if installed on skids*) with organic material to further reduce compaction. The mulch is to be composted material, i.e. species specific mulch. Alternatively, if installed on a pier & beam construction, piers are to be undertaken manually by using non-motorized hand tools to determine the location of first order and lower order structural roots with a diameter of 20 mm (*structural woody roots*) or greater, without damaging them.

Specific - Tree Protection works – During Construction

5.28 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens during construction in relation to tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

5.29 Where any structural roots (roots with a diameter of greater than >20 mm) encountered by excavation are to be pruned and it is to be undertaken with clean sharp pruning tools, with a final cut to undamaged wood to prevent infestation by pathogens and assist continued root growth and undertaken in consultation with the Consulting Arboriculturist. Tree Protection Zone fences are to be maintained during these works. Ground protection in accordance with AS4970 section 4, 4.5.3 may require steel plates to protect the ground surface from compaction to protect roots between the stages of demolition and construction of the new pavement.

5.30 All Tree Protection Zones of retained trees are to be monitored for the duration of the construction phase of the development. The three main areas requiring monitoring are; *mulching* - mulch must be maintained to a depth of 50–100 mm using material that complies with AS 4454. Where the existing landscape within the TPZ is to remain unaltered (e.g. garden beds or turf) mulch may not be required, *watering* - soil moisture levels should be regularly monitored by the project arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system could be installed and maintained by a competent individual and *weeding* - weeds should be removed by hand without disturbing soil or should be controlled with weedicide.

5.31 Trees to be removed are to be replaced with advanced specimens being mindful of the space limitations of the new use of the site. The advanced trees should be located in areas along the boundaries of the site. The planting in these locations will provide the maximum benefit to the surrounding properties by screening views to and from the site and the plantings included in the proposed landscape plan. The replacement trees will be located in positions where they may grow to maturity unhindered and will not conflict with built structures or utility services and in greater numbers than the trees removed should provide a net increase in the local amenity.

Specific - Tree Protection works – Post Construction

5.32 At completion of construction work the Site/Project Arborist should carry out an assessment of all trees retained &/or affected by works. This assessment is to document and any required on-going remedial care needed to ensure viable retention of trees affected. Documentation is to be submitted to the consenting authority.

6.0 CONCLUSION

Twenty (20) trees are nominated for removal and replacement with species in accordance with the associated Landscape documentation for the development. The thirteen (13) trees to be preserved will be retained and protected through the implementation of adequate measures for their integration into the development by the application of appropriate technology as detailed in this report. Where appropriate, the Landscape Plan will include planting with new trees including street tree/s.

It is often a consequence of redevelopment, and subject to the nature of the proposed land use that some or all of the trees present on the site prior to that redevelopment may be required to be removed and replaced with new tree plantings in different locations. This may be dependent upon the type of development and its design constraints and the requirements of the local planning instruments and any Landscape Design Codes if existing. Where tree removal is required for this development, it is considered that those trees identified within this report are not sustainable within the context of the proposed development. Where tree retention has been considered, those trees are expected to survive the redevelopment process and remain stable and viable. The retention and protection of existing trees on site is a significant aspect of the development process, allowing those trees as components of the current curtilage to be transferred to the new development for incorporation into the landscaping works for the site. The retention of some or all of the existing trees contributes to: the preservation of local amenity, screening of views to and from the site, and a balance to the scale and bulk of buildings, while maintaining elements of a continuous landscape, providing a more harmonious integration and transition of the use of the land.

If all the recommendations and procedures detailed herein are adhered to, some or all of the trees the subject of this report will continue, or will be replaced with more appropriate plantings in suitable locations, or enhanced by additional new plantings, and will grow to develop as important landscape components providing elements of long term amenity for the property and its owners or occupants, and the local community.

The recommendations made in this report are subject to approval by the consent authority.

As a renewable and dynamic natural resource the urban tree and the growing environment essential for its survival must be understood and carefully managed to balance its needs with those of people. It is crucial that as required: this resource be planned for, planted, nurtured, protected, maintained and replaced, to ensure appropriateness and suitability of new plantings and trees retained, for safety and viability, so that it remains vital, and is sustainable in continuity.

7.0 RECOMMENDATIONS

7.1 Trees 3, 4, 5, 6, 7, 12, 13, 14, 16, 17, 18, 19 & 21 are to be retained in situ within the site and are to be protected as detailed in 5.6 - 5.20 & 5.23 - 5.32. Tree protection fences, or works, to be located in accordance with *Site Plan B - Trees to be Retained and Tree Protection Zones* (Appendix F).

7.2 Where Tree Protection Zone fences are to be moved or relocated this must be undertaken in consultation with the Consultant Arboriculturist for the project to ensure that tree protection is maintained. If the fences are relocated areas are to be mulched in accordance with 5.18 of this report to reduce compaction to the root system of the retained specimens.

7.3 To minimise damage to retained crowns, all Tree Protection Zones are to be adhered to. This must be undertaken in consultation with the Consultant Arboriculturist for the project to ensure that tree protection is maintained. Minor pruning may be required if damage occurs, work is to be undertaken in accordance with section 4 of this report.

7.4 *Milestones* - Project/Site arborist is to inspect/assess all retained specimens prior to Demolition and Tree Removal, Post Demolition, Prior to Construction during Construction and on completion in relation to trees protected and the protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

7.5 Trees 1, 2, 8, 9, 10, 11, 15, 20, 22, 23, 24, 25, 26, 27^{x2}, 28, 29, 30, 31 & 32 are to be removed which is to be undertaken in accordance with section 4.0, parts 4.1 - 4.3.

7.6 Tree removal near retained specimens is to be undertaken in accordance with 5.22 of this report.

7.7 Any work to be undertaken within Tree Protection Zones is to be undertaken in accordance 7.2 of this report.

7.8 There is to be no storage of materials, rubbish, soil, equipment, structures or goods of any type to be kept or placed within 5 metres from the trunk or within the dripline of any tree for the duration of the development. This will ensure protection of the tree/s to be retained on or adjacent to site.

7.9 Each of the replacement are to be a vigorous specimen with a straight trunk, gradually tapering and continuous, crown excurrent, symmetrical, with roots established but not pot bound in a volume container or approved similar and be maintained by an appropriately qualified and experienced landscape contractor for up to one (1) year after planting, or as appropriate.

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1. Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.
2. IACA 2005, Sustainable Retention Index Value, *Institute of Australian Consulting Arboriculturists*, Australia, www.iaca.org.au .
3. Standards Australia 2007, *Australian Standard 4373 Pruning of amenity trees*, Standards Australia, Sydney, Australia.
4. Standards Australia 2009, *Australian Standard 4970 Protection of trees on development sites*, Standards Australia, Sydney, Australia.
5. Work Cover NSW 2007, *Code of Practice Tree Work*, New South Wales Government, Australia.

Appendix A

IACA Significance of a Tree, Assessment Rating System (STARS) © (IACA 2010) ©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined.

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils Significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

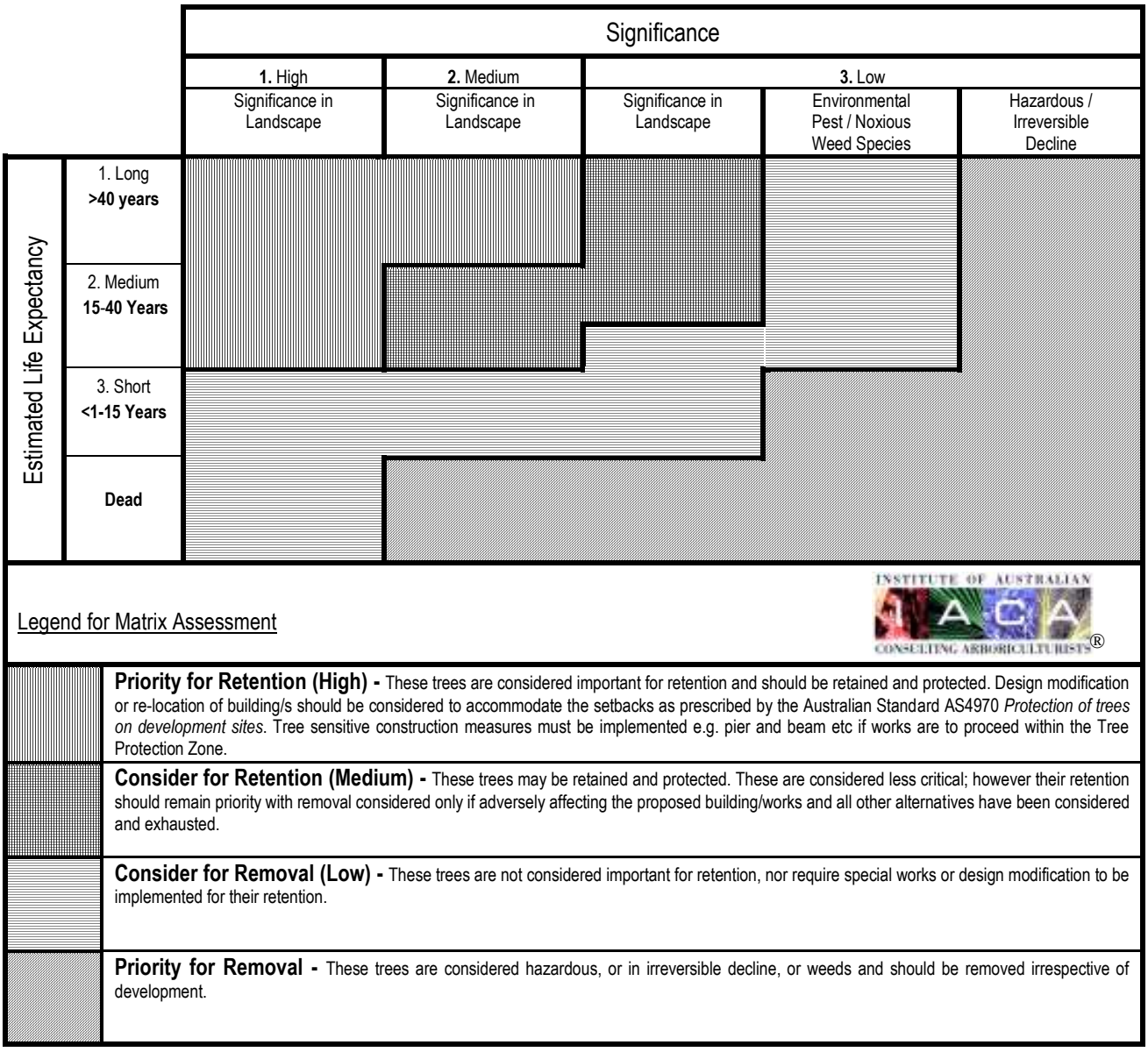
Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

Table 1.0 Tree Retention Value - Priority Matrix.



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Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, www.footprintgreen.com.au

Appendix B

Matrix - Sustainable Retention Index Value (SRIV) ©

Version 4, 2010

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

The matrix is to be used with the value classes defined in the Glossary for Age / Vigour / Condition.
An index value is given to each category 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.
(Y) Young	**YGVG - 9** **Index Value 9** Retention potential - Long Term. Likely to provide minimal contribution to local amenity if height <5 m. High potential for future growth and adaptability. Retain, move or replace.	**YGVF - 8** **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 <5 m. Medium-high potential for future growth and adaptability. Retain, move or replace.	**YGVP - 5** **Index Value 5** Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Low-medium potential for future growth and adaptability. Retain, move or replace.	**YLVG - 4** **Index Value 4** Retention potential - Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5 m. Medium potential for future growth and adaptability. Retain, move or replace.	**YLVF - 3** **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.	**YLVP - 1** **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 <5 m. Low potential for future growth and adaptability.
(M) Mature	**MGVG - 10** **Index Value 10** Retention potential - Medium - Long Term.	**MGVF - 9** **Index Value 9** Retention potential - Medium Term. Potential for longer with improved growing conditions.	**MGVP - 6** **Index Value 6** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVG - 5** **Index Value 5** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVF - 4** **Index Value 4** Retention potential - Short Term. Potential for longer with improved growing conditions.	**MLVP - 2** **Index Value 2** Retention potential - Likely to be removed immediately or retained for Short Term.
(O) Over-mature	**OGVG - 6** **Index Value 6** Retention potential - Medium - Long Term.	**OGVF - 5** **Index Value 5** Retention potential - Medium Term.	**OGVP - 4** **Index Value 4** Retention potential - Short Term.	**OLVG - 3** **Index Value 3** Retention potential - Short Term. Potential for longer with improved growing conditions.	**OLVF - 2** **Index Value 2** Retention potential - Short Term.	**OLVP - 0** **Index Value 0** Retention potential - Likely to be removed immediately or retained for Short Term.

Appendix C

Extract from Australian Standard
AS4970 2009 Protection of trees on development sites

Section 3, Determining the tree protection zones of the selected trees

3.1 Tree protection zone (TPZ)

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

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)."

3.2 Determining the TPZ

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

TPZ = DBH x 12

where

DBH = trunk diameter measured at 1.4 m above ground

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

3.3.5 Structural root zone (SRZ)

"The SRZ is the area required for street stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. Root investigation may provide more information on the extent of these roots."

Determining the SRZ

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

SRZ radius = $(D \times 50)^{0.42} \times 0.64$

where

D = trunk diameter, in metres, measured above the root buttress.

Note: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m (see Figure 1).

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.

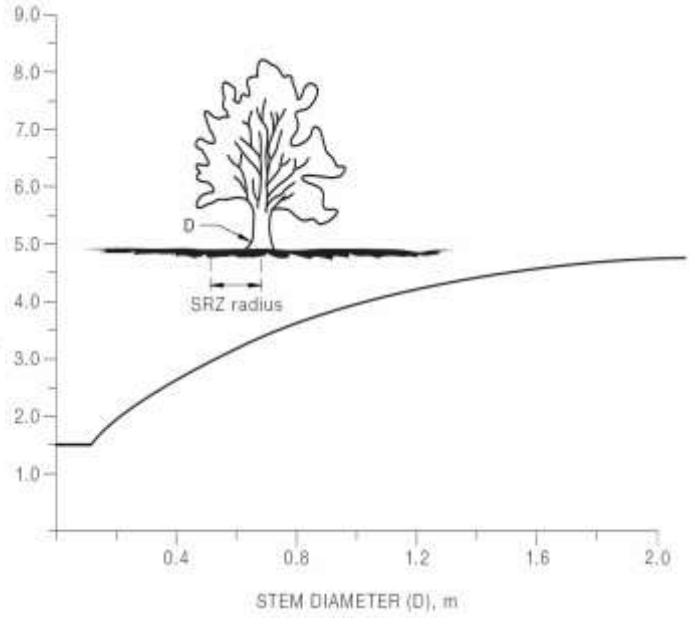


FIGURE 1 STRUCTURAL ROOT ZONE

Appendix D

Glossary

From

Dictionary for Managing Trees in Urban Environments by Draper BD and Richards PA 2009, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Age of Trees

Age 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 and can be categorized as *Young*, *Mature* and *Over-mature* (British Standards 1991, p. 13, Harris *et al*, 2004, p. 262).

Young Tree aged less than <20% of life expectancy, *in situ*.

Mature Tree aged 20-80% of life expectancy, *in situ*.

Over-mature Tree aged greater than >80% of life expectancy, *in situ,* or *senescent* with or without reduced *vigour*, and declining gradually or rapidly but irreversibly to death.

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 (1st) and possibly second (2nd) 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.

Senescent / Moribund Advanced state of decline, dying or nearly dead.

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.

Branch

Branch An elongated woody structure arising initially from the trunk to support leaves, flowers, fruit and the development of other branches. A branch may itself fork and continue to divide many times as successive *orders of branches* with the length and taper decreasing incrementally to the *outer extremity* of the *crown*. These may develop initially as a gradually tapering continuation of the *trunk* with minimal division as in a *young* tree or a tree of *excurrent habit*, or in a *sapling*, or may arise where the trunk terminates at or some distance from the *root crown*, dividing into *first order branches* to form and support the *foliage crown*. In an *acaulescent* tree, branches arise at or near the *root crown*. Similarly branches may arise from a *sprout mass* from damaged *roots*, *branches* or *trunk*.

Orders of branches The marked divisions between successively smaller branches (James 2003, p. 168) commencing at the initial division where the trunk terminates on a *deliquescent* tree or from *lateral* branches on an *excurrent* tree. Successive branching is generally characterised by a gradual reduction in branch diameters at each division, and each gradation from the trunk can be categorised numerically, e.g. first order, second order, third order etc. (See Figure 21.)

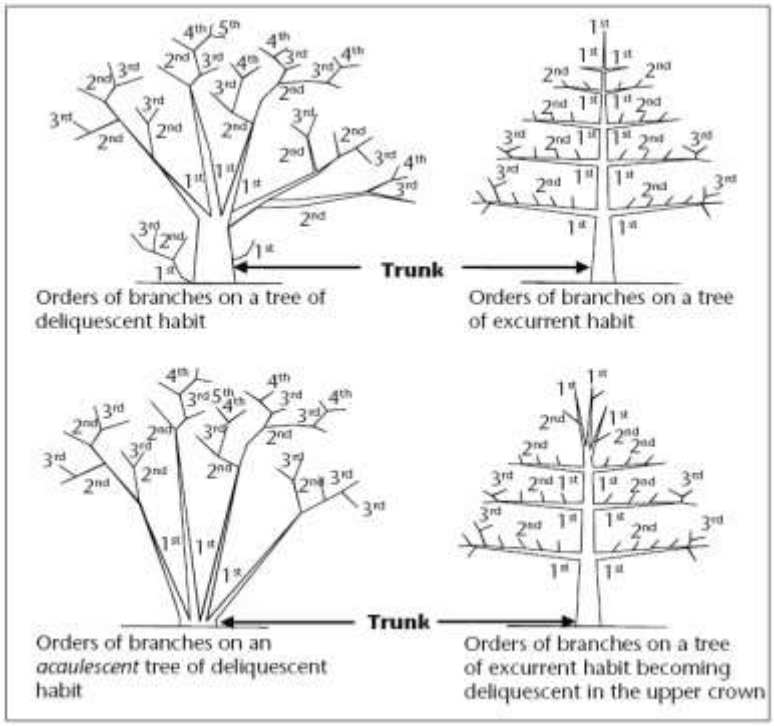


Figure 21 Orders of branches

Crown

Canopy 1. Of multiple trees, the convergence, or merging in full or part, of the crowns of two or more trees due to their proximity, or where competition for light and space available in a forest environment is limited as each tree develops forming a continuous layer of foliage. 2. Used as a plural for crown. 3. Sometimes synonymously used for crown (USA).

Crown Of an individual tree all the parts arising above the trunk where it terminates by its division forming branches, e.g. the branches, leaves, flowers and fruit; or the total amount of foliage supported by the branches. The crown of any tree can be divided vertically into three sections and can be categorised as *lower crown*, *mid crown* and *upper crown* (Figure 8). For a *leaning* tree these can be divided evenly into crown sections of one-third from the *base* to *apex*. The volume of a crown can be categorised as the *inner crown*, *outer crown* and *outer extremity of crown*.

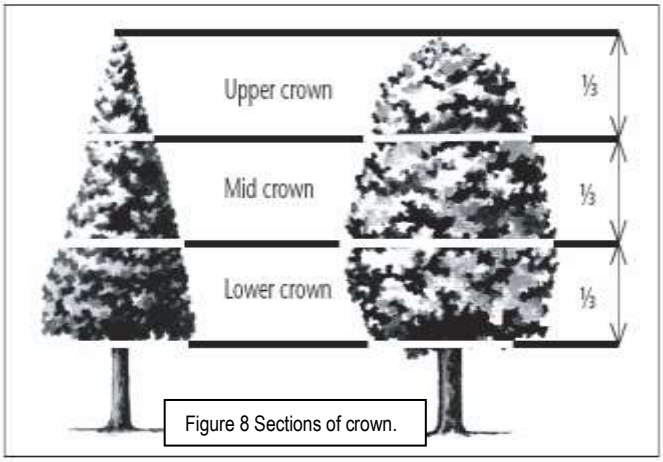


Figure 8 Sections of crown.

Lower crown The *proximal* or lowest section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Mid crown* and *Upper crown*.

Mid crown The middle section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Lower crown* and *Upper crown*.

Upper crown The *distal* or highest section of a crown when divided vertically into one-third (⅓) increments. See also *Crown*, *Mid crown* and *Lower crown*.

Crown Projection (CP) Area within the *dripline* or beneath the lateral extent of the *crown* (Geiger 2004, p. 2). See also *Crown spread* and *Dripline*.

Dripline A line formed around the edge of a tree by the lateral extent of the *crown*. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown. See also *Crown Projection*.

Crown Form of Trees

Crown Form The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as *Dominant*, *Codominant*, *Intermediate*, *Emergent*, *Forest* and *Suppressed*. The habit and shape of a *crown* may also be considered qualitatively and can be categorized as *Good Form* or *Poor Form*.

Good Form Tree of *typical* crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g. indigenous or exotic, but does not appear to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

Poor Form Tree of *atypical* crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as *soil water* availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be *misshapen* or disfigured by disease or vandalism.

Crown Form Codominant Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g. constrained by another tree/s or a building.

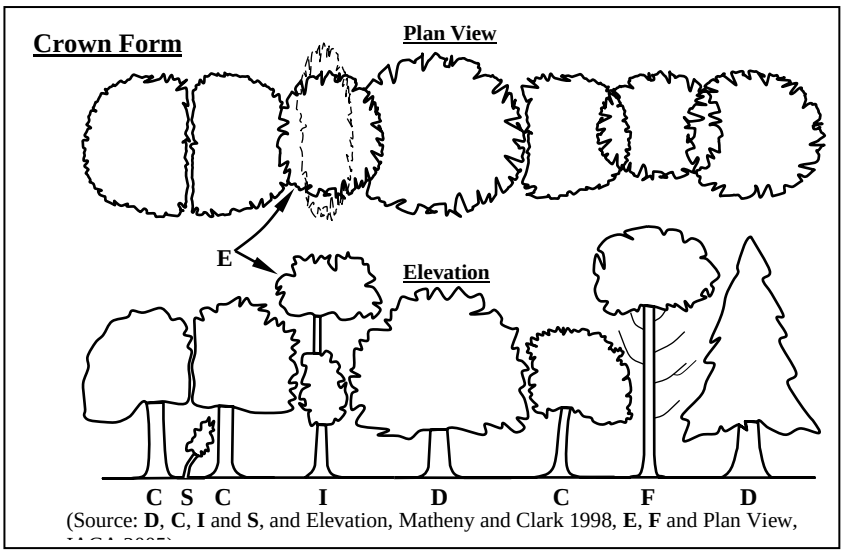
Crown Form Dominant Crowns of trees generally not restricted for space and light receiving light from above and all sides.

Crown Form Emergent Crowns of trees restricted for space on most sides receiving most light from above until the *upper crown* grows to protrude above the canopy in a stand or forest environment. Such trees may be *crown form dominant* or transitional from *crown form intermediate* to *crown form forest* asserting both *apical dominance* and *axillary dominance* once free of constraints for space and light.

Crown Form Forest Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point other first order branches arising radially with each *inferior* and usually temporary, divergent and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the *lower crown*.

Crown Form Intermediate Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form Suppressed Crowns of trees generally not restricted for space but restricted for light by being *overtopped* by other trees and occupying an understorey position in the canopy and growing slowly.



(Source: **D**, **C**, **I** and **S**, and Elevation, Matheny and Clark 1998, **E**, **F** and Plan View, [illegible])

Deadwood

Deadwood Dead branches within a tree's crown and considered quantitatively as separate to *crown cover* and can be categorised as *Small Deadwood* and *Large Deadwood* according to diameter, length and subsequent *risk* potential. The amount of dead branches on a tree can be categorized as *Low Volume Deadwood*, *Medium Volume Deadwood* and *High Volume Deadwood*. See also *Dieback.*

Deadwooding Removing of dead branches by *pruning*. Such pruning may assist in the prevention of the spread of *decay* from *dieback* or for reasons of safety near an identifiable target.

Small Deadwood A dead branch up to 10mm diameter and usually <2 metres long, generally considered of low *risk* potential.
Large Deadwood A dead branch >10mm diameter and usually >2 metres long, generally considered of high *risk* potential.
High Volume Deadwood High Volume Deadwood Where >10 dead branches occur that may require *removal*.
Medium Volume Deadwood Where 5-10 dead branches occur that may require *removal*.
Low Volume Deadwood Where <5 dead branches occur that may require *removal*.

Dieback

Dieback The death of some areas of the *crown*. Symptoms are leaf drop, bare twigs, dead branches and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, *abrupt changes* in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced *resistance, stress* or *decline* which may be temporary. Dieback can be categorized as *Low Volume Dieback*, *Medium Volume Dieback* and *High Volume Dieback*.

High Volume Dieback Where >50% of the *crown cover* has died.
Medium Volume Dieback Where 10-50% of the *crown cover* has died.
Low Volume Dieback Where <10% of the *crown cover* has died. See also *Dieback*, *High Volume Dieback* and *Medium Volume Dieback*.

Epicormic shoots

Epicormic Shoots Juvenile shoots produced at branches or trunk from *epicormic strands* in some Eucalypts (Burrows 2002, pp. 111-131) or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of *stress* or *decline*. Epicormic shoots can be categorized as *Low Volume Epicormic Shoots*, *Medium Volume Epicormic Shoots* and *High Volume Epicormic Shoots*.

High Volume Epicormic Shoots Where >50% of the *crown cover* is comprised of live *epicormic shoots*.
Medium Volume Epicormic Shoots Where 10-50% of the *crown cover* is comprised of live *epicormic shoots*.
Low Volume Epicormic Shoots Where <10% of the c*rown cover* is comprised of live *epicormic shoots*.

General Terms

Cavity A usually shallow void often localized initiated by a *wound* and subsequent *decay* within the trunk, branches or roots, or beneath bark, and may be enclosed or have one or more opening.

Decay Process of degradation of wood by microorganisms (Australian Standard 2007, p. 6) and fungus.

Hazard The threat of danger to people or property from a tree or tree part resulting from changes in the physical condition, growing environment, or existing physical attributes of the tree, e.g. included bark, soil erosion, or thorns or poisonous parts, respectively.

Included bark 1. The bark on the inner side of the *branch union*, or is within a concave *crotch* that is unable to be lost from the tree and accumulates or is trapped by *acutely divergent* branches forming a *compression fork*. 2. Growth of bark at the interface of two or more branches on the inner side of a branch union or in the crotch where each branch forms a branch collar and the collars roll past one another without forming a graft where no one collar is able to subsume the other. Risk of failure is worsened in some taxa where branching is *acutely divergent* or *acutely convergent* and ascending or erect.

Hollow A large void initiated by a *wound* forming a *cavity* in the trunk, branches or roots and usually increased over time by *decay* or other contributing factors, e.g. fire, or fauna such as birds or insects e.g. ants or termites. A hollow can be categorized as an *Ascending Hollow* or a *Descending Hollow*.

Risk The random or potentially foreseeable possibility of an episode causing harm or damage.

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, *crown 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.

Sustainable Retention Index Value (SRIV) A visual tree assessment method to determine a qualitative and numerical rating for the viability of urban trees for development sites and management purposes, based on general tree and landscape assessment criteria using classes of *age*, *condition* and *vigour*. SRIV is for the professional manager of urban trees to consider the tree *in situ* with an assumed knowledge of the *taxon* and its growing environment. It is based on the physical attributes of the tree and its response to its environment considering its position in a matrix for age class, vigour class, condition class and its sustainable retention with regard to the safety of people or damage to property. This also factors the ability to retain the tree with remedial work or beneficial modifications to its growing environment or removal and replacement. SRIV is supplementary to the decision made by a tree management professional as to whether a tree is retained or removed (IACA - Institute of Australian Consulting Arboriculturists 2005).

Visual Tree Assessment (VTA) A visual inspection of a tree from the ground based on the principle that, when a tree exhibits apparently superfluous material in its shape, this represents repair structures to rectify *defects* or to reinforce weak areas in accordance with the *Axiom of Uniform Stress* (Mattheck & Breloer 1994, pp. 12-13, 145). Such assessments should only be undertaken by suitably competent practitioners.

Leaning Trees

Leaning A tree where the *trunk* grows or moves away from upright. A lean may occur anywhere along the *trunk* influenced by a number of contributing factors e.g. genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A *leaning* tree may maintain a *static lean* or display an increasingly *progressive lean* over time and may be hazardous and prone to *failure* and *collapse*. The degrees of leaning can be categorized as *Slightly Leaning*, *Moderately Leaning*, *Severely Leaning* and *Critically Leaning*.

Slightly Leaning A leaning tree where the trunk is growing at an angle within 0^{O}-15^{O} from upright.
Moderately Leaning A leaning tree where the trunk is growing at an angle within 15^{O}-30^{O} from upright.
Severely Leaning A leaning tree where the trunk is growing at an angle within 30^{O}-45^{O} from upright.
Critically Leaning A leaning tree where the trunk is growing at an angle greater than $>45^{O}$ from upright.
Progressively Leaning A tree where the degree of *leaning* appears to be increasing over time.
Static Leaning A leaning tree whose lean appears to have stabilized over time.

Periods of Time

Periods of Time The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as *Immediate*, *Short Term*, *Medium Term* and *Long Term*.

Immediate An *episode* or occurrence, likely to happen within a twenty-four (24) hour period, e.g. tree failure or collapse in full or part posing an imminent danger.
Short Term A period of time less than <1 – 15 years.
Medium Term A period of time 15 – 40 years.
Long Term A period of time greater than >40 years.

Roots

First Order Roots (FOR) Initial woody roots arising from the *root crown* at the base of the *trunk*, or as an *adventitious root mass* for structural support and *stability*. Woody roots may be buttressed and divided as a marked gradation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Depending on soil type these roots may descend initially and not be evident at the root crown, or become buried by changes in soil levels. Trees may develop 4-11 (Perry 1982, pp. 197-221), or more first order roots which may radiate from the trunk with a relatively even distribution, or be prominent on a particular aspect, dependent upon physical characteristics e.g. leaning trunk, *asymmetrical* crown; and constraints within the growing *environment* from topography e.g. slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of *water table* etc.

Orders of Roots The marked divisions between woody roots, commencing at the initial division from the base of the trunk, at the *root crown* where successive branching is generally characterised by a gradual reduction in root diameters and each gradation from the trunk and can be categorized numerically, e.g. *first order roots*, second order roots, third order roots etc. Roots may not always be evident at the *root crown* and this may be dependent on species, age class and the growing environment. Palms at maturity may form an adventitious root mass.

Root Plate The entire root system of a tree generally occupying the top 300-600mm of soil including roots at or above ground and may extend laterally for distances exceeding twice the height of the tree (Perry 1982, pp. 197-221). Development and extent is dependent on water availability, soil type, *soil depth* and the physical characteristics of the surrounding landscape.

Root Crown Roots arising at the base of a trunk.

Zone of Rapid Taper The area in the *root plate* where the diameter of *structural roots* reduces substantially over a short distance from the *trunk.* Considered to be the minimum radial distance to provide structural support and *root plate* stability. See also *Structural Root Zone (SRZ)*.

Structural Roots Roots supporting the infrastructure of the *root plate* providing strength and *stability* to the tree. Such roots may taper rapidly at short distances from the *root crown* or become large and woody as with gymnosperms and dicotyledonous angiosperms and are usually 1st and 2nd order roots, or form an *adventitious root mass* in monocotyledonous angiosperms (palms). Such roots may be crossed and grafted and are usually contained within the area of *crown projection* or extend just beyond the *dripline*.

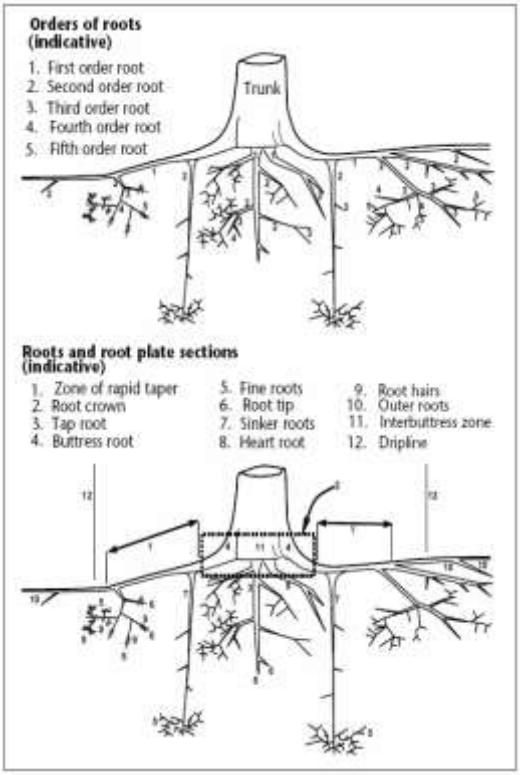


Figure 22 Orders of Roots.

Symmetry

Symmetry Balance within a *crown,* or *root plate,* above or below the *axis* of the trunk of branch and foliage, and root distribution respectively and can be categorized as *Asymmetrical* and *Symmetrical*.

Asymmetrical Imbalance within a crown, where there is an uneven distribution of branches and the foliage *crown* or *root plate* around the vertical *axis* of the trunk. This may be due to *Crown Form Codominant* or *Crown From Suppressed* as a result of natural restrictions e.g. from buildings, or from competition for space and light with other trees, or from exposure to wind, or artificially caused by pruning for clearance of roads, buildings or power lines. An example of an expression of this may be, crown asymmetrical, bias to west.

Symmetrical Balance within a crown, where there is an even distribution of branches and the *foliage crown* around the vertical *axis* of the trunk. This usually applies to trees of *Crown Form Dominant* or *Crown Form Forest*. An example of an expression of this may be crown symmetrical.

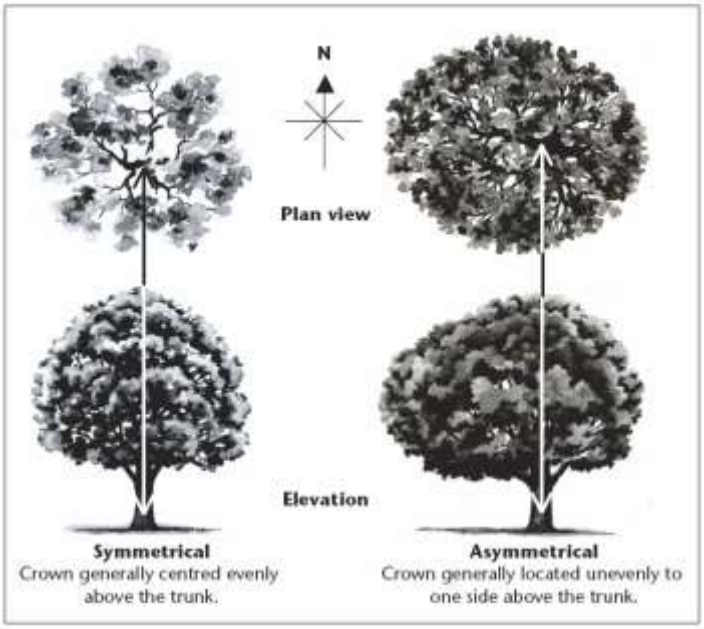


Figure 27 Symmetry within crown

Trunk

Trunk A single stem extending from the *root crown* to support or elevate the *crown*, terminating where it divides into separate *stems* forming *first order branches*. A trunk may be evident at or near ground or be absent in *acaulescent* trees of *deliquescent* habit, or may be continuous in trees of *excurrent* habit. The trunk of any *caulescent* tree can be divided vertically into three (3) sections and can be categorized as *Lower Trunk*, *Mid Trunk* and *Upper Trunk*. For a *leaning* tree these may be divided evenly into sections of one third along the trunk.

Acaulescent A *trunkless* tree or tree growth forming a very short *trunk*. See also *Caulescent.* (See Fig. 21)

Caulescent Tree grows to form a *trunk*. See also *Acaulescent*. (See Fig. 21)

Lower trunk Lowest, or *proximal* section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Mid trunk* and *Upper trunk*.

Mid trunk A middle section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Lower trunk* and *Upper trunk*.

Upper trunk Highest, or *distal* section of a trunk when divided into one-third (⅓) increments along its *axis*. See also *Trunk*, *Lower trunk* and *Mid trunk*.

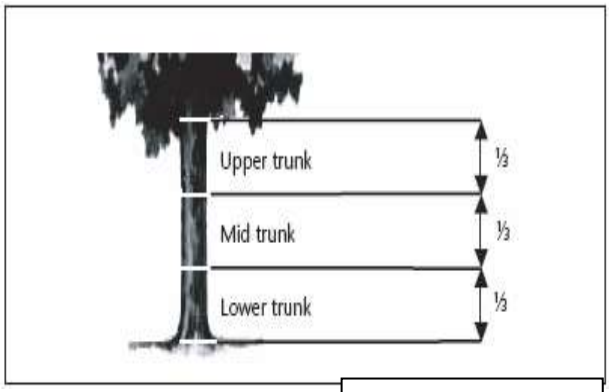


Figure 28 Trunk sections.

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.

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.

Appendices E & F

Appendix E – Survey of Subject Tree/s
Appendix F – Tree Protection Plan

Trees the subject of this report are marked on the plans in the following appendices and are numbered as listed below.

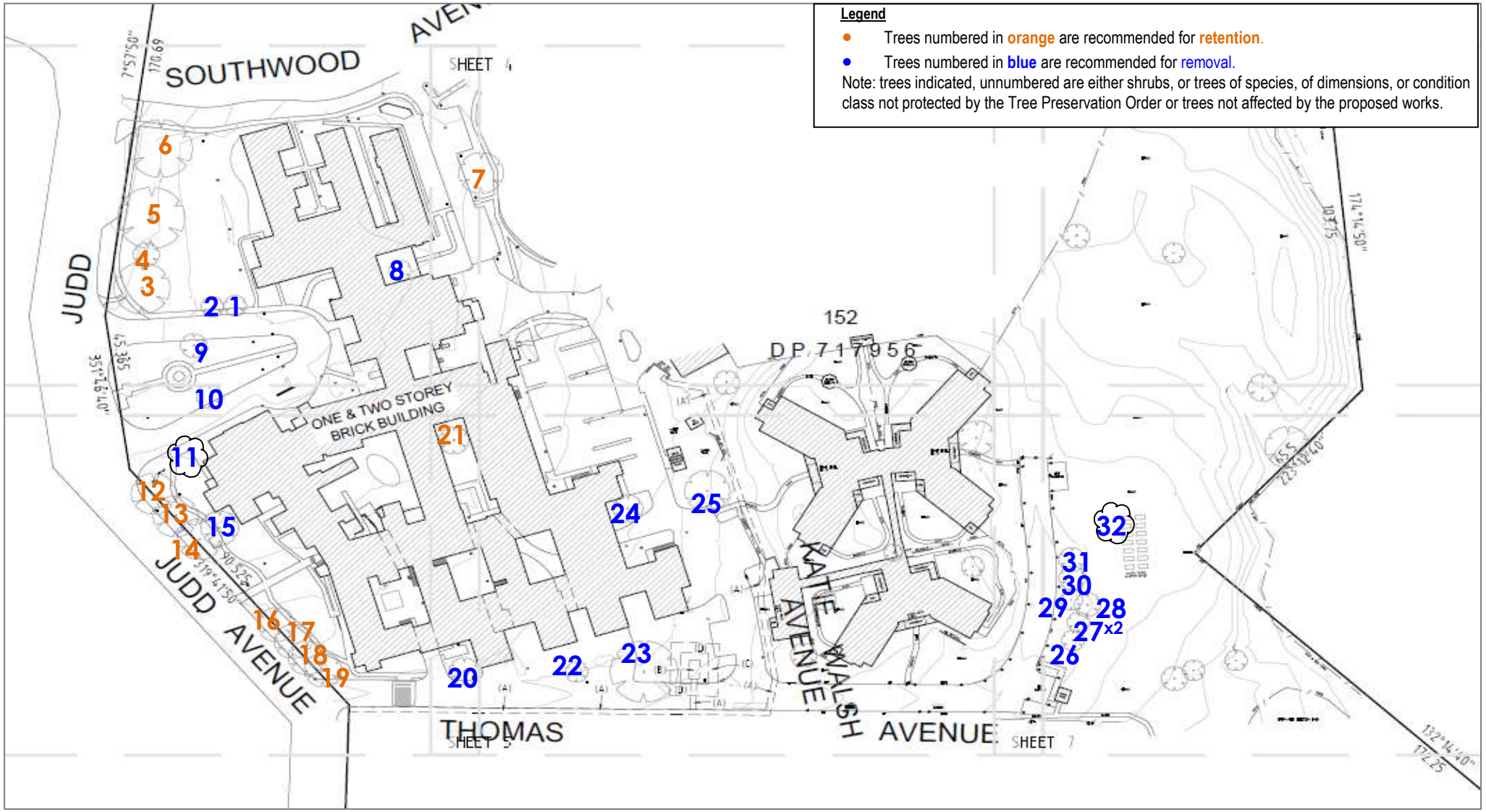
Redgum Tree No.	*Genus and species*	Common name	Recommendation
1	*Callistemon salignus*	Willow Bottlebrush	Remove and replace
2	*Callistemon viminalis 'Hanna Ray'*	Hanna Ray Bottlebrush	Remove and replace
3	*Corymbia maculata*	Spotted Gum	Retain and protect
4	*Corymbia maculata*	Spotted Gum	Retain and protect
5	*Corymbia maculata*	Spotted Gum	Retain and protect
6	*Corymbia maculata*	Spotted Gum	Retain and protect
7	*Eucalyptus microcorys*	Tallowwood	Retain and protect
8	*Acer sp.*	Maple	Remove and replace
9	*Platanus x hispanica*	London Plane Tree	Remove and replace
10	*Platanus x hispanica*	London Plane Tree	Remove and replace
11	*Fraxinus sp.*	Ash	Remove and replace
12	*Platanus x hispanica*	London Plane Tree	Retain and protect
13	*Platanus x hispanica*	London Plane Tree	Retain and protect
14	*Platanus x hispanica*	London Plane Tree	Retain and protect
15	*Fraxinus sp.*	Ash	Remove and replace
16	*Melaleuca quinquenervia*	Broad Leafed Paperbark	Retain and protect
17	*Melaleuca quinquenervia*	Broad Leafed Paperbark	Retain and protect
18	*Melaleuca quinquenervia*	Broad Leafed Paperbark	Retain and protect
19	*Melaleuca quinquenervia*	Broad Leafed Paperbark	Retain and protect
20	*Callistemon salignus*	Willow Bottlebrush	Remove and replace
21	*Triadica sebifera (syn. Sapium sebiferum)*	Chinese Tallowwood	Retain and protect
22	*Robinia pseudoacacia "Frisia"*	Golden Locust	Remove and replace
23	*Robinia pseudoacacia "Frisia"*	Golden Locust	Remove and replace
24	*Triadica sebifera (syn. Sapium sebiferum)*	Chinese Tallowwood	Remove and replace
25	*Eucalyptus fibrosa*	Broad-leaved Ironbark	Remove and replace
26	*Corymbia maculata*	Spotted Gum	Remove and replace
27/2	*Corymbia maculata x2*	Spotted Gum	Remove and replace
28	*Corymbia maculata*	Spotted Gum	Remove and replace
29	*Corymbia maculata*	Spotted Gum	Remove and replace
30	*Corymbia maculata*	Spotted Gum	Remove and replace
31	*Corymbia maculata*	Spotted Gum	Remove and replace
32	*Corymbia maculata*	Spotted Gum	Remove and replace

Plan Details

1. *Plan of Detail & Level Survey of part of Lot 152 DP 717956, Ref No: 41409DT, Sheet 1 of 7, Issue A, Date 16.12.14, Scale 1:800 @ A1 by LTS Lockley Locked Bag 5 Gordon NSW 2072. T: 1300 587 000*
2. *Site Roof Plan, Project No. HAM16022 DA 101, Issue F, Date 05/12/2016, Scale 1:500 @ A1 by Integrated Design Group, T: 02 9764 6100. E: sydney@idgarchitets.com.au*

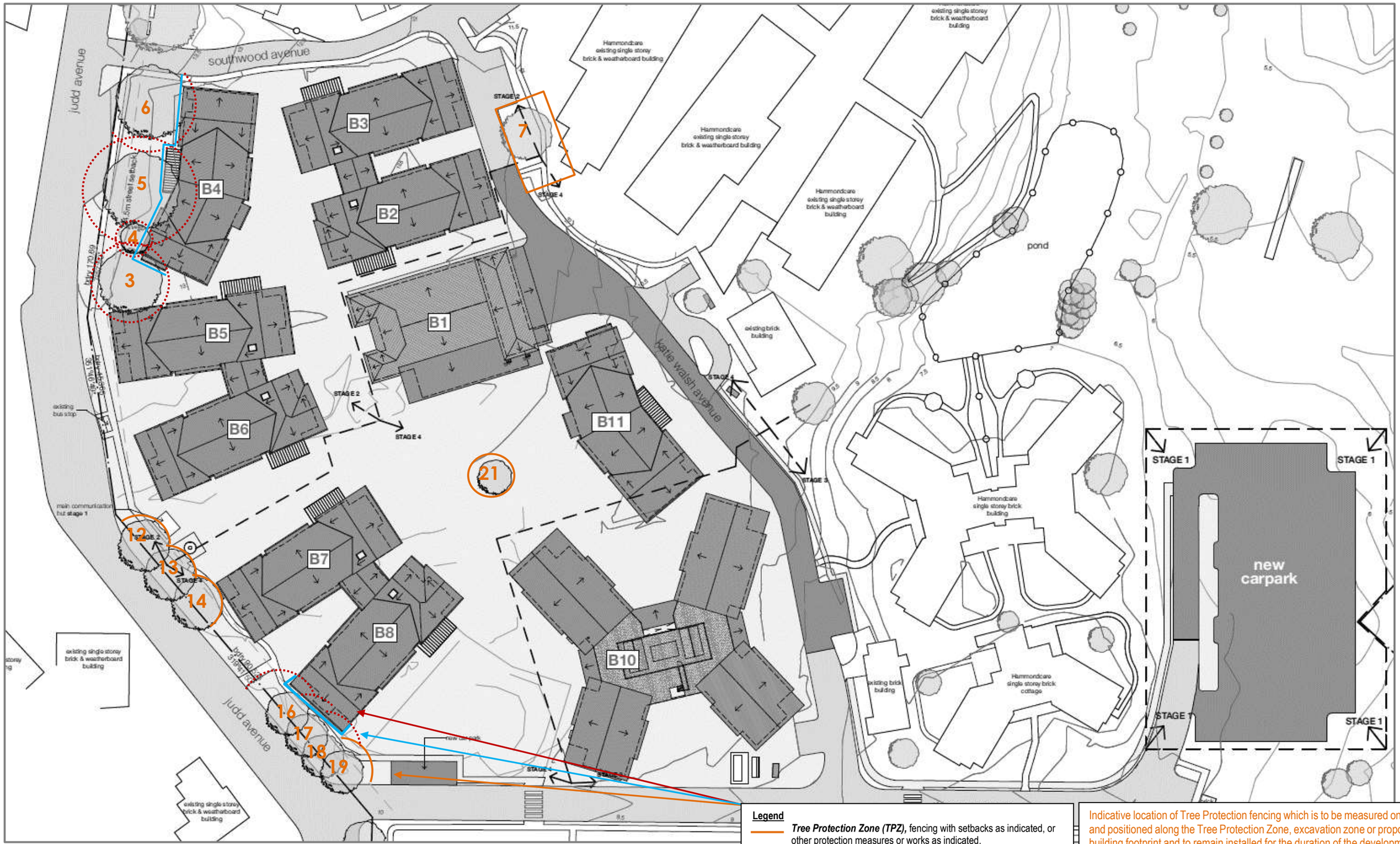
Appendix E - Site Plan A – Survey of Subject Trees

Plan has been reproduced from electronic transmission and is no longer to original scale.



Appendix F - Site Plan B
Survey of Trees to be Retained and Tree Protection Plan

Plan has been reproduced from electronic transmission and is no longer to original scale.
For other tree protection measures see sections 5.0 and 7.0. All Tree Protection Zones are to be measured on site.



Legend

- ***Tree Protection Zone (TPZ),*** fencing with setbacks as indicated, or other protection measures or works as indicated.
- ***Tree Protection Zone,*** area of special protection measures or works outside of fenced area.
- Relocated ***Tree Protection Zone,*** area of special protection measures or works outside of fenced area once construction commences.
- Tree numbers – trees to be retained only. Subject trees represented by the approximate location of the trunk.

Indicative location of Tree Protection fencing which is to be measured on site and positioned along the Tree Protection Zone, excavation zone or proposed building footprint and to remain installed for the duration of the development. Installation of boundary fences within rootzone to be of pier and beam construction. Red dotted Tree Protection around trees relates to relocation of fencing when construction is to be undertaken within these areas. All works to be carried out within the blue Tree Protection area after works commences is to be undertaken in consultation with site arboriculturist.

REDGUM Horticultural
Arboriculture & Horticulture Consultants

REPORT

(ADDENDUM)
A): ARBORICULTURAL IMPACT ASSESSMENT

and

B). TREE MANAGEMENT PLAN
(Trees to be retained and protected)

HammondCare
68-82 Stewart Avenue
(Thomas Avenue)
Hammondville NSW

Prepared 8 August 2017
Our Reference 2534.2

PH/FAX 8824 8314 PO Box 3687, Rouse Hill NSW 2155 ABN 28116465304 E info@redgumhrt.com.au

Contents

1.0 PREFACE

Redgum Horticultural has prepared this addendum report for Integrated Design Group *(the architect)* on behalf of Hammond Care (*the applicant*), Level 2, 447 Kent Street, Sydney NSW which is to be read in conjunction with the Arboricultural Impact Assessment, Ore Ref: 2534.1 dated 5 October 2016, revised 6 December 2016.

Mr. Neville Shields *(the author)* attended 68-82 Stewart Avenue (Thomas Avenue), Hammondville (*the site*), on 8 August 2017 and the trees and their growing environment were examined. The site is subject to a Development Application and this report and any works recommended herein, that require approval from the consenting authority, forms part of that Development application. This report takes into consideration the trees within the site and within five metres of the common boundary affected by the development.

2.0 INTRODUCTION

The land is situated in the Liverpool Council (*the Council)* Local Government Area (*LGA*) and the trees are protected under Councils Tree Preservation Order. The Council is the consenting authority for development works on the site. This report involves 10 trees (*the trees*), as indicated on Site Plan A - Survey of Subject Trees (Appendix C) and considers the removal of one (1) tree and the retention of nine (9) trees within the property. The trees will be considered as 1 stand to encompass all trees within and immediately adjacent to the site, where appropriate, as marked on Appendix C, Survey of Subject Trees. ***Tree Protection Zone*** fencing or works are marked on the Appendix F, Trees to be Retained and Tree Protection Zones.

The section of the site within the scope of this report is predominantly vacant land located in the south west corner of the site with proposed construction of a car parking area at ground, requiring the removal of one (1) existing tree within the site. As part of the Landscape Plan where appropriate, the tree cover on the site will be enhanced by planting with advanced specimens/s of appropriate tree species for the space available above and below ground being soil volumes available and to prevent future conflict between trees and built structures.

The proposed building design and its configuration and infrastructure were arrived at prior to the undertaking of an arboricultural assessment of the trees on the site to determine their significance by Redgum Horticultural. The plans provided do not show the location of sewer, water or electricity supply to the proposed development.

Setbacks for the new works and associated infrastructure should provide sufficient space to protect the existing growing environments both above and below ground for trees to be retained, and so that trees within the property and on adjoining properties will not be adversely affected. The proposed design has considered the spatial requirements for the trees to be retained based on the information available or provided at the time of compiling this report, and those areas to be protected will be discussed further. The Summary lists the general condition of trees and a summary of works in Table 1.0. In section 5.0 each individual tree is described in greater detail including protective or remedial works. Tree maintenance works including pruning, removal or transplantation are detailed in section 4.0.

3.0 SUMMARY

This report considers 10 trees located within the site with Trees 1 to 9 to be retained and protected and Tree 10 is recommended to be removed. For Tree 1 to 9 the alignment of the development is sufficiently setback to not affect these specimens.

If associated infrastructure (pipe works) are to be installed within the Tree Protection Zone of any retained specimen, they are to be installed by hand with non-motorised machinery. If structural roots are found within the trench, they are to be left intact and dug around retaining this specimen's structural integrity. Works are to be undertaken in consultation with the project arborist.

These specimens are sufficiently set back from the development to not be impacted. They are to be retained and protected as per AS 4970 (2009) Section 3, for any works within the Tree Protection Zone. Any excavations must be supervised and certified by the Project Arborist in accordance with AS4970 (2009) and as per discussion points in section 9 in part B of this report.

Table 1.0 General condition and Schedule of works of trees or large shrubs. Trees described in greater detail in section 4.0.

Tree No.	*Genus and species*	Common name	Condition G = Good, F = Fair P = Poor, D = Dead W= Weed	Description of work to be done
1	*Corymbia maculata*	Spotted Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
2	*Corymbia maculata*	Spotted Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
3	*Corymbia maculata*	Spotted Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
4	*Corymbia maculata*	Spotted Gum	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
5	*Melaleuca quinquenervia*	Broad Leafed Paperbark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
6	*Eucalyptus sp.*	Eucalypt	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
7	*Eucalyptus crebra*	Narrow Leaved Red Ironbark	F	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
8	*Corymbia maculata*	Spotted Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
9	*Corymbia maculata*	Spotted Gum	G	Retain and protect within a Tree Protection Zone (TPZ) as per the Tree Protection Plan.
10	*Corymbia maculata*	Spotted Gum	G	Remove and replace with by new plantings as per Landscape Plan

4.0 TREE ASSESSMENT – 7.1 - Assessment of a stand of Trees

Tree No.	*Genus & Species* Common Name	Age Y = Young M = Mature O = Overmature	Vigour GV = Good Vigour LV = Low Vigour	Condition G = Good F = Fair P = Poor D = Dead	1. SRIV Age, Vigour, Condition / Index Rating www.iaca.org.au / 2. Estimated Life Expectancy 1. Long 2. Medium 3. Short	Crown Form D = Dominant C = Co-dominant I = Intermediate S = Suppressed F = Forest E = Emergent	Ht. Approx. metres	Crown Spread approx. metres / Orientation R = Radial, or other	Crown Symmetry 1 = symmetrical 2 = asymmetrical / Orientation	Crown Cover % / Crown Density % / D = dormant	DBH in mm @ 1.4m, or other, as indicated / Trunk Orientation other than R = radial, e.g. N/S g = ground	Trunk Lean 1 = Upright-Slight 2 = Moderate 3 = Severe 4 = Critical. 5 = Acaulescent / Orientation / ST = Static P = Progressive Sc = Self-correcting	Roots Evident at Root Crown 1. = None 2. = Adventitious 3. = Basal Flare 4. = Buttresses 5. = First Order Roots (FOR), No. & distribution e.g. R = radial, or one each to N, S, E and W	Pests, Diseases & Damage No or Yes If Yes see comments	Branch Bark Included No or Yes or N/A	Form G = Good Form P = Poor Form	Significance scale 1=High 2=Medium 3=Low / Retention Value 1=High 2=Medium 3=Low 4=Remove
1	*Corymbia maculata*	M	GV	G	MGVG – 10 1	D	12	3 R	1	70 70	200 R	1/R ST	1	NO	NO	P	1 1
	Spotted Gum	Comment: Trunk to 6 metres then bifurcate, crown deliquescent, orientation radial, symmetrical.															
2	*Corymbia maculata*	M	GV	G	MGVG – 10 1	D	9	2 R	1	70 70	300 R	1/R ST	1	NO	NO	G	1 1
	Spotted Gum	Comment: Trunk to 2 metres, crown deliquescent, orientation radial, symmetrical.															
3	*Corymbia maculata*	M	GV	G	MGVG – 10 1	D	9	2 R	1	70 70	300 R	1/R ST	1	NO	NO	P	1 1
	Spotted Gum	Comment: Trunk to 3 metres then bifurcate, crown deliquescent, orientation radial, symmetrical.															
4	*Corymbia maculata*	M	GV	F	MGVF - 9 1	D	12	2 R	1	70 70	300 R	1/R ST	1	NO	YES	P	1 1
	Spotted Gum	Comment: Trunk to 4 metres then trifurcate with possible inclusion in branch union, crown deliquescent, orientation radial, symmetrical.															
5	*Melaleuca quinquenervia*	M	GV	F	MGVF - 9 1	D	7	7x5 N/S	2/S	60 60	600 R	1/R ST	1	NO	NO	G	1 1
	Broad Leafed Paperbark	Comment: Trunk to 1 metre, crown deliquescent, orientation radial, symmetrical.															
6	*Eucalyptus sp.*	M	GV	F	MGVF - 9 1	D	7	3 R	1	60 60	600# @ g R	5/R ST	1	NO	NO	P	1 1
	Eucalypt	Comment: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical.															
7	*Eucalyptus crebra*	O	LV	F	OLVF - 2 2	D	12	4 R	1	40 70	840# @ g R	5/R ST	1	YES	NO	P	2 2
	Narrow Leaved Red Ironbark	Comment: Acaulescent or short trunk @ or near ground, crown deliquescent, orientation radial, symmetrical. Major deadwood throughout crown, required deadwooding.															
8	*Corymbia maculata*	M	GV	G	MGVG – 10 1	D	7	2 R	1	70 70	200 R	1/R ST	1	NO	NO	G	1 1
	Spotted Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
9	*Corymbia maculata*	M	GV	G	MGVG – 10 1	D	9	3 R	1	70 70	300 R	1/R ST	1	NO	NO	G	1 1
	Spotted Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															
10	*Corymbia maculata*	M	GV	G	MGVG – 10 1	D	10	2 R	1	70 70	300 R	1/R ST	1	NO	NO	G	1 1
	Spotted Gum	Comment: Trunk erect, straight, gradually tapering & continuous, crown excurrent.															

Observations

4.2 The site has a stand of mature or senescent, planted endemic and non-locally indigenous taxa within the current proposal. There specimens to be retained are considered significant for their contribution as landscape elements to the property and the retention of these nine (9) trees allows them as components of the current curtilage to be transferred to the new proposal, maintaining elements of a continuous landscape, providing a more harmonious integration and transition of the use of the land. The other specimen was within the proposed building envelope and is not able to be retained. It is recommended for removal and replacement with super advanced specimens in 75 or 100 litre bags size stock within more appropriate positions within the streetscape. Replacement of these specimens needs to be mindful of their spatial requirements to allow them to grow to maturity and not be impeded by the built structure.

Tree Significance

4.3 Significant Trees as established by the Rating System for Tree Significance – IACA Stars (2010), Appendix A.

Significance Scale
1 – High
2 – Medium
3 – Low

Significance Scale	1	2	3
Redgum Tree No.	1, 2, 3, 4, 5, 6, 8, 9, 10	7	

Tree Retention Value

4.4 See Appendix A for Retention Value Matrix.

Retention Value
High – Priority for Retention
Medium – Consider for Retention
Low – Consider for Removal
Remove - Priority for Removal

Retention Value	High Priority for. Retention	Medium Consider for Retention	Low Consider for Removal	Remove Priority for. Removal
Redgum Tree No.	1, 2, 3, 4, 5, 6, 8, 9, 10	7		

4.5 AS4970 (2009) section 3, 3.3.3 requires the Project Arborist to demonstrate that where a retained tree is subject to a major encroachment (>10% of area of TPZ) it can be protected to remain viable

4.6 Tree 1, 2 & 3 *Corymbia maculata* - Spotted Gum, these specimens were found in fair health & good vigour at time of assessment.

- *Development Impacts:* AS4970 (2009) section 3 requires a Tree Protection Zone (TPZ) setback of 2.4 metres (m) for Tree (T)1 & 3.6m for T2 & T3 from centre of trunk (COT), the setback for the proposed car park adjacent to these specimens are estimated at 2.5m for T1 & >4.0m for T2 & T3 from COT, which is not an encroachment by the proposed development. *These specimens are sufficiently setback from the development to not be affected.*

4.7 Tree 4, 5 & 6 *Eucalyptus sp.* – Eucalypt, all specimens were found in fair health & good vigour at time of

- *Development Impacts:* AS4970 (2009) section 3 requires a TPZ setback of 3.6m for T4 & 7.2m for T5 & T6 from COT, the setback for the proposed car park adjacent to these specimens are estimated at >7.5m from COT, which is not an encroachment by the proposed development. *These specimens are sufficiently setback from the development to not be affected.*

4.8 Tree 7 *Eucalyptus crebra* - Narrow Leaved Red Ironbark, this overmature specimen was found in poor health & low vigour at time of assessment.

- *Development Impacts:* AS4970 (2009) section 3 requires a TPZ setback of 8.9m from COT, the setback for the proposed car park adjacent to this specimen is estimated at >8.0m from COT, which is not an encroachment by the proposed development. *This specimen is sufficiently setback from the development to not be affected.*

4.9 Tree 8 & 9 *Corymbia maculata* - Spotted Gum; both specimens were found in good health & vigour at time of assessment.

- *Development Impacts:* AS4970 (2009) section 3 requires a TPZ setback of 2.4m for T8 & 3.6m for T9 from COT, the setback for the proposed car park adjacent to these specimens are estimated at >4.0m from COT, which is not an encroachment by the proposed development. *These specimens are sufficiently setback from the development to not be affected.*

Demolition and Tree Removal/s

4.10 Tree 10 is to be removed as it is located within the site in a position where it cannot be retained due to the proposed car park footprint and associated infrastructure where encroachment will have an adverse impact on its roots and crown for viability and stability.

- Tree 10: *Corymbia maculata* - Spotted Gum; located within the site and positioned within the proposed car park footprint. This specimen is recommended to be removed and replaced as it cannot be retained due to the proposed carpark footprint.

4.11 Removal of a tree within 6 m 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 20 mm 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 using 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.

Specific - Tree works – Post Construction

4.12 Trees to be removed are to be replaced with advanced specimens being mindful of the space limitations of the new use of the site. The advanced trees should be situated in areas along the boundaries of the site. The planting in these locations will provide the maximum benefit to the surrounding properties by screening views to and from the site and the plantings included in the proposed landscape plan. The replacement trees will be situated in positions where they may grow to maturity unhindered and will not conflict with built structures or utility services and in greater numbers than the trees removed should provide a net increase in the local amenity.

5.0 CONCLUSION

One (1) tree is nominated for removal and replacement with species in accordance with the associated Landscape documentation for the development. The nine (9) trees to be preserved will be retained and protected through the implementation of adequate measures for their integration into the development by the application of appropriate technology as detailed in this report. Where appropriate, the Landscape Plan will include planting with new trees including street tree/s.

<u>The recommendations made in this report are subject to approval by the consent authority.</u>

6.0 RECOMMENDATIONS

9.1 Trees 1 to 9 are to be retained in situ within the site and are to be protected as detailed in 4.5 – 4.9. and Section 9 of part B of this report. Tree protection fences, or works, to be situated in accordance with *Site Plan B - Trees to be Retained and Tree Protection Zones* (Appendix F). *See Tree Protection Plan for additional protection measures for the management of retained specimens.*

9.2 Tree 10 is to be removed which is to be undertaken in accordance with 4.10 - 4.11 of this report.

9.3 Each of the replacement are to be a vigorous specimen with a straight trunk, gradually tapering and continuous, crown excurrent, symmetrical, with roots established but not pot bound in a volume container or approved similar and be maintained by an appropriately qualified and experienced landscape contractor for up to one (1) year after planting, or as appropriate.

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Horticulture Certificate; 1984
Urban Pest Control Certificate; 1983

Member of: Institute of Australia Consulting Arboriculturists (IACA), 2003
International Society of Arboriculture (ISA), 2005
& Australian Institute of Horticulture (AIH) 2005

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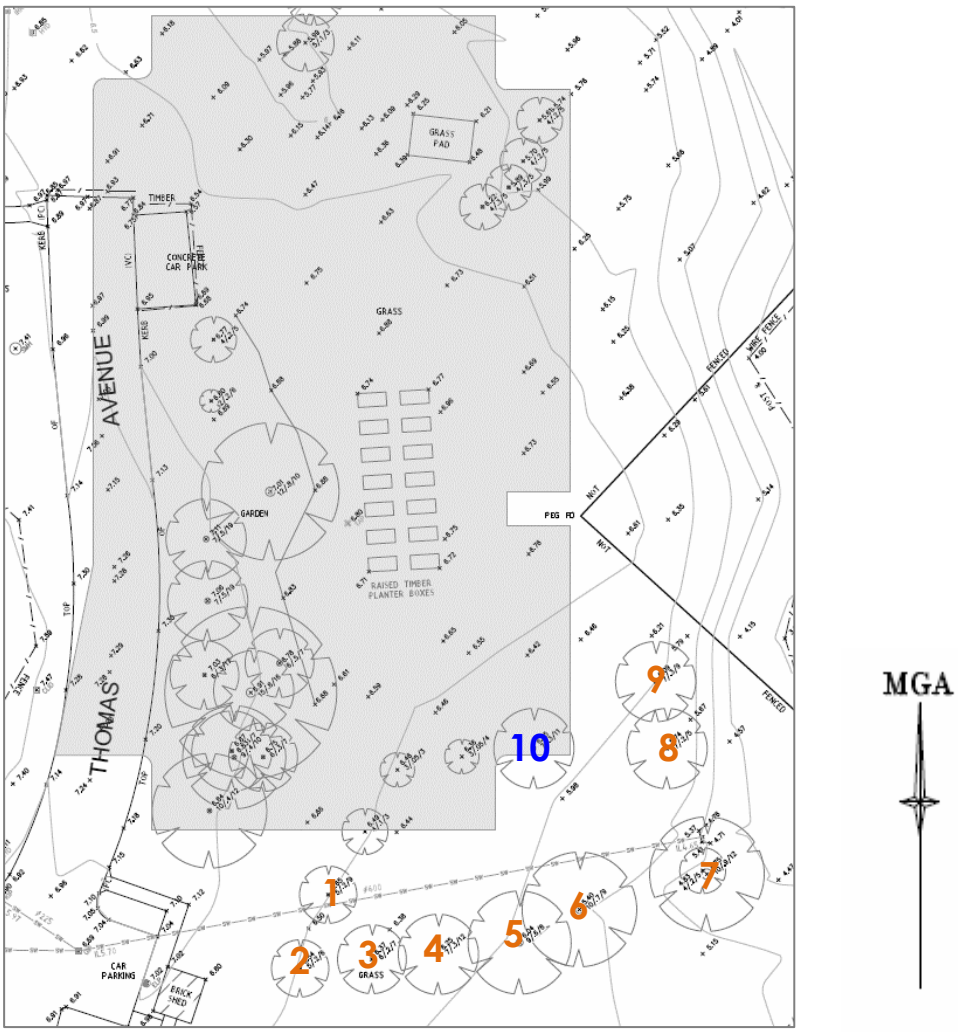
1. Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.
2. IACA 2005, Sustainable Retention Index Value, *Institute of Australian Consulting Arboriculturists*, Australia, www.iaca.org.au .
3. Standards Australia 2007, *Australian Standard 4373 Pruning of amenity trees*, Standards Australia, Sydney, Australia.
4. Standards Australia 2009, *Australian Standard 4970 Protection of trees on development sites*, Standards Australia, Sydney, Australia.
5. Work Cover NSW 2007, *Code of Practice Tree Work*, New South Wales Government, Australia.

Appendix C
Survey of Subject Tree/s

Trees the subject of this report are marked on the plans in the following appendices and are numbered as listed below. This report has relied upon the following plan/s and documents which have been reproduced from electronic transmission and no longer to original scale.

Redgum Tree No.	*Genus and species*	Common name	Recommendation
1	*Corymbia maculata*	Spotted Gum	Retain and protect
2	*Corymbia maculata*	Spotted Gum	Retain and protect
3	*Corymbia maculata*	Spotted Gum	Retain and protect
4	*Corymbia maculata*	Spotted Gum	Retain and protect
5	*Melaleuca quinquenervia*	Broad Leafed Paperbark	Retain and protect
6	*Eucalyptus sp.*	Eucalypt	Retain and protect
7	*Eucalyptus crebra*	Narrow Leaved Red Ironbark	Retain and protect
8	*Corymbia maculata*	Spotted Gum	Retain and protect
9	*Corymbia maculata*	Spotted Gum	Retain and protect
10	*Corymbia maculata*	Spotted Gum	Remove and replace

Appendix C - Site Plan A – Survey of Subject Trees



Legend

- Trees numbered in **orange** are recommended for **retention**.
- Trees numbered in **blue** are recommended for removal.

Note: trees indicated unnumbered are either shrubs, or trees of species, of dimensions not included within the scope of works for this report.

Plan Details

Plan of Detail & Level Survey of part of Lot 152 DP 717956, Ref No: 41409DT, Sheet 8 of 9, Issue E, Date 12/05/2017, Scale 1:200 @ A1 by LTS Lockley, Locked Bag 5 Gordon NSW 2072. T: 1300 587 000

Part B:
TREE PROTECTION PLAN
ADDENDUM
(Trees to be retained and protected)

For

HammondCare
68-82 Stewart Avenue
(Thomas Avenue),
Hammondville NSW

Prepared 8 August 2017
Our Reference 2534.2

7.0 PREFACE

Retention of Significant Tree/s within the continual landscape of a development is recommended to minimise the impact of the built landscape within the overall local amenity. This section of the report highlights the required specifications within the Tree Protection Plan (Tree Management Plan) and is to be read in conjunction with Part A: Arboricultural Impact Assessment of this report.

8.0 INTRODUCTION

8.1 This section of the report provides the specification/s for all tree/s to be retained (on subject site) as detailed in Part A – Arboricultural Impact Assessment.

8.2 The trees to be retained are indicated on the Site Plan - Survey of Subject Trees to be retained & Tree Protection Zones. The minimum setback for protective fencing from development works per tree to be retained is summarized in Table 1.0. Tree Protection Specifications including - Site maintenance, Site Arboricultural service, Periodic inspections, Mulching, Irrigation, Weed control / suppression, Provision of services.

8.3 Tree maintenance works including pruning, removal or transplantation are detailed in section 2.0. Works for Tree Protection on Construction Sites are detailed in section 3.0 and Tree Protection Zones a Standard Procedure as detailed in section 13.0 to be applied, or further detailed, or additional or alternative works added where appropriate.

9.0 SUMMARY: Tree Protection Plan

This Tree Protection Plan recommends; Trees 1 to 9 to be retained and protected within the development for the duration of construction works. For Tree 1 to 9, the alignment of the development is sufficiently setback to not affect these specimens.

Discussion

9.1 *AS4970 (2009) section 3, 3.3.3 requires the Project Arborist to demonstrate that where a retained tree is subject to a major encroachment (>10% of area of TPZ) it can be protected to remain viable*

9.2 Tree 1, 2 & 3 *Corymbia maculata* - Spotted Gum, these specimens were found in good health & vigour at time of assessment.

- *Trees viability to development; these specimens are not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. These specimens should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts:* AS4970 (2009) section 3 requires a Tree Protection Zone (TPZ) setback of 2.4 metres (m) for Tree (T)1 & 3.6m for T2 & T3 from centre of trunk (COT), the setback for the proposed car park adjacent to these specimens are estimated at 2.5m for T1 & >4.0m for T2 & T3 from COT, which is not an encroachment by the proposed development. *These specimens are sufficiently setback from the development to not be affected.*

9.3 Tree 4, 5 & 6 *Eucalyptus sp.* – Eucalypt, all specimens were found in fair health & good vigour at time of assessment.

- *Trees viability to development; these specimens are not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. These specimens should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts:* AS4970 (2009) section 3 requires a TPZ setback of 3.6m for T4 & 7.2m for T5 & T6 from COT, the setback for the proposed car park adjacent to these specimens are estimated at >7.5m from COT, which is not an encroachment by the proposed development. *These specimens are sufficiently setback from the development to not be affected.*

9.4 Tree 7 *Eucalyptus crebra* - Narrow Leaved Red Ironbark, this overmature specimen was found in poor health & low vigour at time of assessment.

- *Trees viability to development; this specimen is not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. This specimen should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts:* AS4970 (2009) section 3 requires a TPZ setback of 8.9m from COT, the setback for the proposed car park adjacent to this specimen is estimated at >8.0m from COT, which is not an encroachment by the proposed development. *This specimen is sufficiently setback from the development to not be affected.*

9.5 Tree 8 & 9 *Corymbia maculata* - Spotted Gum; both specimens were found in good health & vigour at time of assessment.

- *Trees viability to development; these specimens are not impacted by the proposed development. The project arborist is to certify that installation of protection measures have been installed as per D/A conditions prior to commencement and works are to be monitored throughout the project at approx. 3 mthly intervals depending on the length of the development. These specimens should remain viable beyond completion of development provided recommended installation & protection measures are adhered to.*

- *Development Impacts:* AS4970 (2009) section 3 requires a TPZ setback of 2.4m for T8 & 3.6m for T9 from COT, the setback for the proposed car park adjacent to these specimens are estimated at >4.0m from COT, which is not an encroachment by the proposed development. *These specimens are sufficiently setback from the development to not be affected.*

If associated infrastructure (pipe works) are to be installed within the Tree Protection Zone of any retained specimen, they are to be installed by hand with non-motorised machinery. If structural roots are found within the trench, they are to be left intact and dug around retaining this specimen's structural integrity. Works are to be undertaken in consultation with the project arborist.

These specimens are sufficiently set back from the development to not be impacted. They are to be retained and protected as per AS 4970 (2009) Section 3, for any works within the Tree Protection Zone. Any excavations must be supervised and certified by the Project Arborist in accordance with AS4970 (2009) and as per discussion points in section 9 in part B of this report.

General – Tree Protection works – Prior to Demolition

9.6 *Milestones* – Prior to demolition works, a site arborist shall be appointed to supervise all tree protection procedures detailed in this specification. The Site Arborist shall have a minimum level 5 AQF qualification in Arboriculture. Milestones are to be adhered to throughout the duration of this development and all relevant documentation is to be submitted to the local authority.

9.7 The Tree Protection Zone for each tree/s is to be incorporated into the construction works for the site and the protection fencing or works to be situated as indicated on the Appendix F – Tree Protection Plan. The setbacks from building works on the side closest to each tree are to be carried out as indicated in Table 2.0, and Tree Protection Zones be constructed as described here and detailed in Appendix D. The trees will be sustained within the constraints of the modifications to the site by the proposed development works.

9.8 Trees 1 to 9 are to be retained and protected and incorporated into the landscape works for the site, and Tree Protection Zone fencing to be marked accordingly on the Landscape Plan, where appropriate and installed prior to any demolition or construction.

9.9 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. These measures may be applied to root zones beyond the TPZ.

9.10 Where applicable, any excavation for the establishment of a batter slope or benching for reasons of safety and to comply with Work Cover Authority safety regulations should be restricted as far as is safely possible near to trees to be retained to prevent root damage. If the excavations cannot be undertaken near to vertical the stability of these trees and their long-term viability may be compromised and their retention in a safe and healthy condition jeopardized and they may need to be revised and possibly removed.

Specific - Tree Protection Works - Prior to Demolition and Tree Removal

9.11 All other trees/shrubs; prior to demolition and tree removal works these tree/s are to be placed within a Tree Protection Zone with protective fencing and maintained and retained until the completion of all building works. Protective fencing is to be installed as shown in Appendix F - Tree Protection Plan.

- *The Protective fencing where required may delineate the **Tree Protection Zone (TPZ)** and should be situated 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" or similar.*
- *Tree Protection signage is to be attached to each **TPZ** and displayed from within the development site in accordance with AS4970 2009 Protection of trees on development sites*
- *The area of the Tree Protection Zone to be mulched to a depth of 100 mm 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. Where deep excavation will expose the soil profile to drying out the root plate is to be protected by pegging jute matting across the ground surface 2 m back from the edge of the profile and 2 m down the face of the profile and is to be in one continuous sheet or layers up to 5 mm thick and overlapped 300 mm and pegged. Pegs are to be a minimum length of 200 mm and spaced at 500 mm increments in a grid pattern. Once installed mulch is to be placed on top of the jute matting previously described.*

9.12 There is to be no storage of materials, rubbish, soil, equipment, structures or goods of any type to be kept or placed within 5 metres from the trunk or within the dripline of any tree for the duration of the development. This will ensure protection of the tree/s to be retained on or adjacent to site.

9.13 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens prior to demolition to inspect tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

Demolition and Tree Removal/s

9.14 Removal of a tree within 6 m 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 20 mm 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.

9.15 Ground protection in accordance with AS4970 section 4, 4.5.3 may require steel plates to protect the ground surface from compaction to protect roots between the stages of demolition and construction of the new pavement.

Specific - Tree Protection works – Post Demolition and Prior to Construction

9.16 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens prior to construction in relation to tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

9.17 Location of underground utilities within a Tree Protection Zone of a retained specimen.
Any utility services to be situated underground within the TPZ are to be undertaken utilising excavation techniques that prevent or minimise damage to structural roots (roots greater than >20 mm diameter). To prevent soil compaction and root damage these works should be conducted with non-motorised hand tools, air knife or directional drilling.

9.18 Re-grading of site near retained trees; Grading &/or re-grading of sites/slopes within Tree Protection Zones or near retained specimens is to be undertaken **only** if at all, after consultation with the Project Arborist. This is to protect all structural roots systems from damage or compaction from machinery.

9.19 Placement of relocatable buildings; consideration should be given to tree sensitivity such as the buildings being placed on pier and beam or skids construction as they are to be positioned now on the eastern side of their driplines within the Tree Protection Zone (TPZ). The area of the Tree Protection Zone under the buildings is to be mulched to a depth of 200 mm (*if installed on skids*) with organic material to further reduce compaction. The mulch is to be composted material, i.e. species-specific mulch. Alternatively, if installed on a pier & beam construction, piers are to be undertaken manually by using non-motorized hand tools to determine the location of first order and lower order structural roots with a diameter of 20 mm (*structural woody roots*) or greater, without damaging them.

Specific - Tree Protection works – During Construction

9.20 *Milestone* - Project/Site arborist is to inspect/assess all retained specimens during construction in relation to tree protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

9.21 Where any structural roots (roots with a diameter of greater than >20 mm) encountered by excavation are to be pruned and it is to be undertaken with clean sharp pruning tools, with a final cut to undamaged wood to prevent infestation by pathogens and assist continued root growth and undertaken in consultation with the Consulting Arboriculturist. Tree Protection Zone fences are to be maintained during these works. Ground protection in accordance with AS4970 section 4, 4.5.3 may require steel plates to protect the ground surface from compaction to protect roots between the stages of demolition and construction of the new pavement.

9.22 All Tree Protection Zones of retained trees are to be monitored for the duration of the construction phase of the development. The three main areas requiring monitoring are; *mulching* - mulch must be maintained to a depth of 50–100 mm using material that complies with AS 4454. Where the existing landscape within the TPZ is to remain unaltered (e.g. garden beds or turf) mulch may not be required, *watering* - soil moisture levels should be regularly monitored by the project arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system could be installed and maintained by a competent individual and *weeding* - weeds should be removed by hand without disturbing soil or should be controlled with weedicide.

9.23 Trees to be removed are to be replaced with advanced specimens being mindful of the space limitations of the new use of the site. The advanced trees should be situated in areas along the boundaries of the site. The planting in these locations will provide the maximum benefit to the surrounding properties by screening views to and from the site and the plantings included in the proposed landscape plan. The replacement trees will be situated in positions where they may grow to maturity unhindered and will not conflict with built structures or utility services and in greater numbers than the trees removed should provide a net increase in the local amenity.

Specific - Tree Protection works – Post Construction

9.24 *Milestone* - At completion of construction work the Site/Project Arborist should carry out an assessment of all trees retained &/or affected by works. This assessment is to document and any required on-going remedial care needed to ensure viable retention of trees affected. Documentation is to be submitted to the consenting authority.

10.0 CONCLUSION

One (1) tree is nominated for removal and replacement with species in accordance with the associated Landscape documentation for the development. The nine (9) trees to be preserved will be retained and protected through the implementation of adequate measures for their integration into the development by the application of appropriate technology as detailed in this report. Where appropriate, the Landscape Plan will include planting with new trees including street tree/s.

If all the recommendations and procedures detailed herein are adhered to, some or all the trees the subject of this report will continue, or will be replaced with more appropriate plantings in suitable locations, or enhanced by additional new plantings, and will grow to develop as important landscape components providing elements of long term amenity for the property and its owners or occupants, and the local community.

The recommendations made in this report are subject to approval by the consent authority.

11.0 RECOMMENDATIONS – Retention

11.1 Trees 1 to 9 are to be retained in situ within the site and are to be protected as detailed in 9.2 - 9.24 of Part B of this report. Tree protection fences, or works, to be located in accordance with *Site Plan B – Trees to be Retained and Tree Protection Zones* (Appendix F).

11.2 Where Tree Protection Zone fences are to be moved or relocated this must be undertaken in consultation with the Consultant Arboriculturist for the project to ensure that tree protection is maintained. If the fences are relocated areas are to be mulched in accordance with 9.11 of this report to reduce compaction to the root system of the retained specimens.

11.3 To minimise damage to retained crowns, all Tree Protection Zones are to be adhered to. This must be undertaken in consultation with the Consultant Arboriculturist for the project to ensure that tree protection is maintained. Minor pruning may be required if damage occurs from asphalt installation, work to undertaken in accordance with section 4 of this report.

11.4 *Milestones* - Project/Site arborist is to inspect/assess all retained specimens prior to Demolition and Tree Removal, Post Demolition, Prior to Construction during Construction and on completion in relation to trees protected and the protection measures have been carried out as per the approved D/A conditions for the site. Documentation is to be submitted to the consenting authority after each inspection.

11.5 Any work to be undertaken within Tree Protection Zones is to be undertaken in accordance with 11.2 of this report.

11.6 Tree removal near retained specimens is to be undertaken in accordance with 9.14 of this report.

11.7 There is to be no storage of materials, rubbish, soil, equipment, structures or goods of any type to be kept or placed within 5 metres from the trunk or within the dripline of any tree for the duration of the development. This will ensure protection of the tree/s to be retained on or adjacent to site.

11.8 Each of the replacement are to be a vigorous specimen with a straight trunk, gradually tapering and continuous, crown excurrent, symmetrical, with roots established but not pot bound in a volume container or approved similar and be maintained by an appropriately qualified and experienced landscape contractor for up to one (1) year after planting, or as appropriate.

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International Society of Arboriculture (ISA), 2005
& Australian Institute of Horticulture (AIH) 2005

Appendix F

Survey of Subject Tree/s

Trees the subject of this report are marked on the plans in the following appendices and are numbered as listed below.

Redgum Tree No.	*Genus and species*	Common name	Recommendation
1	*Corymbia maculata*	Spotted Gum	Retain and protect
2	*Corymbia maculata*	Spotted Gum	Retain and protect
3	*Corymbia maculata*	Spotted Gum	Retain and protect
4	*Corymbia maculata*	Spotted Gum	Retain and protect
5	*Melaleuca quinquenervia*	Broad Leafed Paperbark	Retain and protect
6	*Eucalyptus sp.*	Eucalypt	Retain and protect
7	*Eucalyptus crebra*	Narrow Leaved Red Ironbark	Retain and protect
8	*Corymbia maculata*	Spotted Gum	Retain and protect
9	*Corymbia maculata*	Spotted Gum	Retain and protect
10	*Corymbia maculata*	Spotted Gum	Remove and replace

Table 2.0 This table only applies to trees being retained. Tree Protection Zone fencing locations 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). Tree Protection Zone fences and setbacks where applicable are indicated in Appendix F.

1. Redgum Tree No.	2. **S**tructural **R**oot **Z**one **SRZ (DARB)** From centre of trunk (COT) **D**iameter **A**bove **R**oot **B**uttress AS4970 2009 Section 3, 3.3.5 (see Appendix D) where applicable (Minimum 1.5 metres)	3. **T**runk **D**iameter at **B**reast **H**eight **DBH** 1.4m above ground, AS4970 2009, or mm or m above ground where indicated. # = average. g = ground	4. **T**ree **P**rotection **Z**one (**TPZ**) = **12 x DBH** From centre of trunk (COT) in metres AS4970 2009Section 3 (see Appendix D) (Minimum 2.0 metres)	5. Distance of fence with TPZ setback **(reduced by 10% of area of TPZ)** in metres as per AS4970 2009 Section 3, 3.3 (Minimum 2.0 metres)	6. Proposed distance of tree protection fence/works on the side closest to building construction[2], in metres by Redgum Horticultural.
1	1.7	200	2.4	2.2	2.4
2	2.0	300	3.6	3.2	3.6
3	2.0	300	3.6	3.2	3.6
4	2.0	300	3.6	3.2	3.6
5	2.7	600	7.2	6.5	7.2
6	2.7	600	7.2	6.5	7.2
7	2.9	740	8.9	8.0	8.9
8	1.7	200	2.4	2.2	2.4
9	2.0	300	3.6	3.2	3.6

Descriptors for modified setbacks in Column 6.

1 Special conditions apply to protect the roots of trees generally.
2 Additional protective fencing information is detailed in attached plans.
3 Acceptable due to the good relative tolerance of the species to development impacts.
4 Range of setbacks for the trees at each end of a linear stand are to be calculated if required.
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 Section 5.0 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 works.
11 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 good 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 20 mm or more.
15 Acceptable as a specimen of palm taxa tolerant of encroachment.
16 Acceptable as excavation on down slope or across slope side of tree.
17 Acceptable as encroachment into growing area below ground minor, with one corner of building or excavation works extending to within the radius of the dripline.
18 Acceptable as encroachment by pier, including screw piles, with minimal disturbance.
19 Acceptable as encroachment above grade without excavation or sub-base compaction.
20 Acceptable as located within 0.5 m from edge of dripline.
21 Acceptable as encroachment with gap graded fill that can accommodate gaseous exchange between roots/soil and the atmosphere and ongoing root growth.
22 Minimum setback 2 m, AS4970 (2009) section 3, 3.2.
23 Maximum setback 15 m, AS4970 (2009) section 3, 3.2.
24 Tree is a palm, other monocot, cycad or tree fern TPZ is to be 1 m outside crown projection AS4970 (2009) section 3, 3.2.
25 Minimum Structural Root Zone (SRZ) for trees less than 0.15 m diameter is 1.5 m, AS4970 (2009) section 3, 3.5.

Explanatory notes for Table 4.0.

This table is based upon Australian Standard AS4970 2009 *Protection of trees on development sites*, Section 3 Determining the protection zone of the selected trees (see Appendix D), where the approved building works should be no closer, including excavation, than the dimensions stated above.

"3.3 Variations to the TPZ

3.3.2 Minor Encroachment - *If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.*

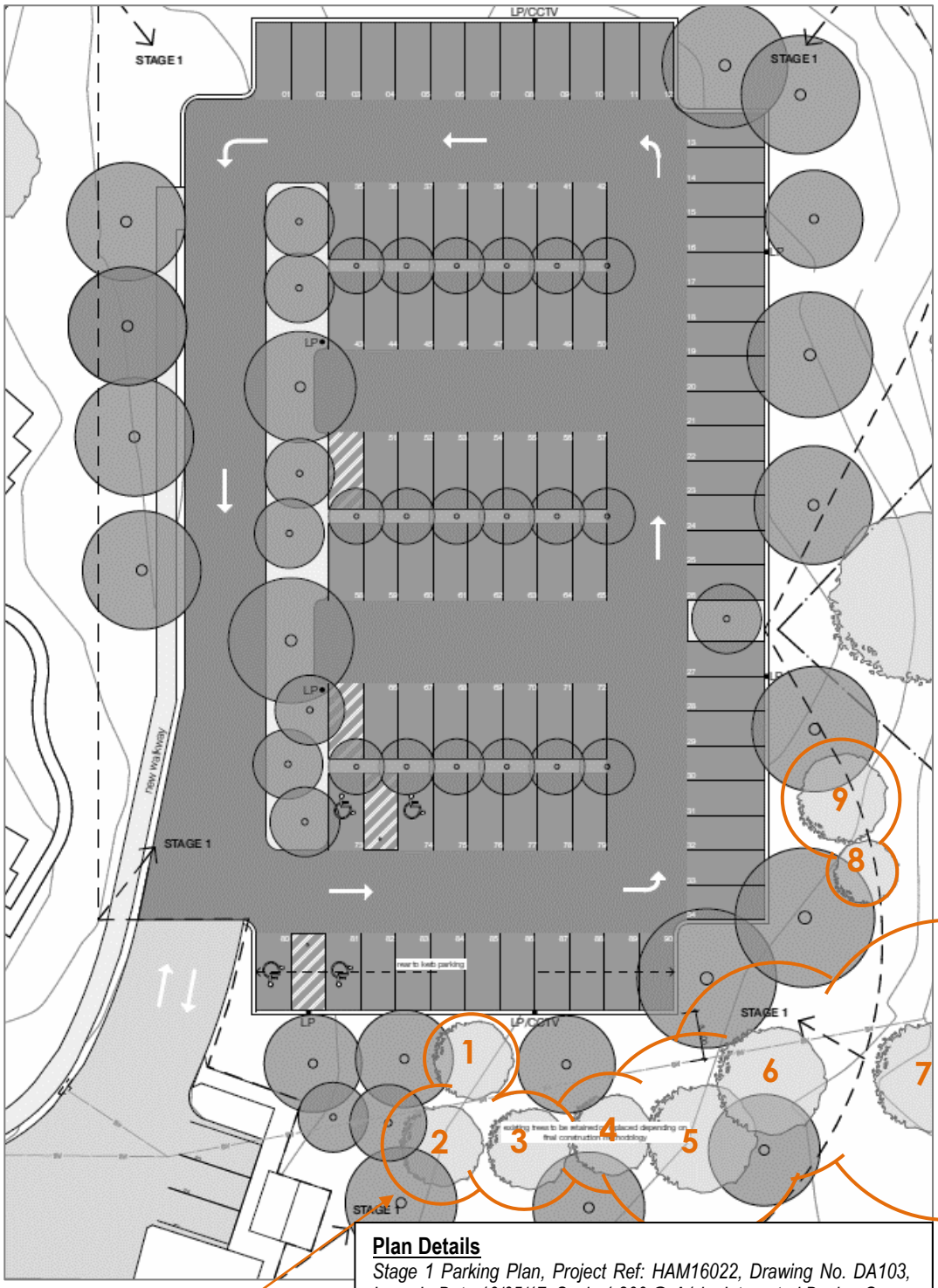
3.3.3 Major Encroachment

If the proposed encroachment is greater than 10% of the area of the TPZ or inside the SRZ the project arborist must demonstrate that the tree(s) would remain viable. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ."

Appendix F

Site Plan - Survey of Subject Trees to be Retained & Tree Protection Zones

This report has relied upon the following plan/s and documents which has been reproduced from electronic transmission and no longer to original scale.



Plan Details

Stage 1 Parking Plan, Project Ref: HAM16022, Drawing No. DA103, Issue L, Date 10/05/17, Scale 1:200 @ A1 by Integrated Design Group Pty Ltd, Sydney T: 02 9764 6100 E: sydney@idgarchitects.com.au

Indicative location of Tree Protection fencing which is to be measured on site and positioned along the Tree Protection Zone, excavation zone or proposed building footprint and to remain installed for the duration of the development. Installation of boundary fences within rootzone to be of pier and beam construction. All works to be carried out within the Tree Protection area after works commences is to be undertaken in consultation with site arboriculturist.

Legend

Tree Protection Zone (TPZ), fencing with setbacks as indicated, or other protection measures or works as indicated.

Tree numbers – trees to be retained only.
Subject trees represented by the approximate location of the trunk.