Arboricultural Assessment

445-467 Blackburn Road, Mount Waverley

Prepared for Just China Holdings

Tree Logic Ref: 8319

Prepared by Andrew Fox

7/06/2017

treelogic

Tree management for the urban forest

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Front cover images

Left: A view looking south, showing the relative size, location and condition of the Calery's Pear (*Pyrus calleryana*) Trees 10 – 11 that existed to the east of the study area.

Top Right: A view looking southwest showing the relative size, location and condition of the moderately rated Silver Birch (*Betula pendula*) trees, # 1 and 2, which existed in the centre of the existing carpark to the north of the subject site.

Bottom Right: A view from outside of the site looking southwest, showing the relative size, location and condition of the Council managed Kanooka (*Tristaniopsis laurina*). The tree was located within the Lemont Avenue nature strip planting to the north of the site.

Ref: 8319_445-467 Blackburn Road, Mount Waverley

File No.	Version	Author	Issue date	Revision	Issued by.
8319	1	Andrew Fox	7/06/2017	Preliminary assessment	AF

Executive Summary

Tree Logic was engaged to undertake an arboricultural assessment of tree features within and surrounding 445-467 Blackburn Road, Mount Waverley to inform designers of tree related constraints and opportunities to any future redevelopment of the site. The survey was required to determine the type, condition and retention value of trees within the site and to provide appropriate tree protection measures.

The tree study area comprised the grounds of the Hotel Bruce County, which was located on the western side of Blackburn Road in Mount Waverley. The assessed area was approximately 6,272 square metres in size.

Twenty-seven (27) individually assessed tree features, along with one (1) tree group, comprising approximately fifty (50) semi-mature Leyland Cypress (*XCupressocyparis leylandii*) specimens were recorded.

All trees were attributed an arboricultural rating which reflects their retention value.

Of the individually assessed trees:

- Ten (10) trees, along with Group 1, were attributed Moderate arboricultural ratings.
- Sixteen (16) tree features were attributed a Low arboricultural rating, due to health and/or structural deficiencies or being of small size.
- One (1) tree, no. 17, was attributed an arboricultural rating of None.

From an arboricultural perspective, trees of Moderate value represent the best opportunity to retain as amenity specimens, as they comprise established trees of fair or better quality. Low rated trees are not considered worthy of being a constraint on any proposed development. Trees attributed an arboricultural value of None are not suitable to retain on arboricultural grounds, regardless of any proposed development.

Schedule 1 to the Vegetation Protection Overlay (VPO1), covers the site. The vegetation comprised specimens that were less than 10 metres in height and therefore exempt from permit requirements under the VPO1.

The current design sees an extensive redevelopment of the site. Given the extent of the proposed development the majority (20) of the individually assessed trees, along with Group 1, stand to incur significant TPZ encroachments and will have to be removed in order to facilitate the design.

Refer to Appendix 1 for tree assessment details, Appendix 2 for a tree location plan and Appendix 3 for tree descriptors.

1 Method:

1.1 Site inspection method;

A site inspection was undertaken on Tuesday, 30 May 2017. The trees were inspected from the ground and observations were made of the growing environment and the surrounding area. The trees were not climbed and no samples of the trees or site soil were taken.

Tree assessment details are listed in the tree assessment table in Appendix 1 and relate to the trees shown and numbered in Appendix 2.

Observations were made of the trees to determine age and condition, with measurements taken to establish tree height (measured with a clinometer), crown width (paced) and trunk diameter (measured at 1.4 m above grade unless otherwise stated).

Definitions of arboricultural descriptors can be seen in Appendix 3.

Photographs of some trees and site conditions were taken for further reference and inclusion in the report.

1.2 Arboricultural assessment method;

The health and structural characteristics of each tree were assessed and each tree was attributed an 'Arboricultural Rating'. The arboricultural rating correlates the combination of tree condition factors (health, structure and form) with tree amenity value. Amenity relates to the trees biological, functional and aesthetic characteristics within a built environment. The arboricultural rating in combination with other factors can assist the project team and planners in nominating trees suitable for retention. The four (4) arboricultural ratings used by Tree Logic include:

- **High:** Trees of high quality in good to fair condition. Retention of such trees is highly desirable.
- **Moderate**: Trees with a Moderate arboricultural rating were generally suitable for retention and design should attempt to incorporate these trees and provide adequate clearances during development stages where reasonable design intent is not unduly hampered.
- **Low**: Trees with a Low arboricultural rating generally had low retention values. They were either fair specimens of relatively small size or displayed general health or structural deficiencies and were not worthy of being a constraint on reasonable design intent. Retention of Low rated trees may be considered in some instances if not requiring a disproportionate expenditure of resources to successfully incorporate into the design or manage ongoing condition.
- **None**: Trees attributed an arboricultural rating of None had health or structural characteristics that were beyond arboricultural maintenance or were environmental weed species or self-sewn trees spreading through the site to the exclusion of other plants.

  Full tree descriptors are included at Appendix 3.

1.3 The Australian Standard AS 4970-2009 Protection of trees on development sites (AS 4970), has been used as a guide in the allocation of Tree Protection Zones (TPZs) for the assessed trees. The TPZ methodology is explained in detail in Section 4 and the specific measurements are included in the tree assessment data in Appendix 1. TPZ measurements are included in the tree assessment data in Appendix 1.

1.4 Documents reviewed include;

- Feature and level survey, 445-467 Blackburn Road, Mount Waverley. Prepared by SOS Surveying. Drawing Number: 1467 03AA. Date: 23/05/17.
- Ground floor plan, 445 Blackburn Road, Mount Waverley. Supplied by marchese partners on 26/05/2017.
- Planning property reports and the City of Monash planning zones and overlays. Schedule 1 to the Vegetation Protection Overlay (VPO1), covers the site. *A permit is required to remove or destroy any vegetation that has a trunk circumference greater than 500 mm (160 mm diameter) at 1200 mm above ground level and is higher than 10 metres.*
- Native Vegetation on the site is considered under Clause 52.17 Native Vegetation given that the site is greater than 4,000 square metres in size. Proposed removal of naturally occurring trees native to Victoria may trigger permit and offset requirements under the Clause.

2 Observations

Site description.

2.1 The tree study area comprised the grounds of the Hotel Bruce County, which was located on the western side of Blackburn Road in Mount Waverley. The assessed area was approximately 6,272 square metres in size.

Tree population.

2.2 Twenty-seven (27) individual tree features and one (1) tree row, comprising approximately fifty (50) semi-mature Leyland Cypress (X*Cupressocyparis leylandii*) specimens were assessed and recorded within and adjacent to the site.

2.3 The assessed tree population comprised 15 different species.

The four (4) most common species represented approximately 64% of the individually assessed tree population and are listed in Table 1 below.

Table 1: Common Name (*Species*)	**Origin**	**Count of trees**
Bracelet Honey-myrtle (*Melaleuca armillaris*)	Victorian native	8
Callery's Pear (*Pyrus calleryana*)	Exotic deciduous	4
Chinese Hawthorn (*Photinia serratifolia*)	Exotic evergreen	4
Silver Birch (*Betula pendula*)	Exotic deciduous	2
	Totals	**18**

Tree origin:

2.4 The origin of the trees was assessed to determine which trees may be indigenous to the local area or native to Victoria and may trigger permit requirement under the native vegetation clause of the planning scheme, Clause 52.17.

2.5 Based on the level of historic land use, development and disturbance associated with the site as well as the spatial arrangement, age class and species selection it was determined that all of the trees within the site were introduced specimens of Victorian, Australian native and exotic species planted for amenity and screening purposes.

2.6 Tree health was assessed based on foliage colour, size and density as well as shoot initiation and elongation.

2.6.1 In general terms the majority of the individually assessed trees (26 trees), along with Group 1, were displaying characteristics considered to be typical or better of the species growing in this environment under current conditions.

2.6.2 Two (2) Silver Birch trees displayed minor health deficiencies such as reduced foliage density or minor/tip dieback which may improve or fluctuate with seasonal conditions and was relatively characteristic of trees within a given population.

2.7 Tree structure was assessed for structural defects and deficiencies, likelihood of failures and risk to potential targets.

2.7.1 Fifty-seven percent (16) of the individually assessed trees, along with Group 1, displayed fair or better structure considered typical and acceptable for the species.

2.7.2 Eight (8) individually assessed trees displayed fair to poor structural condition, with minor deficiencies, wounds, past failures and crown asymmetry. Some of the deficiencies may be manageable with arboricultural input.

2.7.3 Two (2) trees displayed poor structure and two (2) Bracelet Honey-myrtle trees were collapsing.

Arboricultural Rating:

2.8 It should be noted that the arboricultural rating is different to the conservation/ecological values placed on trees by other professions.
Definitions of arboricultural ratings can be seen in Appendix 3.
Table 2 indicates the arboricultural ratings attributed to the trees inspected.

Table 2: Arb. Ratings	Total	Individual tree features
Moderate	11	1-3, 6, 8, 12, 18-21, Group 1
Low	16	4, 5, 7, 9-11, 13-16, 22-27
None	1	17

3 Tree permit requirements

3.1 The site falls within the City of Monash Planning Scheme and is covered by Schedule 1 to the Vegetation Protection Overlay (VPO1). Under the schedule, a *permit is required to remove or destroy any vegetation that has a trunk circumference greater than 500 mm (160 mm diameter) at 1200 mm above ground level and is higher than 10 metres.*

The vegetation comprised specimens that were less than 10 metres in height and therefore exempt from permit requirements under the VPO1.

3.2 Tree controls apply to Victorian Native trees under Clause 52.17 – Native Vegetation.

- Permitted clearing of Native Vegetation-Biodiversity Assessment Guidelines, Clause 52.17 of the local planning scheme is applicable to sites greater than 4,000 m^2 in area.

Clause 52.17 applies only to vegetation native to Victoria.
Native vegetation planted for purposes of 'shelter belts, woodlots, street trees, gardens or the like' are generally exempt under 52.17-7.

It was determined that the tree study area comprised introduced specimens of Victorian, Australian native and exotic species, planted for amenity and screening purposes and are therefore exempt from Clause 52.17

4 Tree protection

4.1 The preliminary arboricultural assessment report provides planners and designers with information on the measures required to protect trees suitable for retention.

4.2 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.

4.3 The AS 4970-2009 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 metres), measured at 1.4 metres up from ground level. The radius of the TPZ is calculated by multiplying the trees' DBH by 12. The 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 15 m radius and the minimum TPZ should be no less than 2 m 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, and encroachment should be compensated for by recruitment of an equal area contiguous with the TPZ. The crown of the tree should also not require excessive pruning that would cause the tree to become unbalanced or disfigured.
Examples of minor encroachment are provided in Diagram 1A &1B.

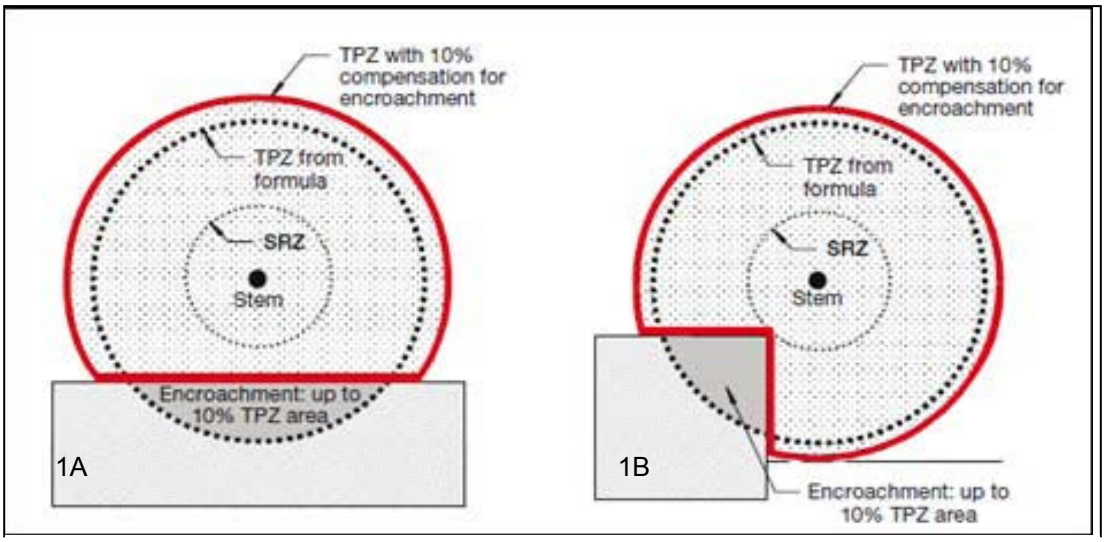

Diagram 1A & 1B: *Examples of minor encroachment into a TPZ.*
Extract from: AS4970-2009, Appendix D, p30 of 32.

4.4 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 identify the location of roots.

4.5 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 excavation works are permitted within the SRZ radius.

4.6 Existing soil grades should remain unaltered within any tree protection zone adopted on site. Trenching for installation of services should not occur within the recommended reduced TPZ of any retained tree unless prior approval by the municipal arborist is obtained.

4.7 Where tree removals are proposed and permitted in the vicinity of other trees nominated to be retained suitably qualified and experienced arborists must undertake the tree removal in a controlled manner so that no retained trees are damaged.

4.8 All TPZ measurements are provided in the tree assessment data in Appendix 1. General TPZ management guidelines are listed in Appendix 4 - Protection of retained trees.

5 General design comments

5.1 The current design sees an extensive redevelopment of the site. The existing buildings are currently proposed to be demolished to make way for the construction of a new hotel facility and underground basement area. The existing crossover off Lemount Avenue is proposed to be removed and replaced by two crossovers, one providing access to the car park and the second providing drop off access.

Given the extent of the proposed construction, all of the trees within the site stand to incur significant TPZ encroachments and will have to be removed in order to facilitate the design. The five (5) street trees, nos. 22 – 26 exist within the alignment of the proposed pavement on the southern side of Lemount Avenue and will also have to be removed in order to facilitate the design.

5.1.1 As the five (5) street trees are under Council management, any proposed removal would first have to be negotiated with the relevant authority.

5.2 The remaining seven (7) Bracelet Honey-myrtle trees to the south of the site can be retained under the current design, providing appropriate tree protection management is implemented. The recommended TPZs of the seven (7) trees extended into the site by varying amounts.

Shown in Figure 2, the footprint of the proposed Common Entry Foyer extends into the 6.5 m radius TPZ of Tree 15 by approximately 22 square metres or 16%. Tree 15 was an over-mature specimen that displayed poor structure and was in the process of collapsing. The proposed 16% TPZ encroachment is likely to be inconsequential to the ongoing demise of the tree.

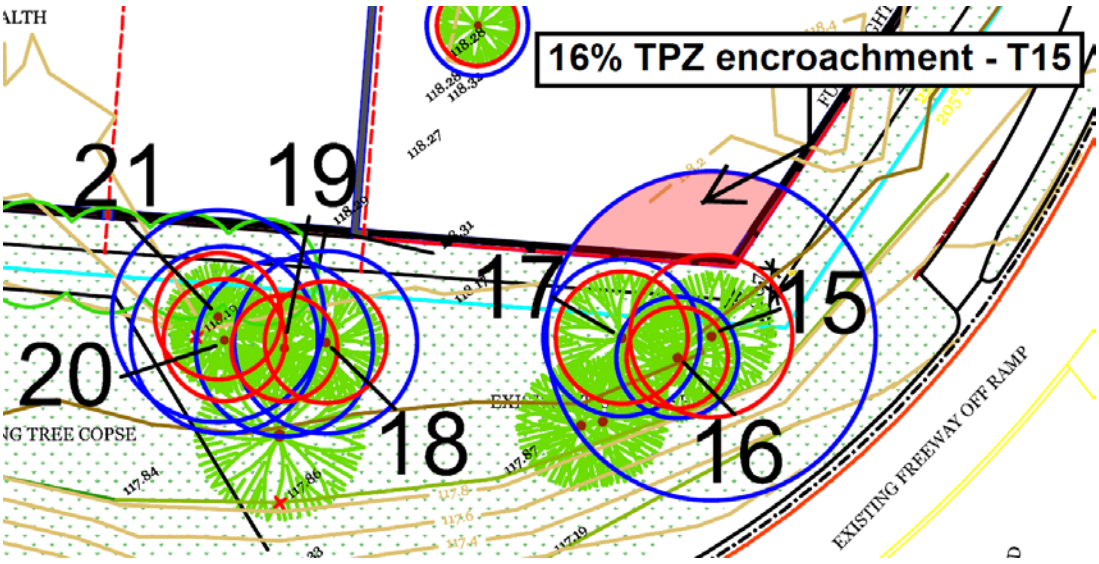

Figure 2: *An excerpt of the current design, showing the proposed construction within the TPZ of Tree 15.*

5.3 To successfully retain the suitable trees, tree protection fencing and management must be implemented prior to commencing any construction related activity including demolition, bulk earthworks and landscaping. TPZ fencing must be erected:

5.3.1.1 Along the south eastern boundary to protect the TPZs of Trees 15 – 21. Appropriate tree protection management is required to be established 1 metre back from the proposed building footprint with appropriate ground buffering installed between the TPZ fence and the building, where the footprint exists within the trees' allocated TPZs.

5.3.1.2 Around the Council managed Chinese Hawthorn, Tree 27, to the extent of the back of kerb and edge of foot path to prevent debris, spoil, building materials, deliveries or vehicle movements occurring within its recommended TPZ.

5.4 TPZ fencing must be maintained for the duration of the construction process including landscaping. Where TPZ fencing is impractical, ground protection measures will be required in order to prevent root damage and soil compaction (refer to Diagram 2 in Appendix 4).
Appendix 4 provides tree protection guidelines that should be incorporated into the design and management plans for retained trees.

5.5 Existing soil levels within the TPZ's must not be altered during construction activities including the landscape phase. It is imperative that no open cut excavation occurs within the recommended TPZ area of any retained trees for installation of underground services such as water, drainage, electricity, gas, telecommunications, security or any other landscape feature without prior consultation with the project arborist and/or the relevant authority.

6 Photographic examples

1 A view looking south, showing the row of semi-mature Leyland Cypress, Group 1, which existed along the site's southern boundary.

2 View looking south, showing the relative size, location and condition of Calery's Pear Trees 10 – 11 that existed to the east of the study area.

3 An image of the showing the relative size and deteriorating condition of the Bracelet Honey-myrtle – Trees 15 – 17.

4 The eastern aspect of the Moderately rated European Ash (*Fraxinus excelsior*) – Tree 8.

7 Conclusion and Recommendations:

7.1 The tree study area comprised trees located within and adjacent to 445-467 Blackburn Road, Mount Waverley. The subject site was approximately 6,272 square metres in size.

7.2 Twenty-seven (27) trees, along with one (1) tree group, comprising approximately (50) semi-mature Leyland Cypress were individually inspected and recorded within the study area.

7.3 Fifteen (15) different species were recorded, with approximately 64% of the individually assessed trees found to be made up of four (4) species, being Bracelet Honey-myrtle, Callery's Pear, Chinese Hawthorn and Silver Birch.

7.4 All trees were attributed an arboricultural rating that reflects the retention value of each tree.

- Ten (10) trees, along with Group 1, were attributed Moderate arboricultural ratings.
- Sixteen (16) tree features were attributed a Low arboricultural rating, due to health and/or structural deficiencies or being of small size.
- One (1) tree, # 17 was attributed an arboricultural rating of None.

Refer to Table 2 in Section 2 and Appendix 1 for the individual tree numbers.

7.5 Given the extent of the proposed construction, all of the trees within the site stand to incur significant TPZ encroachments and will have to be removed in order to facilitate the design. The remaining assessed trees (nos.15-21 and 27) can be retained under the current design, providing appropriate tree protection management is implemented.

7.6 Any proposed removal of the five (5) street trees, nos. 22-26, would first have to be negotiated with the relevant authority.

7.7 Tree protection zones (TPZ's) must be established and fenced prior to commencing any works on site. Tree protection measures must be adopted including the following:

- Tree protection fencing must be erected around trees to be retained to the satisfaction of the Council and/or as described in Appendix 4 prior to commencing any works on site including bulk earth works, construction and landscaping and maintained for the duration of the redevelopment works.
- All TPZ dimensions are provided in the tree assessment data in Appendix 1 and relate to the trees identified in Appendix 2. TPZ management guidelines are included in Appendix 4.
- All conditions of the tree protection guidelines attached as Appendix 4 should be adopted and applied for the duration of site works.

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

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References and bibliography:

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

Mattheck, C & Breloer, H. (1997) *Body language of trees. A handbook for failure analysis*. The Stationary Office, London.

Harris, R.W, Clark, J.R. & Matheny, N.P. (2004), *Arboriculture: Integrated Management of Landscape trees, shrubs and vines*, Prentice Hall, New Jersey.

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 details: 445-467 Blackburn Road, Mount Waverley.

Refer to the following two (2) pages.

DBH = Diameter at Breast Height (measured in centimetres at 1.4 m above ground unless otherwise stated).

TPZ = Tree Protection Zone (metre radius).

Calculated using AS 4970-2009 and described in Section 4.

SRZ = Structural Root Zone (No Go Zone)

Radius distances measured in metres from the centre of the trunk.

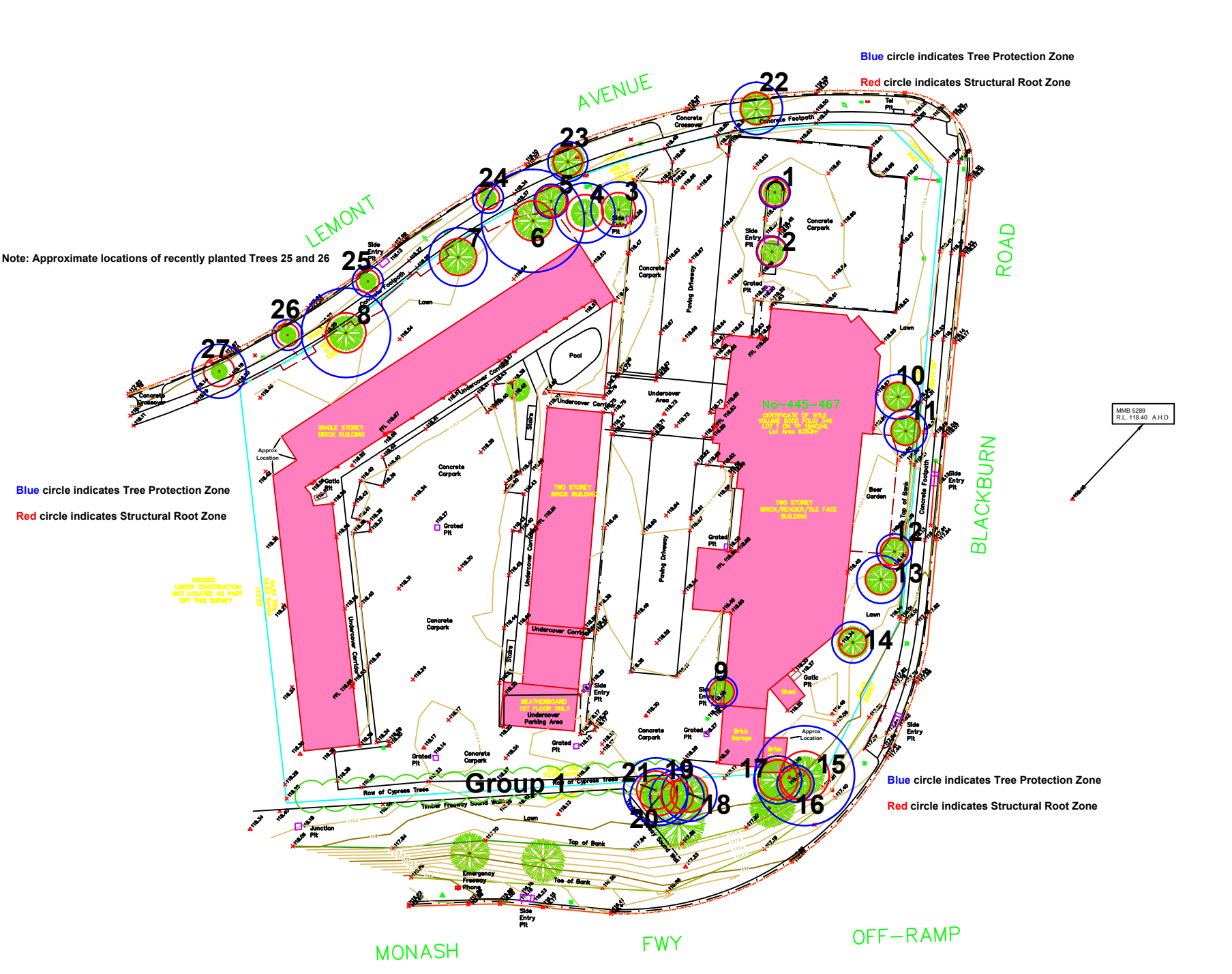
For tree location and numbering refer Appendix 2. See Appendix 3 for Tree descriptors.

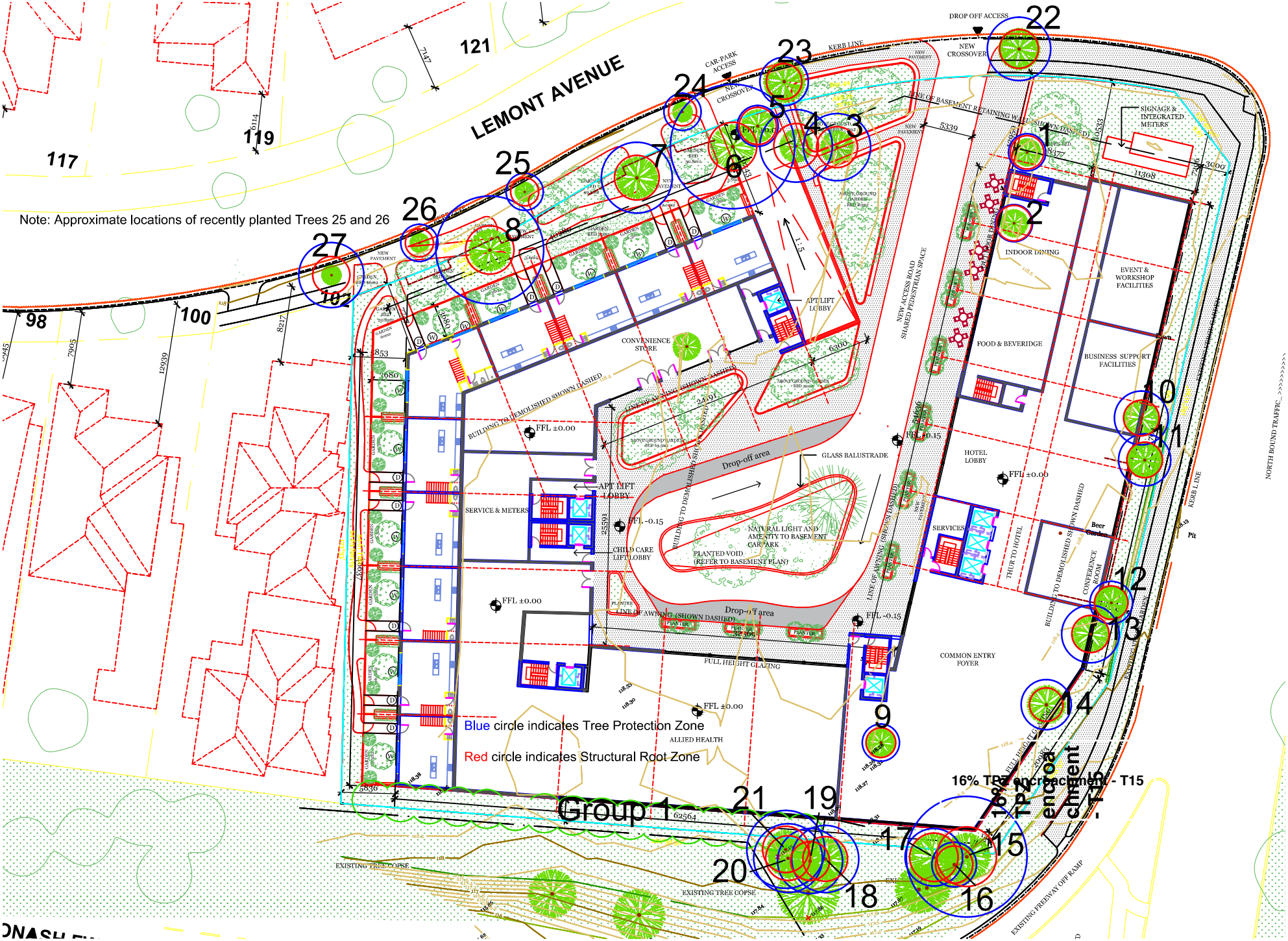
No.	Common Name (Botanic name)	Origin	Age	DBH (cm)	Height x Width (m)	Health	Structure	Arb. Value	Comment	TPZ (m radius)	SRZ (m radius)	Retained/ Removed
1	Silver Birch (Betula pendula)	Exotic deciduous	Semi-mature	14	6 x 5	Fair to poor	Fair	Moderate		2.0	1.8	Removed
2	Silver Birch (Betula pendula)	Exotic deciduous	Semi-mature	16	6 x 4	Fair to poor	Fair	Moderate		2.0	1.9	Removed
3	Bracelet Honey-myrtle (Melaleuca armillaris)	Victorian native	Semi-mature	24, 18	4 x 6	Fair	Fair	Moderate		3.6	2.2	Removed
4	Privet (Ligustrum sp.)	Exotic evergreen	Semi-mature	23, 17, 16	6 x 6	Fair	Poor	Low	Multi stemmed with acute forks.	3.9	2.4	Removed
5	Weeping Bottlebrush (Callistemon viminalis)	Australian native	Semi-mature	12, 10, 9	5 x 4	Fair	Fair	Low (size)		2.2	2.0	Removed
6	Willow Myrtle (Agonis flexuosa)	Australian native	Early-mature	56	7 x 6	Fair	Fair to poor	Moderate	Acute forks. Crack in trunk.	6.7	2.6	Removed
7	Cotoneaster (Cotoneaster sp.)	Exotic evergreen	Early-mature	19, 17, 14, 12	5 x 8	Fair	Fair to poor	Low		3.8	2.4	Removed
8	European Ash (Fraxinus excelsior)	Exotic deciduous	Maturing	33, 27, 22	9 x 11	Fair	Fair	Moderate		5.8	2.6	Removed
9	Smooth Arizona Cypress (Hesperocyparis glabra)	Exotic conifer	Semi-mature	16	4 x 3	Fair	Fair	Low (size)		2.0	1.6	Removed
10	Callery's Pear (Pyrus calleryana)	Exotic deciduous	Semi-mature	24 @ 100	9 x 6	Fair	Fair to poor	Low	Co-dominant stems with acute forks.	2.9	1.9	Removed
11	Callery's Pear (Pyrus calleryana)	Exotic deciduous	Semi-mature	23 @ 100	9 x 6	Fair	Fair to poor	Low	Co-dominant stems with acute forks.	2.8	1.9	Removed
12	Callery's Pear (Pyrus calleryana)	Exotic deciduous	Semi-mature	19 @ 100	6 x 5	Fair	Fair to poor	Moderate	Acute forks	2.3	1.8	Removed
13	Callery's Pear (Pyrus calleryana)	Exotic deciduous	Semi-mature	26 @ 100	9 x 5	Fair	Fair to poor	Low	Co-dominant stems with acute forks.	3.1	2.0	Removed
14	Chinese Hawthorn (Photinia serratifolia)	Exotic evergreen	Semi-mature	16, 13, 10	4 x 4	Fair	Fair	Low (size)		2.7	1.8	Removed
15	Bracelet Honey-myrtle (Melaleuca armillaris)	Victorian native	Over-mature	30, 29, 26, 22	7 x 9	Fair	Collapsing	Low		6.5	3.2	Retained
16	Bracelet Honey-myrtle (Melaleuca armillaris)	Victorian native	Over-mature	17, 10	4 x 4	Fair	Poor	Low	Canopy suppressed.	2.4	2.0	Retained
17	Bracelet Honey-myrtle (Melaleuca armillaris)	Victorian native	Over-mature	20, 16	7 x 10	Fair	Collapsing	None		3.1	2.6	Retained
18	Bracelet Honey-myrtle (Melaleuca armillaris)	Victorian native	Early-mature	30	8 x 7	Fair	Fair to poor	Moderate	Past stem failure	3.6	2.4	Retained

No.	Common Name (Botanic name)	Origin	Age	DBH (cm)	Height x Width (m)	Health	Structure	Arb. Value	Comment	TPZ (m radius)	SRZ (m radius)	Retained/ Removed
19	Bracelet Honey-myrtle (Melaleuca armillaris)	Victorian native	Semi-mature	29	8 x 8	Fair	Fair	Moderate		3.5	2.1	Retained
20	Bracelet Honey-myrtle (Melaleuca armillaris)	Victorian native	Semi-mature	24, 20	8 x 9	Fair	Fair	Moderate		3.7	2.4	Retained
21	Bracelet Honey-myrtle (Melaleuca armillaris)	Victorian native	Early-mature	35	7 x 6	Fair	Fair	Moderate		4.2	2.5	Retained
22	Kanooka (Tristaniopsis laurina)	Australian native	Semi-mature	21, 19 @ 100	4 x 5	Fair	Fair	Low (size)	Street tree	3.4	2.1	Removed
23	Chinese Hawthorn (Photinia serratifolia)	Exotic evergreen	Semi-mature	22@70	4 x 5	Fair	Fair	Low (size)	Street tree	2.6	1.9	Removed
24	Purple Leaf Cherry Plum (Prunus cerasifera 'Nigra')	Exotic deciduous	Semi-mature	10, 8	3 x 2	Fair	Fair to poor	Low	Street tree	2.0	1.5	Removed
25	Chinese Hawthorn (Photinia serratifolia)	Exotic evergreen	Young	5	1 x 1	Fair	Fair	Low (size)	Street tree. Recently planted.	2.0	1.5	Removed
26	Maple (Acer sp.)	Exotic deciduous	Young	5	1 x 1	Fair	Fair	Low (size)	Street tree. Recently planted.	2.0	1.5	Removed
27	Chinese Hawthorn (Photinia serratifolia)	Exotic evergreen	Early-mature	16, 15, 15, 12	4 x 8	Fair	Fair	Low (size)	Street tree	3.5	2.0	Removed
Grp 1	Leyland Cypress (XCupressocyparis leylandii)	Exotic conifer	Semi-mature	~25	~9 x 6	Fair	Fair	Moderate	Approximately 50 trees in the row.	3.0	2.0	Removed

Appendix 2: Tree location plan and impact assessment: 445-467 Blackburn Road, Mount Waverley.

Refer to the following page.


Blue circle indicates Tree Protection Zone
Red circle indicates Structural Root Zone
Note: Approximate locations of recently planted Trees 25 and 26
AVENUE
LEMONT
ROAD
BLACKBURN
MONASH
FWY
OFF-RAMP
Nos445-467
Group 1
Row of Cypress Trees
Timber Freeway Sound Wall
Undercover Carpark
Undercover Corridor
Undercover Parking Area
Concrete Carpark
Concrete Crossover
Concrete Footpath
Paving Driveway
Lawn
Pool
Grated Pit
Side Entry Pit
Gatic Pit
Junction Pit
Tel Pit
Emergency Freeway Phone
Top of Bank
Toe of Bank
Bear Garden
Approx Location
HOUSES UNDER CONSTRUCTION NOT LOCATED AS PART OF THIS SURVEY
MMB 5289
R.L. 118.40 A.H.D


LEMONT AVENUE
Note: Approximate locations of recently planted Trees 25 and 26
Blue circle indicates Tree Protection Zone
Red circle indicates Structural Root Zone
16% TPZ encroachment - T15
Group 1
DROP OFF ACCESS
NEW CROSSOVER
CAR-PARK ACCESS
KERB LINE
LINE OF BASEMENT RETAINING WALL SHOWN DASHED
SIGNAGE & INTEGRATED METERS
INDOOR DINING
EVENT & WORKSHOP FACILITIES
FOOD & BEVERIDGE
BUSINESS SUPPORT FACILITIES
NEW ACCESS ROAD SHARED PEDESTRIAN SPACE
APT LIFT LOBBY
CONVENIENCE STORE
BUILDING TO DEMOLISHED SHOWN DASHED
LINE OF AWNING (SHOWN DASHED)
Drop-off area
GLASS BALUSTRADE
SERVICE & METERS
CHILD CARE LIFT LOBBY
NATURAL LIGHT AND AMENITY TO BASEMENT CARPARK
PLANTED VOID (REFER TO BASEMENT PLAN)
HOTEL LOBBY
SERVICES
THUR TO HOTEL
BUILDING TO DEMOLISHED SHOWN DASHED
CONFERENCE ROOM
Beer Garden
COMMON ENTRY FOYER
FULL HEIGHT GLAZING
ALLIED HEALTH
EXISTING TREE COPSE
EXISTING FREEWAY OFF RAMP
NORTH BOUND TRAFFIC
KERB L INE
Pit
FFL ±0.00
FFL -0.15
117
119
121
98
100
102

Appendix 3: Arboricultural Descriptors (April 2015)

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

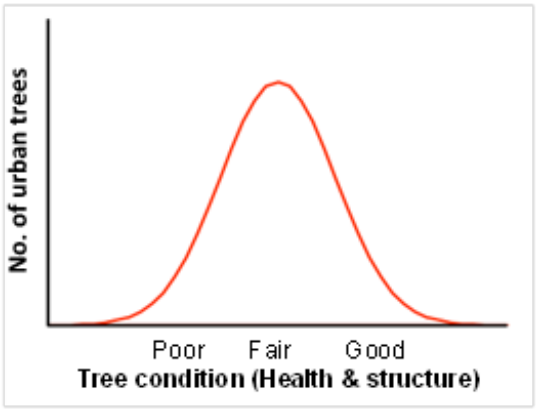


Diagram 1: Indicative normal distribution curve for tree condition

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, 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 vigour of the tree.

Category	Vigour, 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. 90-100% 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 vigour	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	Exhibiting severe deficiencies. Thinning foliage, generally smaller or deformed	Extreme and contributing to decline
Dead	N/A	N/A	N/A	N/A

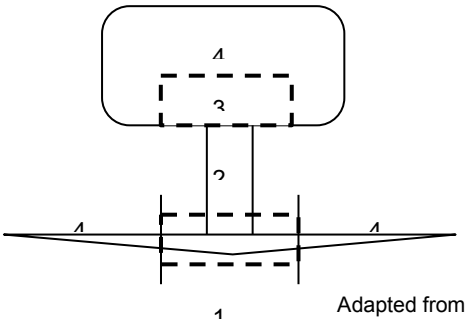
7. Structure

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



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 take into account 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. Arboricultural Rating

Relates to the combination of tree condition factors, including health and structure (arboricultural merit), and also conveys an amenity value. 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 taken into account.

Category	Description
High	Tree of high quality in good to fair condition. Generally a prominent arboricultural/landscape feature. These trees have the potential to be a medium- to long-term component of the landscape if managed appropriately. Retention of these trees is highly desirable.
Moderate	Tree of moderate quality, in fair or better condition. Tree may have a condition, and or structural problem that will respond to arboricultural treatment. These trees have the potential to be a medium- to long-term component of the landscape if managed appropriately. Retention of these trees is generally desirable.
Low	Unremarkable tree of low quality or little amenity value. Tree in either poor health or with poor structure or a combination. Tree is not significant because of either its size or age, such as young trees with a stem diameter below 15 cm. These trees are easily replaceable. Tree (species) is functionally inappropriate to specific location and would be expected to be problematic if retained. 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
None	Trees of low quality with an estimated remaining life expectancy of less than 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 would be expected in the short term. Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline. Tree infected with pathogens of significance to either the health or safety of the tree or other adjacent trees. Tree whose retention would not be viable after the removal of adjacent trees (includes trees that have developed in close spaced groups and would not be expected to acclimatise to severe alterations to surrounding environment – removal of adjacent shelter trees). Tree has a detrimental effect on the environment, for example, the tree is a recognised environmental woody weed with potential to spread into waterways or natural areas. Unremarkable tree of no material landscape, conservation or other cultural value.

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 criterion 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

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). 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. 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.). Tree may be over-mature and senescing.
21-30 years (Moderate)	Trees displaying normal growth characteristics. Tree may be growing in restricted environment (e.g. Streetscapes) or may be in late maturity.
31-60 years (Moderately long)	Semi-mature and mature trees exhibiting normal growth characteristics. Juvenile trees in streetscapes.
60+ years (Long)	Generally juvenile and semi-mature trees exhibiting normal growth characteristics in parks or open space. Could also be maturing, long-lived trees. 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, which can either increase or decrease, or sudden changes to a tree's growing environment creating an acute stress.

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Appendix 4: Tree protection zones.

Introduction

In order to sustain trees on a development site consideration must be given to the establishment of tree protection zones.

The physical dimensions of tree protection zones can sometimes be difficult to define. The projection of a tree's crown can provide a guide but is by no means the definitive measure. The unpredictable nature of roots and their growth, differences between species and their tolerances, and observable and hidden changes to the trees growing environment, as a result of development, are variables that must be considered.

Most vigorous, broad canopied trees survive well if the area within the drip-line of the canopy is protected. Fine root density is usually greater beneath the canopy than beyond (Gilman, 1997). If few to no roots over 3cm in diameter are encountered and severed during excavation the tree will probably tolerate the impact and root loss. A healthy tree can sustain a loss of between 30% and 50% of absorbing roots (Harris, Clark, Matheny, 1999), however encroachment into the structural root system of a tree may be problematic.

The structural root system of a tree is responsible for ensuring the stability of the entire tree structure in the ground. A tree could not sustain loss of structural root system and be expected to survive let alone stand up to average annual wind loads upon the crown.

Allocation of tree protection zone (TPZ)

The method of allocating a TPZ to a particular tree will be influenced by site factors, the tree species, its age and developed form.

Once it has been established, through an arboricultural assessment, which trees and tree groups are to be retained, the next step will require careful management through the development process to minimise any impacts on the designated trees. The successful retention of trees on any particular site will require the commitment and understanding of all parties involved in the development process. The most important activity, after determining the trees that will be retained is the implementation of a TPZ.

The intention of tree protection zones is to:

- mitigate tree hazards;
- provide adequate root space to sustain the health and aesthetics of the tree into the future;
- minimise changes to the trees growing environment, which is particularly important for mature specimens;
- minimise physical damage to the root system, canopy and trunk; and
- define the physical alignment of the tree protection fencing

Tree protection

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 (stem) diameter (DBH), measured at 1.4 metres up from ground level. The radius of the TPZ is calculated by multiplying the trees DBH by 12. The 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 minimum TPZ should be no less than 2m and the maximum no more than 15m radius. The TPZ of palms should be not less than 1.0m outside the crown projection.

Encroachment into the TPZ is permissible under certain circumstances though 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. Examples are provided in Diagram 1. 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.

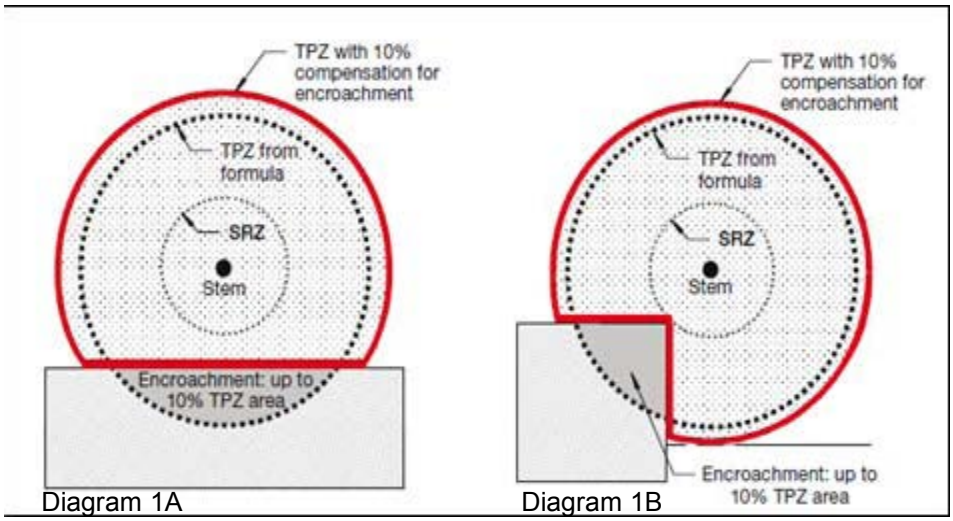


Diagram 1: Examples of minor encroachment into a TPZ.

(Extract from: AS4970-2009, Appendix D, p30 of 32)

The 10% encroachment on one side equates to approximately ⅓ radial distance. 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. The roots of some trees may have grown in response to the site conditions and therefore if existing hard surfaces and building alignments are utilised in new designs the impacts on the trees should be minimal. The most reliable way to estimate root disturbance is to find out where the roots are in relation to the demolition, excavation or construction works that will take place (Matheny & Clark, 1998). Exploratory excavation prior to commencement of construction can help establish the extent of the root system and where it may be appropriate to excavate or build.

The TPZ should also give consideration to the canopy and overall form of the tree. If the canopy requires severe pruning in order to accommodate a building and in the process the form of the tree is diminished it may be worthwhile considering altering the design or removing the tree.

General tree protection guidelines

The most important factors are:

- Prior to construction works the trees nominated for tree works should be pruned to remove larger dead wood. Pruning works may also identify other tree hazards that require remedial works.
- Installation of tree protection fencing. Once the tree protection zones have been determined the next step is to mulch the zone with woodchip and erect tree protection fencing. This must be completed prior to any materials being brought on-site, erection of temporary site facilities or demolition/earth works. The protection fencing must be sturdy and withstand winds and construction impacts. The protection fence should only be moved with approval of the site supervisor. Other root zone protection methods can be incorporated if the TPZ area needs to be traversed.
- Appropriate signage is to be fixed to the fencing to alert people as to importance of the tree protection zone.
- The importance of tree preservation must be communicated to all relevant parties involved with the site.
- Inspection of trees during excavation works.

Exploratory excavation

The most reliable way to estimate root disturbance is to find out where the roots are in relation to the demolition, excavation or construction works that will take place (Matheny & Clark, 1998).

Exploratory excavation prior to commencement of construction can help establish the extent of the root system and where it may be appropriate to excavate or build. This also allows management decisions to be made and allows time for redesign works if required.

Any exploratory excavation within the allocated TPZ is to be undertaken with due care of the roots. Minor exploration is possible with hand tools. More extensive exploration may require the use of high pressure water or air excavation techniques. Either hydraulic or pneumatic excavation techniques will safely expose tree roots; both have specific benefits dependent on the situation and soil type. An arborist is to be consulted on which system is best suited for the site conditions.

Substantial roots are to be exposed and left intact.

Once roots are exposed decisions can be made regarding the management of the tree. Decisions will be dependent on the tree species, its condition, its age, its relative tolerance to root loss, and the amount of root system exposed and requiring pruning.

Other alternative measures to encroaching the TPZ may include boring or tunnelling.

How to determine the diameter of a substantial root

The size of a substantial root will vary according to the distance of the exposed root to the trunk of the tree. The further away from the trunk of a tree that a root is, the less significant the root is likely to be to the tree's health and stability.

The determination of what is a substantial root is often difficult because the form, depth and spread of roots will vary between species and sites. However, because smaller roots are connected to larger roots in a framework, there can be no doubt that if larger roots are

severed, the smaller roots attached to them will die. Therefore, the larger the root, the more significant it may be.

Gilman (1997) suggests that trees may contain 4-11 major lateral roots and that the five largest lateral roots account (act as a conduit) for 75% of the total root system. These large lateral roots quickly taper within a distance to the tree, this distance is identified as the Structural Root Zone (SRZ). Within the SRZ distance, all roots and the soil surrounding the roots are deemed significant.

No root or soil disturbance is permitted within the SRZ.
In the area outside the SRZ the tree may tolerate the loss of one or a number of roots. The table below indicates the size of tree roots, outside the SRZ that would be deemed substantial for various tree heights. The assessment of combined root loss within the TPZ would need to be undertaken by an arborist on an individual basis because the location of the tree, its condition and environment would need to be assessed.

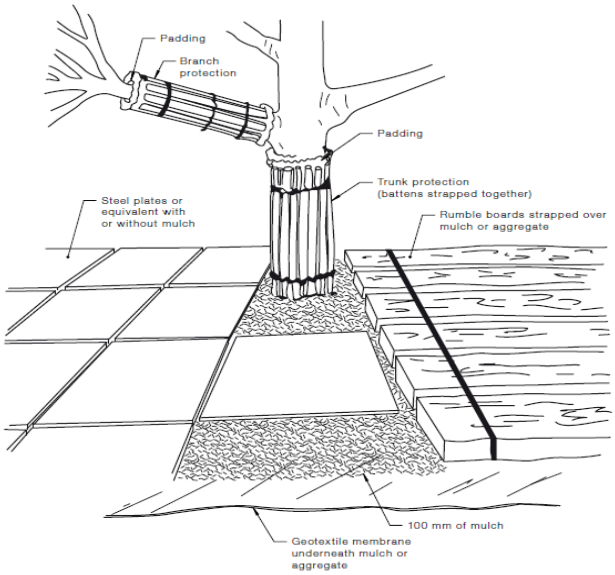
Table 1: Estimated significant root sizes outside SRZ

Height of tree	Diameter of root
Less than 5m	≥ 30mm
Between 5m - 15m	≥ 50mm
More than 15m	≥ 70mm

Ground buffering

Where works are required to be undertaken within the Tree root zone without penetration of the surface, ground buffering and trunk and limb protection must be provided to minimise the potential for soil to become compacted and avoid potential for impact wounds to occur to surface roots, trunk or limbs. Refer below.

Diagram 2: Examples of ground buffering and trunk and limb protection.



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.

FIGURE 4 EXAMPLES OF TRUNK, BRANCH AND GROUND PROTECTION

(Extract from: AS4970-2009, Appendix D, pg17)

Construction Guidelines

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

- The Tree Protection Zone (TPZ) is fenced and clearly marked at all times. The actual fence specifications should be a minimum of 1.2 - 1.5 metres of chain mesh or like fence with 1.8 meter posts (e.g. treated pine or star pickets) or like support every 3-4 metres and a top line of high visibility plastic hazard tape. The posts should be strong enough to sustain knocks from on site excavation equipment. This fence will 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. Note: There are many different variations on the construction type and material used for TPZ fences, suffice to say that the fence should satisfy the responsible authority.

- 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 importance of tree preservation must be communicated to all relevant parties involved with the site.

- The consultant arborist is on-site to supervise excavation works around the existing trees where the TPZ will be encroached.

- 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.

- No persons, vehicles or machinery to enter the TPZ without the consent of the consulting arborist or site manager.

- Where machinery is required to operate inside the TPZ it must be a small skid drive machine (i.e Dingo or similar) operating only forwards and backwards in a radial direction facing the tree trunk and not altering direction whilst inside the TPZ to avoid damaging, compacting or scuffing the roots.

- 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.

- 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.

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