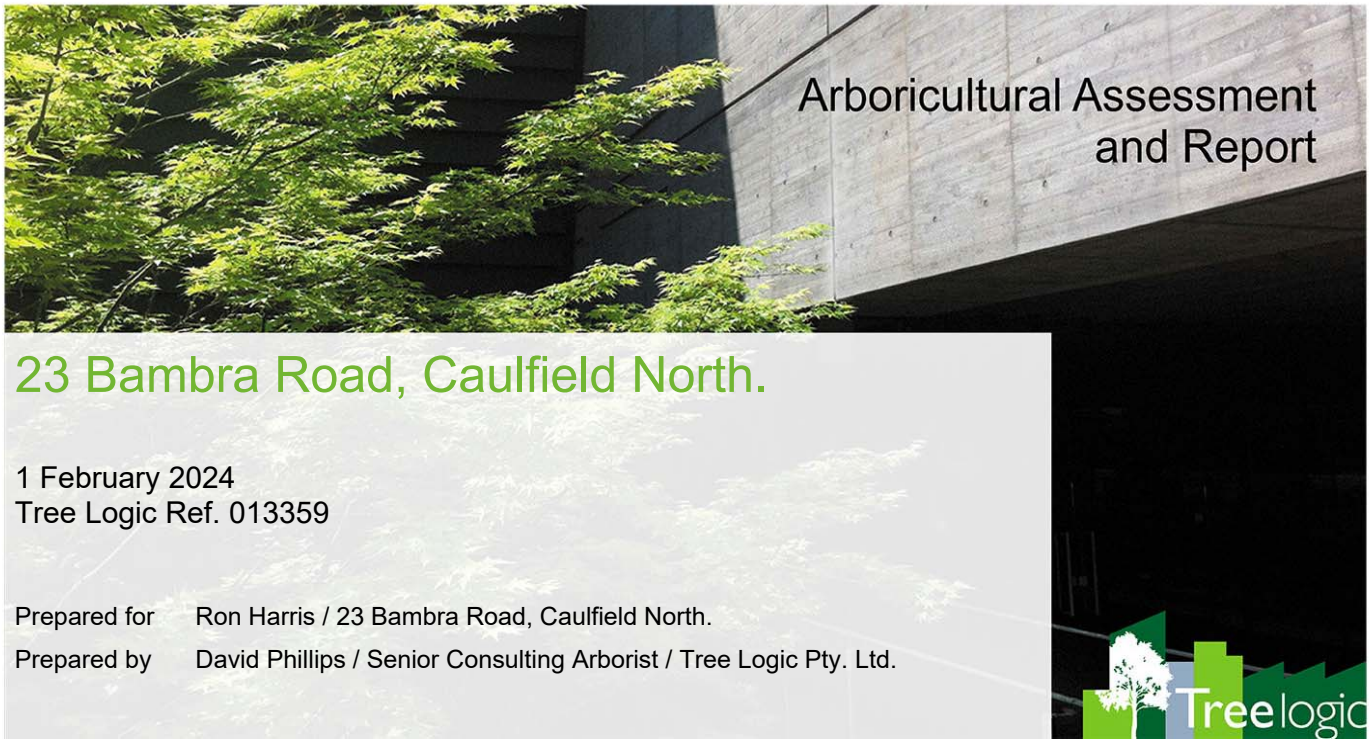


Arboricultural Assessment and Report

23 Bambra Road, Caulfield North.

1 February 2024
Tree Logic Ref. 013359

Prepared for Ron Harris / 23 Bambra Road, Caulfield North.
Prepared by David Phillips / Senior Consulting Arborist / Tree Logic Pty. Ltd.

1 Summary

Reason for Assessment

Treelogic Pty. Ltd. was engaged by Ron Harris to undertake an arboricultural assessment and prepare a report in relation to the condition of trees located at 23 Bambra Road, Caulfield North.

The requirements of the arboricultural report include:

- To provide information on species, origin, dimensions, health and structure of the trees and their appropriateness for retention.
- Determine the Tree Protection Zones (TPZ) and Structural root zones (SRZ) for trees compliant with *AS4970 'Protection of trees on development sites'*.
- Determine the statutory requirements relating to tree preservation that apply to the subject site.

2 Method

2.1 A site inspection was carried out on Tuesday 30th January 2024. The trees were inspected from the ground and observations were made of the growing environment and surrounding area. The trees were not climbed, and no samples of the tree or soil were taken for analysis.

2.2 Only trees were assessed, and data collected. A tree is generally a plant with a height greater than 5 metres on a single trunk with a single trunk (stem) diameter (DBH) being greater than 150 mm at a height of 1.4 metres above ground level.

2.3 Observations were made of the assessed trees to determine the species, age category, and condition with measurements taken to establish tree crown height (measured with a laser rangefinder) and crown width (paced) and trunk dimensions (measured 1.4 metres above ground level with a diameter tape unless otherwise stated). Descriptors used in the assessment can be seen in Appendix 3.

2.4 Tree locations were captured on field tablets with inbuilt geo-locating capabilities using the co-ordinate reference system GDA 94 MGA Zone 55. The Feature Survey Plan overlayed on a recent aerial image was utilised to locate the trees.
Aerial image seen in Appendix 2 was sourced from Nearmaps.com (2024).

2.5 Assessment details of individual trees are listed in Appendix 1: tree assessment table and their location can be seen in Appendix 2.

2.6 Some photographs of the trees and the environs were taken for further reference and inclusion in the report.

2.7 Each of the assessed trees was attributed an 'Arboricultural Rating'. The arboricultural rating correlates the combination of tree condition factors (health and structure) with tree amenity value. Definitions of arboricultural ratings can be seen in Appendix 3.

2.8 The assessed trees have been allocated tree protection zones (TPZ). The Australian Standard, AS 4970-2009, has been used as a guide in the allocation of TPZs for the assessed trees. This method provides a TPZ that addresses both the stability and growing requirements of a tree. TPZ distances are measured as a radius, from the centre of the trunk at (or near) ground level. All TPZ measurements for retained trees are provided in Appendix 1.

Documents viewed;

- Planning Property Report for 23 Bambra Road, Caulfield North (www.planning.vic.gov.au, cited 25/01/2024).
- The site is located within the Glen Eira Planning Scheme and is scheduled to the Neighbourhood Residential Zone (NRZ1).
- Schedule 10 to Clause 43.01 Heritage Overlay (HO10) applies to the property. There are no tree controls that apply under HO10.

- Glen Eira Significant Tree Registry, https://www.gleneira.vic.gov.au/our-city/classified-trees, cited 25/01/2024. The registry currently shows that none of the assessed trees are on the Significant Tree Register.
- Plan of Features & Levels, prepared by Reeds Consulting, Rev A, 24/10/2023.
- Proposed Concept Plan 01 & Demolition, prepared by Andrew L Straube, Dwg No. CD02, Rev C, dated 25/10/2023.

3 Observations

3.1 The property at 23 Bambra Road, Caulfield North or 'Halstead" is comprised of 3 allotments (65, 67 and 69 Halstead Street, Caulfield North). It is a residential allotment, approximately 2,270 m² in size located at the intersection of Halstead Street and Bambra Road. Residential properties abutted the western and southern title boundaries. See Figure 1.

Figure 1: *Area view of the subject site located at 23 Bambra Road, Caulfield North 'Halstead'. (nearmaps.com, cited 25/01/2024).*

3.2 The study area consisted of trees located within the front setback of Bambra Road within Lots 1 and 4. The front setback was a rather flat section of land with mature trees forming an overstorey to small trees, shrubs, and herbaceous plantings. Vehicle ingress/egress was via Bambra Road to the south-east with a tear-drop shaped asphalt driveway extending to the front of the residence.

Tree Population

3.3 Twenty-seven (27) individual trees in total were assessed. The details of each tree can be seen in Appendix 1: Tree assessment table and their location can be seen in Appendix 2.

3.4 The assessment was undertaken to determine the condition of the tree population and did not include two trees, an Oak (*Quercus* sp.) and a Kauri (*Agathis* sp.) located to the south of the residence.

3.5 The assessment of tree health was based on foliage colour, size, and density as well as shoot initiation and elongation. In general, the assessed trees displayed Fair health (21 trees) with characteristics considered to be typical of the species growing under the current environment conditions.

3.6 Six (6) trees, being Trees 4, 9, 19, 20, 21 and 23 exhibited Fair to poor health. These trees exhibited some crown dieback, reduced foliage density, signs of insect pests or possum grazing.

3.7 Tree structure was assessed for structural defects and deficiencies, likelihood of failures and risk to potential targets. Sixteen (16) trees exhibited Fair structure. These trees exhibited a minor defect or deficiency that is within tolerable levels that generally do not require practical intervention.

3.8 Nine (9) trees, being Trees 4, 6, 12, 13, 14, 18, 23, 24 and 25 exhibited Fair to poor structure. These trees exhibited a moderate structural defect that increase the potential for a tree part to fail. The defect is generally within tolerable levels, but may require practical intervention to reduce the risk, particularly where high value targets are present.

3.9 Two (2) trees, being Trees 9 and 19 exhibited poor structure. Tree 9, an English Elm (*Ulmus procera*) had its main leaders lopped and the resulting crown was comprised of adventitious (epicormic) growth that is poorly attached. Poorly structured trees exhibited major structural defects that generally require practical intervention where high valued targets are present.

3.10 The assessed trees were attributed with an arboricultural rating. This rating relates to the combination of tree condition factors, including health and structure (arboricultural merit), and conveys an amenity value. Amenity relates to the trees biological, functional, and aesthetic characteristics within an urban landscape context.

Table 1: *Summary of arboricultural ratings.*

Arboricultural Rating	No. of trees	Tree numbers
Moderate A	1	2
Moderate B	6	5, 6, 10, 18, 22, 24
Moderate C	9	1, 3, 7, 8, 13, 20, 21, 25, 27
Low	7	9, 11, 12, 14, 15 ,16, 17
Very Low	4	4, 19, 23, 26
Total	**27**	

**A summary of the arboricultural ratings can be seen in Appendix 3.*

4 Discussion

4.1 The assessment was undertaken to determine the condition of the tree population. The client is also concerned about a large Moreton Bay Fig (*Ficus macrophylla*) that was planted close to the residence and is being a nuisance.

4.2 A review of the statutory controls that apply to the site including Schedule 10 to Clause 43.01 Heritage Overlay (HO10) determined that there are no tree controls that apply under HO10. A review of the Glen Eira Significant Tree registry found none of the assessed trees were listed on the register. There and no other planning overlays that apply to the site. Therefore, there are no statutory controls governing tree preservation that apply to the assessed trees.

4.3 The tree study area site was comprised of mature trees forming a canopy cover over smaller trees, shrubs, and herbaceous plantings. Seven (7) trees, being Trees 1, 2, 12, 13, 18, 20 and 22 were between 14 – 19 m tall with crown spreads 7 m or wider. Trees 1, 13 and 20 had a crown spread of 15, 13 and 16 m respectively and were the dominant canopy trees on site. The remaining trees were mostly less than 10 m tall contributing less the overall canopy cover and landscape character.

4.4 In general, the tree population was mature in age and the trees had reached their expected size within the landscape. There were no significant health or structural issues concerning the population however, a couple of trees were inappropriately located and being a nuisance. In the case of Trees 13 and 20, both Silky Oaks (*Grevillea robusta*) they had reached their peak in the landscape and were beginning to show the signs of senescence with crown tip dieback. Tree 9 was also a declining specimen due to poor past management and the infestation of Elm Leaf beetle.

4.5 Trees 1 and 17 were both Moreton Bay Figs. Tree 1 had been planted within 7 m of the residence that has a height of 16 m with a crown spread of 15 m. While Tree 17 was a self-sown specimen that has self-propagated within 0.5 m of the boundary fence on Bambra Road.

4.6 The site inspection observed disruption to the asphalt driveway and cracking to the external façade of the residence adjacent to Tree 1. The damage to the house and driveway is consistent with the influence of tree roots, although the age of the residence may also be a contributing factor. It is likely that its roots are contributing to the damage due to its size, proximity to the residence and the extensive root systems and relatively high-water demand that Fig trees have. The client also claims the tree's roots have evaded the water pipes causing pits to overflow. Should the tree be removed to mitigate further damage, consideration should be given to consulting a structural engineer. The reason being is that soil moisture levels surrounding the house removal will change following the tree's removal the that may affect the integrity of the footing/s.

4.7 Tree 17 was a self-seeded specimen approximately 12 m tall with a crown spread of 10 m and located within 0.5 m of the front boundary fence. The tree is in the active growth phase of its development (semi-mature) where it is expected to grow larger at maturity. The tree's roots were cracking the masonry wall with a vertical crack observed immediately adjacent to the tree and in other sections. No disruption to the public footpath was observed. With increased growth into the future, the tree's roots are expected to cause greater damage to the fence and potentially the public footpath. Similarly, a self-sown Fig tree was growing at the base of Tree 10 and its roots are also expected to damage to the boundary wall into the short to medium term future.

5 Images

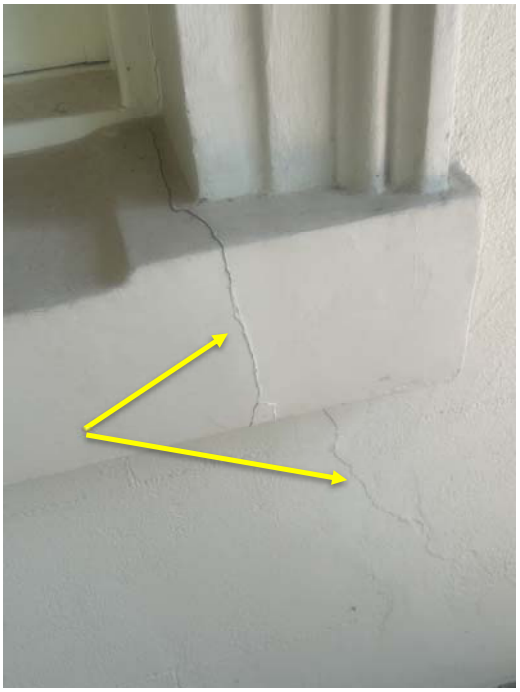


Figure 2 (upper left): *Shows the relative size, condition and location of Tree 1, a mature Moreton Bay Fig. The tree has been planted close to the residence where its roots are likely contributing to damage of the driveway and dwelling.*
Figure 3 (upper right): *Shows cracking of the external façade of the residence adjacent to Tree 1.*
Figure 4 (above left): *Shows cracking of the windowsill adjacent to Tree 1.*
Figure 5 (above right): *Shows the area of cracking and disruption to the asphalt driveway from the roots of Tree 1.*

	***Figure 6 (left):*** *View facing north-west showing the property frontage from Bambra Road.*
	***Figure 7 (left):*** *Shows the property frontage on Halstead Street.*
	***Figure 8 (left):*** *View facing north-east showing lower storey Trees 3 and 5 and overstorey Trees 13, 20 and 22.*

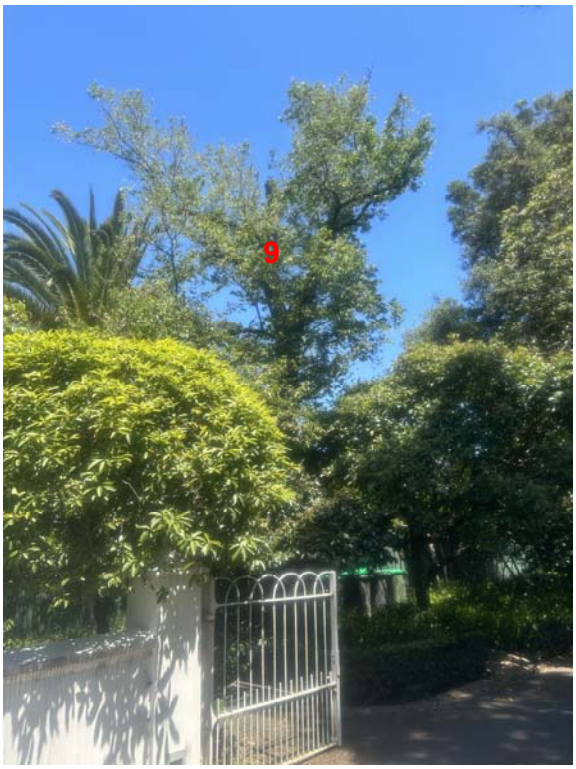


Figure 9 (above left): *Shows cracking to the front boundary fence from the roots of Tree 17.*
Figure 10 (above right): *View facing south-west showing the relative size, condition and location of Tree 9, an English Elm. The Elm exhibited poor structure due to past lopping of its main leaders.*

6 Tree protection zones

6.1 The Tree protection zones (TPZs) provided for each tree in Appendix 1 and referred to in this statement, are calculated using the formula provided in the Australian Standard AS4970 where the Radial TPZ = Trunk diameter (DBH) measured at 1.4 m above grade and multiplied by 12. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. A TPZ should not be less than 2 m nor greater than 15 m.

6.2 The TPZ forms an area around a tree or group of trees that addresses both their stability and growing requirements. Construction and worksite activities within the TPZ need to be determined to assess their impacts as part of preserving tree condition.

6.3 Minor encroachment, up to 10% of the TPZ area, is generally permissible provided encroachment is compensated for by recruitment of an equal area contiguous with the TPZ. Encroachment greater than 10% is considered major encroachment under AS4970 and is only permissible if it can be demonstrated that after such encroachment the tree/s would remain viable.

6.4 The structural root zone (SRZ) provided for each tree has been calculated using the method provided in AS4970. The SRZ is the area in which the larger woody roots required for tree stability are found close to the trunk and which then generally taper rapidly. This is the minimum area recommended to maintain tree stability but does not reflect the larger area required to sustain tree health. No works are recommended within the SRZ radius as tree stability could be compromised. SRZ's calculated for each tree are provided in Appendix 1.

6.5 See Appendix 5 for TPZ establishment and types of encroachment.

7 Conclusion

7.1 Twenty-seven (27) individual trees in total were assessed as part of determining the condition of the tree population located at 23 Bambra Road in Caulfield North (Halstead).

7.2 The tree population was mature in age and the trees had reached their expected size within the landscape. There were no significant health or structural issues concerning the population. However, Trees 1 and 17 were being a nuisance contributing damage to the surrounding residence, boundary wall and driveway. Should Tree 1 be removed, it is recommended that a structural engineer is engaged to determine if its removal will impact upon the footing/s of the residence.

7.3 There are no statutory controls governing tree preservation that apply to the assessed trees and none of them were located on the Glen Eira Significant Tree Register.

I am available to answer any questions arising from this report.

Signed

David Phillips – Ass Deg. Env Hort

Senior Consulting Arborist

M 0433 813 587 P 03 9870 7700

E david.phillips@treelogic.com.au

References

Australian Standard (4970-2009) Protection of Trees on development sites. Standards Australia, Sydney NSW Australia.

Australian Standard (AS 2870—2011) Residential slabs and footings. Standards Australia, Sydney NSW Australia.

Clark, J.R. & Matheny, N.P (1998), Trees and Development: A technical guide to preservation of trees during land development. ISA, Champaign, Illinois.

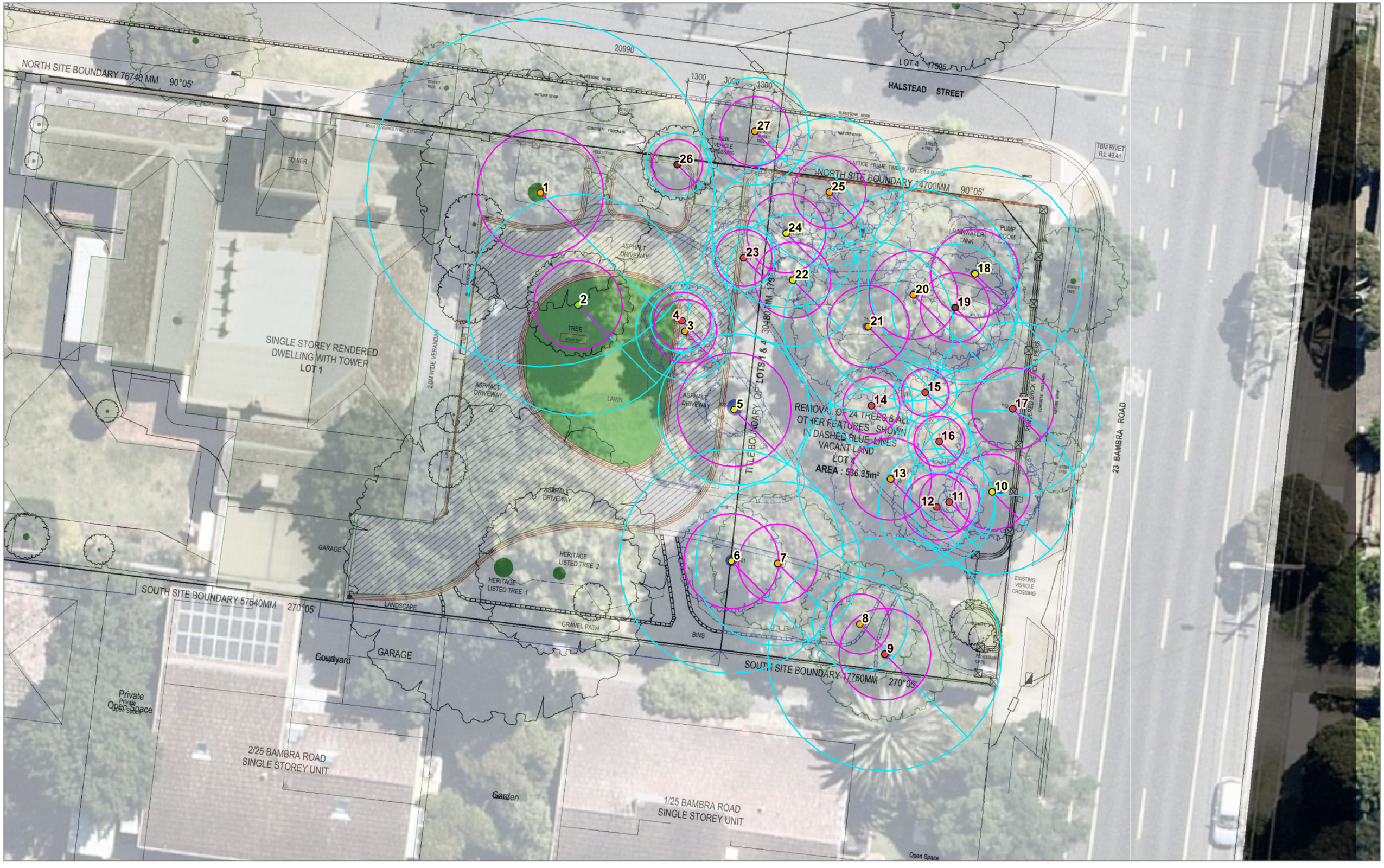
Appendix 1: Tree Assessment details: 23 Bambra Road, Caulfield North (Treelogic, 2024).

Key: **DBH** = Diameter at breast height, 1.4m up trunk, unless otherwise indicated. Basal dimensions equate to the trunk diameter measured immediately above the buttress. **ARB rating** = arboricultural rating. **TPZ** = Tree protection zone in radial metres. **SRZ** = Structural root zone in radial metres. **ULE** = Useful Life Expectancy measured in years. Definition of the descriptor categories used in the assessment can be seen Appendix 3.

See following 2 pages.

Tree ID	Common Name (Botanical Name)	Age class	Origin	DBH (cm)	Basal (cm)	Height X Width (m)	Health	Structure	Arboricultural rating	ULE (yrs)	Comments	TPZ (m radius)	SRZ (m radius)
1	Moreton Bay Fig (Ficus macrophylla)	Maturing	Australian native	44,38,40,58	160	16 x 15	Fair	Fair	Moderate C	6-10 y	Disruption to adjacent driveway, cracking to external façade of residence. Tree roots possibly contributing to house damage. Claims of disruption to water pipes from client	11	4
2	Bhutan Cypress (Cupressus torulosa)	Maturing	Exotic conifer	58	66	19 x 7	Fair	Fair	Moderate A	11-20 y		7	2.8
3	Lilly Pilly (Acmena smithii)	Early-mature	Victorian native	26 @ 1m	30	6 x 5	Fair	Fair	Moderate C	11-20 y		3.1	2
4	Cotoneaster (Cotoneaster sp.)	Maturing	Exotic evergreen	12,9,5,6,5 @ 1.2m	24	4 x 5	Fair to Poor	Fair to Poor	Very Low	1-5 y	Woody weed species, reduced foliage density	2	1.8
5	European Fan Palm (Chamaerops Humilis)	Maturing	Exotic palm	19,16,18,18,19 (estimated)	120	4 x 7	Fair	Fair	Moderate B	21-40 y	Basal obscured, dimension estimated	4.8	3.6
6	Norfolk Island Hibiscus (Lagunaria patersonia)	Maturing	Australian native	22,39,39	82	12 x 10	Fair	Fair to Poor	Moderate B	21-40 y		7.1	3
7	Brush Box (Lophostemon confertus)	Early-mature	Australian native	23,37	53	9 x 8	Fair	Fair	Moderate C	11-20 y	Reduction in crown density	5.2	2.5
8	Chinese Hawthorn (Photinia serratifolia)	Maturing	Exotic evergreen	25 @ <1m	27	4 x 7	Fair	Fair	Moderate C	11-20 y		3	1.9
9	English Elm (Ulmus procera)	Maturing	Exotic deciduous	62	74	9 x 9	Fair to Poor	Poor	Low	6-10 y	Historic lopping of main leaders, epicormic crown, reduced crown density, minor Elm Leaf Beetle infestation	7.4	2.9
10	Italian Cypress (Cupressus sempervirens)	Maturing	Exotic conifer	43 @ <1m	45	10 x 4	Fair	Fair	Moderate B	11-20 y	Rapidly growing Fig tree at base	5.2	2.4
11	Chinese Windmill Palm (Trachycarpus fortunei)	Early-mature	Exotic palm	24	27	3 x 2	Fair	Fair	Low	21-40 y	Small size	2.9	1.9
12	Silver Wattle (Acacia dealbata)	Maturing	Victorian native	31	35	15 x 7	Fair	Fair to Poor	Low	6-10 y	Trunk wounds	3.7	2.1
13	Silky Oak (Grevillea robusta)	Maturing	Australian native	49	58	16 x 13	Fair	Fair to Poor	Moderate C	11-20 y	Trunk wounds present, crown tip dieback, trending to low	5.9	2.6
14	Kowhai (Sophora microphylla)	Maturing	Exotic evergreen	22 @ 1m	25	6 x 5	Fair	Fair to Poor	Low	6-10 y		2.6	1.8
15	Brush Box (Lophostemon confertus)	Semi-mature	Australian native	12	15	5 x 4	Fair	Fair	Low	11-20 y	Small size	2	1.5
16	Brush Box (Lophostemon confertus)	Semi-mature	Australian native	15	19	5 x 5	Fair	Fair	Low	11-20 y	Small size	2	1.6

Tree ID	Common Name (Botanical Name)	Age class	Origin	DBH (cm)	Basal (cm)	Height X Width (m)	Health	Structure	Arboricultural rating	ULE (yrs)	Comments	TPZ (m radius)	SRZ (m radius)
17	Moreton Bay Fig (Ficus macrophylla)	Semi-mature	Australian native	46 @ 1.2m	54	12 x 10	Fair	Fair	Low	1-5 y	Inapropriate location, cracking of adjacent brick fence, continued growth of tree with increased potential for further damage to fence & public footpath	5.5	2.6
18	Bhutan Cypress (Cupressus torulosa)	Maturing	Exotic conifer	57	65	16 x 8	Fair	Fair to Poor	Moderate B	11-20 y		6.8	2.8
19	Sweet Pittosporum (Pittosporum undulatum)	Maturing	Victorian native	33	39	9 x 9	Fair to Poor	Poor	Very Low	<1 y		4	2.2
20	Silky Oak (Grevillea robusta)	Maturing	Australian native	56	68	17 x 16	Fair to Poor	Fair	Moderate C	11-20 y		6.7	2.8
21	Chinese Hawthorn (Photinia serratifolia)	Maturing	Exotic evergreen	26,37	58	8 x 11	Fair to Poor	Fair	Moderate C	11-20 y	Crown tip dieback, possibly possum grazed, ageing specimen	5.4	2.6
22	Mexican Fan Palm (Washingtonia robusta)	Semi-mature	Exotic palm	35	45	14 x 4	Fair	Fair	Moderate B	21-40 y		4.2	2.4
23	Cotoneaster (Cotoneaster sp.)	Maturing	Exotic evergreen	13,9	23	4 x 5	Fair to Poor	Fair to Poor	Very Low	6-10 y	Woody weed species, reduced foliage density	2	1.8
24	Jacaranda (Jacaranda mimosifolia)	Maturing	Exotic deciduous	22,23,23 @ 1.1m	52	9 x 11	Fair	Fair to Poor	Moderate B	21-40 y		4.7	2.5
25	Kurrajong (Brachychiton populneus)	Early-mature	Victorian native	39 @ 1.3m	44	9 x 7	Fair	Fair to Poor	Moderate C	11-20 y	Co-dominant stems with included bark primary union	4.7	2.3
26	Shining Privet (Ligustrum lucidum)	Semi-mature	Exotic evergreen	8,12,8	18	4 x 3	Fair	Fair	Very Low	<1 y	Self seeded woody weed species	2	1.6
27	Brush Box (Lophostemon confertus)	Semi-mature	Australian native	28	39	8 x 5	Fair	Fair	Moderate C	21-40 y	Street tree	3.4	2.2



APPENDIX 2 — TREE LOCATIONS AND PROTECTION ZONES

PROJECT
23 Bambra Road, Caulfield North

TL REF. 013359
MAP NO. 1 / 1
DATE 2024-01-31
CLIENT Ron Harris

DATA SOURCES
Nearmaps.com (2024), Concept Plan 01 & Demolition, CD02, 25/10/23

LEGEND

Arboricultural ratinig
- Mod-A
- Mod-B
- Mod-C
- Low
- Very Low
- TPZ
- SRZ

NOTES
Tree protection (TPZ) and structural root zones (SRZ) calculated in accordance with AS4970-2009 Protection of trees on development sites

TREE LOCATION DISCLAIMER
Tree locations are approximate

COORDINATE REFERENCE SYSTEM
EPSG:28355 | GDA 94 MGA Zone 55

0 3 6m

ABN: 95 080 021 610
TEL: 1300 656 926
TREELOGIC PTY LTD
4 / 21 Eugene Tce
Ringwood, VIC
Australia 3134
Plan, manage, protect

Appendix 3: Arboricultural Descriptors (February 2019).

Note that not all of the described tree descriptors may be used in a tree assessment and report. The assessment is undertaken with regard to contemporary arboricultural practices and consists of a visual inspection of external and above-ground tree parts.

1. Tree Condition

The assessment of tree condition evaluates factors of health and structure. The descriptors of health and structure attributed to a tree evaluate the individual specimen to what could be considered typical for that species growing in its location under current climatic conditions. For example, some species can display inherently poor branching architecture, such as multiple acute branch attachments with included bark. Whilst these structural defects may technically be considered arboriculturally poor, they are typical for the species and may not constitute an increased risk of failure. These trees may be assigned a structural rating of fair-poor (rather than poor) at the discretion of the assessor.

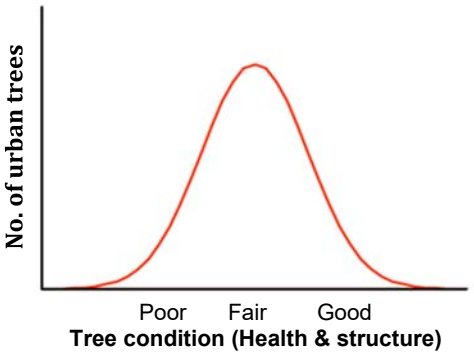


Diagram 1: Indicative normal distribution curve for tree condition

Diagram 1, provides an indicative distribution curve for tree condition to illustrate that within a normal tree population the majority of specimens are centrally located within the condition range (normal distribution curve). Furthermore, that those individual trees with an assessed condition approaching the outer ends of the spectrum occur less often.

2. Tree Name

Provides botanical name, (genus, species, variety and cultivar) according to accepted international code of taxonomic classification, and common name.

3. Tree Type

Describes the general geographic origin of the species and its type e.g. deciduous or evergreen.

Category	Description
Indigenous	Occurs naturally in the area or region of the subject site. Remnant.
Victorian native	Occurs naturally within some part of the State of Victoria (not exclusively) but is not indigenous (component of EVC benchmark). Could be planted indigenous trees.
Australian native	Occurs naturally within Australia but is not a Victorian native or indigenous
Exotic deciduous	Occurs outside of Australia and typically sheds its leaves during winter
Exotic evergreen	Occurs outside of Australia and typically holds its leaves all year round
Exotic conifer	Occurs outside of Australia and is classified as a gymnosperm
Native conifer	Occurs naturally within Australia and is classified as a gymnosperm
Native Palm	Occurs naturally within Australia. Woody monocotyledon
Exotic Palm	Occurs outside of Australia. Woody monocotyledon

4. Height and Width

Indicates height and width of the individual tree; dimensions are expressed in metres. Crown heights are measured with a height meter where possible. Due to the topography of some sites and/or the density of vegetation it may not be possible to do this for every tree. Tree heights may be estimated in line with previous height meter readings in conjunction with assessor's experience. Crown widths are generally paced (estimated) at the widest axis or can be

measured on two axes and averaged. In some instances the crown width can be measured on the four cardinal direction points (North, South, East and West).

Crown height, crown spread are generally recorded to the nearest half metre (crown spread would be rounded up) for dimensions up to 10 m and the nearest whole metre for dimensions over 10 m. Estimated dimensions (e.g. for off-site or otherwise inaccessible trees where accurate data cannot be recovered) shall be clearly identified in the assessment data.

5. Trunk diameters

The position where trunk diameters are captured may vary dependent on the requirements of the specific assessment and an individual trees specific characteristics. DBH is the typical trunk diameter captured as it relates to the allocation of tree protection distances. The basal trunk diameter assists in the allocation of a structural root zone. Some municipalities require trunk diameters be captured at different heights, with 1.0 m above grade being a common requirement. The specific planning schemes will be checked to ascertain requirements.

Stem diameters shall be recorded in centimetres, rounded to the nearest 1 cm (0.01 m).

Diameter at Breast Height (DBH)

Indicates the trunk diameter (expressed in centimetres) of an individual tree measured at 1.4m above the existing ground level or where otherwise indicated, multiple leaders are measured individually. Plants with multiple leader habit may be measured at the base. The range of methods to suit particular trunk shapes, configurations and site conditions can be seen in Appendix A of Australian Standard *AS 4970-2009 Protection of trees on development site*s. Measurements undertaken using foresters tape or builders tape.

Basal trunk diameter

The basal dimension is the trunk diameter measured at the base of the trunk or main stem(s) immediately above the root buttress. Used to ascertain the Structural Root Zone (SRZ) as outlined in AS4970.

6. Health

Assesses various attributes to describe the overall health and vitality of the tree.

Category	Vitality, Extension growth	Decline symptoms, Deadwood, Dieback	Foliage density, colour, size, intactness	Pests and or disease
Good	Above typical. Excellent. Full canopy density	Negligible	Better than typical	Negligible
Fair	Typical vitality. >80% canopy density	Minor or expected. Little or no dead wood	Typical. Minor deficiencies or defects could be present.	Minor, within damage thresholds
Fair to Poor	Below typical - low vitality	More than typical. Small sub-branch dieback	Exhibiting deficiencies. Could be thinning, or smaller	Exceeds damage thresholds
Poor	Minimal - declining	Excessive, large and/or prominent amount & size of dead wood. Significant dieback	Exhibiting severe deficiencies. Thinning foliage, generally smaller or deformed	Extreme and contributing to decline
Dead	N/A	N/A	N/A	N/A

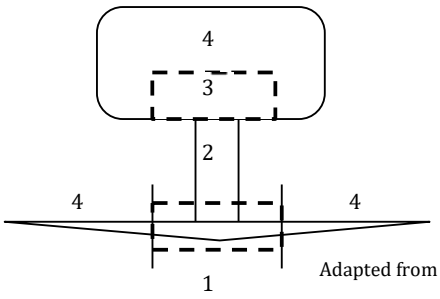
7. Structure

Assesses principal components of tree structure (Diagram 2).

Descriptor	Zone 1 - Root plate & lower stem	Zone 2 - Trunk	Zone 3 - Primary branch support	Zone 4 - Outer crown and roots
Good	No obvious damage, disease or decay; obvious basal flare / stable in ground	No obvious damage, disease or decay; well tapered	Well formed, attached, spaced and tapered. No history of failure.	No obvious damage, disease, decay or structural defect. No history of failure.
Fair	Minor damage or decay. Basal flare present.	Minor damage or decay	Generally, well attached, spaced and tapered branches. Minor structural deficiencies may be present or developing. No history of branch failure.	Minor damage, disease or decay; minor branch end-weight or over-extension. No history of branch failure.
Fair to Poor	Moderate damage or decay; minimal basal flare.	Moderate damage or decay; approaching recognised thresholds	Weak, decayed or with acute branch attachments; previous branch failure evidence.	Moderate damage, disease or decay; moderate branch end-weight or over-extension. Minor branch failure evident.
Poor	Major damage, disease or decay; fungal fruiting bodies present. Excessive lean placing pressure on root plate	Major damage, disease or decay; exceeds recognised thresholds; fungal fruiting bodies present. Acute lean. Stump re-sprout	Decayed, cavities or has acute branch attachments with included bark; excessive compression flaring; failure likely. Evidence of major branch failure.	Major damage, disease or decay; fungal fruiting bodies present; major branch end-weight or over-extension. Branch failure evident.
Very Poor	Excessive damage, disease or decay; unstable / loose in ground; altered exposure; failure probable	Excessive damage, disease or decay; cavities. Excessive lean. Stump re-sprout	Decayed, cavities or branch attachments with active split; failure imminent. History of major branch failure.	Excessive damage, disease or decay; excessive branch end-weight or over-extension. History of branch failure.

Diagram 2: Tree structure zones

1. Root plate & lower stem
2. Trunk
3. Primary branch support
4. Outer crown & roots



Adapted from Coder (1996)

Structure ratings will also take into account general branching architecture, stem taper, live crown ratio, crown symmetry (bias or lean) and crown position such as tree being suppressed amongst more dominant trees.

The lowest or worst descriptor assigned to the tree in any column could generally be the overall rating assigned to the tree. The assessment for structure is limited to observations of external and above ground tree parts. It does not include any exploratory assessment of underground or internal tree parts unless this is requested as part of the investigation. Trees are assessed and then given a rating for a point in time. Generally, trees with a poor or very poor structure are beyond the benefit of practical arboricultural treatments.

The management of trees in the urban environment requires appropriate arboricultural input and consideration of risk. Risk potential will consider the combination of likelihood of failure and impact, including the perceived importance of the target(s).

8. Age class

Relates to the physiological stage of the tree's life cycle.

Category	Description
Young	Sapling tree and/or recently planted. Approximately 5 or less years in location.
Semi-mature	Tree increasing in size and yet to achieve expected size in situation. Primary developmental stage.
Early-mature	Tree established, generally growing vigorously. > 50% of attainable age/size.
Mature	Specimen approaching expected size in situation, with reduced incremental growth.
Over-mature	Mature full-size with a retrenching crown. Tree is senescent and in decline. Significant decay generally present.

9. Useful life expectancy

Assessment of useful life expectancy provides an indication of health and tree appropriateness and involves an estimate of how long a tree is likely to remain in the landscape based on species, stage of life (cycle), health, amenity, environmental services contribution, conflicts with adjacent infrastructure and risk to the community. It would enable tree managers to develop long-term plans for the eventual removal and replacement of existing trees in the public realm. It is not a measure of the biological life of the tree within the natural range of the species. It is more a measure of the health status and the trees positive contribution to the urban landscape.

Within an urban landscape context, particularly in relation to street trees, it could be considered a point where the costs to maintain the asset (tree) outweigh the benefits the tree is returning.

The assessment is based on the site conditions not being significantly altered and that any prescribed maintenance works are carried out (site conditions are presumed to remain relatively constant and the tree would be maintained under scheduled maintenance programs).

Useful Life Expectancy	Typical characteristics
<1 year (No remaining ULE)	Tree may be dead or mostly dead. Tree may exhibit major structural faults. Tree may be an imminent failure hazard. Excessive infrastructure damage with high risk potential that cannot be remedied.
1-5 years (Transitory, Brief)	Tree is exhibiting severe chronic decline. Crown is likely to be less than 50% typical density. Crown may be mostly epicormic growth. Dieback of large limbs is common (large deadwood may have been pruned out). Major structural defects that cannot be remedied. Tree may be over-mature and senescing. Infrastructure conflicts with heightened risk potential. Tree has outgrown site constraints.
6-10 years (Short)	Tree is exhibiting chronic decline. Crown density will be less than typical and epicormic growth is likely to present. The crown may still be mostly entire, but some dieback is likely to be evident. Dieback may include large limbs. Structural defects present that influence the tree's risk rating, amenity or vitality. Over-mature and senescing or early decline symptoms in short-lived species. Early infrastructure conflicts with potential to increase regardless of management inputs.
11-20 years (Moderate)	Tree not showing symptoms of chronic decline, but growth characteristics are likely to be reduced (bud development, extension growth etc.). Developing structural defects that reduce viability with limited scope for management. Tree may be over-mature and beginning to senesce. Potential for infrastructure conflicts regardless of management inputs.
21-40 years (Moderately long)	Trees displaying normal growth characteristics, but vitality is likely to be reduced (bud development, extension growth etc.). Structural issues relatively minor and manageable with arboricultural input. Tree may be growing in restricted environment (e.g. streetscapes) or may be in late maturity. Semi-mature and mature trees exhibiting normal growth characteristics. Juvenile trees in streetscapes.

>40 years (Long)	Generally juvenile and semi-mature trees exhibiting normal growth characteristics within adequate spaces to sustain growth, such as in parks or open space. Could also pertain to maturing, long-lived trees. No observable major structural defects. Tree well suited to the site with negligible potential for infrastructure conflicts.

Note that ULE may change for a tree dependent on the prevailing climatic conditions, sudden changes to a tree's growing environment creating an acute stress or impact by pathogens.

The ULE may not be applicable for trees that are manipulated, such as topiary, or grown for specific horticultural purposes, such as fruit trees.

There may be instances where remedial tree maintenance could extend a tree's ULE.

10. Arboricultural Rating

Relates to the combination of assigned tree condition factors, including health and structure (arboricultural merit) and ULE, and conveys an amenity value (An amenity tree can occupy a site that complements its surroundings in a useful manner which culminates in the aid, protection, comfort and emotional response of humans. Adapted from Coder, 2004). Amenity relates to the trees biological, functional and aesthetic characteristics (Hitchmough, 1994) within an urban landscape context. The presence of any serious disease or tree-related hazards that would impact risk potential are considered.

The arboricultural rating can be used by applying only the main category high, moderate, low or very low without using the sub categories. The sub-categories can assist in differentiating a trees value and/or characteristic in more detail within the specific tree assessment context, such as a development site.

Arboricultural rating			
Category	*Description*		
High	Exemplary specimen due to multiple factors which could include; good condition and vitality, large size/canopy and prominence in the landscape. Likely to be a very long-term component in the landscape with a long ULE. Other factors that could contribute to a high rating: • Particularly good example of the species; rare or uncommon. • Tree has visual importance as a landscape feature; provides substantial contribution to landscape character. • Tree may have significant ecological or conservation value. • *Tree has historical, commemorative or other distinct social/cultural significance. Trees in this category must be considered for retention and/or incorporated within design proposals.		
Category	*Description*	*Sub category*	*Description*
Moderate	Tree of moderate quality, in fair or typical condition. Tree may have a condition, and or structural problem that will respond to arboricultural treatment. These trees have the potential to be moderate- to long-term components of the landscape (moderate to long ULE) if managed appropriately. The sub-categories relate predominately to age, size and amenity. Trees in this category should be considered for retention and/or incorporated within design proposals.	A	Moderate to large, maturing tree. Suited to the site & contributes to the landscape character. Tree may have conservation or other cultural/social value.
		B	Moderate sized, established tree, > 50% of attainable age/size. Suited to the site & contributes to the landscape character (other attributes covered under 'Moderate' description)
		C	• Young to semi-mature, generally a smaller tree, established, >15 cm DBH, >5 years in the location. Not a dominant canopy. No significant qualities currently but has the potential to become a higher value tree & long-term component of the landscape. Replacement of tree is likely to take up to 6 - 10 years to attain similar attributes. • Semi- to mature tree with accumulating deficiencies and reducing ULE, trending towards Low arboricultural value.
Category	*Description*		

Low	Unremarkable tree of low quality or little amenity value. Tree in either poor health and/or with poor structure. Short to transitory useful life expectancy (<10 years). • Tree is not prominent in the landscape due to its size or age, such as young trees with a stem diameter below 15 cm. Tree < 5 years in location. These trees are easily replaceable or capable of being transplanted. • Tree (species) is functionally inappropriate to the specific location. Is causing excessive damage/nuisance to adjacent infrastructure or would be expected to be problematic if retained (i.e. palm tree under power lines). • Unremarkable tree of no material landscape, conservation or other cultural value. Not visible from surrounding landscapes. • Tree infected with pathogens that could lead to its decline. • Tree has potential to be an environmental woody weed (may be dependent on location of tree in an urban landscape). • Tree impacting or suppressing trees of better quality. Retention of such trees may be considered if not requiring a disproportionate expenditure of resources for a tree in its condition and location.
Category	*Description*
Very low	Trees of low quality with a brief to no remaining ULE (<5 years). • Tree has either a severe structural defect or health problem or combination that cannot be sustained with practical arboricultural techniques and the loss of the tree or tree part would be expected in the short term. • Tree whose retention would not be viable after the removal of adjacent trees, such as trees that have developed in close spaced groups and would not be expected to adapt to severe and sudden alterations to environmental & site conditions, e.g. removal of adjacent shelter trees. • Small or young tree, <5m in height, <10cm DBH. Easily replaced in short-term or capable of being transplanted. • Acknowledged environmental woody weed species. Tree has a detrimental effect on the environment, for example, the tree has weed potential and is likely to spread into waterways or natural areas if nearby. • Tree infected with pathogens that will lead to decline and has potential to spread to adjacent trees. • Tree is dead (dead tree may offer habitat values) or is showing signs of significant, immediate, and irreversible overall decline. Tree cannot realistically be retained and should be considered for removal.

Other considerations - Even though a tree may be declining or dead, a tree could be retained for other purposes such as habitat or soil stabilisation. These trees would still need to be managed appropriately to reduce risk.

*A tree may have (attract) a high value by the community for historical, commemorative or other distinct social/cultural significance factors, albeit the tree may not be in good condition. In the context of an assessment, for multiple reasons, but more so for development, if it is a noted 'significant' tree it should receive higher consideration during the planning process.

Trees have many values, not all of which are considered when an arboricultural assessment is undertaken. However, individual trees or tree group features may be considered important community resources because of unique or noteworthy characteristics or values other than their age, dimensions, health or structural condition. Recognition of one or more of the following criteria is designed to highlight other considerations that may influence the future management of such trees.

Significance	**Description**
Horticultural Value/ Rarity	Outstanding horticultural or genetic value; could be an important source of propagating stock, including specimens that are particularly resistant to disease or exposure. Any tree of a species or variety that is rare.
Historic, Aboriginal Cultural or Heritage Value	Tree could have value as a remnant of a particular important historical period or a remnant of a site or activity no longer in action. Tree has a recognised association with historic aboriginal activities, including scar trees. Tree commemorates a particular occasion, including plantings by notable people, or having associations with an important event in local history.

Ecological Value	Tree could have value as habitat for indigenous wildlife, including providing breeding, foraging or roosting habitat, or is a component of a wildlife reserve. Remnant Indigenous vegetation that contribute to biological diversity

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Appendix 4: Protection of Retained Trees.

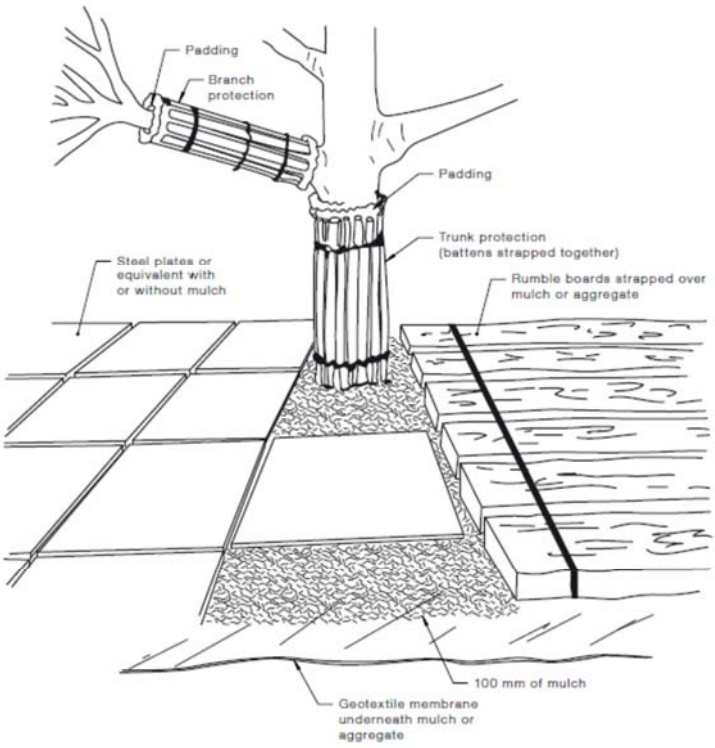
The following are guidelines that must be implemented to minimise the impact of the proposed construction works on the retained trees.

- The Tree Preservation Zone (TPZ) is fenced and clearly marked at all times. This fence should deter the placement of building materials, entry of heavy equipment and vehicles and also the entry of workers and/or the public into the TPZ. Australian Standard AS 4687 - 2007 Temporary fencing and hoardings, specifies appropriate fencing requirements. Existing perimeter fencing can be incorporated into the protective fencing. Shade cloth should be attached to reduce the movement of dust and other particulates into the TPZ. Signs identifying the TPZ are to be placed on the fencing.
- If the area within the TPZ is to be accessed during the construction phase then the area will need ground protection. Measures may include a permeable membrane, such as a geotextile, to cover the TPZ area beneath a 100 mm layer of crushed rock below rumble boards.
- Contractors and site workers should receive written and verbal instruction as to the importance of tree protection and preservation within the site. Successful tree preservation occurs when there is a commitment from all relevant parties involved in designing, constructing and managing a development project. Members of the project team need to interact with each other to minimise the impacts to the trees, either through design decisions or construction practices.
- The consultant arborist is on-site to supervise excavation works around the existing trees where the TPZ will be encroached.
- No persons, vehicles or machinery to enter the TPZ without the consent of the consulting arborist or site manager.
- Any underground service installations within the allocated TPZ should be bored and utility authorities should common trench where possible.
- No fuel, oil dumps or chemicals shall be allowed in or stored on the TPZ and the servicing and re-fuelling of equipment and vehicles should be carried out away from the root zones.
- No storage of material, equipment or temporary building should take place over the root zone of any tree.
- Nothing whatsoever should be attached to any tree including temporary services wires, nails, screws or any other fixing device.
- Any pruning that is required must be carried out by trained and competent arborist who has a thorough knowledge of tree physiology and pruning methods and carry out pruning to the Australian Standard AS 4373 – 2007 '*Pruning of Amenity Trees'.*
- All root excavation should be carried out by hand digging or with the use of 'Air-Excavation' techniques, and roots should be severed by saw cutting or with a sharp axe and not with a Backhoe or any machinery or blunt instrument.
- Pruning of roots greater than 50mm in diameter at the edge of the TPZ must be undertaken using a sharp saw or secateurs or any other machinery specifically designed to prune tree roots. Any machinery not specifically designed to prune roots must not be used.
- Where required, trunk protection can be achieved through the use of adequate padding secured around the trunk. Timber hoarding or palings, sufficient in length to cover the trunk, laid over rubber or similar padding wrapped around the trunk and fixed using non-invasive fixing device such as steel strapping is

suitable.

Attaching items to a trunk requiring invasive fittings such as screws, nails or bolts is not permitted.

- Trunk protection material should not be maintained for prolonged periods and should be removed from the tree as soon as the threat ceases.
- A layer of organic mulch (woodchips) to a depth of no more than 100mm should be placed over the root systems within the TPZ of trees, which are to be retained so as to assist with moisture retention and to reduce the impact of compaction.
- Supplementary watering should be provided to all trees through any dry periods during and after the construction process. Proper watering is the most important maintenance task in terms of successfully retaining the designated trees. The areas under the canopy drip lines should be mulched with woodchip to a depth of no more than 100mm. The mulch will help maintain soil moisture levels. Testing with a soil probe in a number of locations around the tree will help ascertain soil moisture levels and requirements to irrigate. Water needs to be applied slowly to avoid runoff. A daily watering with 5 litres of water for every 30 mm of trunk calliper may provide the most even soil moisture level for roots (Watson & Himelick, 1997), however light frequent irrigations should be avoided. Irrigation should wet the entire root zone and be allowed to dry out prior to another application. Watering should continue from October until April.



NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

Diagram 1. Examples of appropriate Trunk, limb and root zone buffering protection or ground protection. Extract from Australian Standard (4970-2009) Protection of Trees on development sites – Section 4.5.3.

Appendix 5: Tree Protection Zones.

The most important consideration for the successful retention of trees is to allow appropriate above and below ground space for the trees to continue to grow. This requires the allocation of tree protection zones for retained trees.

The Australian Standard (AS 4970-2009) '*Protection of Trees on Development Sites'* has been used as a guide in the allocation of TPZs for the assessed trees. The TPZ for individual trees is calculated based on trunk diameter (DBH measured in centimetres), measured at 1.4 metres up from ground level. The radius of the TPZ is calculated by multiplying the trees DBH by 12.

This method provides a TPZ that addresses both the stability and growing requirements of a tree. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. The maximum TPZ should be no more than 15m radius and the minimum TPZ should be no less than 2m radius.

Encroachment into the TPZ is permissible under certain circumstances though this is dependent on both site conditions and tree characteristics. Minor encroachment, up to 10% of the TPZ, is generally permissible provided encroachment is compensated for by recruitment of an equal area contiguous with the TPZ. Encroachment must also consider the crown of the tree and ensure that excessive pruning is not required that would cause the tree to become unbalanced or disfigured.

The 10% encroachment on one side equates to approximately a ⅓ reduction of the radial distance.

Examples of minor encroachment are provided in Diagram 1A &1B.

Encroachment greater than 10% is considered major encroachment under AS4970-2009 and is only permissible if it can be demonstrated that after such encroachment the tree would remain viable. Non-destructive root investigation (NDRI) may be required to investigate and identify the location of roots within the proposed area of encroachment.

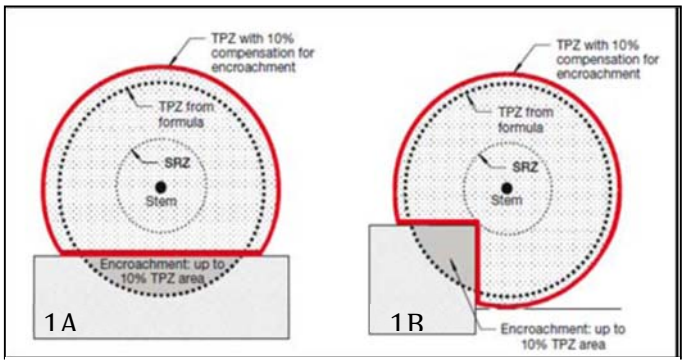


Diagram 1A & 1B: Examples of minor encroachment into a TPZ.
Extract from: AS4970-2009, Appendix D,p30 of 32

Tree root growth is opportunistic and occurs where the essentials to life (primarily air and water) are present. Heterogeneous soil conditions, existing barriers, hard surfaces and buildings may have inhibited the development of a symmetrically radiating root system. Existing infrastructure around some trees may be within the TPZ or root plate radius. Where this has occurred, the roots of some trees may have grown in response to the site conditions and if existing hard surfaces and building alignments are utilised in new designs the impacts on trees should be minimal.

All TPZ measurements are provided in the tree assessment data in Appendix 1. More specific tree protection distances and other measures could be provided during the design phase of a development project. Appendix 4 provides tree protection guidelines that should be incorporated into design and management plans for retained trees.

The Structural Root Zone (SRZ) is the area in which the larger woody roots required for tree stability are found close to the trunk and which then generally taper rapidly. This is the minimum area recommended to maintain tree stability but does not reflect the area required to sustain tree health. The area between the reduced TPZ and the SRZ may only be encroached if root sensitive construction methods are adopted, based on results of Non-destructive root investigation and if approved by the consulting arborist. No works are permitted within the SRZ radius as tree stability maybe compromised.

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