



ARBORICULTURAL IMPACT ASSESSMENT

Bigge Street Developments
c/- CV McNally
17- 25 Bigge Street,
LIVERPOOL

25th February, 2016

Report Reference: AIA – BSD 02/16

Prepared by:

Sam Allouche

Diploma of Arboriculture (Cert. V)

Cert IV in Horticulture (Arboriculture)

Member of Arboriculture Australia | Member of International Society of Arboriculture



Table of Contents

1.0	Introduction	3
2.0	Methodology.....	3
3.0	Observations	4
3.1	Site Observations	4
3.2	Tree Assessment	6
5.0	Construction Impacts.....	12
5.1	Direct Impacts	12
5.2	Indirect Impacts	16
6.0	Conclusion & Recommendations.....	17
	Appendix A	19
	Site Map	19
	Appendix B	21
	Table 3.2 Definitions & Descriptors	21
	Appendix C	22
	IACA Significance of a Tree, Assessment Rating System (STARS) (IACA 2010)©	22
	Appendix D.....	24
	Hazard Rating Scale	24
	Appendix E	25
	Tree AZ Categories (Version 10.10 ANZ).....	25
	Appendix F	26
	Glossary of Terms	26
	Disclaimer.....	28
	Bibliography	29

1.0 Introduction

- I. This Arboricultural Impact Assessment (AIA) was commissioned by CV McNally on behalf of Bigge Street Developments P/L, proprietors of 17-25 Bigge Street, Liverpool, with respect to trees potentially upon by the redevelopment of these sites for high density residential living.
- II. The Arboricultural Assessment takes into account a total of thirty three (33) trees, hereon referred to as T1 – T33, including trees confined within the site boundaries of the above properties as well as those on adjoining land but potentially affected by the proposal.
- III. An Impact Assessment is undertaken and all trees will be assessed with direct reference to guidelines as stipulated in the Australian Standard – *Protection of trees on development sites* (AS 4970-2009). This includes the establishment of Tree Protection Zones (TPZ), and the calculation of Structural Root Zones (SRZ) where required.
- IV. In consultation with clients and architects, plan changes are endorsed to minimise impact to particular trees given their worthiness for long term retention. Where for varied reasons, trees are not to be retained, they are recommended for removal or transplantation where viable.

2.0 Methodology

- I. A Visual Tree Assessment (VTA) was conducted on all trees, at ground level only, on 30th June 2015, 2nd July 2015, 21st July 2015, January 4th 2016 and February 17th 2016.
- II. No aerial inspections carried out nor were a subterranean investigation undertaken.
- III. All dimensions are estimated by diameter tape or by eye sight.
- IV. Where trees are located on sites and not under the client's authority, observations were limited to over the fence, with data collected being limited for assessment. Trunk diameters were estimated at fence height only (2 metres high)
- V. Weather conditions on the days of assessment were optimal and data was collated with no interference.
- VI. Trees physical characteristics are noted by the Arborist, including age, vigour and crown characteristics, general health and condition, defects and the presence of pest and disease. Findings are tabled in Table 1 - Tree Assessment. This is to be read in conjunction with Appendix B- Table 3.2 Definitions and Descriptors.

- VII. Table 3.2 also details a Hazard Rating that quantifies any risks associated with the trees, an appraisal of trees with reference to Tree AZ; determination of the worthiness of trees in the planning process, and a Tree Retention Value (STARS Matrix) that assesses the trees significance and value for retention on the site where development occurs. (Refer to Appendix C, D & E for further clarification of all scales and values)
- VIII. A Site Map is included in Appendix A, using Google imagery, and overlaid by the Arborist based on locating trees from familiar points and scaling onto the drawing. The Arborist is not a registered surveyor and the true position of trees may vary from true location.
- IX. A Glossary of terms is provided (Appendix F) for clarification of Arboricultural terms and meanings
- X. The following documentation was used as part of this assessment;

Plan Type/Document	Provided By	Reference	Date
Basement 1	Rothe Lowman	Job No. 215002 TP 01.03	21.05.2015
Ground Level	Rothe Lowman	Job No. 215002 TP 01.04	21.05.2015
Details & Contour Survey	Land Partners	SY073589-SV1	03.03.2015

3.0 Observations

3.1 Site Observations

- I. The sites are known as Lot 4 DP 13930 (No. 17) and Lots A-D DP 345161 (No. 19-25 respectively), of Liverpool Council.
- II. The sites are five (5) consecutively adjoining lots and locate on the western side of Bigge Street, predominantly facing east.
- III. All sites and currently accommodate either freestanding dwellings or attached row homes.
- IV. The sites are all zoned R4 High Density Residential, and this degree of redevelopment is evident in the immediate environment with residential flat buildings being constructed in and around the Liverpool CBD.
- V. In situ soil was not formally assessed although exposed/disturbed ground contained to the rear yards indicates heavy clays.

- VI. Topographically the sites share similar characteristics in that reasonably flat with very soft slopes along the whole length span.
- VII. The sites are modestly treed with a variety of species of varying maturity and size. The common boundaries among the sites are lined with *Grevillia robusta* and *Ligustrum sp*, characteristically self-sown urban weeds.

3.2 Tree Assessment

ID	Genus & Species Common Name	DBH (mm)	H (m)	S (m)	Age	Vigour	Condition	Crown Form	Crown Cover Symmetry Orientation	Defects	Pest & Disease	TREES AZ	Hazard	Significant scale Life Expectancy	Retention Value
1	<i>Ficus hillebrandii</i> Hills weeping fig	400	8	8	M	G	F	C	90	BI	NO	Z10	5	M 2	L
		Located in adjoining property of No. 15 . Observations limited, assessment carried from the street footpath													
2	<i>Radermachera sinica</i> China doll	250	8	6	M	G	F	C	80	NO	NO	Z10	5	L 2	L
		Located in adjoining property of No. 15 .Observations limited, assessment carried from the street footpath													
3	<i>Leptospermum sp</i>	400	7	7	M	G	F	C	70 A	NO	NO	Z10	5	L 2	L
		Located in adjoining property of No. 15. Observations limited, assessment carried from the street footpath													
4	<i>Lagerstroemia</i> Crepe Myrtle	300	7	5	M	G	F	D	Dormant	NO	NO	Z1	5	L 2	L
		Located in in the front yard No. 17													
5	<i>Bauhinia sp</i>	220	6	6	M	G	G	D	80	NO	NO	Z1	5	L 2	L
		Located in in the front yard No. 17													

ID	Genus & Species Common Name	DBH (mm)	H (m)	S (m)	Age	Vigour	Condition	Crown Form	Crown Cover Symmetry Orientation	Defects	Pest & Disease	TREES AZ	Hazard	Significant scale Life Expectancy	Retention Value
6	<i>Syzygium Leuhmanii</i> Bush cherry X 6 specimens	100-200	6-7	3-4	M	G	G	Hedge	50	NO	NO	Z10	5	L 2	L
	Located in No. 17														
7	<i>Lagerstroemia</i> Crepe Myrtle	370	7	6	M	G	G	Dormant	-	NO	NO	Z1	5	L 2	L
	Located in No. 19														
8	<i>Callistemon sp</i>	200	8	5	M	G	F	C	90	NO	NO	Z1	5	L 2	L
	Located in front yard of No. 21														
9	<i>Ligustrum lucidum</i> Privet	200	6	5	M	G	G	C	80	NO	NO	Z3	5	L 2	L
	Located in No. 19. Listed as a noxious weed under NSW Department of Primary Industries and Exempt under Tree Preservation Order of Liverpool Council. No further assessment required.														
10	<i>Grevillea robusta</i> Silky Oak	250	14	5	M	F	F	C	70	NO	NO	Z10	5	L 2	L
	Located in No. 19. self-sown														
11	<i>Grevillea robusta</i> Silky Oak	11	12	5	M	F	F	C	80	NO	NO	Z10	5	L 2	L
	Located in No. 19 self-sown														

ID	Genus & Species Common Name	DBH (mm)	H (m)	S (m)	Age	Vigour	Condition	Crown Form	Crown Cover Symmetry Orientation	Defects	Pest & Disease	TREES AZ	Hazard	Significant scale Life Expectancy	Retention Value
12	<i>Shinus ariera</i> Pepper corn tree	600+	9	8	M	F	P	C	50	DB, TO	B	Z10	5	L 3	L
	Located in rear yard of No. 23. Tree in poor condition														
13	<i>Cupressus torulosa</i> Bhutan Cypress pine	600	13	7	M	G	G	D	90+	NO	NO	Z2	5	L 2	L
	Located in the front No. 23														
14	<i>Acacia baileyana</i> Cootamundra wattle	100	4	4	M	F	P	C	60	NO	NO	Z1	5	L 2	L
	Located in No. 23. Exempt under Tree Preservation Order of Liverpool Council. No further assessment required.														
15	<i>Eucalyptus microcorys</i> Tallowwood	300	15	7	M	G	F	C	70 A W	L	NO	Z10	5	L 2	L
	Located in No. 25. Crown lopped and of poor form														
16	<i>Eucalyptus microcorys</i> Tallowwood	380	15	7	M	G	F	C	80+ A W	BI L	NO	Z10	5	L 2	L
	Located in No. 25. Bark included														
17	Row of <i>Melaleuca</i> and <i>Leptospermum</i>	100-150	6-7	5-6	M	F/G	F	C	60-80	NO	NO	Z1	5	L 2	L
	Located in No. 25. Group of 7 shrubs														

ID	Genus & Species Common Name	DBH (mm)	H (m)	S (m)	Age	Vigour	Condition	Crown Form	Crown Cover Symmetry Orientation	Defects	Pest & Disease	TREES AZ	Hazard	Significant scale Life Expectancy	Retention Value
18	<i>Eucalyptus scoparia</i>	400	15	14	M	F	F	C	80+	?	B	Z10	?	L 3	L
	Wallangarra white gum	Located in No. 25. Tree condition is obscured due to the smothering of weed vines													
19	<i>Grevillea robusta</i>	300	16	8	M	F	F	C	60	?	NO	Z10	?	L 3	L
	Silky Oak	Located in No. 27 on the northern boundary .Observations limited to over the fence. Self -sown													
20	<i>Corymbia citriodora</i>	600	22	15	M	F	F	D	80	?	NO	A2	?	M 2	M
	Lemon scented gum	Located on the eastern boundary of the rear adjoining property .Observations limited to over the fence													
21	<i>Grevillea robusta</i>	500	20	8	M	F	P	C	60	NO	NO	Z10	5	L 3	L
	Silky Oak	Self –sown , locates behind shed													
22	<i>Grevillea robusta</i>	320	10	6	M	P	P	C	50	DB	NO	Z10	5	L 3	L
	Silky Oak	Self –sown, rapid decline													
23	<i>Grevillea robusta</i>	200 x 2	12	6	M	P	P	C	60	DB	NO	Z10	5	L 3	L
	Silky Oak	Self -sown, rapid decline													

ID	Genus & Species Common Name	DBH (mm)	H (m)	S (m)	Age	Vigour	Condition	Crown Form	Crown Cover Symmetry Orientation	Defects	Pest & Disease	TREES AZ	Hazard	Significant scale Life Expectancy	Retention Value
24	<i>Corymbia citriodora</i> Lemon scented gum	300	18	10	M	F	F	C	70	?	NO	A2	?	M 2	M
	Located on the eastern boundary of the rear adjoining property .Observations limited to over the fence														
25	<i>Melaleuca decora</i> White Feather honeymyrtle	100x6	7	7	M	F	F	S	80+	NO	NO	A2	5	M 2	L
	Multi stemmed specimen with low set canopy														
26	<i>Callistemon viminalis</i> Bottle brush	300	6	6	M	F	F	C	90+	NO	NO	Z2	5	L 2	L
	Young and insignificant														
27	<i>Grevillea robusta</i> Silky Oak	290	14	6	M	P	P	P	50	BI	NO	Z10	5	L 2	L
	Self –sown specimen and crown in poor condition														
28	<i>Quercus robur</i> English Oak	700	11	15	M	F	F	C	Dormant	BD	F	Z10	5	L 2	L
	Basal decay														
29	<i>Grevillea robusta</i> Silky Oak	250	12	6	M	F	F	C	50	NO	NO	Z10	5	L 2	L
	Self –sown leggy specimen														

ID	Genus & Species Common Name	DBH (mm)	H (m)	S (m)	Age	Vigour	Condition	Crown Form	Crown Cover Symmetry Orientation	Defects	Pest & Disease	TREES AZ	Hazard	Significant scale Life Expectancy	Retention Value
30	<i>Grevillea robusta</i>	250	12	6	M	F	F	C	50	NO	NO	Z10	5	L 3	L
	Silky Oak	Self -sown													
31	<i>Lophostemon confertus</i>	400	11	8	M	G	G	C	90	NO	NO	A2	5	L 2	M
	Brush box	Tree is in reasonable health and form .May be incorporated in new landscape													
32	<i>Grevillea robusta</i>	270	10	5	M	F	F	C	60	NO	NO	Z10	5	L 2	L
	Silky Oak	Self -sown													
33	<i>Eucalyptus microcorys</i>	600	15	14	M	F	F	C	90	NO	NO	Z10	5	M 2	L
	Tallowwood	Tree locates on the rear adjoining property and proximal to the common boundary line. Exposed roots on the counter side of lean													

5.0 Construction Impacts

The following table calculates the encroachment for TPZ and SRZ in accordance with AS 4970/2009, with distance to works measured to the nearest most point of proposed works. The Arborist tables whether the tree is *totally lost* (consumed by the design and would result in it needing to be removed), or makes commentary on how the design impacts the tree and if this is manageable with respect to the trees viability.

5.1 Direct Impacts

Tree	Construction Impacts										
	TPZ (m)	SRZ (m)	Distance to Works (m)	TPZ Encroachment (% and aspect)	SRZ Encroachment (% and aspect)	Total Root Mass Incursion of TPZ (%)	Incursion area of TPZ (m ²)	Loss of crown (% , Aspect and Branch Order)			Tolerance to construction L= Low M=Moderate H=High
1	4.8	2.47									
	Not affected										
2	3.0	2.13									
	Not affected										
3	4.8	2.47									
	Not affected										
4	3.6	2.25									
	Total loss										
5	2.64	2.05									
	Total Loss										
6	2.64	2.05									
	Total loss										
7	4.44	2.41									
	Total loss										
8	2.64	2.04									
	Impacted by demolition/excavation										

Tree	Construction Impacts												
	TPZ (m)	SRZ (m)	Distance to Works (m)	TPZ Encroachment (% and aspect)		SRZ Encroachment (% and aspect)		Total Root Mass Incursion of TPZ (%)	Incursion area of TPZ (m ²)	Loss of crown (% , Aspect and Branch Order)			Tolerance to construction L= Low M=Moderate H=High
10	3.0	2.13											
	Total loss												
11	3.0	2.13											
	Total loss												
12	7.2	2.85											
	Total loss												
13	7.2	2.85											
	Total loss												
15	3.6	2.25	2.0	44.4	W	11.1	W	16.55	6.74	50	west	2 nd	L
	Major impact rendering tree unstable. Tree below average form with asymmetric canopy												
16	4.56	2.43	2.0	56.14	W	17.6	W	23.0	15.03	50	west	2 nd	L
	Major impact rendering tree unstable.												
17	2.0	1.85											
	Total loss												
18	4.8	2.47	1.5	68.75	N	39.2	N	18.75	13.57	50	North	1 st	
	Major impact, however SRZ not impeded. Crown in poor condition not worthy of retention irrespective of proposal												
19	3.6	2.25	1.0	70	N	-	-	40+	2.94	Nil			M
	Major impact that impedes the SRZ thus affecting tree stability												
20	7.2	2.85	5.0	30.5	E	-	-	9.66	15.73				
	Root mass incursion represents less than 10%, encroachment is manageable. SRZ remains unaffected.												
21	6.0	2.67											
	Total loss												
22	3.84	2.3											

Tree	Construction Impacts											
	TPZ (m)	SRZ (m)	Distance to Works (m)	TPZ Encroachment (% and aspect)	SRZ Encroachment (% and aspect)	Total Root Mass Incursion of TPZ (%)	Incursion area of TPZ (m ²)	Loss of crown (% , Aspect and Branch Order)			Tolerance to construction L= Low M=Moderate H=High	
	Total loss											
23	3.36	2.2										
	Total loss											
24	3.6	2.25										
	Total loss											
25	2.88	1.82										
	Total loss											
26	3.6	2.25										
	Total loss											
27	3.48	2.23										
	Total loss											
28	8.4	3.01										
	Total loss											
29	3.0	2.13										
	Total loss											
30	3.0	2.13										
	Total loss											
31	4.8	2.47										
	Total Loss											
32	3	2.13	-									
	Total Loss											
33	7.2	2.85	4.4	East	Nil	-	13.67	22.27	10	East	2 nd	M
	Minor encroachment of TPZ of approx. 18%, manageable with no adverse effects anticipated. Canopy will require some pruning											

CALCULATING TPZ and SRZ FOR TREES (AS 4970/2009)

- The Australian Standards provides a formula for calculating both the TPZ and SRZ. The TPZ is a combination of both root and crown area requiring protection for viable tree retention. Basically it is the area isolated from construction disturbances. The TPZ incorporates the SRZ, the area required for tree stability.
- AS 4970-2009 stipulates a minor encroachment of the TPZ as being less than 10%, whilst more than 10% is considered a major encroachment. Such encroachment may be deemed acceptable as long as the tree still remains viable. This is based on many other variables, including the characteristics of the tree and the use of viable construction methods conducive to the tree.
- It should be noted that the TPZs have been calculated with the following in mind; tree characteristics, typography of the site and the TPZ reconfiguration allowance as stated in AS 4970-2009. (Refer to Appendix E for calculation methods of TPZ.) The Standards allow 10% of the radii from one edge of the TPZ to be offset and added to another edge whilst still maintaining total surface area required for TPZ.
- T9 and T14 are not assessed for Construction Impacts

5.2 Indirect Impacts

The following are indirect impacts that trees may succumb to during construction related activities. It is imperative that these be taken into consideration and all attempts made to minimise indirect impacts, as they can occur over the duration of construction and indeed accumulate to have significant effect on trees longevity.

- I. Mechanical damage from plant/machinery; Direct wounding and damage of stems and branches by large plant & machinery, including excavator, bob cat, crane, etc., during construction activities will have some impact in the form of cambium damage/abrasion to tree trunks and branch tearing well into collar attachments in turn exposing live woody tissue and predisposing the tree to pest and disease. Similarly plant/machinery is also responsible for soil compaction within the trees TPZ.
- II. Indirect root injury from soil compaction; When soil is compacted either via building materials/debris stockpiled on the TPZ or TPZ is utilised as a thoroughfare for heavy plant and machinery, the soil inevitable becomes compacted and impacts on the air and moisture uptake and ultimately affecting the gaseous exchange within the drip line that is vital for the trees health and longevity.
- III. Soil contamination; where chemicals, cement, and paint products etc., get washed or spilled into the soil and the tree absorbs the soluble content through its roots In addition limes from cement wash off can alter the soil PH
- IV. Soil grade changes; when the top soil cover down to a depth of approximately 150mm is striped it can illuminate vital feeder roots and can temporarily shock the tree. This process is common particularly during the landscape process. In addition these fine roots if exposed can prematurely dehydrate and die
- V. Landscaping Impact; Side paths and driveways comprised of concrete and non-porous materials can deprive roots of air and water and affect gaseous exchange. This is particularly true when there has been lack of consideration for trees located on adjacent properties and within close proximity to building envelope. In addition masonry fence lines require sub grade footings and usually at the expense of root loss of nearby trees. Furthermore there can be an increase in reflected heat to the remaining trees as a result from surrounding hard surfaces.

6.0 Conclusion & Recommendations

- I. The Arborist notes that the sites are typically urban weed havens with an abundance of self-sown species, and although not all exempt under Liverpool Councils Tree Preservation Order, are located in random, inappropriate growing locations. The site boundaries are abundant with Silky oaks, Camphor's and Privet, all of which have conformed to existing proximal structures and consequently they are either of poor form or in poor condition.
- II. Even so, a development of this magnitude, with large scale construction activities that includes bulk excavation as well as a large degree of indirect impacts as stated under 5.2 in this report, will result in large portions of the natural environment *needing* to be redeveloped at the expense of trees.
- III. The overwhelming majority of site trees are totally consumed by the current design of the building envelope. Even where trees are not impacted directly by the building envelope, the Arborist notes that such trees will be significantly impacted by peripheral works, such as demolition, bulk excavation and the logistics of plant and machinery on the site.
- IV. Where design changes are *usually* endorsed to accommodate tree retention, the Arborist notes that with a proposal as such, it is better to focus on the endorsement of new plantings as part of the landscape plan that will better adapt to the newly built environment. Recommendations for this site are as follows;
 - a. Removal of all site trees is supported by the Arborist. Site trees will not be able to sustain the degree of impacts from development of this magnitude and therefore significantly impede their viability. No trees are worthy of design changes to the proposal to accommodate for their retention.
 - b. In the case of T19 (adjoining tree), it is the only tree that locates against a shared boundary. Where the Arborist would otherwise endorse design changes to accommodate for its retention, the tree is self-sown thus its current location will *always* prove problematic irrespective of the proposed development. This species is short lived in Sydney with this specimen assigned a limited useful life expectancy (less than 10 years). As such the Arborist recommends that this tree be removed. Where trees are located on adjoining land the client has **no** authority over their removal, this needs to be negotiated with both the tree owner and appropriate approvals sought from Liverpool Council.
 - c. Other adjoining trees, T20 and T33 – based on *current* information provided on allocated setbacks, are anticipated to remain viable, given that there is no encroachment from the proposed basement and a minor encroachment from the building footprint. In addition, a small portion of their canopies, for spatial clearance will be required. However more detailed information on

both the installation of underground services and landscaping will need to be assessed for any further impact to these trees. This is especially true where plans indicate that the existing sewer located on site boundaries is to be relocated. Given that earthworks are required to facilitate the relocation, this impacts T20 and T33, and for this reason, the Arborist recommends that the existing sewer line remain redundant in situ and new piping be relocated at a 4.5 metre radius from these trees in order to minimise disturbance to the root systems.

- d. Where there is anticipated loss to visual amenity from reduced canopy cover this is to be mitigated with a strict replanting regime as part of the Landscape Plan. Local provenance is highly endorsed to assist in maintaining the biodiversity of this area, even where urbanisation has degraded such vegetation.
 - e. Instatement of a Project Arborist (PA) as part of the project to oversee critical stages of development with respect to all retained trees. The PA will provide compliance certification for pivotal stages of this proposal.
 - f. That boundary fences remain intact to isolate those trees on adjoining sites, and serve as tree protection fencing. Where this is not viable, temporary protection fencing is to be installed purposefully for the protection of adjoining trees at a minimum of 2m from the trunk and an exclusion zone established
 - g. Excavation in the portion of TPZ located on client's site is to be supervised by the PA.
 - h. That the Arborist be consulted with regards to the installation of underground services where they are located in the TPZ of adjoining trees. The SRZ is not to be encroached by such services.
 - i. Landscaping that encroaches the TPZ of trees is to consist of; permeable pavement to allow air and gaseous exchange to tree roots, retaining walls with no continuous footings, fencing of lightweight construction with minimal ground intrusion.
- V. A **Tree Protection Plan (TPP) and Arborist Method Statement (AMS)** is to be provided to depict methods for tree protection on a plan, including tree protection measures, and viable construction methods, and in accordance with AS 4970-2009, and is to include the following;
- a. Clear depiction of the TPZ and SRZ for those trees retained
 - b. Details of tree protection fencing and ground cover
 - c. Details of associated demolition within TPZ
 - d. Outlining of strategic methods for foundations and pavement within the TPZ

- e. Location of underground services
- f. Intrusive landscape with the TPZ
- g. Pruning specification where required
- h. Stipulation of Hold Points for the PA

Yours Faithfully,



Sam Allouche

Diploma of Arboriculture (AQF Level 5)

Cert IV in Horticulture

Arboriculture Australia (Consultant Arborist) | Member No. 1469

Member of International Society of Arboriculture | Member No.173439

Appendix A



Appendix B

Table 3.2 Definitions & Descriptors

DBH	Diameter at Breast Height (estimated circumference of tree at approximately 1400mm)
H	Height of tree (estimated)
S	Spread of tree (estimated)
Age	Y = Young J= Juvenile M= Mature O=Over mature S=Senescent EM = Early Mature
Vigour	G= Good F=Fair L= Low D=Dormant
Condition	G= Good F=Fair P= Poor D= Dead
Crown Form	D=Dominant C=Co-dominant I=Intermediate S=Suppressed F=Forest E=Emergent
Crown Cover Symmetry Orientation	Percentage of crown foliage present on tree A = Asymmetric S = Symmetric N=North E=East S=South W=West
Defects	BI = Bark Inclusion (defect fork) BC = Basal cavity BD = Basal decay C =Cavity or hollow CC = Cable conflict CT = Crooked trunk DB = Dieback DC = Declining canopy DW = Deadwood H = Hangers PBA = Poor Branch Attachment R =Root exposure/decay RD = Root Decline SBD = Summer Branch Drop SC = Stem cavity SF = Stem Failure SFW = Stem failure Wound SW =Stem Wound TO = Tear out
Pest and Disease	B=Borers F=Fungal T= Termites NO = Nothing Obvious O= other
HAZARD Rating	Low=3-5 Medium=6-9 High=10-12 Refer to Appendix D- Hazard Rating
TREES AZ	Categorisation of trees with regards to development Refer to Appendix E-Tree AZ
Significant Scale Life Expectancy	H=High M=Medium L=Low 1=High 2=Medium 3=Short 4=Dead (Refer to Appendix C- Significance of a Tree, Assessment Rating System (STARS))©
Retention Value	H=High M=Medium L=Low R=Removal (Refer to Appendix C- Significance of a Tree, Assessment Rating System (STARS))©

Appendix C

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. An example of its use in an Arboricultural report is shown as Appendix A.

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

Table 1.0 Tree Retention Value - Priority Matrix

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

		Significance				
		1. High Significance in Landscape	2. Medium Significance in Landscape	Significance in Landscape	3. Low Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					
Legend for Matrix Assessment						
	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.					
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.					
	Consider for Removal (Low) - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.					
	Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.					

Appendix D

Hazard Rating Scale

Failure Potential (4 points):

Identifies the most likely failure and rates the likeliness of failure of structural defect(s)

Rating	Likelihood of failure
1	Low (Minor defects)
2	Medium (defects are present and obvious)
3	High (Numerous/significant defects present)
4	Severe (Defects are severe)

Size of defective part (4 points):

Rates the size of the part of the tree most likely to fail, where the larger the part that fails the greater the potential for damage:

Rating	Size of part
1	< 6 inches (15cm) in diameter
2	6-18 inches (15-45cm) in diameter
3	18-30 inches (45-75cm) in diameter
4	> 30 inches (75cm) in diameter

Target rating (4 points)

Rates the use and occupancy of area affected by defective part

Rating	Use/ occupancy of area
1	Occasional (jogging, cycling track)
2	Intermittent (picnic area, daily parking)
3	Frequent (seasonal activities)
4	Constant (daily basis, year round, residence)

$$\text{HAZARD RATING} = \text{Failure Potential} + \text{Size of Part} + \text{Target Rating}$$

Hazard Evaluation Rating Scale

Total Score	Hazard rating
3 - 5	Low Risk
6 - 9	Medium Risk
10 - 12	High Risk

The assessment process is undertaken with the following considerations;

- Length of evaluation cycle
- Level of resolution as identified by goals of Tree management program
- Past history and previous ratings of tree

If the above information is not made available and therefore not used in current evaluation process this rating can only affect the **current status of the tree**, rather than long-term development.

(Source: Mathany, N.P. and Clark, J.R. 1994)

Appendix E

Tree AZ Categories (Version 10.10 ANZ)

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species

- Z1** Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
- Z2** Too close to a building, i.e. exempt from legal protection because of proximity, etc
- Z3** Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe
- Z4** Dead, dying, diseased or declining
- Z5** Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
- Z6** Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people
- Z7** Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
- Z8** Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population
- Z9** Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
- Z10** Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
- Z11** Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
- Z12** Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

- A1** No significant defects and could be retained with minimal remedial care
- A2** Minor defects that could be addressed by remedial care and/or work to adjacent trees
- A3** Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
- A4** Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

Appendix F

Glossary of Terms

Taken from: Draper, D. B and Richards, P.A. (2009) *Dictionary for Managing Trees in Urban Environments*, CSIRO Publishing, Victoria, Australia

Arborist An individual with competence to cultivate, care and maintain trees from amenity or utility purposes.

Basal Proximal end of the trunk or branch, e.g. trunk wound extending to the ground is a basal wound, or as epicormic shoots arising from lignotuber

Branch failure The structural collapse of a branch that is physically weakened by wounding or from the actions of pests and diseases or overcome by loading forces in excess of its load – bearing capacity.

Buttress A flange of adaptive wood occurring at a junction of a trunk and root or trunk and branch in response to additional loading.

Callus wood Undifferentiated and unligified wood that forms initially after wounding around the margins of a wound separating damaged existing wood from the later forming lignified wood or wound wood.

Canker A wound created by repeated localized killing of the vascular cambium and bark by wood decay fungi and bacteria usually marked by concentric discoloration. The wound may appear as a depression as each successive growth increment develops around the lesion forming a wound margin (Shigo 1991, p. 140)

Canopy cover The amount of area of land covered by the lateral spread of the tree canopy, when viewed from above that land.

Codominant stem Two or more first order structural branches or lower order branches of similar dimensions arising from about the same position from a trunk or stem.

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 fruits; or the total amount of foliage supported by the branches.

Decline The response of the tree to a reduction of energy levels resulting from stress. Recovery from a decline is difficult and slow, and decline is usually irreversible.

Diameter at Breast Height (DBH) Measurement of a trunk width calculated at a given distance from above ground from the base of the tree often measured at 1.4m.

Dominance A tendency in a leading shoot to maintain a faster rate of apical elongation and expansion other than other nearby lateral shoots, and the tendency also for a tree to maintain a taller crown than its neighbours (Lonsdale 1999, p.313)

Dripline A line formed around the edge of a tree by the lateral extent of the crown.

Dynamic Load Loading force that is moving and changes over time, e.g. from wind movement (James 2003, p. 166)

Endemic A native plant usually with a restricted occurrence limited to a particular country, geographic region or area and often further confined to a specific habitat.

Epicormic Branch derived from an epicormic shoot

Frass The granular wood particles produced from borer insects and can be categorized as fine frass, medium frass, and coarse frass with the different types being of different sizes and caused by different insects.

Habitat tree A tree providing a niche supporting the life processes of a plant or animal

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 The bark on the inner side of the branch union, or in 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

Indigenous A native plant usually with a broad distribution in a particular country, geographic region or area. See also Endemic, Locally indigenous and non-locally indigenous.

In situ Occurring in its original place, e.g. soil level, remnant vegetation, the place from where a tree was transplanted, or where a tree is growing.

Irreversible decline The decline of a tree where it has progressively deteriorated to a point where no remedial works will be sufficient to prevent its demise, usually of poor form and low vigour.

Isolated tree A tree growing as a solitary specimen in an exposed location away from other trees as a result of natural or artificial causes and may be naturally occurring.

Kino The extractive polyphenols (tannins) formed in veins in a cambial zone as a defense in response to wounding in eucalypts. Often visible as an exudate when the kino veins rupture or are injured (Boland, *et al.* 2006, p. 691)

Lignotuber A woody tuber developed in the axils of the cotyledons.

Loading Weight that is carried, e.g. as bending stress on a branch.

Locally Indigenous A native plant as remnant vegetation, self-sown or planted in an area or region where it occurred originally.

Longevity Long lived, referring to a plant living for a long period of time.

Mechanical wound -Wound inflicted by abrasion, by mechanical device

Naturalised A plant introduced from another country or region to a place where it was not previously indigenous where it has escaped from agriculture or horticulture or as a garden escape and has sustained itself unassisted and given rise to successive generations of viable progeny.

Necrotic Dead area of tissue that may be localized e.g. on leaves, branches, bark or roots

Negligence With regard to trees, failure to take reasonable care to prevent hazardous situations from occurring which may result in injury to people or damage to property (Lonsdale 1999, p. 317)

Noxious weed A plant species of any taxa declared a weed by legislation. Treatment for the control or eradication of such weeds is usually prescribed by legislation...

Remnant A plant /s of any taxa and their progeny as part of the floristics of the recognised endemic ecological community remaining in a given location after alteration of the site or its modification or fragmentation by activities on that land or on adjacent land

Useful Life Expectancy (ULE) A system used to determine the time a tree can be expected to be usefully retained

Shedding - Shedding of plant organs when it is mature or aged, by the formation of a corky layer across its base. This may be influenced by stress, drought, senescence, declining condition, reduced vigour and also occurs

Stability Resistance to change especially from loading forces or physical modifications to a trees growing environment

Stress A factor in a plants environment that can have adverse impacts on its life processes e.g. altered soil conditions, root damage, toxicity, drought or water logging. The impact of stress may be reversible given good arboricultural practices that may lead to plant decline.

Structural defect A weak point in or on a tree causing its structural deterioration diminishing its stability in full or part

Structural integrity The ability of a load bearing part of a tree, and its resistance to loading forces

Structural roots- Roots supporting the infrastructure of the root plate providing strength and stability of the tree.

Symbiotic An association between different species usually but not always mutually beneficial.

Termite leads Tunnels of mud on the stem and between the bark created by termites that may be active or inactive.

Tree Protection Zone (TPZ) A combination of RPZ and CPZ as an area around the tree set aside for the protection of a tree and a sufficient proportion of its growing environment above and below ground established prior to demolition or construction and maintained until the completion of works to allow for its viable retention including stability.

Visual Tree Assessment (VTA) A visual inspection of a tree from the ground. Such assessment should only be undertaken by suitably competent practitioners.

Disclaimer

This report has been compiled using knowledge & expertise relating to trees, and makes recommendations based on this. It should be noted that trees are affected by many elements, environmental and situational, some of which cannot be predicted or foreseen even by Qualified Arborists.

The client when reading this report should take the following factors into consideration;

- ❖ It is not feasible to assume that Arborists identify all hazards or risks associated with trees at the time of consultation or indeed in this report.
- ❖ This Assessment is valid for 3 months from the date stipulated on the report, and may need to be updated after this.
- ❖ Regular maintenance and monitoring by a Qualified Arborist will minimize the risks associated with tree and contribute to its longevity in its growing environment, however there is no guarantee that all risks are to be eliminated and that the tree is not privy to external factors that will impact on the tree after it has been assessed by our service.
- ❖ The report is compiled in good faith, where any information given to our service is correct and true, and where interested parties and /or stakeholders are notified. This includes title and ownership of property, orders as directed by relevant authorities, development application determinations and other matters that affect the tree/s in question.
- ❖ The Arborist shall not be required to give testimony or to attend court by reason of this report unless other arrangements are made prior.
- ❖ This Arborist Report does not issue permission for any recommendations made in this report, particularly where trees are to be removed. Permission must be sought and obtained from Council and owner/s of trees.
- ❖ Any treatments recommended by the Arborist cannot be guaranteed, due to the volatile environment in which trees are growing.
- ❖ Clients may choose to accept or disregard the recommendations of the Arborist, or to seek additional advice.
- ❖ This report is intended for the Recipient, no part of this report is to be copied or altered without the authors permission

Bibliography

- Australian Standards, 2009. *“Protection of Trees on Development Sites”*, (AS 4970-2009) Standards Australia, Sydney, Australia.
- Australian Standards, 2007. *“Pruning of Amenity Trees”*, (AS 4373/2007) Standards Australia, Sydney, Australia
- Bankstown Council. www.bankstown.nsw.gov.au. Accessed 10.07.2015
- Barrell, J.D., (1993) Pre Planning Surveys: Safe Useful Life Expectancy (SULE) is the Natural Progression. *Arboricultural Journal* (UK)
- Botanica (2001), *Trees & Shrubs*, Random House, Australia
- Cronin, L. (2002), *Australian Trees*, 2nd edition, Envirobook, Australia
- Draper, D. B and Richards, P.A. (2009), *Dictionary for Managing Trees in Urban Environments*, CSIRO Publishing, Victoria, Australia
- Environmental Protection & Biodiversity Conservation Act 1999 (Commonwealth Government) http://www.austlii.edu.au/au/legis/cth/consol_act/epabca1999588/
- Footprint Green Pty Ltd. 2001, *Footprint Green Tree Significance & Retention Value Matrix* , Avalon, NSW Australia, www.footprintgreen.com.au
- Holliday, I. ,and Watton, G. (2002) *Gardeners Companion to Eucalypts 4th revised Edition* Reed New Holland, Australia
- IACA, 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au
- Matheny, N. & Clark, J (1994). *A Photographic guide to Hazard Trees in Urban Areas*. 2nd Edition. Illinois, (USA).
- Matheny, N. & Clark, J (1998). *Trees & Development, A technical Guide to Preservation of Trees during Land Development*. International Society of Arboriculture, Champaign, USA.
- Matheny, N. & Clark, J (2004), *Arboriculture*. Fourth Edition. Pearson Education Incorporated. New Jersey, USA.
- Mattheck, C. (1999). *Body Language of trees*. Forschungszentrum Karlsruhe, Germany