



ARBORICULTURAL IMPACT ASSESSMENT

81 Palmgrove Road, Avalon

Version 1

Prepared for:

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1 Background

1.1 Introduction

S&B Tree Services was commissioned by Nicole Saunders to prepare an Arboricultural Impact Assessment (AIA) for a proposed development located at 81 Palmgrove Road, Avalon. The purpose of this report is to:

- Identify the trees within and adjacent to the proposed construction footprint.
- Assess the current health and condition of the subject trees.
- Assess the potential impacts of the development on the subject trees.
- Evaluate the significance of the subject trees and assess their suitability for retention.

1.2 The proposal

The key features of the proposal are summarised as follows:

- Construction of a proposed granny flat and carport located at the front of the property.

1.3 The subject trees

The subject trees were inspected on 17 June 2017. A total of 6 trees were assessed and included within this report. Further information, observations and measurements specific to each of the subject trees can be found in **Chapter 3**.

1.4 Documents and plans referenced

The conclusions and recommendations of this report are based on the *Australian Standard, AS 4970-2009, Protection of Trees on Development Sites*, the findings from the site inspections and analysis of the following documents/plans:

- *Northern Beaches Council (Pittwater) - Guidelines for Arborist Reports.*
- *Pittwater Council - Local Environmental Plan (LEP) 2014.*
- *Pittwater Council - Development Control Plan (DCP) 2014.*
- *Avalon Granny Flats - Architectural Plans, Issue PD-D, 24/05/19.*

Avalon Granny Flats - Architectural Plans (Site Plan 2) has been used as a base map for **Appendix I** and **III**.

1.5 Council tree preservation

Tree 1, 3 and 6 are listed as exempt species. All remaining trees are protected under the conditions prescribed within the *Pittwater Council - Development Control Plan (DCP) 2014*.

2 Method

2.1 Visual tree assessment

The subject trees were assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994)¹, and practices consistent with modern arboriculture.

The following limitations apply to this methodology:

- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing.
- Tree height and canopy spread was estimated, unless otherwise stated.
- Trees within adjacent properties or restricted areas were not subject to a complete visual inspection (i.e. defects and abnormalities may be present but not recorded).
- Tree identification was based on broad taxonomical features present and visible from ground level at the time of inspection.

2.2 Retention value

The retention value of a tree or group of trees is determined using a combination of environmental, cultural, physical and social values.

- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by *Australian Standard AS4970 Protection of trees on development sites*.

This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturalists (IACA) Significance of a Tree, Assessment Rating System (STARS). The system uses a scale of High, Medium and Low significance in the landscape. Once the landscape significance of a tree has been defined, the retention value can be determined. Each tree must meet a minimum of three (3) assessment criteria to be classified within a category. Further details and the assessment criteria can be found in the **Appendices**.

¹ VTA is an internationally recognised practice in the visual assessment of trees as formulated by Mattheck & Breloer (1994). Principle explanations and illustrations are contained within the publication, Field Guide for Visual Tree Assessment by Mattheck, C., and Breloer, H. *Arboricultural Journal* 1, Vol 18 pp 1-23 (1994).

2.3 Tree protection zones

- **Tree protection zone (TPZ):** The TPZ is the optimal combination of crown and root area (as defined by AS 4970-2009) that requires protection during the construction process so that the tree can remain viable. The TPZ is an area that is isolated from the work zone to ensure no disturbance or encroachment occurs into this zone. Tree sensitive construction measures must be implemented if work is to proceed within the TPZ.
- **Structural root zone (SRZ):** The SRZ is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support and anchorage of the tree. Severance of structural roots (>50 mm in diameter) within the SRZ is not recommended as it may lead to the destabilisation and/or decline of the tree.

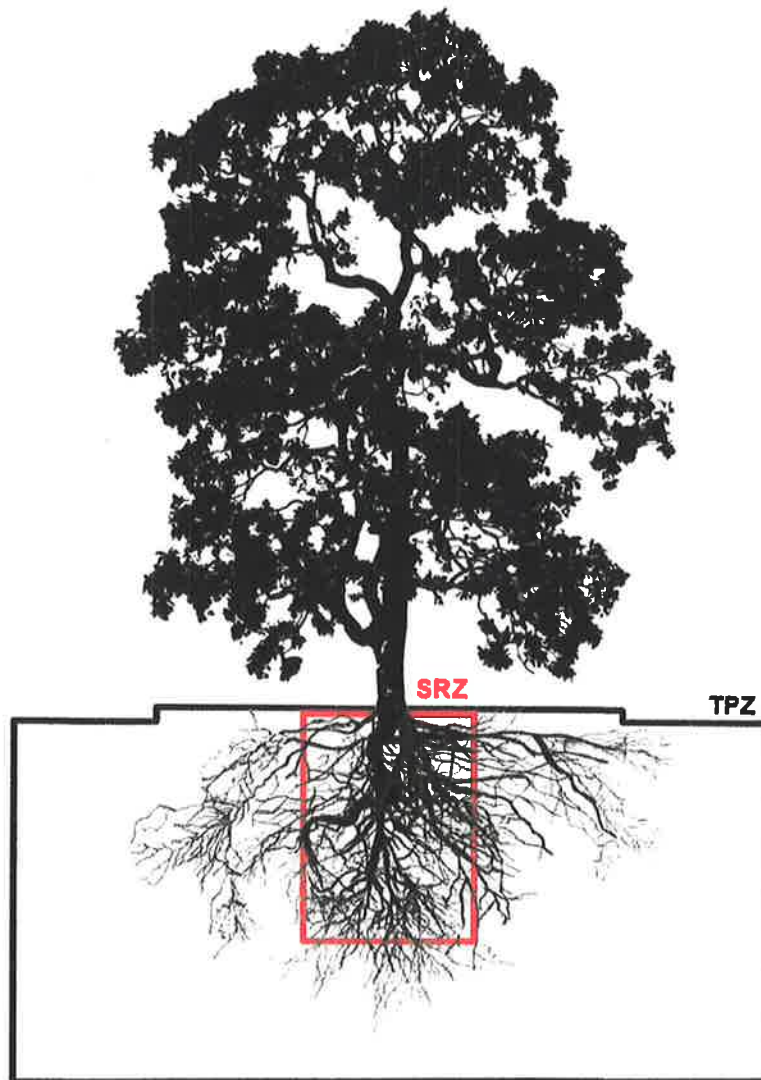


Figure 1: Indicative TPZ and SRZ

2.4 Impact assessment

- **No encroachment (0%):** No likely or foreseeable encroachment within the TPZ.
- **Minor encroachment (<10%):** If the proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and be contiguous with the TPZ.
- **Major encroachment (>10%):** If the proposed encroachment is greater than 10% of the TPZ, the project arborist must demonstrate that the tree(s) remain viable. The area lost to this encroachment should be compensated for elsewhere and be contiguous with the TPZ. Root investigation by non-destructive methods may be required for any proposed works within this area.

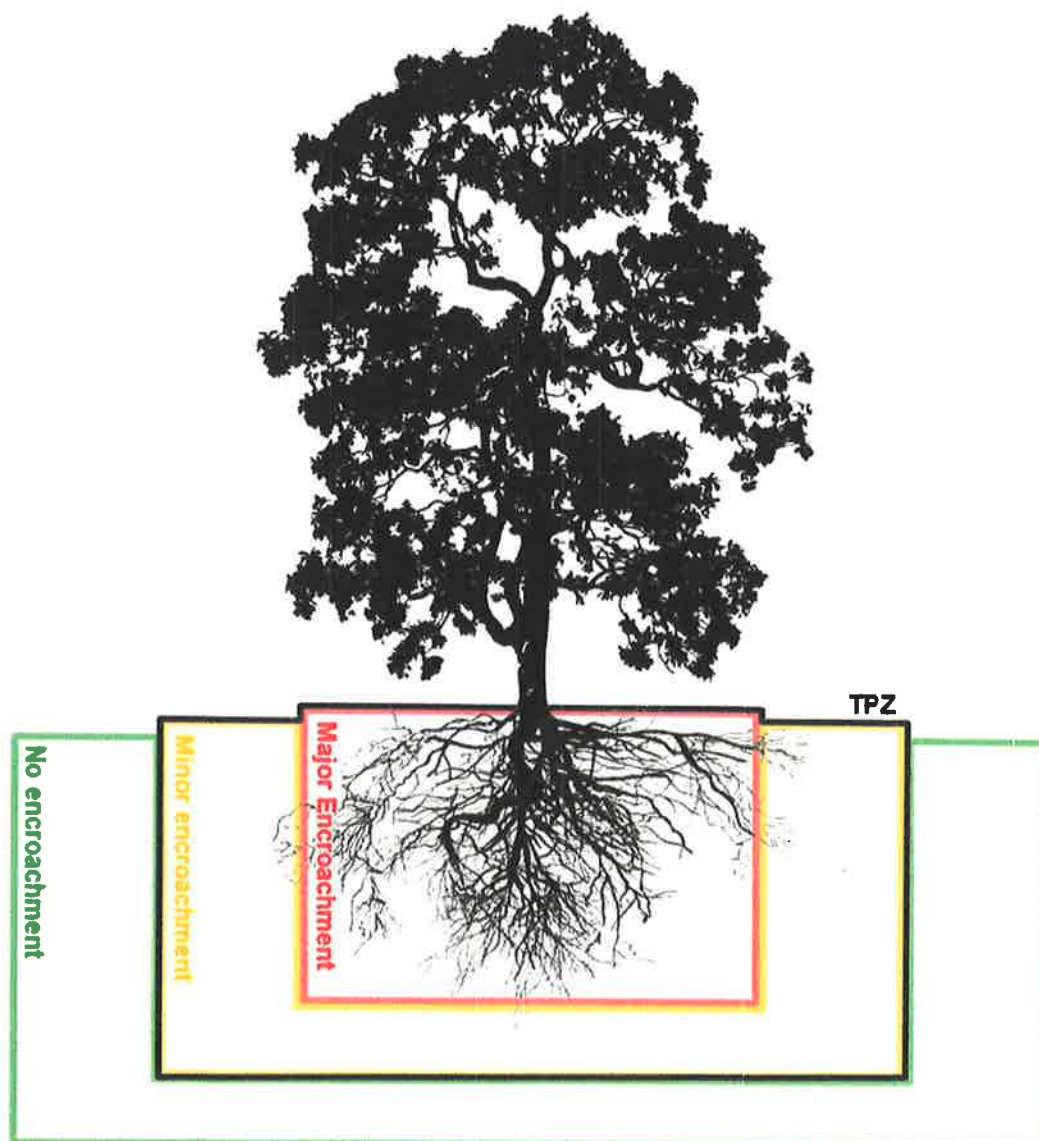


Figure 2: Indicative zones of encroachment within the TPZ

2.5 Mitigation measures

Encroachment within the TPZ must be compensated with a range of mitigation measures to ensure that impacts to the subject tree(s) are reduced or restricted wherever possible. Mitigation must be increased relative to the level of encroachment within the TPZ to ensure the subject tree(s) remain viable. The table below outlines requirements under AS 4970-2009, and mitigation measures required within each category of encroachment. These mitigation measures will only apply if trees are proposed to be retained.

Table 1: Mitigation measures

Encroachment	Mitigation Measures
No encroachment (0%)	<ul style="list-style-type: none"> N/A
Minor encroachment (<10%)	<ul style="list-style-type: none"> The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. Detailed root investigations should not be required. Tree protection must be installed.
Major encroachment (>10%)	<ul style="list-style-type: none"> The project arborist must demonstrate the tree(s) would remain viable. Root investigation by non-destructive methods may be required for any trees proposed for retention. Consideration of relevant factors including: Root location and distribution, tree species, condition, site constraints and design factors. The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. The project arborist will be required to supervise any works within the TPZ. Tree protection must be installed.

3 Results

Table 2 shows the results of the arboricultural assessment. Key points are:

No encroachment (0%): No likely or foreseeable encroachment within the TPZ:

- **Tree 6** is located outside of the proposed construction footprint. No impacts to this tree are foreseeable under the current proposal.

Minor encroachment (<10%): The proposed encroachment is less than 10% of the TPZ:

- **Tree 3, 4 and 5** will be subject to a minor encroachment of less than 10% within the TPZ. The encroachment will be caused by excavations for the pier footings of the grany flat. An encroachment of less than 10% is highly unlikely to impact the overall health or condition of these trees. Under the current proposal, these trees can be successfully retained.

Major encroachment (>10%): The proposed encroachment is greater than 10% of the TPZ:

- **Tree 1 and 2** are located within or directly adjacent to the construction footprint and cannot be retained under the current proposal.

Table 2: Results of the arboricultural assessment

Id	Botanical name	Spread (metres diameter)		Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH (millimetre diameter)	TPZ (metres radius)	SPZ (metres radius)	Encroachment	% Encroachment within TPZ	Other notes	Proposal
		Height (metres)	Spread													
1	<i>Liquidamber styraciflua</i>	6	3	Fair	Fair	Semi-mature	Low	Medium	Low	250	3.0	1.9	Major	100%	Tree is located inside the footprint of the proposed granny flat	Remove
2	<i>Angophora floribunda</i>	12	8	Poor	Fair	Over-mature	Medium	Short	Medium	450	5.4	2.5	Major	38%	Tree is located 1m from the footprint of the proposed carport (cut required)	Remove
3	<i>Olea species</i>	7	5	Fair	Fair	Semi-mature	Low	Short	Low	400	4.8	2.3	Minor	5%	Minor excavations required for pier footings of granny flat	Retain
4	<i>Corymbia maculata</i>	18	9	Good	Good	Mature	Medium	Medium	High	500	6.0	2.5	Minor	5%	Minor excavations required for pier footings of granny flat	Retain
5	<i>Corymbia maculata</i>	15	8	Good	Good	Mature	Medium	Medium	High	350	4.2	2.1	Minor	5%	Minor excavations required for pier footings of granny flat	Retain
6	<i>Jacaranda mimosifolia</i>	8	7	Fair	Fair	Semi-mature	Low	Medium	Low	300	3.6	2.0	No	0%	-	Retain

4 Recommendations

4.1 Trees proposed for retention

A total of 4 trees are proposed for retention. The following mitigation measures will be required:

- The tree protection plan (**Appendix II**) must be implemented.
- Proposed work within the tree protection zones must be carried out under the supervision of the project arborist. (see **Appendix III**)
- The area lost to the encroachment should be compensated for elsewhere, contiguous with the TPZ (see **Appendix IV**).

4.2 Site-specific tree protection measures

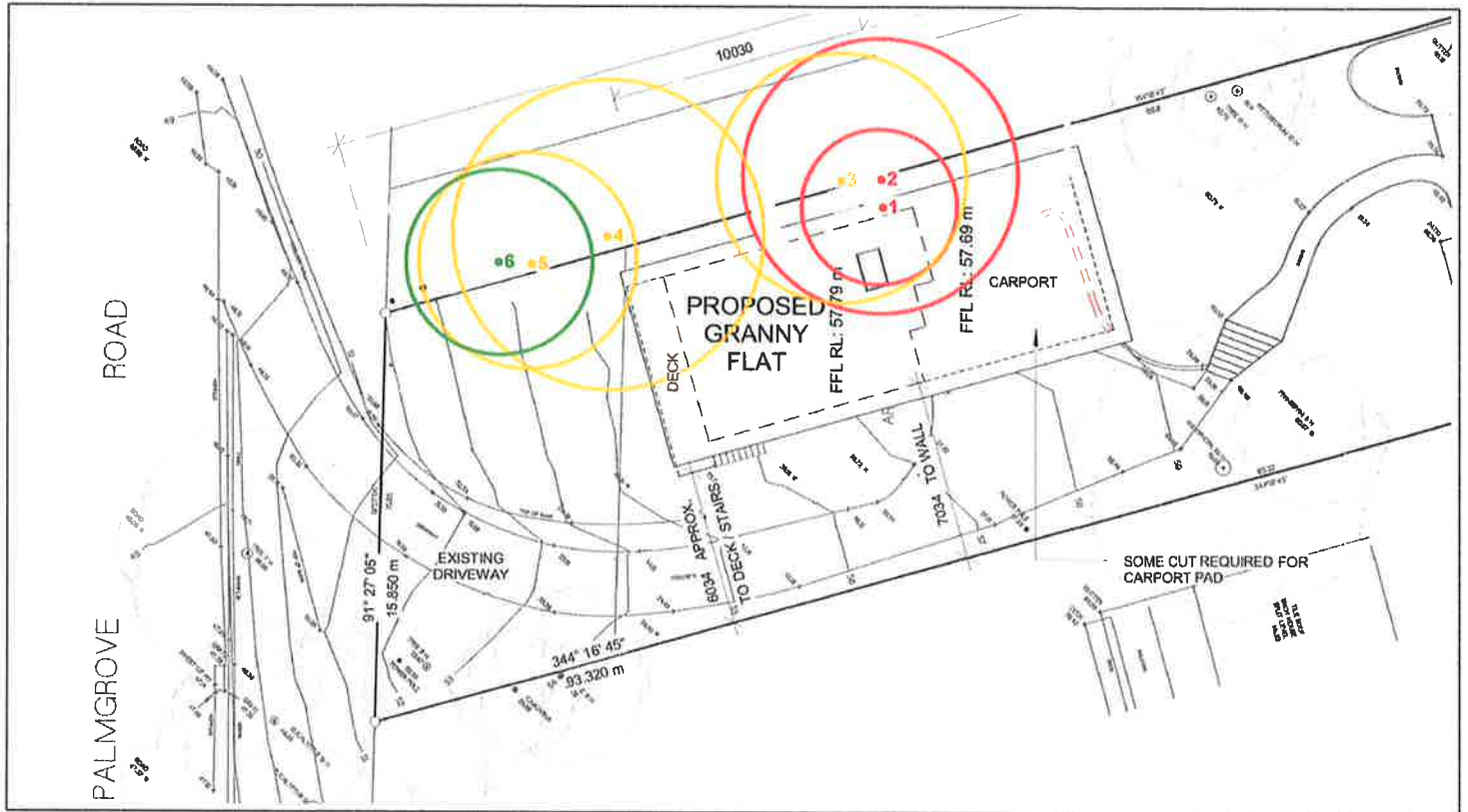
- Location of pier footings for the proposed granny flat must be determined using non-destructive excavation under supervision of the project arborist. Flexibility in the design must allow footings to be shifted or relocated if significant roots are encountered. This will allow any significant roots (greater than 50mm in diameter) to be retained and protected.
- Structural soil (with a particle size larger than that of the existing soil) should be used for any fill required in the TPZ. Soils used for this purpose must be consistent with the existing soils and preferably sourced from the same area to reduce the risk of contamination.
- Any underground services proposed within the TPZ must be installed using tree sensitive methods such as; horizontal directional drilling, boring, non-destructive excavation.

4.3 Trees proposed for removal

A total of 2 trees are proposed for removal. The following recommendations apply to these trees:

- Any loss of trees should be offset with replacement planting at a ratio of 1:1, or as recommended by the Northern Beaches Council. Species selection should be in co-ordination with the *Northern Beaches Council (Pittwater): Native Plant List*, with consideration to the following species:
 - *Angophora costata* (Sydney Red Gum)
 - *Angophora floribunda* (Rough Bark Apple)
 - *Banksia integrifolia* (Coastal Banksia)
 - *Banksia serrata* (Old Man Banksia)
 - *Callistemon salignus* (Willow Bottlebrush)
 - *Eleocarpus reticulatus* (Blueberry Ash)
 - *Melaleuca linariifolia* (Snow in Summer)
 - *Syzygium paniculatum* (Magenta Cherry)
 - *Syncarpia glomulifera* (Turpentine)
- All tree removal work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture, in accordance with *Australian Standard AS 4373-2007, Pruning of Amenity Trees* and the *NSW WorkCover Code of Practice for the Amenity Tree Industry (1998)*.

Appendix I - Impact assessment



Appendix I: No encroachment, minor encroachment, major encroachment

Appendix II - Tree protection plan

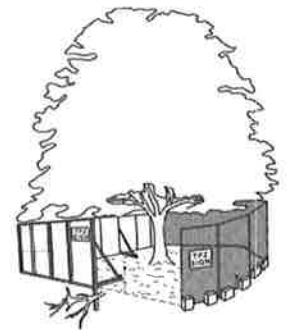
Tree protection fencing

Tree protection fencing must be established at the locations shown in **Appendix III**. Existing fencing, site hoarding or structures (such as a wall or building) may be used as tree protection fencing, providing the TPZ remains isolated from construction footprint.

Tree protection fencing must be installed prior to site establishment and remain intact until completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist.

Tree protection fencing shall be:

- Enclosed to the full extent of the TPZ (or as specified in the Recommendations and Tree Protection Plan).
- Temporary mesh panel fencing (minimum height 1.8m).
- Certified and inspected by the project arborist.
- Installed prior to the commencement of works.
- Prominently signposted with 300mm x 450mm boards stating, "NO ACCESS - TREE PROTECTION ZONE".



If tree protection fencing cannot be installed due to sloping or uneven ground, tree protection barriers must be installed as an alternative.

Specifications for tree protection barriers are as follows:

- Star pickets spaced at 2m intervals,
- Connected by a continuous high-visibility barrier/hazard mesh.
- Maintained at a minimum height of 1m.

Where approved works are required within the TPZ, fencing may be setback to provide construction access. Trunk, branch and ground protection shall be installed and must comply with *AS 4970-2009, Protection of Trees on Development Sites*. Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist.

Trunk protection

Where provision of tree protection fencing is impractical or must be temporarily removed, trunk protection shall be installed to avoid accidental mechanical damage.

Specifications for trunk protection are as follows:

- A thick layer of carpet underfelt, geotextile fabric or similar wrapped around the trunk to a minimum height of 2m.
- 1.8m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with a small gap of approximately 50mm between the timbers).
- The timbers must be secured using galvanised hoop strap (aluminium strapping).

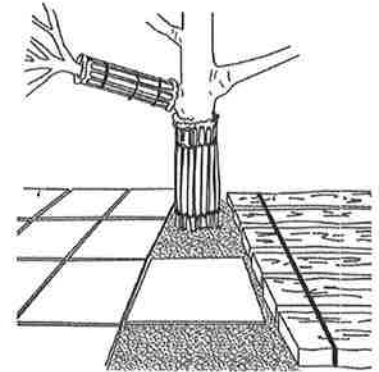
The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage to the tree.

Ground protection

If temporary access for vehicle, plant or machinery is required within the TPZ ground protection shall be installed. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Where possible, areas of existing pavement shall be used as ground protection.

Specifications for light traffic access (<3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- Layer of mulch or crushed rock (at minimum depth of 100mm)
- Specifications for heavy traffic access (>3.5 tonne) are as follows:
- Permeable membrane such as geotextile fabric.
- Layer of lightly compacted road base (at minimum depth of 200mm)
- Geotextile fabric shall extend a minimum 300mm beyond the edge of the road base.



Pedestrian, vehicular and machinery access within the TPZ shall be restricted solely to areas where ground protection has been installed.

Excavations

All approved excavations (including root investigations) within the TPZ must be carried out using tree sensitive methods under supervision of the project arborist. These methods may include:

- Manual excavation (hand tools).
- Air spade.
- Hydro-vacuum excavations (sucker-truck).

Where approved by the project arborist, excavations using compact machinery fitted with a flat bladed bucket is permissible. Excavations using compact machinery shall be undertaken in small increments and guided by the Project Arborist who is to look for and prevent root damage to roots (>50mm in diameter).

Exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with geotextile fabric, and plastic membrane or glad wrap (where practical). Coverings shall be weighted to secure them in place. The geotextile fabric shall be kept damp at all times.

No over-excavation, battering or benching shall be undertaken beyond the footprint of any structure unless approved by the project arborist. Hand excavation and root mapping shall be undertaken along excavation lines within the TPZ prior to the commencement of mechanical excavation (to prevent tearing and shattering of roots from excavation equipment). Any conflicting roots (>50mm in diameter) shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears. All root pruning must be documented and carried out by the project arborist.

Underground services

All underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they must be installed using tree sensitive excavation methods under supervision of the project arborist. Alternatively, boring methods such as horizontal directional drilling (HDD) may be used for underground service installation, providing the installation is at minimum depth of 800mm below grade. Excavations for entry/exit pits must be located outside the TPZ.

Site Inspections

In accordance with the *Australian Standard, AS 4970-2009, Protection of Trees on Development Sites*, inspections must be conducted by the project arborist at the following key project stages:

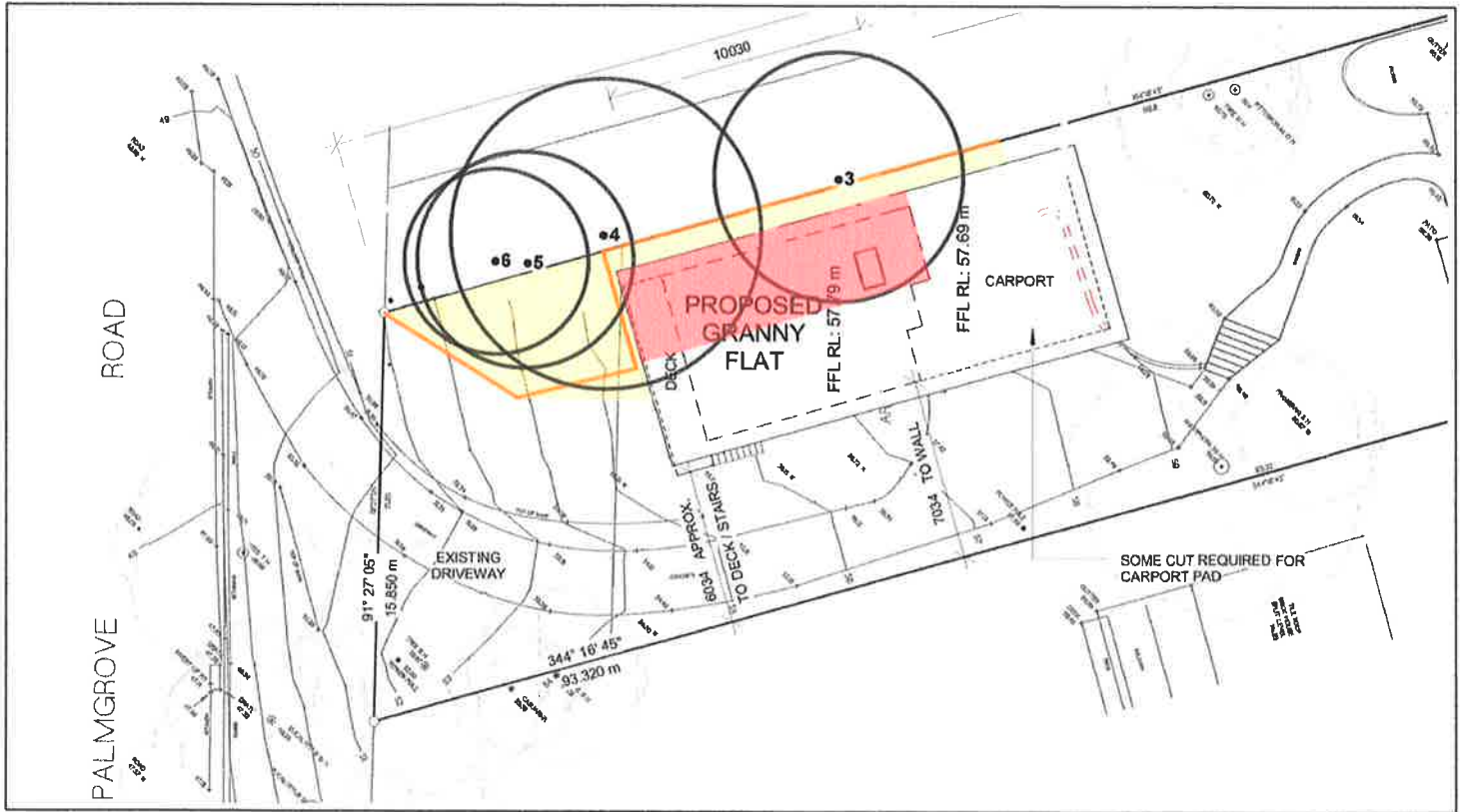
- Prior to any work commencing on-site (including demolition, earthworks or site clearing) and following installation of tree protection.
- During any excavations, building works and any other activities carried out within the TPZ of any tree to be retained & protected.
- A minimum of every month during the construction phase from commencement to issue of the occupation certificate.
- Following completion of the building works.

It shall be the responsibility of the project manager to notify the project arborist prior to any works within the TPZ of any protected tree at a minimum of 48 hours' notice. To ensure the tree protection plan is implemented, hold points have been specified in the schedule of work (**Table 1**).

Table 1: Schedule of work

Construction stage	Hold point	Description
Pre-construction	1	Prior to demolition and/or site establishment indicate clearly (with spray paint on trunks) trees marked for removal only.
	2	Tree protection (for trees that will be retained) shall be installed prior to demolition and site establishment, this may include mulching of areas within the TPZ. Project arborist shall inspect and certify tree protection.
During Construction	3	Scheduled inspection of trees by the project arborist should be undertaken monthly during the construction period.
	4	Project arborist to supervise and document all works carried out within the TPZ of trees to be retained.
	5	Inspection of trees by project arborist after all major construction has ceased, following the removal of tree protection measures.
Post Construction	6	Final inspection of trees by project arborist.

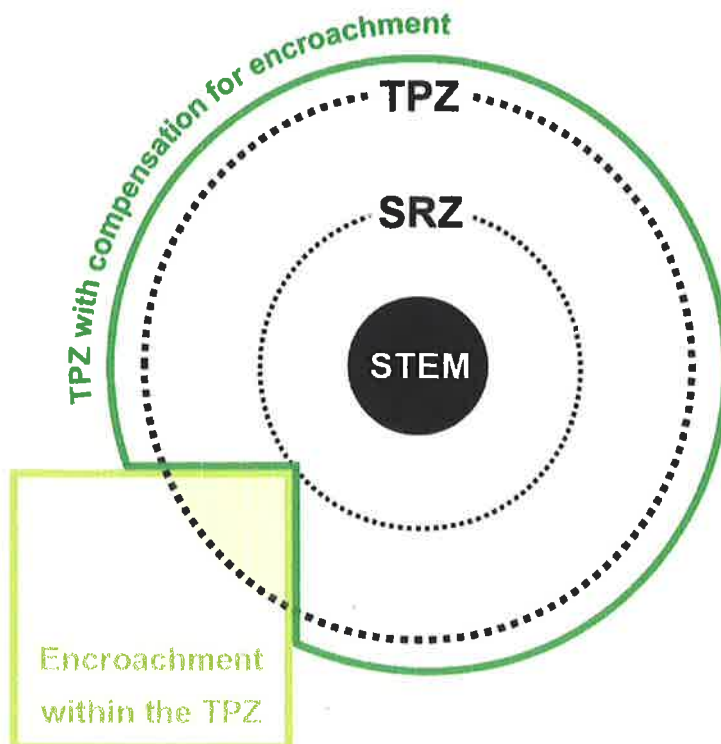
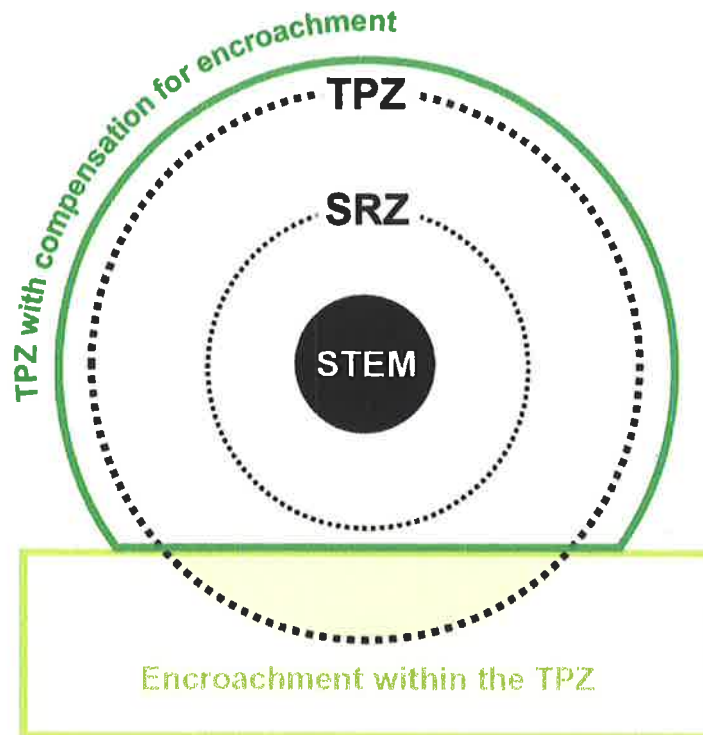
Appendix III - Tree protection map

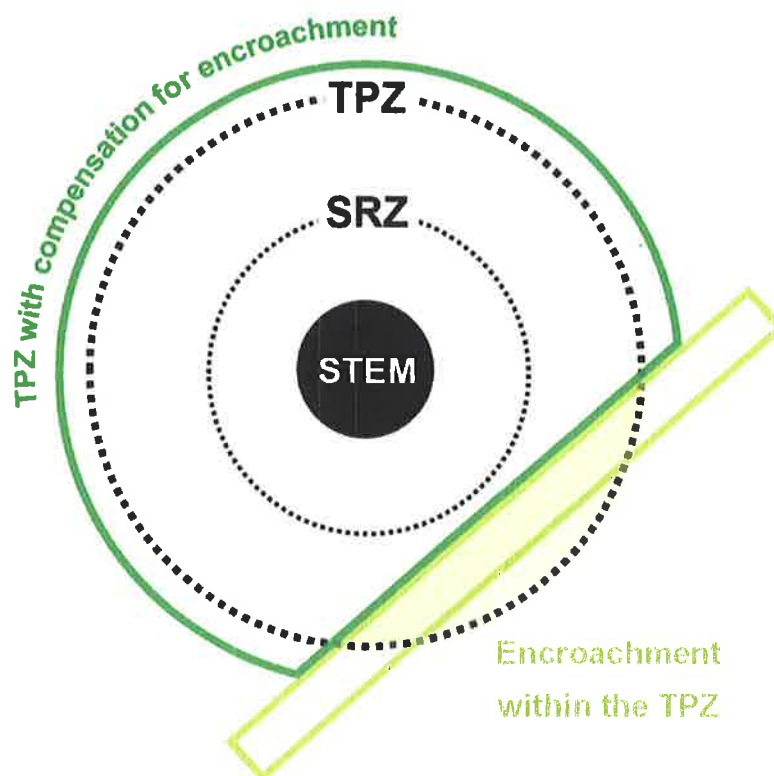
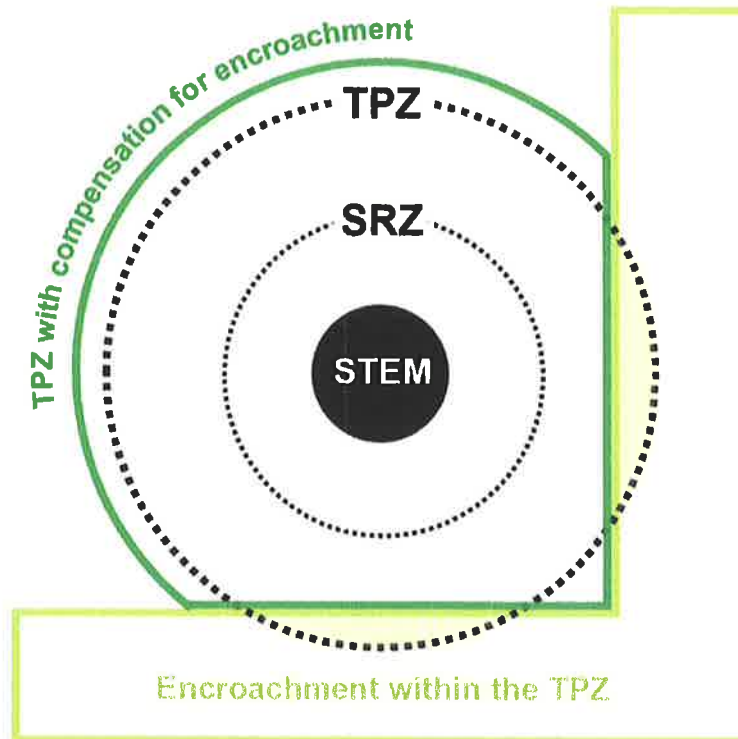


Appendix III: Tree protection zone, tree protection fencing, arborist supervision required (excavations for pier footings)

Appendix IV - Encroachment within the TPZ

The images below show how encroachment within the tree protection zone can be compensated for elsewhere.





Reference

Council of Standards Australia (August 2009)
AS 4970-2009 Protection of Trees on Development Sites
Standards Australia, Sydney

Appendix V - STARS© assessment matrix

Tree Significance - Assessment Criteria		
Low	Medium	High
<p>The tree is in fair-poor condition and good or low vigour.</p> <p>The tree has form atypical of the species</p> <p>The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings</p> <p>The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area</p> <p>The tree is a young specimen which may or may not have reached dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen</p> <p>The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ – tree is inappropriate to the site conditions</p> <p>The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms</p> <p>The tree has a wound or defect that has the potential to become structurally unsound.</p> <p>The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties.</p> <p>The tree is a declared noxious weed by legislation</p>	<p>The tree is in fair to good condition</p> <p>The tree has form typical or atypical of the species</p> <p>The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area</p> <p>The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street</p> <p>The tree provides a fair contribution to the visual character and amenity of the local area</p> <p>The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ</p>	<p>The tree is in good condition and good vigour</p> <p>The tree has a form typical for the species</p> <p>The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age.</p> <p>The tree is listed as a heritage item, threatened species or part of an endangered ecological community or listed on council's significant tree register</p> <p>The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity.</p> <p>The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values.</p> <p>The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ – tree is appropriate to the site conditions.</p>

Useful Life Expectancy - Assessment Criteria

Remove	Short	Medium	Long
<p>Trees with a high level of risk that would need removing within the next 5 years.</p> <p>Dead trees.</p> <p>Trees that should be removed within the next 5 years.</p> <p>Dying or suppressed or declining trees through disease or inhospitable conditions.</p> <p>Dangerous trees through instability or recent loss of adjacent trees.</p> <p>Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form.</p> <p>Damaged trees that considered unsafe to retain.</p> <p>Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.</p> <p>Trees that will become dangerous after removal of other trees for the reasons.</p>	<p>Trees that appear to be retainable with an acceptable level of risk for 5-15 years.</p> <p>Trees that may only live between 5 and 15 more years.</p> <p>Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals.</p> <p>Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons.</p> <p>Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.</p>	<p>Trees that appear to be retainable with an acceptable level of risk for 15-40 years.</p> <p>Trees that may only live between 15 and 40 more years.</p> <p>Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals.</p> <p>Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons.</p> <p>Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.</p>	<p>Trees that appear to be retainable with an acceptable level of risk for more than 40 years.</p> <p>Structurally sound trees located in positions that can accommodate future growth.</p> <p>Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery.</p> <p>Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.</p>

Tree Significance					
Useful Life Expectancy		High	Medium	Low	
	Long >40 years				
	Medium 15-40 years				
	Short <1-15 years				
	Dead				

Legend for Matrix Assessment	
	Priority for retention (High): These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 Protection of trees on development sites. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.
	Consider for retention (Medium): These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with the removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

Reference

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