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Arboricultural Impact Assessment Report
Revision B

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Date Prepared: 1st April 2023

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1. INTRODUCTION

1.1 This report has been commissioned by client Eva Wykrota to provide an Arboricultural Impact Assessment Report for trees on and adjoining the site that may be impacted by a proposed development.

1.2 One site inspection was carried out on 13th March 2023 to collect tree data. The weather at the time of the assessments was clear with average visibility.

Table 1: documents provided for the assessment.

Title	Author	Date	Reference on document
Proposed Subdivision Plans A and B	Bo Piotrowski	30/11/21 22/11/22	(Part A) 001B (Part B) 001SP

2. SCOPE OF THE REPORT

2.1 **This report has been undertaken to meet the following objectives.**

2.1.1 The proposed plans provided identify future works to Lot 9C including a dwelling and driveway. These proposed works under a future DA have been excluded from the scope of this assessment.

2.1.2 Conduct a visual assessment from ground level of trees located on and adjoining the site within five metres of the proposed works.

2.1.3 For the purpose of this report, a tree taken to have height greater than 5 metres.

2.1.4 Determine the trees estimated contribution years and remaining, useful life expectancy and award the trees a retention value.

2.1.5 Provide an assessment of the potential impact the proposed development is likely to cause to the condition of the subject trees in accordance with AS4970 Protection of trees on development sites (2009).

2.1.6 Provide pragmatic recommendations for the management of trees and mitigation of construction impacts on retained trees.

2.1.7 Specify tree protection measures for trees to be retained in accordance with AS 4970-2009.

3. LIMITATIONS

3.1 The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 Several trees have not been included on the site survey. These trees have been located on the plans within this report based on available setbacks taken on site and the accuracy of their location is not guaranteed.

3.3 Where access was limited, measurements have been estimated.

3.4 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.5 The tree inspections were visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.6 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.7 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.8 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with a spp.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Hugh The Arborist neither guarantees, nor is responsible for, the accuracy of information provided by others that is contained within this report.

3.11 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.12 The ultimate safety of any tree cannot be categorically guaranteed. Even trees apparently free of defects can collapse or partially collapse in extreme weather conditions. Trees are dynamic, biological entities subject to changes in their environment, the presence of pathogens and the effects of ageing. These factors reinforce the need for regular inspections. It is generally accepted that hazards can only be identified from distinct defects or from other failure-prone characteristics of a tree or its locality.

3.13 Alteration of this report invalidates the entire report.

4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

- 4.1.1 Tree common name
- 4.1.2 Tree botanical name
- 4.1.3 Tree age class
- 4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m above ground level) - millimetres.
- 4.1.5 Estimated height - metres.
- 4.1.6 Estimated crown spread (Radius of crown) - metres.
- 4.1.7 Health
- 4.1.8 Structural condition
- 4.1.9 Amenity value
- 4.1.10 Estimated remaining contribution years (SULE)[1]
- 4.1.11 Retention value (Tree AZ)[2]
- 4.1.12 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were an iPhone camera, Japanese made 170mm blade digging knife and a Leica DistoD410 digital laser tape.

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1 Barrell Tree Consultancy, *SULE: Its use and status into the New Millennium*, TreeAZ/03/2001, http://www.treeaz.com/.

2 Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

3 Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009). See appendices for more information.

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

5. SITE LOCATION AND BRIEF DESCRIPTION OF THE PROPOSAL

5.1 The site is located in the in the Northern Beaches Council suburb of North Narrabeen. All trees at the site are managed under the following policy and legislation.

5.1.1 Pittwater Local Environmental Plan (LEP) 2014

5.1.2 Pittwater 21 Development Control Plan (DCP) 2014

5.1.3 State Environmental Planning Policy (Biodiversity and Conservation)

5.1.4 Northern Beaches Tree Management Controls

5.2 The site is a large, steep block containing multiple trees and natural rock escarpments. The site appears to have been heavily disturbed in the past.

5.3 The proposed works consist of the subdivision of the land.

5.4 The site has not been identified as within a heritage conservation area but has been identified as within an area containing high levels of biodiversity.[4]

[4] https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/Public/XC.Track/SearchProperty.aspx

Tile 1: Site Location [5]

[5] https://maps.six.nsw.gov.au/

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6. OBSERVATIONS AND GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree information**: Details of each individual tree assessed, including the observations taken during the site inspection, can be found in the tree inspection schedule in appendix 2, where the indicative tree protection zone (TPZ) and Structural Root Zone (SRZ) has been calculated for each of the subject trees. The TPZ and SRZ should be measured in radius from the centre of the trunk. Each of the subject trees have been awarded a retention value based on the observations using the Tree AZ method. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline.

6.2 **Site plans:** Appendix 1A and 1B shows tree locations overlaid onto the proposed plans. The TPZ and SRZ have also been overlaid on both plans.

6.3 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads, and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection.

6.4 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the tree's stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula: $(DAB \times 50)^{0.42} \times 0.64$. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads, and tree ferns do not have an SRZ.

6.5 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill, and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

6.6 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment.

7. ASSESSEMENT OF CONSTRUCTION IMPACTS

7.1 **Table 2:** In the table below the impact of proposed development impact to all trees included in the report has been assessed. **Encroachments have been calculated on the tree locations and boundaries as shown on the survey plan provided.**

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
1	*Angophora costata*	A1	6.0	2.7	None	Tree located above and existing natural rock shelf and will not be encroached upon by the proposed or existing works.	Retain and protect
2	*Eucalyptus botryoides*	A1	6.1	2.7	None	Tree located on an elevated section of the site surrounded by rock floaters. The tree will not be subject to encroachment providing the rocks are retained.	Retain and protect
3	*Eucalyptus botryoides*	Z10	7.9	3.0	Major	The approved dwelling on Lot 9B will encroach into the Tree Protection Zone and the Structural Root Zone by up to 27%. This is a major encroachment that is likely to affect the health and viability of the tree. Tree 3 has already been assessed for removal in the existing DA336/09.	Remove
4	*Eucalyptus botryoides*	Z10	3.6	2.1	Major	The approved dwelling on Lot 9B will encroach into the Tree Protection Zone and the Structural Root Zone by up to 22%. This is a major encroachment that is likely to affect the health and viability of the tree. Tree 3 has already been assessed for removal in the existing DA336/09.	Remove
5	*Allocasuarina torulosa*	A1	2.3	1.7	None	Tree located on an adjoining site and will not be subject to encroachment.	Retain and protect
6	*Eucalyptus botryoides*	A1	3.8	2.3	None	Tree located on an adjoining site and will not be subject to encroachment.	Retain and protect
7	*Pittosporum undulatum*	Z3	2.0	1.5	None	Tree located on an adjoining site and will not be subject to encroachment.	Retain and protect
8	*Ligustrum sinense*	Z3	2.0	1.7	None	Tree located on an adjoining site and will not be subject to encroachment. The species is a listed weed.	Retain and protect

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
9	*Eucalyptus botryoides*	A1	7.6	2.8	Major	The proposed plans provided identify future works to Lot 9C including a dwelling and driveway. These proposed works under a future DA have been excluded from the scope of this assessment. A proposed temporary parking bay has been proposed within the Tree Protection Zone but is located outside of the Structural Root Zone. The parking bay encroaches into the Tree Protection Zone by up to 16.7% but not into the Structural Root Zone which is a major encroachment. The proposed plans show retaining walls and battering that indicate excavations are proposed. Section plans have not been provided and the depth of excavation is unknown. The existing site is heavily disturbed, and it is not possible to determine the natural levels and where the tree roots are most likely to be located. To reduce the development impacts of the parking bay to a level that is unlikely to significantly impact the tree a proposed design modification is required to allow a greater setback from the tree to the retaining wall excavation. To achieve this, the parking bay should be moved slightly to the south (further away from the tree) so it is flush with the proposed boundary to lot 9a. In addition, the proposed batter should be deleted and the proposed northern retaining wall of the parking bay continued along the same alignment east to meet the driveway. The resulting encroachment will be 11% and is unlikely to impact the health or condition of the tree.	Design modification required
10	*Ligustrum lucidum*	Z3	2	1.8	Footprint	The species is a listed weed in NSW ad is recommended for removal irrespective of the proposal.	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
11	*Ligustrum lucidum*	Z3	2.5	1.8	Footprint	The species is a listed weed in NSW ad is recommended for removal irrespective of the proposal.	Remove
12	*Ficus rubiginosa*	A1	5.0	1.8	None	Tree 12 is self-sown on top of a rock which is isolating the Tree Protection Zone. The tree will not be subject to encroachment providing the natural rock is retained.	Retain and protect
13	*Livistona australis*	A1	2.0	NA	None	No encroachment proposed	Retain and protect
14	*Erythrina x sykesii*	Z3	5.8	2.5	Major	The proposed driveway and batter will encroach into the Tree Protection Zone and the Structural Root Zone by up to 34%. This is a major encroachment that may impact the health and condition of the tree. The species is of low value, exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works.	Remove
15	*Erythrina x sykesii*	Z3	2.4	2.0	Minor	The proposed driveway and batter will encroach into the Tree Protection Zone by less than 10% which is a minor encroachment and unlikely to impact the condition of the tree. However, the species is of low value, exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works.	Remove
16	*Erythrina x sykesii*	Z3	4.8	2.4	Major	The proposed driveway and batter will encroach into the Tree Protection Zone by less than 12% which is a major encroachment and unlikely to impact the condition of the tree. However, the species is of low value, exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works.	Remove
17	*Erythrina x sykesii*	Z3	6.0	2.6	Major	The proposed driveway and batter will encroach into the Tree Protection Zone and the Structural Root Zone by up to 35%. This is a major encroachment that may impact the health and condition of the tree. The species is of low value,	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
						exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works.	
18	*Erythrina x sykesii*	Z3	5.1	2.3	Major	The proposed driveway and batter will encroach into the Tree Protection Zone by up to 18%. This is a major encroachment that may impact the health and condition of the tree. The species is of low value, exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works. Excavations have already been carried out within the TPZ and the SRZ which may have impacted the stability of the tree, the tree is recommended for removal irrespective of the proposal.	Remove
19	*Erythrina x sykesii*	Z3	4.7	2.3	Minor	The proposed driveway and batter will encroach into the Tree Protection Zone by less than 10% which is a minor encroachment and unlikely to impact the condition of the tree. However, the species is of low value, exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works. Excavations have already been carried out within the TPZ and the SRZ which may have impacted the stability of the tree, the tree is recommended for removal irrespective of the proposal.	Remove
20	*Erythrina x sykesii*	Z3	4.7	2.3	Minor	The proposed driveway and batter will encroach into the Tree Protection Zone by less than 10% which is a minor encroachment and unlikely to impact the condition of the tree. However, the species is of low value, exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works. Excavations have already been carried out within the TPZ and the SRZ which may have impacted the stability of the tree, the tree is recommended for removal irrespective of the proposal.	Remove
21	*Erythrina x sykesii*	Z3	3.6	2.1	Major	No encroachment from the proposed driveway or fill however excavations have already been carried out within the TPZ and the SRZ which may have impacted	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
						the stability of the tree, the tree is recommended for removal irrespective of the proposal.	
22	*Erythrina x sykesii*	Z3	6.1	2.6	Major	No encroachment from the proposed driveway or fill however excavations have already been carried out within the TPZ and the SRZ which may have impacted the stability of the tree, the tree is recommended for removal irrespective of the proposal.	Remove
23	*Erythrina x sykesii*	Z3	3.5	2.1	Major	The proposed driveway and batter will encroach into the Tree Protection Zone and the Structural Root Zone by up to 23%. This is a major encroachment that may impact the health and condition of the tree. The species is of low value, exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works. Excavations have already been carried out within the TPZ and the SRZ which may have impacted the stability of the tree, the tree is recommended for removal irrespective of the proposal.	Remove
24	*Erythrina x sykesii*	Z3	3.8	2.3	Major	The proposed driveway and batter will encroach into the Tree Protection Zone by up to 18%. This is a major encroachment that may impact the health and condition of the tree. The species is of low value, exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works. Excavations have already been carried out within the TPZ and the SRZ which may have impacted the stability of the tree, the tree is recommended for removal irrespective of the proposal.	Remove
25	*Erythrina x sykesii*	Z3	13.2	3.6	Major	The tree has been containerized by a retaining wall to the south however up to 40% of the Tree Protection Zone and the Structural Root Zone may be impacted by the proposed driveway and battering. This is a major encroachment that is likely to impact the health and condition of the tree. The species is of low value,	Remove

Tree ID	Species	Retention value	TPZ radius (m)	SRZ radius (m)	TPZ encroachment	Discussion/ Conclusion	Recommendation
						exempt from protection in the locality and is not worthy of constraint to development. The tree is proposed to be removed as part of the works.	

8. CONCLUSIONS

8.1 **Table 3:** Summary of the impact to trees during the development.

Impact	Reason	Category		
		AA1	A	Z
Trees to be removed	Building/landscape construction, new surfacing and/or proximity, or trees in poor condition.	None	None	3,4,10,11, 14,15,16, 17,18,19, 20,21,22, 23,24,25 Sixteen trees
Retained trees subject to TPZ encroachment	Removal of existing surfacing/structures and/or installation of new surfacing/structures will not significantly impact the tree	None	None	None
Retained trees subject to no TPZ encroachment	Located outside of the construction area	None	1,2,5,6,12, 13 Six trees	7,8 Two trees
Trees requiring design modification to enable retention	Building/landscape construction, new surfacing and/or proximity.	None	9 One Tree	None

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9. RECOMMENDATIONS

9.1 This report assesses the impact of a proposed development at the site on twenty-five trees located on and adjoining the site.

9.2 A total of sixteen trees have been proposed to be removed as part of the development works. All sixteen trees are assessed as low value category Z trees.

9.3 Eight trees will be retained and subject to no encroachment or development impacts. Of these, six are category A trees and two are category Z trees.

9.4 One category A tree (T9) has been identified as subject to major encroachment that may impact the health and condition of the tree. To ensure the tree is not adversely impacted by the construction, it must be demonstrated the following design modifications can be implemented. If the construction cannot be completed in accordance with these recommendations, the trees may not be viable for retention. All modifications are recommended to be reviewed by a Consulting Arborist prior to finalising plans.

9.5 **Tree 9.** To reduce the development impacts of the parking bay to a level that is unlikely to significantly impact the tree a proposed design modification is required to allow a greater setback from the tree to the retaining wall excavation. To achieve this, the parking bay should be moved slightly to the south (further away from the tree) so it is flush with the proposed boundary to lot 9a. In addition, the proposed batter should be deleted and the proposed northern retaining wall of the parking bay continued on the same alignment to the east as the parking bay to meet the driveway. The resulting encroachment will be 11% and is unlikely to impact the health or condition of the tree.

9.6 During the site inspection it was observed that trees 18 to 24 have been impacted by excavations for a pit. The excavations are within one metre and within the Structural Root Zones of the trees. It is recommended these low value trees be removed irrespective of the proposal.

9.7 The following sections contain general advice to minimise impacts to trees on development sites.

9.8 **Underground services:** AS4970 Protection of trees on development sites (2009) recommends that all underground services located inside the TPZ of any tree to be retained should be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention.

If directional drilling is proposed, section 4.5.5 of AS4970-2009 says that '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'.[6]
If manual excavations are proposed, all excavations for the services should be carried out manually under the supervision of the project Arborist (minimum qualification AQF 5). Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. All roots greater than 40mm in diameter should be retained in the service trench. The service pipe should then be threaded below the retained roots where practical. Roots greater than 40mm within the alignment of the service pipe should only be severed/pruned under the approval of the project Arborist. All root pruning should be in accordance with AS4373 Pruning of amenity trees (2007). Open trenching in the SRZ of trees can be impractical without impacting significant roots, as often dense root growth is present in the SRZ. Open trenching should therefore be avoided in the SRZ. It is recommended that any section of pipe that is located in the SRZ of trees to be retained is installed via sub-surface boring/directional drilling methods only. The feasibility of sub-surface boring/directional drilling will need to be investigated by a sub-surface boring/directional drilling specialist. The project Arborist should provide advice and supervise excavations for bore pits, which must be carried out manually if located within the TPZ. The top of the pipe must be at least 600mm below the existing soil grade. The location of bore pits should be flexible in the TPZ to avoid significant roots, the project Arborist should assess and advise in writing the impact of any significant root severance to the condition of the tree.

6 Council Of Standards Australia, *AS 4970 Protection of trees on development sites* (2009) page 18.

9.9 **Tree Sensitive Hard Surfacing Construction (stairs and driveways):** Hard surfacing within the TPZ of retained trees should be constructed in a tree sensitive method. The hard surfacing should be constructed above existing grades in the TPZ of the trees. The diagram below (Image C) gives an example of a no-excavation method for constructing hard surfacing close to trees. The location of retaining pegs should be flexible, avoiding damage to structural roots. If excavations are essential, they must not exceed 100mm below the existing grades. The excavations should be supervised by a project Arborist with a minimum AQF level 5 qualification. All excavations for the hard surfacing should be carried out manually to avoid impacting retained tree roots. All tree roots greater than 40mm in diameter should be retained unless the project arborist has assessed and advised that the pruning/severing of the root will not impact the condition or stability of the tree. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. Where tree roots greater than 40mm are encountered that must be retained, the hard surfacing should be elevated over the individual tree root to allow for its retention. Examples of methods that can be used to bridge individual tree roots have been included below (Image D and E). Using pier and beam bridges as per image E is the recommended/preferred method, as it will allow for future growth of the tree roots, reducing future damage to the surfacing from the roots.

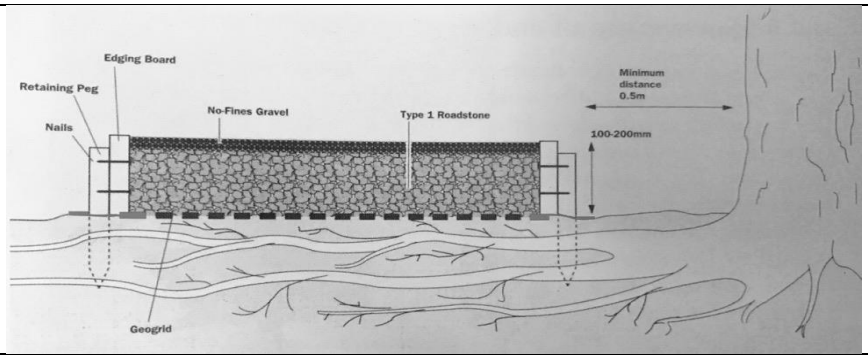


Image C: An image from 'Tree Roots in the Built Environment'[7], showing how to construct hard surfacing above a trees root system without excavation. Type 1 Roadstones are an example of blue metal or crushed sandstone.

[7] Roberts, J., Jackson, N., & Smith, M., *Tree Roots in the Built Environment*, The Stationary Office, London, England (2006). Page 305 & 306.

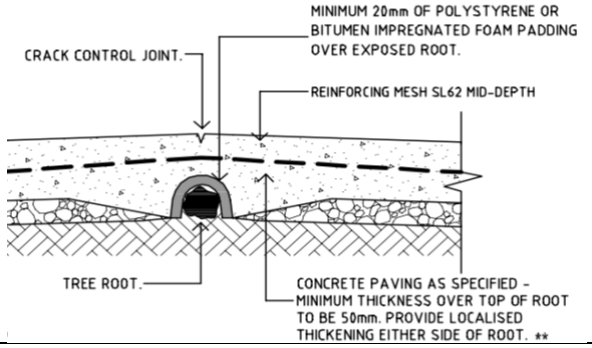


Image D: Example method for bridging concrete surfacing over tree roots provided in the Canterbury Bankstown Council standard drawings.[8]

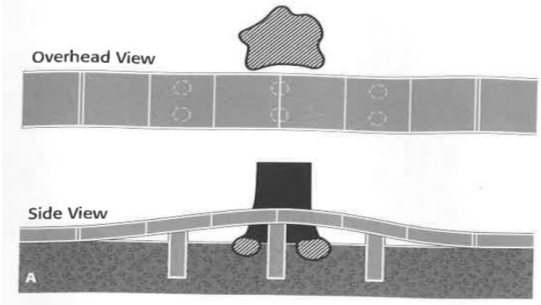


Image E: Example method from Reducing infrastructure damage by tree roots: A compendium of strategies.[9]

9.10 **Bulk Earthworks - Soil Level Modifications (Cut and Fill):** The following points outline how cut and fill can significantly impact trees.

Cut: A trees root system is generally located far shallower in the soil than is normally considered and should be thought of as a 'root plate'. The majority of a trees root growth is usually found in the upper 600mm of the soil closest to the surface, but a percentage of the roots will extend deeper in the soil. An image has been included below that is taken from AS4970-2009 which provides an example of the structure of a trees root system. Any significant cut/lowering the soil level in the TPZ can impact the tree. The only way to identify the precise impact to a trees root system by cut in the TPZ is by carrying out detailed root investigation to identify the individual significant roots. No detailed root investigations have been undertaken as part of the assessment.

8 *Canterbury Bankstown Council standard drawing S-209 Existing street tree treatments*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/council-standard-drawings, accessed 3 October 2019.

9 Costello, L. R., & Jones, K. S, *Reducing infrastructure damage by tree roots: A compendium of strategies*, Western Chapter of the International Society of Arboriculture, 31883 Success Valley Drive, Porterville, CA (2003), page 27.

9.11 **Fill:** tree roots require air, water and nutrients to function properly. Increasing the soil level in the TPZ can impact the trees by reducing the availability of water, nutrients and air to the trees underlying root system and can cause the decline of a trees health and vigour. Placing fill directly against the trunk of a tree can potentially cause collar rot. Collar rot forms when soil against the trunk of the tree accelerates sapwood or heartwood decay.[10]

9.12 **Tree Sensitive Retaining Walls:** To reduce the impact of the retaining walls, timber sleeper retaining walls should be used to avoid severing/pruning significant roots in the TPZ (no continuous strip footing). During the construction of the retaining walls, all sleepers should be located on or above existing soil grades, and piers/posts locations should be flexible to avoid significant roots (roots greater than 40mm in diameter) that are critical to the health and stability of the tree. The project Arborist should directly supervise the construction of retaining walls and no roots greater than 40mm in diameter should be pruned/severed unless assessed and approved in writing by the project Arborist

9.13 **Retaining Walls to Limit Cut and Fill in the TPZ:** The image below is an example of how a retaining wall can limit fill within the TPZ.

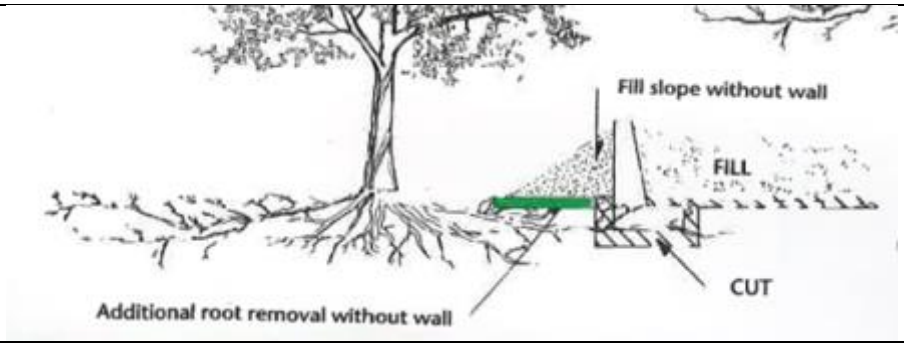


Image B: An image from A technical guide to preservation of trees during land development ,[11] showing how retaining walls can be used to limit fill inside the TPZ.

9.14 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

[10] Dunster, Julian A., Thomas Smiley, Nelda Matheny, and Sharon Lilly, *Tree Risk Assessment Manual*, Champaign, Illinois: International Society of Arboriculture (2013), page 108.

[11] Matheny, N. & Clark, J. R, *A technical guide to preservation of trees during land development*, International Society of Arboriculture, P.O Box 3029, Champaign, IL, USA (1998), page 98.

10. ARBORICULTURAL WORK METHOD STATEMENT (AMS) AND TREE PROTECTION REQUIREMENTS

10.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site and be provided with a copy of this report.

10.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

10.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 3 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

10.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. I recommend regular site inspections on a frequency based on the longevity of the project; this is to be agreed in the initial meeting.

10.5 **Table 4: Site Specific Tree Protection Recommendations**

Tree Number	Protection specification
All retained trees	- A site specific tree protection plan is recommended to be developed in conjunction with design modifications and a construction management plan.

10.6 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

10.7 **Protective fencing:** Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre 'cyclone chainmesh fence'. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

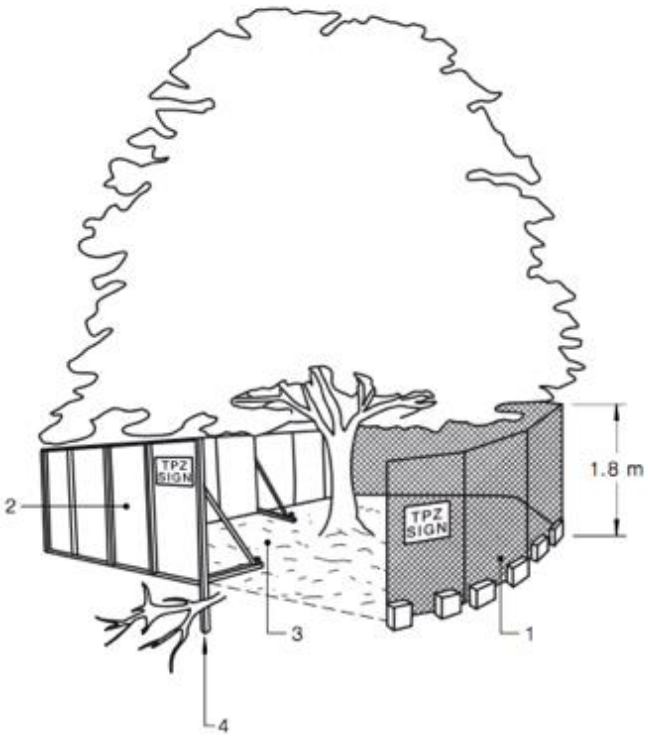
10.8 **TPZ signage:** Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

10.9 **Trunk and Branch Protection:** The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals and must be fixed against the trunk with tie wire or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

10.10 **Mulch:** Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

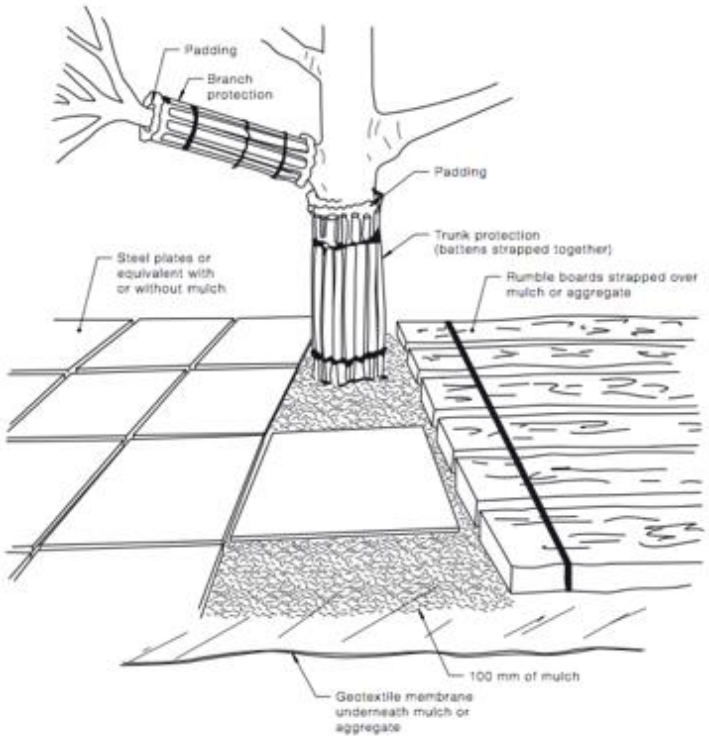
10.11 **Ground Protection:** Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.



LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[12] with example tree protection.

[12] Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.



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.

An image from AS4970-2009,[13] with example tree protection.

[13] Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

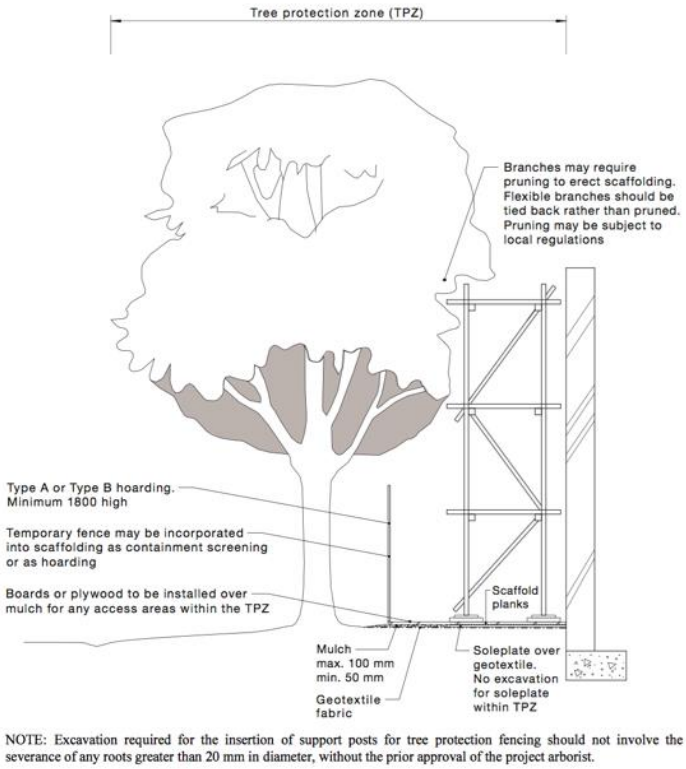


Image 3: An image from AS4970-2009,[14] with example tree protection involving scaffold.

10.12 **Root investigations:** Where major TPZ encroachments require demonstrating the viability of trees the following method for root investigations is to be used. Non-destructive excavations are to be carried out along the outer edge of proposed or existing structures within the TPZ (excavation methods include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device). Excavations generally consist of a trench to a depth dictated by the location of significant roots, bedrock, unfavourable conditions for root growth, or the required depth for footings up to 1 metre. The investigation is to be carried out by AQF5 consulting Arborist who is to record all roots greater than 30 millimetres in diameter and produce a report discussing the significance of the findings. No roots 30 millimetres in diameter are to be frayed or damaged during excavation and the trench is to be backfilled as soon as possible to reduce the risk of roots drying out. In the event roots must be left exposed, they are to be wrapped in hessian sack and regularly irrigated for the duration of exposure.

[14] Council of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 19.

10.13 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refueling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

10.14 **Excavations and root pruning:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 10mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[15] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

10.15 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimise the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

[15] Council of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

10.16 **Level changes should be minimised**. The existing ground levels within the landscape areas should not be lowered by more than 50mm or increased by more 100mm without assessment by a consulting Arborist.

10.17 **New retaining walls** should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

10.18 **New footpaths** and hard surfaces should be minimised, as they can limit the availability of water, nutrients, and air to the tree's root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpath should be located outside the SRZ.

10.19 **The location of new plantings** inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

10.20 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

10.21 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

10.22 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

HUGH
THE ARBORIST

11. HOLD POINTS

11.1 **Hold Points:** Below is a sequence of hold points requiring project Arborist certification throughout the development process**.** The hold points must be checked and certified. All certifications must be provided in written format upon completion of the development. The final certification must include details of any instructions for remediation undertaken during the development.

Hold Point	Stage	Responsibility	Certification	Complete Y/N and date
Project Arborist to hold pre construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to feasibility of tree protection requirements that may arise.	Prior to work commencing.	Principle contractor	Project Arborist	
Project Arborist To supervise all pruning works to retained trees.	Prior to works commencing	Principal Contractor	Project Arborist	
Project Arborist to assess and certify that tree protection has been installed in accordance with section 11 and AS4970-2009 prior to works commencing at site.	Prior to development work commencing.	Principle contractor	Project Arborist	
In accordance with AS4970-2009 the project arborist should carryout regular site inspections to ensure works are carried out in accordance with the recommendations. I recommend site inspections on a bi-monthly frequency.	Ongoing throughout the development	Principle contractor	Project Arborist	
Project Arborist to oversee all excavations and demolition inside the TPZ of any tree to be retained.	Construction	Principle contractor	Project Arborist	
Project Arborist to certify that all pruning of roots greater than 30mm in diameter has been carried out in accordance with AS4373-2007. All root pruning must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3.	Construction	Principle contractor	Project Arborist	
Project Arborist to certify that all underground services including storm water inside TPZ of any tree to be retained have been installed in accordance with AS4970-2009.	Construction	Principle contractor	Project Arborist	
All landscaping works/boundary walls within the TPZ of trees to be retained are to be undertaken in consultation with the project Arborist to minimise the impact to trees.	Landscape	Principle contractor	Project Arborist	

After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigor and authorize the removal of protective fencing. If changes to condition are identified the project Arborist should provide recommendations for remediation.	Upon completion of construction	Principle contractor	Project Arborist	
Any wounding or injury that occurs to a tree during the demolition/construction process will require the project arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. All remediation work is to be carried out by the project arborist, at the contractor's expense.	Ongoing throughout the development	Principle contractor	Project Arborist	

12. BIBLIOGRAPHY/REFERENCES

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- Council of Standards Australia, *AS4373 Pruning of amenity trees* (2007).
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- Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.
- *Pittwater Local Environmental Plan 2014* https://legislation.nsw.gov.au/#/view/EPI/2014/320/historical2017-08-25/full.
- *Pittwater 21 Development Control Plan,* https://eservices.northernbeaches.nsw.gov.au/ePlanning/live/pages/plan/book.aspx?exhibit=PDCP.
- *Northern Beaches Council - Removing and Pruning Trees on Private Land*, https://www.northernbeaches.nsw.gov.au/planning-development/tree-management/private-land
- State Environmental Planning Policy (Biodiversity and Conservation 2021)

13. LIST OF APPENDICES

The following are included in the appendices:

Appendix 1A – Proposed Plan A
Appendix 1B – Proposed Plan B
Appendix 2 - Tree inspection schedule
Appendix 3 – Health
Appendix 4 – Landscape Value
Appendix 5 – Age Class
Appendix 6 – Structural Condition
Appendix 7 – SULE Categories
Appendix 8 – Trees AZ Field Sheet
Appendix 9 – TPZ Encroachment Examples

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RFS Tech. Cert. II (UK)
QTRA Registered User
ISA Tree Risk Assessment Qualification
MAA
MISA

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Tree Crown

Tree Protection Zone

Structural Root Zone

0 25m

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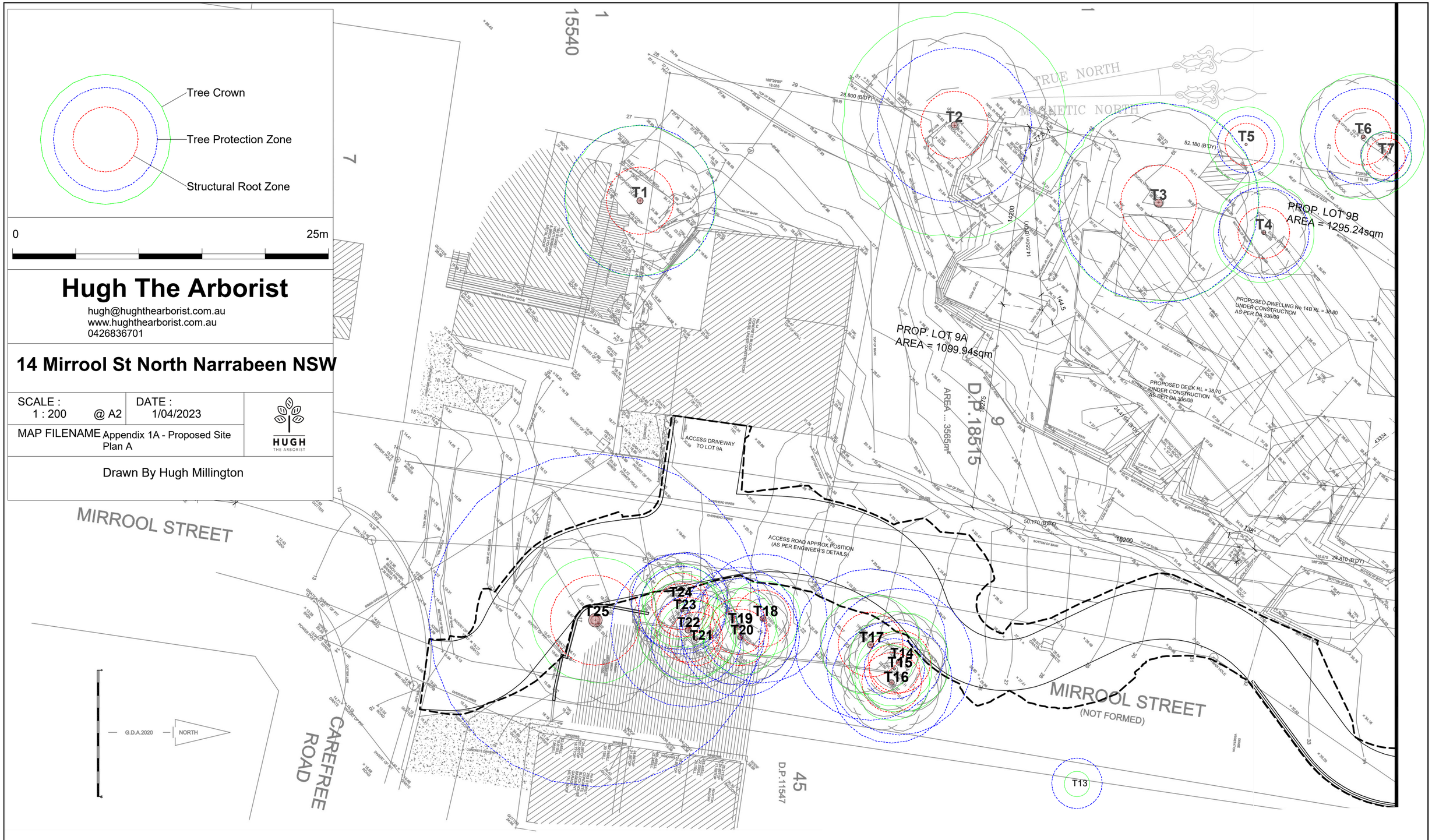
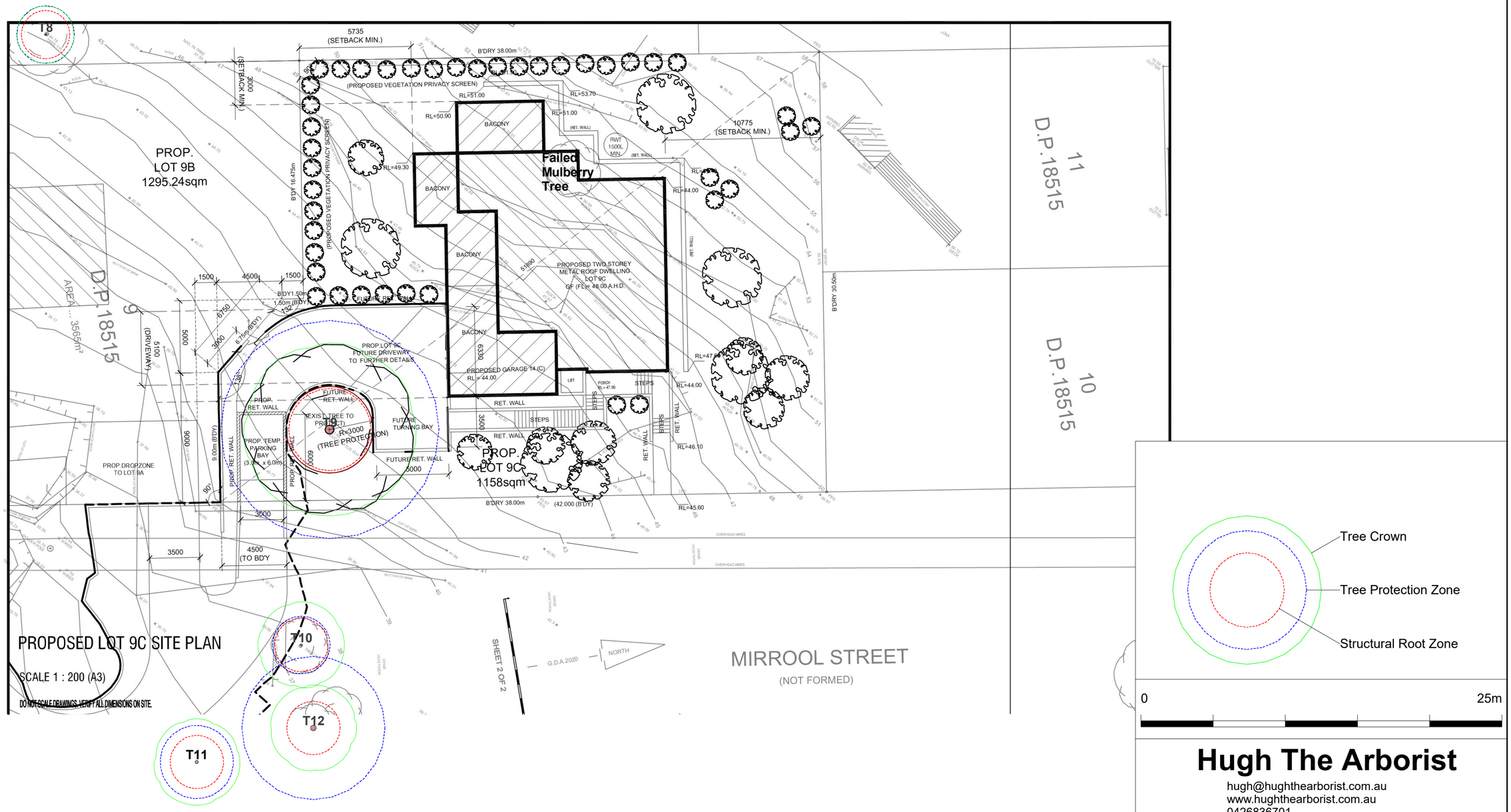
SCALE : 1 : 200 @ A2	DATE : 1/04/2023	HUGH THE ARBORIST
MAP FILENAME Appendix 1A - Proposed Site Plan A		
Drawn By Hugh Millington		





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SCALE :	DATE :
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MAP FILENAME Appendix 1B - Proposed Site Plan B	

Drawn By Hugh Millington

Appendix 2 - Tree Inspection Schedule

Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1 (mm)	Stem 2 (mm)	Stem 3	Stem 4	Stem 5	Stem 6	DBH (mm)	DAB (mm)	Health	Structure	Landscape Value	SULE	Trees AZ Value	TPZ Radius (m)	SRZ Radius (m)	Notes
1	Smooth Barked Apple	*Angophora costata*	Semi-mature	13	6	500						500	600	Good	Good	High	1. Long	A1	6.0	2.7	On rock shelf existing building works below. Isolated
2	Bangalay	*Eucalyptus botryoides*	Semi-mature	15	9	510						510	600	Good	Good	High	1. Long	A1	6.1	2.7	On rock prov no rocks are removed stability or assess by geotechnical
3	Bangalay	*Eucalyptus botryoides*	Semi-mature	12	8	580	320					662	800	Good	Fair	Medium	3. Short	Z10	7.9	3.0	Existing approval and major roots severed within 1m of trunk. Old wounds
4	Bangalay	*Eucalyptus botryoides*	Semi-mature	9	4	300						300	320	Good	Fair	Medium	3.Short	Z10	3.6	2.1	Existing approval and major roots severed within 1m of trunk. Old wounds
5	Forest Oak	*Allocasuarina torulosa*	Semi-mature	6	3	190						190	200	Good	Good	Medium	1. Long	A1	2.3	1.7	Neighbors tree
6	Bangalay	*Eucalyptus botryoides*	Semi-mature	10	5	320						320	400	Good	Good	Medium	1. Long	A1	3.8	2.3	Neighbors tree
7	Sweet Pittosporum	*Pittosporum undulatum*	Semi-mature	5	2	110						110	120	Good	Good	Low	1. Long	Z3	2.0	1.5	Neighbors tree
8	Small Leaved Privet	*Ligustrum sinense*	Mature	5	2	100	50	50	50	50		141	200	Good	Good	Very Low	1. Long	Z3	2.0	1.7	Neighbors tree
9	Bangalay	*Eucalyptus botryoides*	Semi-mature	13	6	630						630	700	Good	Good	Medium	1. Long	A1	7.6	2.8	
10	Broad Leaved Privet	*Ligustrum lucidum*	Semi-mature	9	3	150						150	250	Good	Good	Very Low	1. Long	Z3	2.0	1.8	Isolated on rock shelf
11	Broad Leaved Privet	*Ligustrum lucidum*	Semi-mature	9	3	150	150					212	250	Good	Good	Very Low	1. Long	Z3	2.5	1.8	
12	Port Jackson Fig	*Ficus rubiginosa*	Semi-mature	9	3	350	220					413	250	Good	Good	Very Low	1. Long	A1	5.0	1.8	Isolated on rock shelf
13	Cabbage Palm	*Livistona australis*	Semi-mature	7	1	200						200	NA	Good	Good	High	1. Long	A1	2.0	NA	
14	Indian Coral	*Erythrina x sykesii*	Semi-mature	9	4	380	300					484	500	Good	Good	Very Low	1. Long	Z3	5.8	2.5	On adjoining site
15	Indian Coral	*Erythrina x sykesii*	Young	5	3	200						200	300	Fair	Poor	Very Low	1. Long	Z3	2.4	2.0	
16	Indian Coral	*Erythrina x sykesii*	Semi-mature	9	3	400						400	450	Good	Good	Very Low	1. Long	Z3	4.8	2.4	
17	Indian Coral	*Erythrina x sykesii*	Semi-mature	12	4	500						500	550	Good	Good	Very Low	1. Long	Z3	6.0	2.6	Site highly disturbed Road over existing fill
18	Indian Coral	*Erythrina x sykesii*	Semi-mature	9	3	360	180	80	80	80		426	400	Good	Good	Very Low	1. Long	Z3	5.1	2.3	On council land?
19	Indian Coral	*Erythrina x sykesii*	Semi-mature	10	3	390						390	400	Good	Good	Very Low	1. Long	Z3	4.7	2.3	
20	Indian Coral	*Erythrina x sykesii*	Semi-mature	10	3	390						390	400	Good	Good	Very Low	1. Long	Z3	4.7	2.3	
21	Indian Coral	*Erythrina x sykesii*	Semi-mature	10	3	300						300	350	Good	Good	Very Low	1. Long	Z3	3.6	2.1	
22	Indian Coral	*Erythrina x sykesii*	Semi-mature	11	4	510						510	550	Good	Good	Very Low	1. Long	Z3	6.1	2.6	
23	Indian Coral	*Erythrina x sykesii*	Semi-mature	10	3	200	210					290	350	Good	Good	Very Low	1. Long	Z3	3.5	2.1	
24	Indian Coral	*Erythrina x sykesii*	Semi-mature	10	3	320						320	400	Good	Good	Very Low	1. Long	Z3	3.8	2.3	
25	Indian Coral	*Erythrina x sykesii*	Mature	13	5	1100						1100	1200	Good	Fair	Very Low	2. Medium	Z3	13.2	3.6	In recent retaining wall.

Explanatory Notes

Tree Species - Botanical name followed by common name in brackets. Where species is unknown it is indicated with an '*spp'.*
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y), Dead (D).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level. Where DBH has been estimated it is indicated with an 'est'.

Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - (DAB x 50) $^{0.42}$ x 0.64. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
(x) Indicates the measurement taken for the diameter at tree base above the buttress roots.
(E) Indicates estimated measurements.

Appendix 3 – Assessment of Health

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

Appendix 4 Landscape Value

RATING	HERITAGE VALUE	ECOLOGICAL VALUE	AMENITY VALUE
1. SIGNIFICANT	The subject tree is listed as a Heritage Item under the Local Environment Plan (LEP) with a local, state or national level of significance or is listed on Council's Significant Tree Register	The subject tree is scheduled as a Threatened Species as defined under the Threatened Species Conservation Act 1995 (NSW) or the Environmental Protection and Biodiversity Conservation Act 1999	The subject tree has a very large live crown size exceeding 300m² with normal to dense foliage cover, is located in a visually prominent position in the landscape, exhibits very good form and habit typical of the species
	The subject tree forms part of the curtilage of a Heritage Item (building /structure /artefact as defined under the LEP) and has a known or documented association with that item	The tree is a locally indigenous species, representative of the original vegetation of the area and is known as an important food, shelter or nesting tree for endangered or threatened fauna species	The subject tree makes a significant contribution to the amenity and visual character of the area by creating a sense of place or creating a sense of identity
	The subject tree is a Commemorative Planting having been planted by an important historical person (s) or to Commemorate an important historical event	The subject tree is a Remnant Tree, being a tree in existence prior to development of the area	The tree is visually prominent in view from surrounding areas, being a landmark or visible from a considerable distance
2. VERY HIGH	The tree has a strong historical association with a heritage item (building/structure/artefact/garden etc) within or adjacent the property and/or exemplifies a particular era or style of landscape design associated with the original development of the site.	The tree is a locally-indigenous species, representative of the original vegetation of the area and is a dominant or associated canopy species of an Endangered Ecological Community (EEC) formerly occurring in the area occupied by the site.	The subject tree has a very large live crown size exceeding 200m²; a crown density exceeding 70% (normal-dense), is a very good representative of the species in terms of its form and branching habit or is aesthetically distinctive and makes a positive contribution to the visual character and the amenity of the area
3. HIGH	The tree has a suspected historical association with a heritage item or landscape supported by anecdotal or visual evidence	The tree is a locally-indigenous species and representative of the original vegetation of the area and the tree is located within a defined Vegetation Link / Wildlife Corridor or has known wildlife habitat value	The subject tree has a large live crown size exceeding 100m²; The tree is a good representative of the species in terms of its form and branching habit with minor deviations from normal (e.g. crown distortion/suppression) with a crown density of at least 70% normal); The subject tree is visible from the street and surrounding properties and makes a positive contribution to the visual character and the amenity of the area
4. MODERATE	The tree has no known or suspected historical association, but does not detract or diminish the value of the item and is sympathetic to the original era of planting.	The subject tree is a non-local native or exotic species that is protected under the provisions of this DCP.	The subject tree has a medium live crown size exceeding 40m²;The tree is a fair representative of the species, exhibiting moderate deviations from typical form (distortion/suppression etc) with a crowndensity of more than 50% (thinning to normal); and The tree is visible from surrounding properties, but is not visually prominent – view may be partially obscured by other vegetation or built forms. The tree makes a fair contribution to the visual character and amenity of the area.
5. LOW	The subject tree detracts from heritage values or diminishes the value of a heritage item	The subject tree is scheduled as exempt (not protected) under the provisions of this DCP due to its species, nuisance or position relative to buildings or other structures.	The subject tree has a small live crown size of less than 40m² and can be replaced within the short term (5-10 years) with new tree planting
6. VERY LOW	The subject tree is causing significant damage to a heritage Item.	The subject tree is listed as an Environment Weed Species in the Local Government Area, being invasive, or is a known nuisance species.	The subject tree is not visible from surrounding properties (visibility obscured) and makes a negligible contribution or has a negative impact on the amenity and visual character of the area. The tree is a poor representative of the species, showing significant deviations from the typical form and branching habit with a crown density of less than 50% (sparse).
7. INSIGNIFICANT	The tree is completely dead and has no visible habitat value	The tree is a declared Noxious Weed under the Noxious Weeds Act (NSW) 1993 within the relevant Local Government Area.	The tree is completely dead and represents a potential hazard.

Ref: *Determining the retention value of trees of development sites,* presentation handouts at TAFE NSW Ryde College, March 2012

Appendix 5 - Age class

Determining the exact age of a tree is difficult without carrying out potentially invasive testing. The age class of the subject tree has been estimated using the definitions below.

Category	Description
Young/Newly planted	• Young or recently planted tree.
Semi Mature	• Up to 20% of the usual life expectancy for the species.
Early mature/Mature	• Between 20% - 80% of the usual life expectancy for the species.
Over mature	• Over 80% of the usual life expectancy for the species.
Dead	• Tree is dead or almost dead.

Appendix 4 - Structural condition

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

Appendix 7 - Safe Useful Life Expectancy (SULE), (Barrel, 2001)

A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long	Useful life expectancy over 40 years
2. Medium	Useful life expectancy 15 to 40 years
3. Short	Useful life expectancy 5 to 15 years
4. Remove	Useful life expectancy under 5 years
5. Small/Young	Trees that could be transplanted or replaced with similar specimen.
6. Unstable	Tree has become hazardous or structurally unstable.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

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

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

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

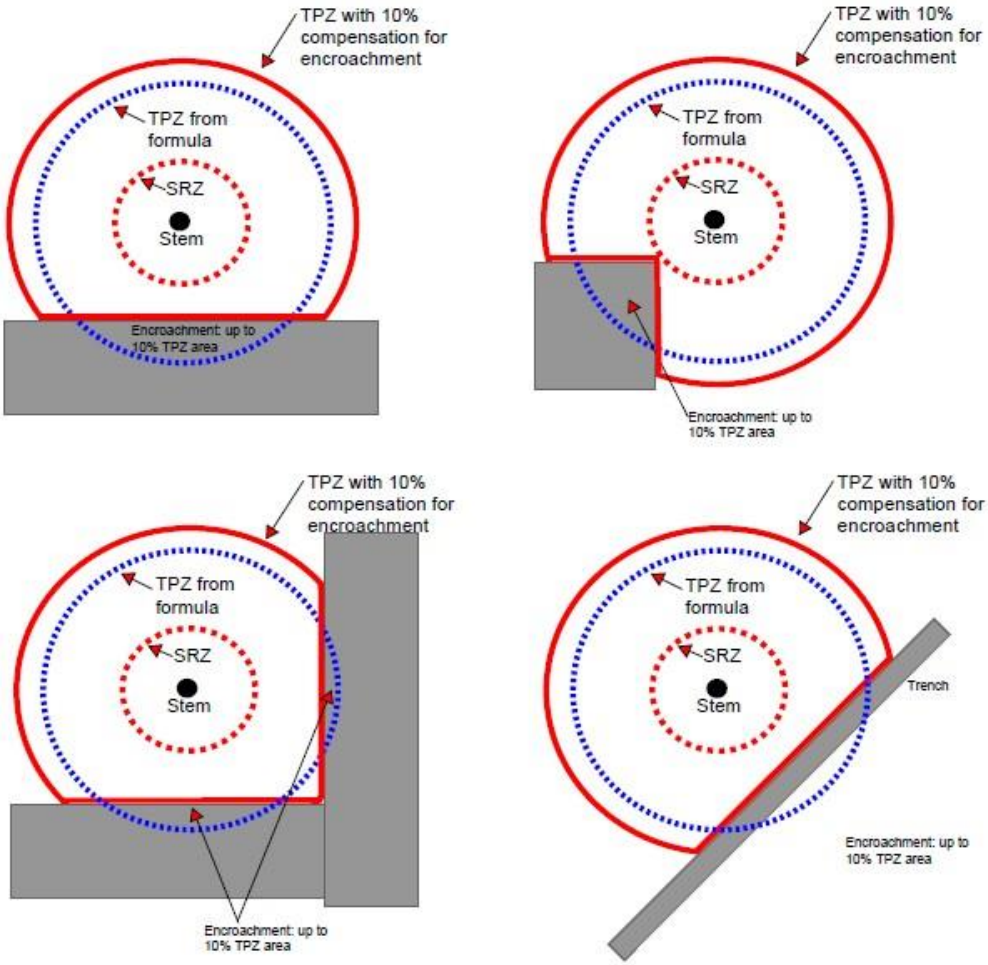
Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

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

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

Appendix 10 – Examples of TPZ Encroachment

Encroachment into the Tree Protection Zone is sometimes unavoidable. The following diagram shows examples of acceptable levels of encroachment and how they may be compensated for by providing additional space contiguous to the TPZ area.



Note: Less than 10% TPZ area and outside SRZ. Any loss of TPZ compensated for elsewhere.