



**OLDMEADOW
ARBORICULTURE**

TREE CARE SPECIALISTS



Arboricultural Impact Report

Prepared for:

Nick Vlahandreas
Mountain Planning

0409 723 259

nickv@mountainplanning.com

Prepared by:

Rhys Oldmeadow

Diploma of Arboriculture

rhys@oldarb.com.au

0412 199 628

Site assessment:

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2031 gar0521oldarb

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1. Introduction

1.1 Purpose

Oldmeadow Arboriculture has been engaged to undertake an objective assessment of any trees within the vicinity of the proposed construction of a 2-story dwelling located at 130 Great Alpine Road, Hotham Heights, Vic 3741.

The proposal involves the addition of a basement garage to the existing dwelling as well as other renovations including a deck to the north.

The purpose of this report is to identify and assess construction related impacts relating to assessed trees, and to provide a summary of the assessment herein.

1.2 Scope

- Based on the current proposal, determine which trees (the subject trees) within the area of assessment may be impacted by the proposed works.
- Visually assess trees from ground and collect the following data:
 - Tree number
 - Tree species
 - Approximate height and canopy spread (widest point)
 - Condition (health/structure)
 - Age/maturity
 - DBH (at 1.4m above ground)
 - Defects
- Assess the impact the proposed works are likely to have on the subject trees.
- Comment on measure likely to be required to enable the protection of subject trees proposed to be retained, in particular, the single snow gum proposed to be retained within the north facing deck area.

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1.3 Method

- A site visit was undertaken by Rhys Oldmeadow on 04 June 2021.
- All observations were taken at ground level, using stage 1 of the Visual Tree Assessment (VTA) method (Mattheck and Breloer 1994).

Documents viewed during the preparation of this report

- New Basement Plan. Project number AB01. Dated 16 Feb 2021. Prepared by Mango Property Services PTY LTD. Dd02 Rev L

1.4 Limitations

- The assessment was undertaken from ground and did not involve excavation; root condition was not investigated unless above ground signs were observed such as surface roots or cracking/heaving of the soil
- No instruments were used to record internal tree structure
- No aerial examination (climbing) was undertaken of the upper canopy
- Only noteworthy trees that might be significantly impacted by the proposed works (regardless of property boundaries) are included in this report
- Weeds, shrubs, dead trees and juvenile exotic trees of low amenity/retention value were not assessed individually

1.5 Document control

Current	Title	Type	Date	Version	Author
>	2031 gar0521oldarb	Arboricultural impact report	07//06/2021	A	Rhys Oldmeadow

1.6 Planning schemes and applicable overlays

The property is covered by the Alpine Planning Scheme and zoned as Comprehensive Development Zone – Schedule 1 (CDZ1)

Applicable overlays

- Bushfire management overlay (BMO)
- Erosion management overlay (EMO)
- Designated bushfire prone area

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2. Observations

2.1 Site summary



Plate 1 Photo is looking toward the north west corner of the existing building



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The 1307sqm property supports an existing 2 story dwelling with stone foundations and shingle walls. The property is surrounded on 3 sides by indigenous *Eucalyptus pauciflora*, snow gums.

An existing, rudimentary drive approaches the property from the north west (behind where the photo in plate 1 was taken). There is also access to the rear of the property from Davenport Drive.


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2.2 Tree data


TREE #	1	
NUM OF TREES	1	
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	33	
TPZ (M)	4	
HEIGHT (M)	5	
SPREAD (M)	6	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	4m to existing decking	
IMPACT	Moderate ~24% encroachment from proposed driveway upgrade and underground basement excavation. Prune any exposed roots during excavation to Australian standard 4373.	
RECOMMENDATIONS	Install new driveway on grade. Erect TPZ fencing surrounding the TPZ to protect from development related impacts.	
TREE #	2	
NUM OF TREES		
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)		
TPZ (M)	2	
HEIGHT (M)	0	
SPREAD (M)	0	
STRUCTURE	N/A	
HEALTH	N/A	
AGE	N/A	
AMENITY VALUE	Nil	
ULE (YRS)	0	
NOTES	Stump	
IMPACT	High. Proposed to be removed	
RECOMMENDATIONS	Remove stump to ground level or grind out carefully to prevent damage to adjacent tree roots.	

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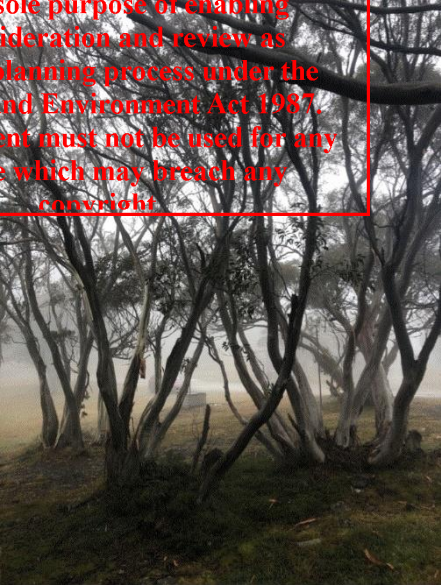
TREE #	3	
NUM OF TREES	3	
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	25	
TPZ (M)	3	
HEIGHT (M)	6	
SPREAD (M)	4	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	Average DBH of tree group. Several trees with multiple stems.	
IMPACT	Moderate ~15% encroachment from basement excavation. The trees will likely tolerate this degree of incursion; however, they may have some minor adverse impacts.	
RECOMMENDATIONS	Erect TPZ fencing surrounding the TPZ to protect from development related impacts. Prune any exposed roots during excavation to Australian standard 4373.	

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TREE #	4	
NUM OF TREES	1	
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	35	
TPZ (M)	4.2	
HEIGHT (M)	6	
SPREAD (M)	5	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	Single tree with leaning form.	
IMPACT	Moderate ~16% encroachment from basement excavation. This tree will likely tolerate this degree of incursion; however, it may have some minor adverse impacts.	
RECOMMENDATIONS	Erect TPZ fencing surrounding the TPZ to protect from development related impacts. Prune any exposed roots during excavation to Australian standard 4373.	


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TREE #	5	
NUM OF TREES	1	
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	49	
TPZ (M)	5.9	
HEIGHT (M)	6	
SPREAD (M)	9	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	DBH estimated from multiple stem calculation.	
IMPACT	Low – All works should be outside of the TPZ. May be impacted by construction related activities.	
RECOMMENDATIONS	Erect TPZ fencing surrounding the TPZ to protect from development related impacts.	

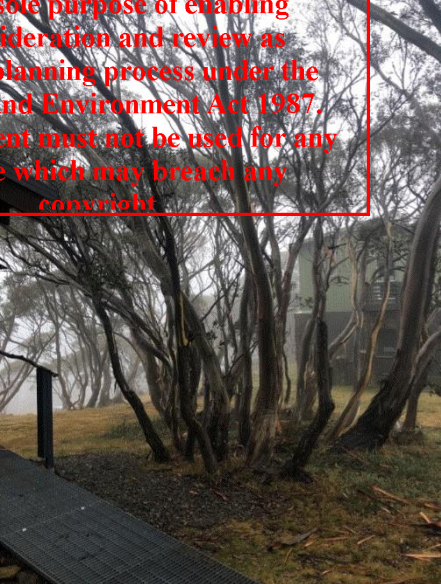
TREE #	6	
NUM OF TREES	3	
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	49	
TPZ (M)	5.9	
HEIGHT (M)	6	
SPREAD (M)	9	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	Average DBH of tree group estimated. 4m from existing dwelling.	
IMPACT	Low – No ground works are proposed within the TPZ of these trees. Could be impacted by construction related activities.	
RECOMMENDATIONS	Erect TPZ fencing surrounding the TPZ to protect from development related impacts	

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TREE #	7	
NUM OF TREES	4	
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	45	
TPZ (M)	5.4	
HEIGHT (M)	6	
SPREAD (M)	4	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	Average DBH of tree group estimated. 5m from existing dwelling	
IMPACT	Low – No ground works are proposed within the TPZ of these trees. Could be impacted by construction related activities.	
RECOMMENDATIONS	Erect TPZ fencing surrounding the TPZ to protect from development related impacts	


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TREE #	8	
NUM OF TREES	15	
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	22	
TPZ (M)	2.6	
HEIGHT (M)	6	
SPREAD (M)	4	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	Average DBH of tree group estimated. 4m from existing dwelling. Large group of trees	
IMPACT	Low – No ground works are proposed within the TPZ of these trees. Could be impacted by construction related activities.	
RECOMMENDATIONS	Erect TPZ fencing surrounding the TPZ to protect from development related impacts	


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TREE #	9	
NUM OF TREES		
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	37	
TPZ (M)	4.4	
HEIGHT (M)	5	
SPREAD (M)	5	
STRUCTURE	Good	
HEALTH	Fair	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	15 > 40	
NOTES	Thin canopy. 4m to existing dwelling.	
IMPACT	High ~39% encroachment from basement car park excavation and concrete slab excavation. Depth of excavation unknown. May be further impact by proposed deck depending on height, may require canopy pruning.	
RECOMMENDATIONS	Redesign plans to remove car space 3 to reduce impact. Or minimise excavation as far as practicable and undertaken in the presence of a qualified arborist. Prune any exposed roots during excavation to Australian Standard 4373.	

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TREE #	10	
NUM OF TREES		
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	35	
TPZ (M)	4.2	
HEIGHT (M)	6	
SPREAD (M)	7	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	2 of 4 stems removed already.	
IMPACT	High. Proposed for removal	
RECOMMENDATIONS	Proposed for removal	

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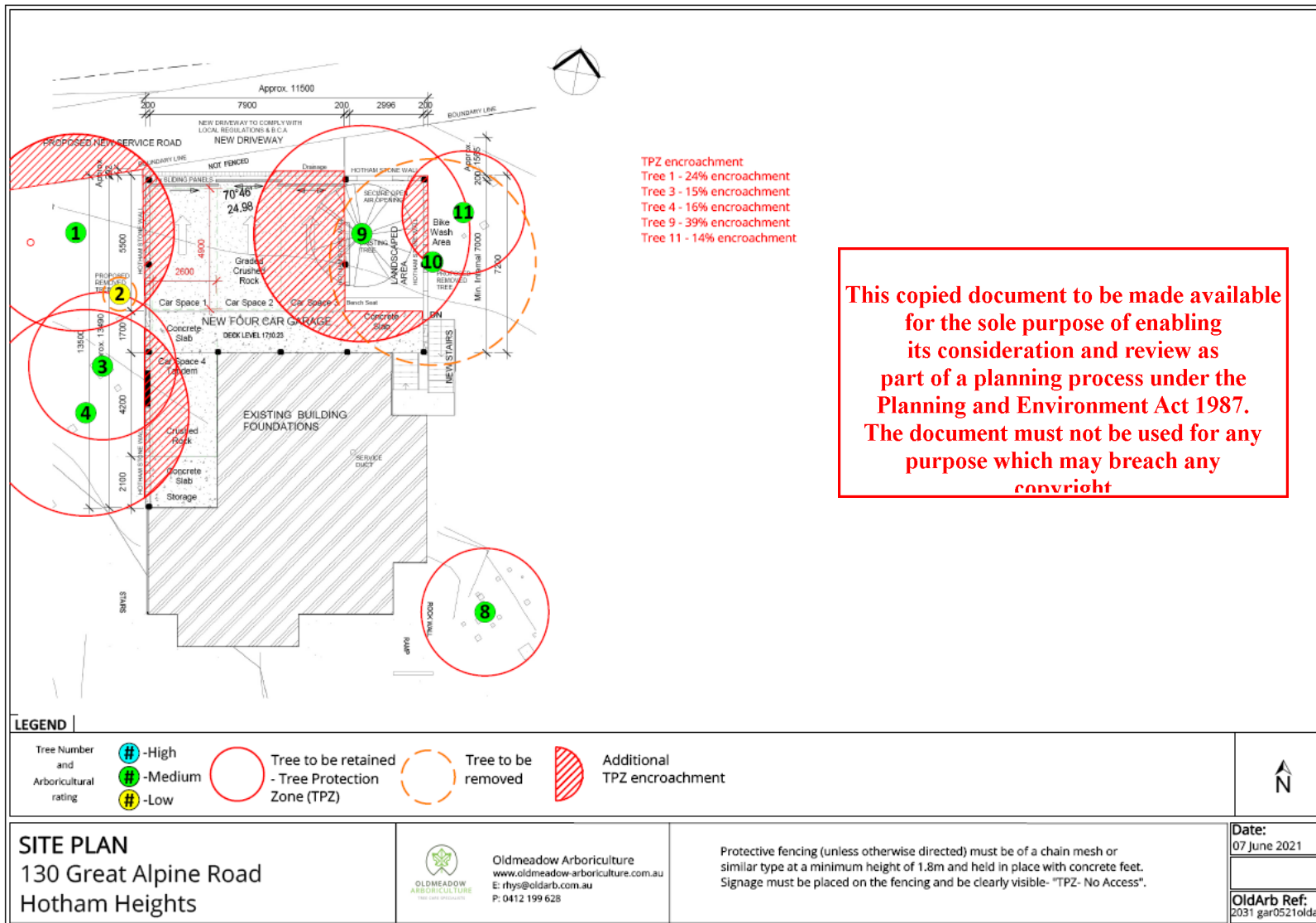
TREE #	11	
NUM OF TREES	6	
SPECIES	<i>Eucalyptus pauciflora</i>	
COMMON NAME	Snow Gum	
DBH (CM)	21	
TPZ (M)	2.5	
HEIGHT (M)	6	
SPREAD (M)	3	
STRUCTURE	Good	
HEALTH	Good	
AGE	Mature	
AMENITY VALUE	Medium	
ULE (YRS)	>40	
NOTES	Average DBH of tree group thin canopy	
IMPACT	Moderate ~14% encroachment. Impact could be less than calculated if the stone wall is built on grade without excavation. These trees will likely tolerate this degree of encroachment with some minor adverse impacts possible.	
RECOMMENDATIONS	Erect TPZ fencing surrounding the TPZ to protect from development related impacts.	

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2.3 Site map



3. Discussion

3.1 Encroachment / impacts on trees

Works such as site cut and fill, re-grading, trenching, installation of underground services, building footings, landscaping or reducing the rain catchment within Tree Protection Zones (TPZ) are considered as encroachment. These activities may damage trees; this may be via direct (physical wounding) or indirect (soil alteration or compaction) impacts. Encroachment may result in wounds, decay, increased deadwood, thinning foliage, decreased health, instability, failures and death.

Likely impacts are assessed based on the degree of encroachment, the type of proposed works, the tree, and surrounding conditions.

3.2 Construction related activities

Trees without encroachment but in the vicinity of works may be impacted by construction related activities including, (but not limited to); compaction from vehicle parking, positioning of plant and/or foot traffic, and mechanical damage to trunk/branches from delivery/drop off of materials, etc.

Adequate tree protection measures including fencing or ground protection are important in preventing these impacts during construction.

3.3 Pre-existing structures within tree protection zones

None of the trees adjacent to the property and to the south have been detailed on the site plan as there are no planned earth works due to the pre-existing structure being retained. However, these trees are still at risk of construction related activities, see 3.2.

3.4 Eucalyptus pauciflora

E. pauciflora is a species of eucalypt to 30m tall or forming a mallee structure. Typically, when found in high altitudes (Hotham Heights), the tree presents as a small mallee structure forming a lignotuber. This makes it hard to determine if it is a single tree with multiple stems, or multiple small trees in close proximity.

E. pauciflora is a lignotuberous species of Eucalypt: "woody tubers developed in the axils of the cotyledons or the first few leaf pairs, becoming massive in many mature trees or mallees, possessing embedded vegetative buds for regeneration following crown destruction, for example by fire" (Brooker, M.I.H & Kleinig, D.A (2006)). As such they tend to regenerate from crown damage by producing new stems. However, *E. pauciflora* is fairly susceptible to the ingress and spread of decay. Root or canopy pruning can result in decay and cause dieback.

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4. Conclusion

The arboricultural assessment undertaken at 130 Great Alpine Road, Hotham Heights, comprised 11 trees/tree groups. All trees assessed were *Eucalyptus pauciflora*, snow gums.

There are several trees not marked on the site plan to the south of the property that should not be directly impacted by the proposed works but may be exposed to construction related activities.

The below table illustrates the degree of impact vs the arboriculture/amenity value of the subject trees.

Impact	Arboricultural/amenity value.		
	Low	Medium	High
Low		2, 5, 6, 7, 8	
Moderate		1, 3, 4, 11	
High	2	9, 10	

Plate 2 Degree of impact x Retention value

5. Recommendations

Tree 1 - Install new driveway on grade. Erect TPZ fencing surrounding the TPZ to protect from development related impacts

Tree 2, 10 - Remove tree/stump fully to prevent damage to adjacent tree roots.

Tree 3-4 - Erect TPZ fencing surrounding the TPZ to protect from development related impacts. Prune any exposed roots during excavation to Australian standard 4373.

Tree 5-8, 11 - Erect TPZ fencing surrounding the TPZ to protect from development related impacts. Prune any exposed roots during excavation to Australian standard 4373.

Tree 13 - Redesign plans to remove car space 3 to reduce impact. Or minimise excavation as far as practicable and undertake in the presence of a qualified arborist. Prune any exposed roots during excavation to Australian standard 4373.

General

- Install TPZ fencing at the extent of the provided TPZ radius in metres, except where truncated by proposed works, to prevent unnecessary access beneath tree canopies.
- Trees to be retained should be protected according to Australian Standard AS 4970-2009 Protection of trees on development sites. Appendix 2. Protection of retained trees, provides guidance on activities restricted in Tree Protection Zones.
- Do not excavate or install underground services through Tree Protection Zones.

6. References

Australian Standard AS 4970-2009: Protection of Trees on Development Sites.

Australian Standard AS 4373-2007: Pruning of Amenity Trees

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7. Appendix 1: Arboricultural descriptors

Age

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

Category	Description
Juvenile	A young tree, given normal environmental conditions for that tree it will not yet flower or fruit.
Semi-mature	Able to reproduce yet still to achieve expected size in situation
Maturing	Specimen approaching expected size in situation, with reduced incremental growth
Over-mature	Tree is senescent and in decline

Arboricultural Rating/Amenity value

Arboricultural rating relates to a 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 with arboricultural treatment. Often the majority of a mature tree population will fit into this category. It is therefore often further divided into classes A, B and C with A being the more desirable for retention. 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 15cm. 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.
None	Trees of low quality with an estimated remaining life expectancy of less than 5 years.

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	<p>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.</p> <p>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.</p> <p>Trees whose retention would no be viable after the removal of adjacent trees (including 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).</p> <p>Tree has a detrimental effect on the environment, for example, the tree is recognised environmental woody weed with potential to spread into waterways or natural areas.</p> <p>Unremarkable tree of no material landscape, conservation or other cultural value.</p>
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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.

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Significant	Description
Horticultural Value/Rarity	Outstanding horticultural or genetic value, could be an important for propagating stock, including specimens that are particularly resistance 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 association 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 contributes to biological diversity.

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. 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 author.



*Figure 1 Tree condition \ (Health & Structure)
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.

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 sites*. Measurements undertaken with foresters \emptyset tape or builders tape.

Health

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

Category	Vigour/Extension growth	Decline symptoms/Deadwood	Foliage density, colour, size, intactness	Pests and or disease
Good	Above typical	None or minimal	Better than typical	None or minimal
Fair	Typical	Typical or expected	Typical	Typical, within damage thresholds
Fair to Poor	Below typical	More than typical	Exhibiting deficiencies	Exceeds damage thresholds
Poor	Minimal	Excessive and large amount/size	Exhibiting severe deficiencies	Extreme and contributing to decline
Dead	N/A	N/A	N/A	N/A

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Height and Width

Indicates height and width of the individual tree; dimensions are expressed in metres. Crown heights are measured with a laser 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 author'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).

Name

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

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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 damage, disease or decay; obvious basal flare / stable in ground	No damage, disease or decay; well tapered	Well formed, attached, spaced and tapered	No damage, disease, decay or structural defect
Fair	Minor damage or decay. Basal flare present.	Minor damage or decay	Typically formed, attached, spaced and tapered	Minor damage, disease or decay; minor branch end-weight or over-extension
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
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 resprout	Decayed, cavities or has acute branch attachments with included bark; excessive compression flaring; failure likely	Major damage, disease or decay; fungal fruiting bodies present; major branch end-weight or over-extension
Very Poor	Excessive damage, disease or decay; unstable / loose in ground; altered exposure; failure probable	Excessive damage, disease or decay; cavities. Excessive lean. Stump resprout	Decayed, cavities or branch attachments with active split; failure imminent	Excessive damage, disease or decay; excessive branch end-weight or over-extension

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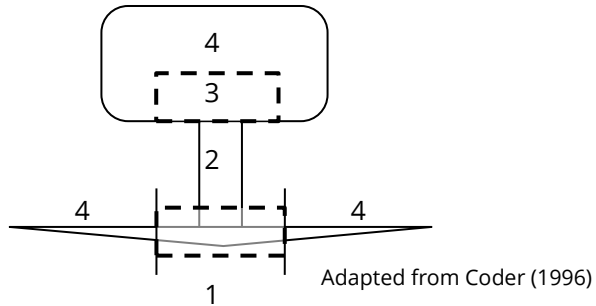
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Structure ratings will also take into account general tree architecture which considers aspects of stem taper, live crown ratio, branch distribution or bias and crown position such as tree being suppressed amongst more dominant trees.

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

Diagram 2: Tree structure zones

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



internal tree parts unless this is requested as part of the investigation. Trees are assessed and the 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).

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
Victorian native	Occurs naturally within some part of the State of Victoria (not exclusively) but is not indigenous
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

8. Appendix 2. Protection of retained trees

Pruning standards / Lopping

An Australian standard exists to give guidance on pruning of trees.

It is important that all remedial works are carried out by a competent contractor in accordance with the Australian Standard. (AS. 4373 2007 - Pruning of Amenity Trees).

Lopping; as defined within the Standard, is detrimental to trees, often resulting in decay and poorly attached epicormic shoots. Natural Target Pruning methods should be used wherever possible when removing sections from trees.

Establishment of Tree Protection Zones

The tree protection zone (TPZ) is the principal means of protecting trees on development sites. Usually fencing will be used to delineate the Tree Protection Zones (TPZ) as defined by AS 4970-2009 Protection of trees on development sites.

Fencing is installed following permitted vegetation removal and pruning but prior to construction site establishment. Fencing should be retained until completion of all construction related activity.

Some works and activities within the TPZ may be authorised by the Responsible Authority. These works should be supervised by the project arborist. Any additional encroachment that becomes necessary as the site works progress should be reviewed by the project arborist and be acceptable to the Responsible Authority before being carried out (AS 4970--2009).

Activities restricted within the TPZ

A TPZ area may surround a single tree or group or a patch of vegetation, activities that must NOT be carried out within a TPZ include, but are not limited to, the following:

- (a) machine excavation including trenching;
- (b) excavation for silt fencing;
- (c) cultivation;
- (d) storage;
- (e) preparation of chemicals, including preparation of cement products;
- (f) parking of vehicles and plant;
- (g) refuelling;
- (h) dumping of waste;
- (i) wash down and cleaning of equipment;
- (j) placement of fill;
- (k) lighting of fires;
- (l) soil level changes;
- (m) vehicle movement – access ways;
- (n) changes of grade;
- (o) temporary or permanent installation of utilities and signs, and
- (p) damage to the tree.

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Maintaining Tree Protection Zones (TPZ)

If at any time the TPZ must be infringed upon for works such as excavation for the installation of pipes or drainage or the movement of equipment or any other interference that may cause a change in the availability of water or oxygen to the tree, a suitably qualified arborist should be consulted to supervise the works and permission from the responsible authority may be required.

It may be possible to work or construct within a TPZ without significantly impacting a tree however the size and number of roots in the area would need to be determined and the specifics of the tree and its resilience to impacts would need to be reviewed prior to commencement. Design and construction methods may need alteration to minimise adverse tree impact.

AS 4970-2009 (extract)

Variations to the TPZ

General

It may be possible to encroach into or make variations to the standard TPZ. Encroachment includes excavation, compacted fill and machine trenching.

Minor encroachment

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

Variations must be made by the project arborist considering relevant factors listed in (see standard) ...

Major encroachment

If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree(s) would remain viable.

The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. This may require root investigation by non-destructive methods and consideration of relevant factors listed in (see standard)

Physical / mechanical damage to trees

Physical damage to tree parts, particularly the trunk, provides entry points for pests and diseases such as fungal infections. This may cause long-term decay and can lead to partial or complete tree failure and death.

Alteration of soil levels

Alteration of soil levels around trees will affect the root zone and stability of a tree as well as tree metabolism. This may result in reduced tree health, excessive deadwood, thinning foliage and poor vigour; it can take some years for the impact to become evident at which time it is normally irreversible.

Tree protection zone fencing

Protective fencing is used to delineate the TPZ. The fence must provide high visibility and act as a physical barrier to construction vehicles. No construction activity is to be undertaken within the fenced TPZ. The fence should be adequately signed, be sturdy and prevent the entry of heavy equipment, vehicles, workers and the public.

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Once erected, protective fencing must not be removed or altered without approval by the project arborist or responsible authority. The TPZ should be secured to restrict access. Tree protection fencing will consist of chain wire mesh panels held in place with concrete feet. The tree protection zone shall be clearly signed "Tree Protection Zone – No Access".



TREE PROTECTION ZONE SIGN EXAMPLE
(Informative)

TPZ sign provides clear and readily accessible information to indicate that a TPZ is established. Figure C1 provides an example of a suitable sign.



Source – AS 4970-2009 Protection of trees on development sites

(Tree Protection)

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Temporary access to the TPZ

When tree protection fencing cannot be installed or requires temporary removal, other tree protection measures should be used.

Where necessary, physical protection for the trunk and branches of trees should be installed. The materials and positioning of protection will be specified by the project arborist. A minimum height of 2m is recommended.

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

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Root protection during works within the TPZ

Works that have been approved by the Responsible Authority to occur within the TPZ, such as re-grading, installation of piers or landscaping have the potential to damage roots.

If the grade is to be raised the material should be coarser or more porous than the underlying material.

Depth changes and compaction should be minimized. Manual excavation should be carried out under the supervision of the project arborist to identify roots critical to tree stability and health. Relocation or redesign of works may be required.

Where the project arborist identifies roots to be pruned within or at the outer edge of the TPZ, they should be pruned with a final cut to undamaged wood.

Pruning cuts should be made with sharp tools such as secateurs, pruners, handsaws or chainsaws. Pruning wounds should not be treated with dressings or paints.

It is not acceptable for roots within the TPZ to be pruned with machinery such as backhoes or excavators.

Where roots within the TPZ are exposed by excavation, temporary root protection should be installed to prevent them drying out. This may include jute mesh or hessian sheeting as multiple layers over exposed roots and excavated soil profile, extending to the full depth of the root zone. Root protection sheeting should be pegged in place and kept moist during the period that roots are exposed.

Other excavation works in proximity to trees, including landscape works such as paving, irrigation and planting can adversely affect root systems, seek advice from the project arborist.

If temporary access is required within a Tree Protection Zone this may be carried out using sheets of heavy plywood or like protection but should not be considered for long term requirements.

Installing underground services within TPZ

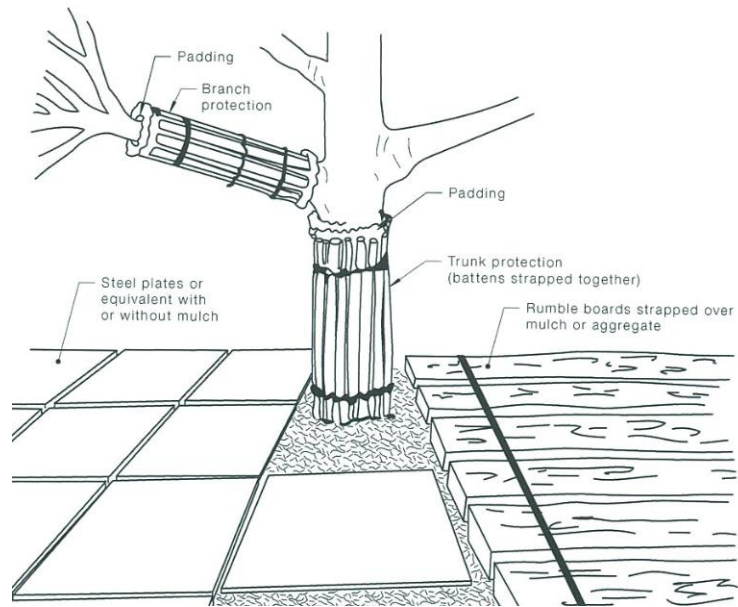
All services should be routed outside the TPZ. If underground services must be routed within the TPZ, they should be installed by directional drilling or in manually excavated trenches using non-destructive methods such as Air or hydro excavation.

The directional drilling bore should be at least 600 mm deep. The project arborist should assess the likely impacts of boring and bore pits on retained trees.

Driveways and paving within TPZ's

Works should not encroach into a TPZ. If encroachment is unavoidable any hard surfaces such as paving or driveways should:

1. not require any scraping or excavation – most roots, particularly small absorbing roots, are shallow; within the upper 100mm of soil.



Source – AS 4970-2009 Protection of trees on development sites

(Ground Protection)

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2. be constructed of a permeable material and laid on a base and subbase specifically designed to allow the movement of water through and into the soil below.

If construction is permitted within a TPZ it should be suspended on piers leaving the ground undisturbed other than the careful placement of pier holes. The bottom of supporting beams should be above existing ground level or, if this is not possible beams should run radially away from the tree trunk. There should be NO excavation of any description, including piers, within a Structural Root Zone (SRZ)

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