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ARBORICULTURAL IMPACT ASSESSMENT

Proposed Boat Ramp Upgrades

SYDNEY ACADEMY OF SPORT AND RECREATION
WAKEHURST PARKWAY, CROMER NSW 2099

Prepared for: Office of Sport
NSW Government
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Arboriculture Australia 2023 Registered Consulting Arborist

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VALID Tree Risk-Benefit Validator

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1 EXECUTIVE SUMMARY

This Arboricultural Impact Assessment (AIA) has been prepared to accompany a Development Application (DA) which seeks consent for the proposed alterations and additions to boat launching infrastructure at the Sydney Academy of Sport and Recreation (the site).

The report relates to twenty (20) trees located on the subject site and provides an evaluation of the likely impact to existing trees as a result of the proposed construction works.

A summary of those trees identified has been provided in ***Table 1*** below along with a description of their location, retention values and nominated retention/removal status under the proposal.

Table 1 *– Tree assessment summary*

Tree No.	*Genus & species* Common Name	Location	Retention Value	Retain / Remove
1	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 1	Medium	Retain & protect
2	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 1	Medium	Retain & protect
3	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 1	Medium	Remove
4	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 1	Low	Remove
5	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 1	Medium	Retain & protect
6	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 1	Medium	Retain & protect
7	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 1	Medium	Retain & protect
8	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 1	Medium	Retain & protect
9	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 2	Medium	Retain & protect
10	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 2	Medium	Retain & protect
11	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 2	Medium	Retain & protect
12	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 2	Low	Retain & protect
13	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 2	Low	Retain & protect
14	***Casuarina glauca*** Swamp Oak	Creek Bank East of Boat Ramp 2	Medium	Retain & protect
15	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 2	Medium	Retain & protect
16	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 2	Medium	Retain & protect
17	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 2	Low	Retain & protect
18	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 2	Low	Retain & protect

Tree No.	*Genus & species* Common Name	Location	Retention Value	Retain / Remove
19	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 2	Medium	Retain & protect
20	***Casuarina glauca*** Swamp Oak	Creek Bank West of Boat Ramp 2	Medium	Retain & protect

Based on the plans supplied and should the proposed works proceed in their current form, it is recommended that two (2) trees (**Trees 3** & **4**) be removed, and eighteen (18) trees (**Trees 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19** & **20**) be retained and protected.

Specific recommendations as per ***Section 7*** will need to be adopted to ensure root sensitive construction techniques and methodology are employed which mitigate any potential negative impacts to retained trees.

2 INTRODUCTION

2.1 Background

This Arboricultural Impact Assessment (AIA) was commissioned by the Office of Sport on the 1st of December 2023 to evaluate the potential impacts that proposed development works will have on existing trees located on the subject site at the Sydney Academy of Sport and Recreation (refer to ***Figure 1***).

Accordingly, the purpose of this report is to assess the potential impact of the proposed development on the subject trees, as well as provide recommendations for further amendments to the design or construction methodology where necessary to minimise any adverse impact. The report also provides recommended tree protection measures to ensure the long-term preservation of the trees to be retained where appropriate.

2.2 Objectives

This report has been prepared to assess the level of impact development works are likely to cause to existing trees and make a determination as to whether trees will be adversely affected. The report will provide guidance as to those trees requiring removal, retention or protection in accordance with the provisions of *AS4970-2009 Protection of trees on development sites*. Where necessary, it will also provide recommendations for design modifications and any replacement planting. As such, the objectives of this report are as follows:

- Assess the current site and growing conditions of trees;
- Assess the current health, condition, lifespan & significance of the trees within the site;
- Identify relative retention values of trees within the site;
- Calculate anticipated encroachment levels resulting from proposed works;
- Determine the likely impact as a result of the calculated encroachments;
- Assess potential for retention and protection of trees where possible;
- Advise any design modifications necessary to retain important trees;
- Recommend tree and root sensitive design and construction methodologies to mitigate impacts to trees to be retained;
- Inform of any tree removal necessary due to unsustainable impacts;
- Provide guidance and recommendations for any replacement planting necessary.

No aerial inspection, root mapping or internal diagnostic testing have been carried out as part of this report. Additionally, no cation exchange capacity testing or plant tissue analysis has been undertaken.

2.3 Legislation & Regulating Documents

This Arboricultural Impact Assessment has considered the following regulatory documents:

- *State Environmental Planning Policy (Biodiversity and Conservation) 2021*
- *Warringah Local Environmental Plan 2011 (Warringah LEP 2011)*
- *Warringah Development Control Plan 2011 (Warringah DCP 2011)*

2.4 Documentation Received

The following documents were received and have been relied upon for this Assessment:

***Table 2** – Documentation received and reviewed as part of the Arboricultural Impact Assessment*

Document Description	Author	Revision No. / Date
Civil Drawings	DRB Consulting Engineers	1 / 17.07.2023
Survey	CMS Surveyors	1 / 09.10.2023
Waterways Impact Statement	H2O Consulting Group	RO / 19.10.2023
Statement of Environmental Effects	CPS	1 / 18.08.2023
Request for Further Information Letter	Northern Beaches Council	- / 18.12.2023

Note: care has been taken to obtain all information from reliable sources; however, the author makes no representations, guarantees or warranties as to the accuracy of information provided by others. No other information has been reviewed, should this become available impacts may be subject to change.

2.5 The Site

The land where the proposed boat ramp upgrades are to take place is known as the Sydney Academy of Sport and Recreation and is legally described as Lot 1 DP 74818 (the site). Two boat ramps are proposed to be upgraded. Boat Ramp 1 is located on the southern shore of Middle Creek and to the east of the pedestrian bridge. Boat Ramp 2 is located on the southern shore of Middle Creek and to the west of the pedestrian bridge (refer to ***Figure 1*** below).

***Figure 1** – Aerial image indicating subject site and location of boat ramp upgrades (circled red)*
***Source**: Nearmap Oct 21 2023*

2.6 Proposed Construction Works

The proposed works involve the upgrade of two existing boat ramps located on the southern shoreline of Middle Creek. Removal of the existing pontoon and concrete slabs will allow for upgrades involving construction of sandstone block retaining walls, placement of compacted sand fill and Geohex erosion control system, and excavation for installation of drainage lines (refer to ***Figure 2*** below). Specifically, those works considered likely to impact the existing trees on the subject site include excavation required for the new sandstone retaining wall footings and drainage lines.

This assessment has assumed the width of Boat Ramp 2 to be 22.95 metres to match the existing slab. The proposed boat ramp at this width will ensure associated works including construction of the retaining walls and installation of subsoil drainage line are within the footprint of the existing slab where by roots from adjoining trees are less likely to be encountered and impacted by the proposed works.

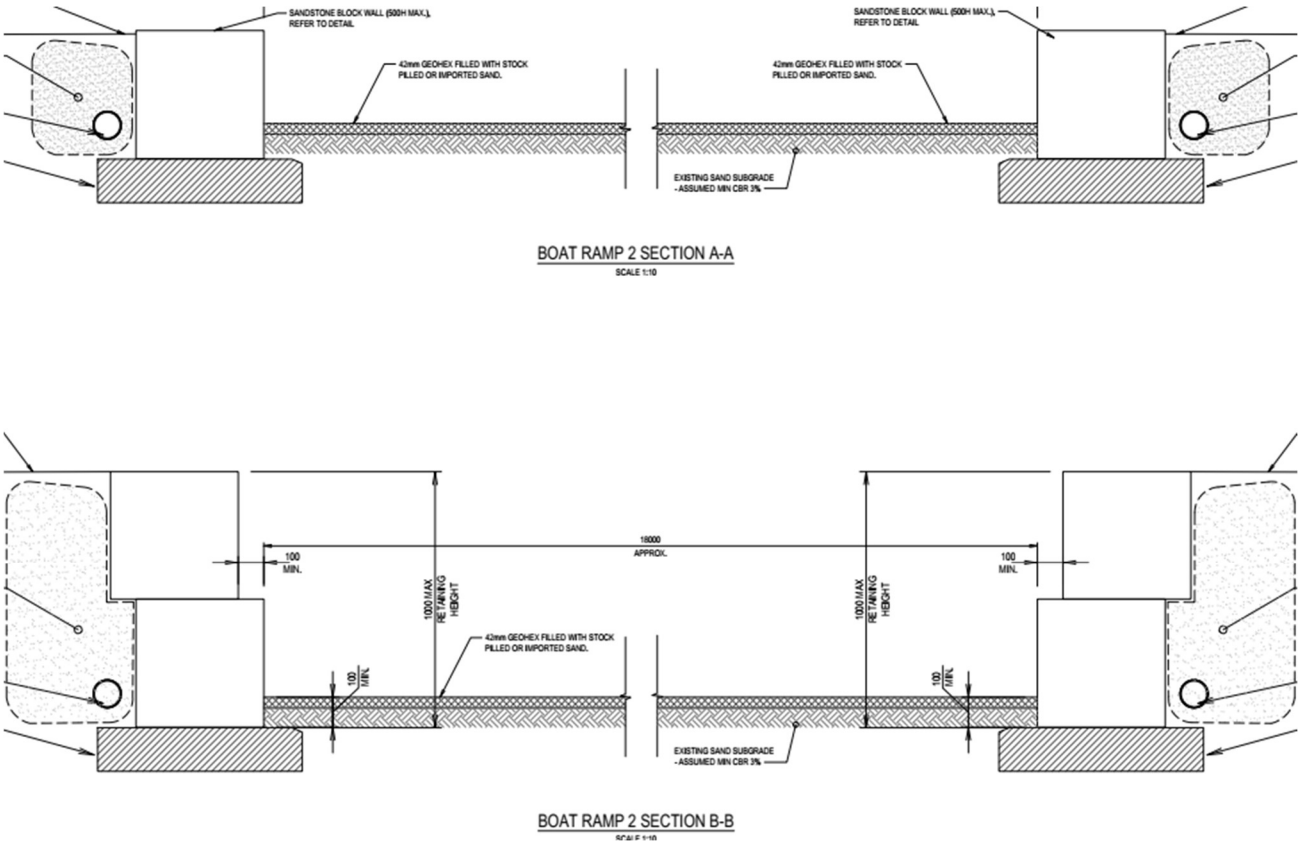

Figure 2 *– Boat Ramp 2 Section & Details extract showing the proposed layout of the works*
Source*: DRB Consulting Engineers 06.08.2023*

2.7 Limitations

Trees are living organisms whose health and condition can change rapidly. The conclusions and recommendations in this report are valid for one (1) year only from the date of the report, unless otherwise stated. Any changes to the site as it stands at present, for example building extensions, excavation works, importing of soils, extreme weather events etc. will invalidate this report. Any reproduction of this report must be in full colour using the report in its entirety.

3 METHOD

3.1 Method

3.1.1 Site Inspection

A site inspection was carried out by the author with the subject trees and the general growing environment evaluated on the 7th of October 2023. The weather at the time of inspections was sunny and dry with good visibility.

The location of seven (7) trees (**Trees 1, 2, 3, 4, 5, 7** & **8**) that were identified and assessed may not be accurate given these trees have not been surveyed. The location of these trees was triangulated on site using a measuring tape from known points for approximate positions. It is recommended an updated Survey be undertaken to determine the precise location of these trees prior to works being carried out.

The subject trees were inspected visually from ground level with the following information recorded and provided in tabulated form at ***Appendix 1***:

- Tree Species (Botanical & Common Name);
- Approximate height;
- Approximate canopy spread;
- Trunk Diameter (measured at 1.4 metres from ground level);
- Trunk Diameter at base (above root crown);
- Age class;
- Health & vigour; using foliage size, colour, extension growth, presence of disease or pest infestation, canopy density, presence of deadwood, dieback and epicormic growth as indicators;
- Condition; using visible evidence of structural defects, instability, evidence of previous pruning and physical damage as indicators;
- Suitability of the tree to the site and its existing location;
- Safe Useful Life Expectancy (SULE).

3.1.2 Safe Useful Life Expectancy (SULE)

The remaining Safe Useful Life Expectancy of a tree is an estimate of the sustainability of the tree in the landscape, calculated based on an estimate of the average age of the species in an urban area, less its estimated current age. The life expectancy of each tree has been further modified where necessary in consideration of its current health, vigour, condition and suitability to the site. The estimated SULE of each tree is shown in ***Appendix 1***.

The following ranges have been allocated to each tree:

- Long SULE: Trees that appear to be retainable with an acceptable level of risk for > 40 years.
- Medium SULE: Trees that appear to be retainable with an acceptable level of risk for 15 to 40 years.
- Short SULE: Trees that appear to be retainable with an acceptable level of risk for 5–15 years.
- Remove: Trees with a high level of risk that would need removing within the next 5 years.
- Small, Young or Regularly Pruned.

3.1.3 Landscape Significance

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. Several factors contribute towards the assessment of a tree's significance including but not limited to condition and vigour, form, visual prominence, heritage status, indigeneity, legislative protection, cultural sentiment and future growth potential.

For the purposes of this report the Australian Institute of Consulting Arborists (IACA) Significance of a Tree, Assessment Rating System (STARS)© has been utilised. The system uses a scale of High, Medium and Low significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined.

Appendix 3 provides a full outline of assessment criteria for each significance rating as per IACA STARS (2010).

3.1.4 Retention Value

Retention values have been determined for each tree on site to establish a hierarchy for tree retention. Retention values are based on estimated life spans and their associated landscape significance rating in accordance with the Tree Retention Value Priority Matrix. This matrix established the following retention values and can be found at ***Appendix 3*** with attributed retention values found within ***Appendix 1***:

- Priority for Retention (High)
- Consider for Retention (Medium)
- Consider for Removal (Low)
- Priority for Removal

3.1.5 AS4970-2009 Protection of Trees on Development Sites

The Australian Standard, *AS4970-2009-'Protection of trees on development sites'*, has been used as a guide to provide recommendations for the assessed trees. The Standard provides guidance on the principles for protecting trees on land subject to development as well as principles for determining viability of tree retention. Terminology and recommended methods are consistent with *AS4970-2009*.

3.1.6 Tree Protection Zones

The assessed trees have been allocated Tree Protection Zones (TPZ). The Australian Standard, *AS4970-2009-'Protection of trees on development sites'*, has been used as a guide in the allocation of TPZs for the assessed trees. The TPZ is calculated based on trunk (stem) diameter at breast height (DBH), measured at 1.4 metres above ground level. The radius of the TPZ is calculated by multiplying the trees DBH by 12. The method provides a TPZ that addresses health and growing requirements of a tree as well as the trees stability. TPZ distances are measured as a radius from the centre of the trunk at (or near) ground level. The maximum TPZ should be no more than 15m radius and the minimum TPZ should be no less than 2m radius.

An extract of the *AS4970-2009* for calculating TPZ has been provided at ***Appendix 4*** for reference.

3.1.7 Structural Root Zone

The assessed trees have been allocated Structural Root Zones (SRZ). The Australian Standard, *AS4970-2009 - 'Protection of trees on development sites'*, has been used as a guide in the allocation of SRZ's for the assessed trees. The SRZ is a radial area extending outwards from the centre of the trunk and is calculated as follows:

SRZ (Radius) = $(D \times 50)^{0.42} \times 0.64$

4 OBSERVATIONS

4.1 General

The site area subject to this assessment was observed as moderately disturbed with tree species dominating the shoreline and limited shrubs and ground cover species present. Tree species observed consisted of the locally indigenous species *Casuarina glauca*. Health, vigour and condition was varied across the trees forming part of the assessment. Root zones of assessed trees were observed growing in and around the creek bank.

4.2 Tree Preservation Order

Part E1 –– *Preservation of Trees and Bushland Vegetation* of the Warringah DCP 2011 applies to all land, waterways and bushland covered by the Warringah DCP 2011. The provisions included within the DCP generally protect any tree or vegetation that corresponds with the following criteria:

1) *Any tree that is over 5 metres in height.*
2) *Vegetation in "Bushland"*

"Bushland" means land on which there is vegetation which is either a remainder of the natural vegetation of the land or, if altered, is still representative of the structure and floristics of the natural vegetation.

4.3 The Trees

A total of twenty (20) trees observed in the riparian zones adjacent to the boat ramp areas have been included in this assessment including eight (8) trees at the Boat Ramp 1 location (**Trees 1-8**) and twelve (12) trees at the Boat Ramp 2 location (**Trees 9-20**).

Seven (7) trees (**Trees 1, 2, 3, 4, 5, 7** & **8**) that were identified and assessed were not located on the Survey prepared by CMS Surveyors dated 9th October 2023. The locations of these trees were triangulated on site using a measuring tape from known points for approximate positions.

All tree data recorded on site has been tabulated and is contained at ***Appendix 1***. Each tree has been provided with an identification number for reference purposes and has been fixed with an identification tag as well as being denoted on the attached Tree Location Plan at ***Appendix 2***.

5 DISCUSSION

5.1 Impact Assessment

The impact assessment is to calculate the incursions to the root zones and canopies as a result of the proposed demolition and construction works and evaluate the likely impact of the proposed works on the subject trees. A summary of the impacts anticipated is contained within the Tree Schedule at ***Appendix 1***. Additionally, plans demonstrating the level of incursion and conflict to TPZ's and SRZ's can be found at ***Appendix 2***. As part of the assessment the following criteria have been considered:

- Existing Relative Levels (R.L.);
- Proposed Relative Levels;
- Tree Protection Zones (TPZ);
- Structural Root Zones (SRZ);
- Footprint of the proposed development;
- Incursions to the TPZ & SRZ;
- Incursions to the tree canopy from vehicles and equipment;
- Pruning necessary for clearance;
- Remediation works for soil contaminants;
- Species tolerance to disturbance; and
- Assessment of the likely impact of the works on existing trees.

5.2 Trees Recommended for Removal

Should the proposed works proceed in their current form, it is recommended that two (2) trees be removed including **Trees 3** & **4**. Removals have been recommended based upon;

- Trees being located within the proposed sandstone retaining wall footprint.

Refer to ***Appendix 2*** for a plan indicating the location of trees that will require removal (dashed red).

Table 3 *– Trees recommended for removal*

Tree No.	Genus & Species	Retention Value	Works within TPZ / Reason for Removal
3	***Casuarina glauca*** Swamp Oak	Medium	Full encroachment. Within footprint of proposed sandstone retaining wall. Removal proposed to facilitate construction of retaining wall.
4	***Casuarina glauca*** Swamp Oak	Low	Full encroachment. Within footprint of proposed sandstone retaining wall. Removal proposed to facilitate construction of retaining wall.

5.3 Trees Recommended for Retention & Protection

Should the proposed works proceed in their current form, it is recommended that eighteen (18) trees (**Trees 1, 2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19** & **20**) be retained and protected.

Trees 1, 2, 5, 6, 7 & **8** will be subject to 'major' 7-23% TPZ + 5-24% SRZ encroachment, as per AS4970:2009 *Protection of Trees on Development Sites* due to the proposed excavation for sandstone retaining wall footings and subsoil drainage lines.

Impacts from the proposed works are likely to be sustainable with minor decline to health and condition of these trees due to the arrangement of site features (concrete slab, site topography and creek line) that are likely to have inhibited root growth into the area proposed for redevelopment. In addition, the species is known to be tolerant to moderate-high root disturbance with good virality and good root initiation at points of damage or severance. Furthermore, the individual trees are generally of juvenile to semi-mature ages classes with increased resistance to impacts and the ability to better respond and recover to any construction related stresses. The retention of these trees is subject to the implementation of recommendations for root-sensitive demolition and protection measures as per **Section 7.3.3** & **7.3.4**

Refer to ***Appendix 2*** for a plan indicating the location of trees that are to be retained and protected (shaded green).

Table 4 *– Trees recommended for retention & protection*

Tree No.	Genus & Species	Retention Value	Works within the Tree Protection Zone (TPZ)
1	***Casuarina glauca*** Swamp Oak	Medium	'Major' 17% TPZ + 20% SRZ incursion from proposed drainage line and sandstone retaining wall. Minor decline to health and condition likely deemed sustainable due to species tolerance for moderate root disturbance. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.
2	***Casuarina glauca*** Swamp Oak	Medium	'Major' 23% TPZ + 24% SRZ incursion from proposed drainage line and sandstone retaining wall. Minor decline to health and condition likely deemed sustainable due to species tolerance for moderate root disturbance & semi-mature age class. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.
5	***Casuarina glauca*** Swamp Oak	Medium	'Major' 13% TPZ + 17% SRZ incursion from proposed drainage line and sandstone retaining wall. Minor decline to health and condition likely deemed sustainable due to species tolerance for moderate root disturbance & semi-mature age class. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.

Tree No.	Genus & Species	Retention Value	Works within the Tree Protection Zone (TPZ)
6	***Casuarina glauca*** Swamp Oak	Medium	'Major' 7% TPZ + 13% SRZ incursion from proposed drainage line and sandstone retaining wall. Minor decline to health and condition likely deemed sustainable due to species tolerance for moderate root disturbance. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.
7	***Casuarina glauca*** Swamp Oak	Medium	'Major' 14% TPZ + 10% SRZ incursion from proposed drainage line and sandstone retaining wall. Minor decline to health and condition likely deemed sustainable due to species tolerance for moderate root disturbance and juvenile age class. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.
8	***Casuarina glauca*** Swamp Oak	Medium	'Major' 14% TPZ + 5% SRZ incursion from proposed drainage line and sandstone retaining wall. Minor decline to health and condition likely deemed sustainable due to species tolerance for moderate root disturbance and juvenile age class. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.
9	***Casuarina glauca*** Swamp Oak	Medium	'Minor' 7% TPZ incursion from proposed drainage line and sandstone retaining wall. Negligible decline to health and condition likely due to species tolerance for moderate root disturbance. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.
10	***Casuarina glauca*** Swamp Oak	Medium	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.
11	***Casuarina glauca*** Swamp Oak	Medium	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.
12	***Casuarina glauca*** Swamp Oak	Low	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.
13	***Casuarina glauca*** Swamp Oak	Low	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.
14	***Casuarina glauca*** Swamp Oak	Medium	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.

Tree No.	Genus & Species	Retention Value	Works within the Tree Protection Zone (TPZ)
15	***Casuarina glauca*** Swamp Oak	Medium	'Minor' 6% TPZ incursion from proposed drainage line and sandstone retaining wall. Negligible decline to health and condition likely due to species tolerance for moderate root disturbance. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.
16	***Casuarina glauca*** Swamp Oak	Medium	No additional incursion likely due to existing concrete slab that is likely to have inhibited root development into area proposed for boat ramp upgrade. Implement recommendations for root-sensitive demolition and protection measures as per **Section 7.3.2** & **7.3.3**.
17	***Casuarina glauca*** Swamp Oak	Low	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.
18	***Casuarina glauca*** Swamp Oak	Low	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.
19	***Casuarina glauca*** Swamp Oak	Medium	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.
20	***Casuarina glauca*** Swamp Oak	Medium	No works proposed within TPZ No impacts anticipated subject to protection as per ***Section 7***.

5.4 Ancillary Construction Related Impacts

Vehicles, machinery and equipment requiring access to the site have potential to result in inadvertent impacts to those trees being retained including compaction of the root zone, soil disturbance, physical damage to roots, trunk damage etc. and as such will require management.

Furthermore, storage and stockpiling of material may result in similar impacts and will require management. In this regard, protection for those trees to be retained is to be carried out in accordance with ***Appendix 5***.

6 CONCLUSION

6.1 Proposed Development Impact

Based on the plans and information supplied, the proposal would result in the following impacts to existing trees on site:

Removal of two (2) trees, including:

- **Trees 3** & **4** due to being located within the footprint of a proposed sandstone retaining wall.

Retention and protection of eighteen (18) trees, including:

- **Trees 1, 2, 5, 6, 7** & **8** which will be subject to 'major' encroachment, as per AS4970:2009 *Protection of Trees on Development Sites* due to the proposed excavation for sandstone retaining wall footings and subsoil drainage lines;

- **Trees 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19 & 20** which are generally located away from the proposed construction works and are to have either nil or sustainable (<10% TPZ) incursions to their respective Tree Protection Zones. Impacts are considered tolerable and unlikely to impact long term health and viability pending implementation of tree protection measures and Project Arborist supervision.

Impacts are unlikely to result in significant decline to health and viability of trees recommended for retention and protection pending implementation of root-sensitive demolition, tree protection measures and Project Arborist supervision. Any significant departures from the recommended root sensitive construction techniques and protection measures may result in a reduced Useful Life Expectancy and/or tree removal.

Specific recommendations as per ***Section 7*** will need to be adopted to ensure root sensitive construction techniques and methodology are employed which mitigate the potential negative impacts to trees nominated for retention.

7 RECOMMENDATIONS

7.1 Tree Removal

Remove **Trees 3** & **4** (2 trees) to facilitate the proposed development works.

Development consent and relevant approvals must be obtained from Northern Beaches Council prior to the removal or pruning of any tree on site. All tree work is to be carried out by an experienced Arborist with minimum AQF Level 3 qualifications in accordance with *AS4373-2007 - Pruning of Amenity Trees*, Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016) and other applicable legislation.

7.2 Tree Retention

Retain and protect **Trees 1, 2, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19** & **20** (18 trees) in accordance with the Tree Location Plan & Tree Protection Specifications held at ***Appendix 2 & 5***, *AS497-2009 Protection of trees on development sites* and the specific recommendations below:

7.3 Tree Protection

7.3.1 Project Arborist Engagement

A Project Arborist experienced in tree protection on construction sites should be engaged prior to the commencement of any works on site. The Project Arborist shall monitor and report regularly to the Principal Certifying Authority (PCA) and the Applicant on the condition and protection of the retained trees during the works.

7.3.2 Specific Tree Protection Measures

Tree Protection Fencing must be installed as shown on the Tree Location & Protection Plan Specification held at ***Appendix 2*** and in accordance with Section 4.3 of AS4970-2009 and ***Appendix 5***. Tree protection fencing must not be removed or altered without prior approval of the Project Arborist.

7.3.3 Demolition of Existing Hard Surfacing

The Project Arborist must monitor and supervise demolition of the existing concrete slab within the TPZ of **Trees 1, 2, 5, 6, 7, 8, 9, 15** & **16** to ensure impacts to roots, trunks, branches and canopies are mitigated.

Concrete is to be shattered with a hand-operated pneumatic/electric breaker prior to removal taking place. The existing pavement shall be carefully lifted to minimise damage to the underlying soil profile (or sub-base materials) and to prevent damage to tree roots, trunks and branches. Wherever possible, existing sub-base materials shall remain in-situ.

When removing slab sections within TPZ, machinery shall work backwards out of the TPZ to ensure machinery remains on un- demolished sections of slab at all times. Heavy vehicles and machinery is to be excluded from the TPZ unless operating from the existing slabs, pavements or areas of ground protection. Machinery should not contact the tree's roots, trunk, branches and crown.

Exposed roots shall be irrigated by hand and covered with a 75-100mm layer of mulch as soon as possible after being exposed. The mulch must remain in place until new surfaces are put into place.

Should you have any queries in relation to the information presented, please feel free to contact me.

Sincerely,

Greg Tesoriero
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8 REFERENCES

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Northern Beaches Council. Warringah Development Control Plan 2011: Part E1 — *Preservation of Trees and Bushland Vegetation*

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APPENDIX 1: TREE ASSESSMENT SCHEDULE

Tree No.	*Genus & species* Common Name	Height (m)	Crown Spread (m)	DBH #1 (mm)	DBH #2 (mm)	DBH #3 (mm)	DBH #4 (mm)	DGL (mm)	TPZ Radius (m)	SRZ Radius (m)	Age Class	Health / Vitality	Structure/ Condition	SULE Rating	Landscape Significance	Retention Value	Development Impact	Retain / Remove	Comments
1	***Casuarina glauca*** Swamp Oak	6	2	150				200	2.00	1.68	M	Average	Fair	Medium 15-40yrs	Medium	Medium	'Major' 17% TPZ + 20% SRZ incursion from proposed drainage line and sandstone retaining wall	Retain & Protect	Forms part of dense stand of self-sown trees of same species. Suckering from base, crown bias to the east.
2	***Casuarina glauca*** Swamp Oak	4	2	100				100	2.00	1.50	SM	Average	Fair	Medium 15-40yrs	Medium	Medium	'Major' 23% TPZ + 24% SRZ incursion from proposed drainage line and sandstone retaining wall	Retain & Protect	Forms part of dense stand of self-sown trees of same species. Lean and crown bias to west.
3	***Casuarina glauca*** Swamp Oak	7	2	150				200	2.00	1.68	SM	Average	Fair	Medium 15-40yrs	Medium	Medium	Within footprint of proposed sandstone retaining wall	Remove	Forms part of dense stand of self-sown trees of same species. Growing within high water mark on edge of bank, shared root plate with T4.
4	***Casuarina glauca*** Swamp Oak	2	1	150				200	2.00	1.68	M	Fair	Poor	Short 5-15yrs	Medium	Low	Within footprint of proposed sandstone retaining wall	Remove	Horizontal trunk, self-corrected, multiple past pruning events with central leader pruned.
5	***Casuarina glauca*** Swamp Oak	5	2	100				150	2.00	1.50	SM	Fair	Fair	Medium 15-40yrs	Medium	Medium	'Major' 13% TPZ + 17% SRZ incursion from proposed drainage line and sandstone retaining wall	Retain & Protect	Forms part of dense stand of self-sown trees of same species. Shared root plate, growing on edge of high water mark with lean to north.
6	***Casuarina glauca*** Swamp Oak	7	4	250	200			400	3.84	2.25	M	Average	Average	Medium 15-40yrs	Medium	Medium	'Major' 7% TPZ + 13% SRZ incursion from proposed drainage line and sandstone retaining wall	Retain & Protect	Forms part of dense stand of self-sown trees of same species. Shared root plate, growing on edge of high water mark. Twin trunks from ground level with lean to north.
7	***Casuarina glauca*** Swamp Oak	3	2	100				100	2.00	1.50	J	Average	Fair	Medium 15-40yrs	Medium	Medium	'Major' 14% TPZ + 10% SRZ incursion from proposed drainage line and sandstone retaining wall	Retain & Protect	Forms part of dense stand of self-sown trees of same species. Juvenile age class growing mid-way up bank.
8	***Casuarina glauca*** Swamp Oak	3	2	100				100	2.00	1.50	J	Average	Fair	Medium 15-40yrs	Medium	Medium	'Major' 14% TPZ + 5% SRZ incursion from proposed drainage line and sandstone retaining wall	Retain & Protect	Forms part of dense stand of self-sown trees of same species. Juvenile age class growing mid-way up bank.
9	***Casuarina glauca*** Swamp Oak	11	8	350	300	300	200	1000	7.02	3.31	M	Average	Poor	Medium 15-40yrs	Medium	Medium	'Minor' 7% TPZ incursion from proposed drainage line and sandstone retaining wall	Retain & Protect	Multi-stemmed habit from ground level (9 stems), main western leader dead with evidence of internal decay at base on north side, evidence of previous failures of included stems on north side.
10	***Casuarina glauca*** Swamp Oak	10	4	300				450	3.60	2.37	M	Average	Fair	Medium 15-40yrs	Medium	Medium	No works proposed within TPZ	Retain & Protect	Crown bias to west, conflicting with surrounding canopies.
11	***Casuarina glauca*** Swamp Oak	10	4	300				350	3.60	2.13	M	Average	Fair	Medium 15-40yrs	Medium	Medium	No works proposed within TPZ	Retain & Protect	Suppressed form with poor crown development.
12	***Casuarina glauca*** Swamp Oak	9	3	300				400	3.60	2.25	M	Fair	Poor	Short 5-15yrs	Medium	Low	No works proposed within TPZ	Retain & Protect	Poor corwn density and balance, western bifurcated leader dead.
13	***Casuarina glauca*** Swamp Oak	5	2	50				100	2.00	1.50	SM	Average	Fair	Medium 15-40yrs	Low	Low	No works proposed within TPZ	Retain & Protect	Root crown to east within bank.
14	***Casuarina glauca*** Swamp Oak	6	2	150				200	2.00	1.68	SM	Average	Average	Medium 15-40yrs	Medium	Medium	No works proposed within TPZ	Retain & Protect	Group of 5 trees with shared root plate which extends east into bank. Lean to west over water.
15	***Casuarina glauca*** Swamp Oak	12	6	300	400			500	6.00	2.47	M	Average	Average	Medium 15-40yrs	Medium	Medium	'Minor' 6% TPZ incursion from proposed drainage line and sandstone retaining wall	Retain & Protect	Twin trunks from 300mm, root crown lifting/damaging existing slab. Crown shy to west from adjoining T16.
16	***Casuarina glauca*** Swamp Oak	11	8	350				350	4.20	2.13	M	Average	Average	Medium 15-40yrs	Medium	Medium	No additional incursion likely due to existing concrete slab	Retain & Protect	Twin trunks from ground level, crown conflicting with T15 & T17.
17	***Casuarina glauca*** Swamp Oak	7	2	200				250	2.40	1.85	M	Fair	Fair	Medium 15-40yrs	Low	Low	No works proposed within TPZ	Retain & Protect	Congested crown conflicting with T16, rubbing trunks @ 1.5m with damage to cambium.
18	***Casuarina glauca*** Swamp Oak	3	4	100	100	100		200	2.08	1.68	SM	Average	Average	Medium 15-40yrs	Low	Low	No works proposed within TPZ	Retain & Protect	Group of self-sown trees on bank.

Tree No.	*Genus & species* Common Name	Height (m)	Crown Spread (m)	DBH #1 (mm)	DBH #2 (mm)	DBH #3 (mm)	DBH #4 (mm)	DGL (mm)	TPZ Radius (m)	SRZ Radius (m)	Age Class	Health / Vitality	Structure/ Condition	SULE Rating	Landscape Significance	Retention Value	Development Impact	Retain / Remove	Comments
19	***Casuarina glauca*** Swamp Oak	10	7	350	350			650	5.94	2.76	M	Fair	Fair	Medium 15-40yrs	Medium	Medium	No works proposed within TPZ	Retain & Protect	Included twin trunks from ground level, reduced crown density.
20	***Casuarina glauca*** Swamp Oak	8	4	250				300	3.00	2.00	M	Fair	Fair	Medium 15-40yrs	Medium	Medium	No works proposed within TPZ	Retain & Protect	Lean to north, crown bias to north.

Tree Inspection Data Notes & Terminology

Tree No. (Tree Number)
The tree number associated to each tree located on or adjacent to the subject site. Relates to the Tree Location Plan held at Appendix 2.

Botanical Name and Common Name
The botanical and common name of each tree is identified and recorded. Occasionally the exact species name is unknown; sp. is recorded to indicate this.

Height, Crown Width and DBH
- The trees height and crown spread is recorded in metres (m);
- The tree DBH is recorded in millimetres (mm). DBH is an abbreviation of Diameter (of the trunk) measured at Breast Height (or 1.4m from the base of the trunk). If more than one trunk is present the DBH is calculated in accordance with AS4970-2009 Protection of Trees on Development Sites

Age Class
The age class of each tree is estimated as either:
J – Juvenile refers to a well established but young tree
SM – Semi Mature, a tree that has not grown to mature size
M – Mature, a tree that has reached mature size and will slowly increase in size over time
OM – Over Mature, a tree that has been mature for a long period and is beginning to display signs of decline, e.g. large dead branches
S – Senescent, an over mature tree that is now in decline

Health & Condition
The trees health and vigour is recorded as a measurement of:
Good - the tree does not appear to appear stressed with no excessive dieback, insect infestation, decay, deadwood or epicormic shoots
Average - the tree appears stressed and has some crown dieback, and /or a few epicormic shoots, and/or some deadwood in the crown and some new growth at branch tips. These trees may benefit from remediation of the growing environment to reduce stress and return it to good health
Fair - the tree may have areas of crown dieback, and/or epicormic shoots, and/or areas of decay, and/or reduced new growth at branch tips. These trees have been stressed for a short period of time, remediation of the growing environment may improve trees health
Poor - the tree may have large areas of crown dieback, and/or many epicormic shoots, and/or reduced new growth at branch tips. These trees have been stressed for a long period of time, remediation of the growing environment would not return the tree to good health.

SRZ (Structural Root Zone)
The SRZ is a radial area extending outwards from the centre of the trunk. This area contains the majority of the structural woody roots. This area is responsible primarily for stability. Root damage or root loss within this zone greatly increases the opportunity for decay fungi to ingress into the heartwood, causing internal decay in addition to destabilising the trees structural integrity. The SRZ is calculated as follows (This calculation is taken from the Australian Standard 4970 – 2009 Protection of Trees on Development Sites): (D x 50)0.42 x 0.64

TPZ (Tree Protection Zone)
The TPZ is a radial area measured by multiplying the DBH by twelve (12) or a circular area the size of the trees drip line, whichever is greater. This area contains the majority of the structural and feeder roots responsible for stability, gaseous exchange and water and nutrient uptake. Excavation, back filling, compaction or other disturbance should not occur in this area. The TPZ is used to identify the minimum area required for the safe retention of a given tree. This calculation is derived from the Australian Standard 4970-2009 Protection of Trees in Development Sites. An incursion up to 10% within the TPZ is potentially acceptable if no other option is available. A major encroachment (in excess of 10%) is required to be clearly justified by the Project Arborist and compensated for elsewhere. Justification methodology may vary depending on site or individual tree's health, vigour and ability to withstand disturbance and may require root investigation.

Landscape Significance
The landscape significance of a tree or group of trees is determined using a combination of health/vigour/condition, amenity, heritage and ecological values in accordance with IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©.
1. High Significance in Landscape
2. Medium Significance in Landscape
3. Low Significance in Landscape

Retention Value (RV)
Determined by [1] tree free of visual defects and viable for retention, [2] viable for retention with minor faults which may reduce SULE, [3] trees which should not restrict development applications containing faults that are likely to become problematic in the short term, [4] trees to be considered for removal due to average condition.
High Retention - 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 e.g. pier and beam etc. if works are to proceed within the Tree Protection Zone.
Medium Retention - These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
Low Retention - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

S.U.L.E. Categories
Safe Useful Life Expectancy (after *Barrell* 1996, modified by the author). A trees S.U.L.E. category is the life expectancy of the tree modified first by its age, health, condition, safety and location. S.U.L.E. assessments may be modified as dictated by changes in trees health and environment.
Long - Appear retainable at the time of assessment for over 40 years with an acceptable degree of risk assuming reasonable maintenance.
Medium - Appear to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk assuming reasonable maintenance.
Short - Trees appear to be retainable at the time of assessment for 5 to15 years with an acceptable degree of risk assuming reasonable maintenance.
Very Short - Removal - Trees which should be scheduled for removal within the very short term or as specified within this report.
Small, Young or Regularly Pruned – Trees under 5m in height that can be easily moved or replaced, includes screen plantings or hedge lines.

Development Impact
Brief outline of the impact of the proposed development works or ancillary construction related activities likely to impact the tree.

Retain/Remove
The proposed removal or retention recommendation in light of the proposed development related impacts.

NOTES: This report acknowledges the current Australian Standards 'Protection of Trees on Development Sites' AS 4970 – 2009 with reference to the Tree Protection Zone (TPZ): being a combination of the root and crown area requiring protection. The TPZ takes into consideration the Structural Root Zone (SRZ): The area required for tree stability. Determined by AS4970 - 2009 Figure 1,Table of determining the SRZ, section 3.3.5 of the standards. The standard states where a greater than 10% encroachment occurs the arborist is to take into consideration the schedule of determining impacts as set within AS4970 s. 3.3.4. Encroachments are referred to within this report as major or minor encroachments (AS4970 s. 3.3.2 & 3.3.3). Below is the terminology used for estimated percentage of development incursion used within this report. To retain specific trees and ensure their viability, development must take into consideration protection of the TPZ radius. The extent of inclusion within the TPZ radius has been categorised within this report as follows:

<10% - negligible incursion
>10 - <15% - low to moderate level of incursion
>15 - <20% - moderate level of incursion
>20 - <25% - moderate to high level of incursion
>25 - <35% - high level of incursion
>35% - significant incursion within the TPZ

APPENDIX 2 - TREE LOCATION PLAN

CPS
CREATIVEPLANNINGSOLUTIONS
TOWN PLANNING
LANDSCAPE ARCHITECTURE
ARBORICULTURE

LEVEL 3
397 RILEY STREET
SURRY HILLS NSW 2010
PO BOX 1074 BROADWAY NSW 2007
TEL: + (61) 2 8039 7461
INFO@CPSPLANNING.COM.AU
CPSPLANNING.COM.AU

DIMENSIONS :
All dimensions are in millimetres unless otherwise noted. Do not scale from this drawing.

Verify all dimensions on site prior to construction.

CIVIL, STRUCTURAL, HYDRAULIC, ELECTRICAL AND SPECIALIST WATER FEATURE WORKS :
Refer to specialist and consultant's drawings for all information contained within these documents relating to and nominated as specialist and consultant work. Specialist and consultant drawing information contained in the landscape documents are indicative only and not for construction or certification purposes.

Issue	Code	Issue Description	By	Chk	Date
A	DA	FOR APPROVAL	JHG	GT	22.12.23

PRE - Preliminary CA - Council Approval T - Tender CON - Construction

PROJECT

PROPOSED DEVELOPMENT

SYDNEY ACADEMY OF SPORT & RECREATION

DRAWING TITLE

TREE LOCATION CONTEXT PLAN - SHEET 1

CLIENT

OFFICE OF SPORT

Drawn : JHG
Designed : GT
Project No. : G254
Bar Scale

N

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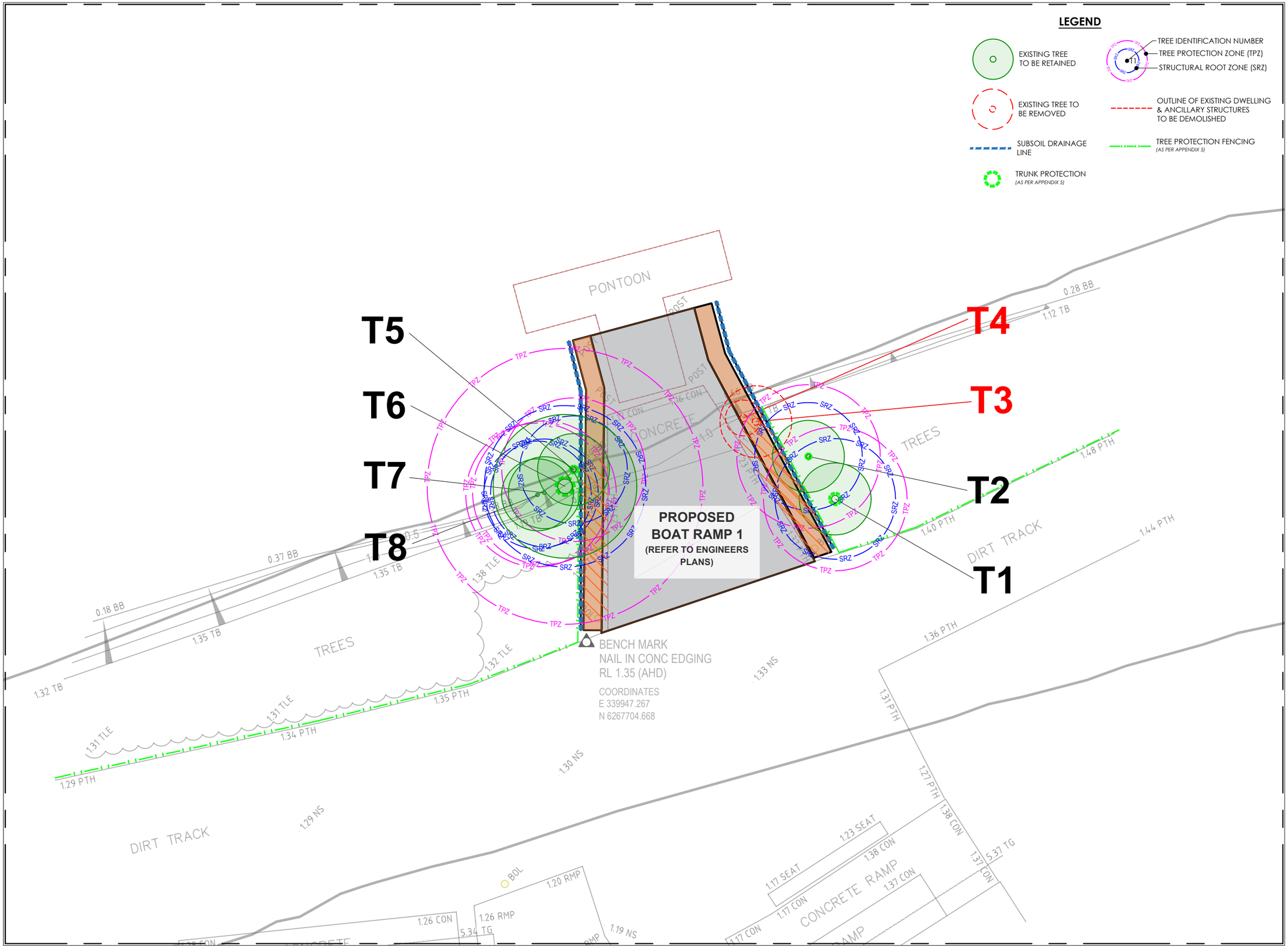
1:750 @ A3

SHEET NUMBER G254_TLP_01

REVISION A

APPENDIX 2 - TREE LOCATION PLAN



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Issue	Code	Issue Description	By	Chk	Date
A	DA	FOR APPROVAL	JHG	GT	22.12.23

PRE - Preliminary CA - Council Approval T - Tender CON - Construction

PROJECT

PROPOSED DEVELOPMENT

SYDNEY ACADEMY OF SPORT & RECREATION

DRAWING TITLE

TREE LOCATION & PROTECTION PLAN - SHEET 2

CLIENT

OFFICE OF SPORT

Drawn : JHG
Designed : GT
Project No. : G254
Bar Scale

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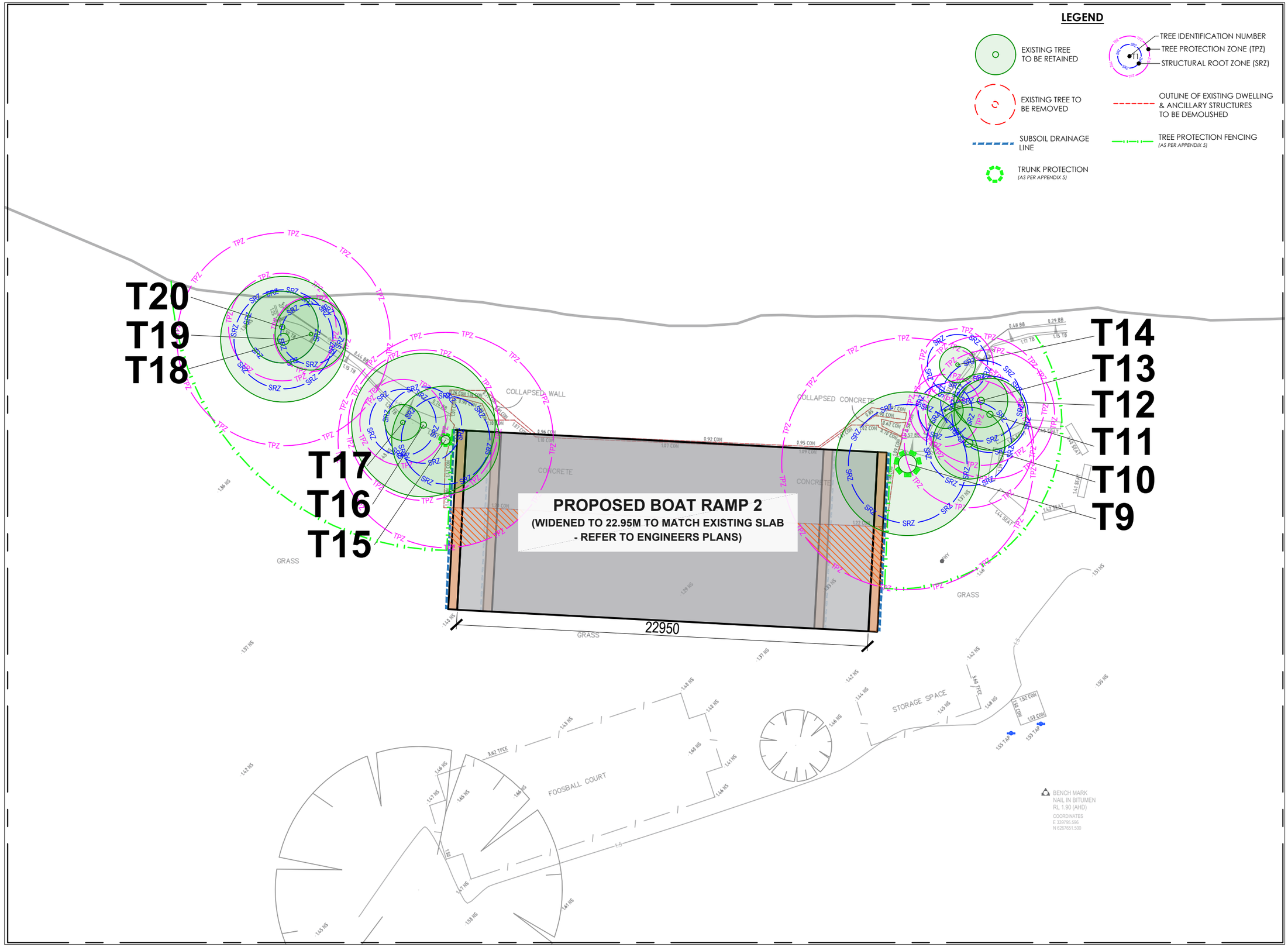
SHEET NUMBER G254_TLP_02

REVISION A

APPENDIX 2 - TREE LOCATION PLAN



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Issue	Code	Issue Description	By	Chk	Date
A	DA	FOR APPROVAL	JHG	GT	22.12.23

PRE - Preliminary CA - Council Approval T - Tender CON - Construction

PROJECT

PROPOSED DEVELOPMENT

SYDNEY ACADEMY OF SPORT & RECREATION

DRAWING TITLE

TREE LOCATION & PROTECTION PLAN - SHEET 3

CLIENT

OFFICE OF SPORT

Drawn : JHG
Designed : GT
Project No. : G254
Bar Scale

N

0 1 2 3 4 5 metres

1:200 @ A3

SHEET NUMBER G254_TLP_03

REVISION A

APPENDIX 3

IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. An example of its use in an Arboricultural report is shown as Appendix A.

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- 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;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- 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;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- 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.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- 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*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- 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,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

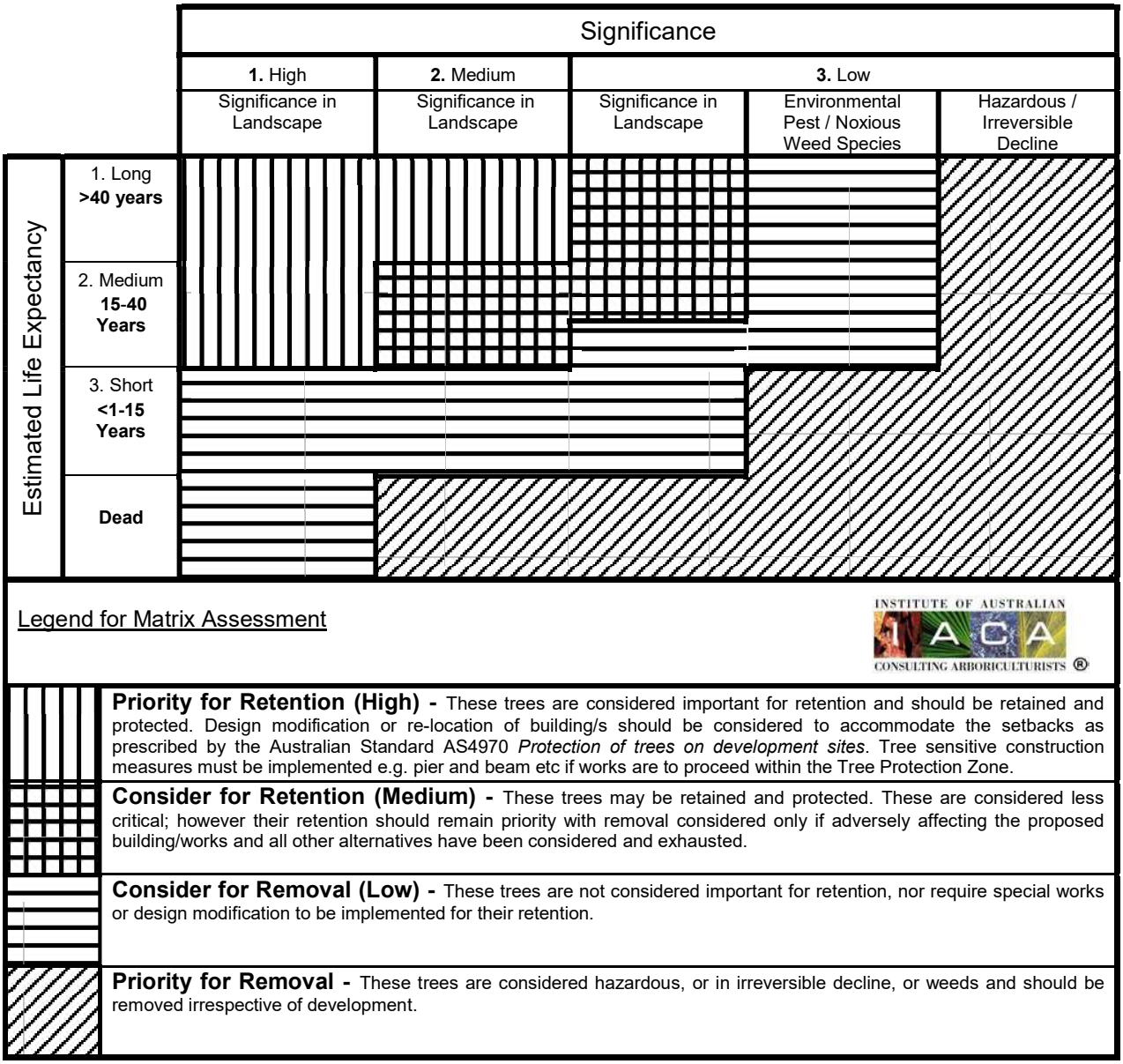
Hazardous/Irreversible Decline

- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

Table 1.0 Tree Retention Value - Priority Matrix.



USE OF THIS DOCUMENT AND REFERENCING

The IACA Significance of a Tree, Assessment Rating System (STARS) is free to use, but only in its entirety and must be cited as follows:

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

REFERENCES

Australia ICOMOS Inc. 1999, *The Burra Charter – The Australian ICOMOS Charter for Places of Cultural Significance*, International Council of Monuments and Sites, www.icomos.org/australia

Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, www.footprintgreen.com.au

The following example shows the IACA **Significance** of a **Tree, Assessment Rating System** (STARS) used in an Arboricultural report.

Tree Significance

Determined by using the Tree Significance - Assessment Criteria of the *IACA Significance of a Tree, Assessment Rating System* (STARS)© (IACA, 2010), Appendix B.

Trees 14, 16, 17/3, 19 and 20/4 are of high significance with the remaining majority of medium significance and a few of low significance. Tree 14 is significant as a prominent specimen and a food source for indigenous avian fauna. Tree 16 as a non-locally indigenous planting is of good from and prominent *in situ*; Tree 17/3 as a stand of 6 street trees along the Davey Street frontage screening views to and from the site and contiguous with trees in Victoria Park extending the aesthetic influence of the urban canopy to the site. Similarly for Trees 20/4 as street trees in Long Road and Tree 19 as an extant exotic planting as a senescent component of the original landscaping. The trees of low significance are recent plantings as fruit trees – Avocados, and 1 Cootamundra Wattle as a non-locally indigenous tree in irreversible decline and potentially structurally unsound.

Significance Scale

1 – High
2 – Medium
3 – Low

Significance Scale	1	2	3
Tree No. / Stand No.	14, 16, 17/3, 19, 20/4	1/1, 2, 4, 5, 6, 7, 8, 9, 10, 11, 12/2, 15, 18, 21/5	3, 13, 22

Tree Retention Value

Determined by using the Retention Value - Priority Matrix of the *IACA Significance of a Tree, Assessment Rating System* (STARS)© (IACA, 2010), Appendix B.

Retention Value

High – Priority for Retention
Medium – Consider for Retention
Low – Consider for Removal
Remove - Priority for Removal

Retention Value	High Priority for Retention	Medium Consider for Retention	Low Consider for Removal	Remove Priority for Removal
Tree No. / Stand No.	1/1, 5, 17/3*, 19	2, 4, 6, 7, 8, 9, 10, 11, 14, 15, 16, 18, 20/4*, 21/5	3, 12/2, 13,	22

* Trees located within the neighbouring property and should be retained and protected.

APPENDIX 4 - EXTRACT FROM AS4970 2009 PROTECTION OF TREES ON DEVELOPMENT SITES

Section 3, Determining the tree protection zones of the selected trees

3.1 Tree protection zone (TPZ)

"The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.

The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5)."

3.2 Determining the TPZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

TPZ = DBH x 12

where

DBH = trunk diameter measured at 1.4 m above ground

Radius is measured from the centre of the stem at ground level.

3.3.5 Structural root zone (SRZ)

"The SRZ is the area required for street stability. A larger area is required to maintain a viable tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. Root investigation may provide more information on the extent of these roots."

Determining the SRZ

The radius of the TPZ is calculated for each tree by multiplying its DBH x 12.

SRZ radius = $(D \times 50)^{0.42} \times 0.64$

where

D = trunk diameter, in metres, measured above the root buttress.

Note: The SRZ for trees less than 0.15 m will be 1.5 m (see Figure 1).

The curve can be expressed by the following formula:

$R_{SRZ} = (D \times 50)^{0.42} \times 0.64$

NOTES:

1 R_{SRZ} is the structural root zone radius.

2 D is the stem diameter measured immediately above root buttress.

3 The SRZ for trees less than 0.15 m diameter is 1.5 m.

4 The SRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns.

5 This does not apply to trees with an asymmetrical root plate.

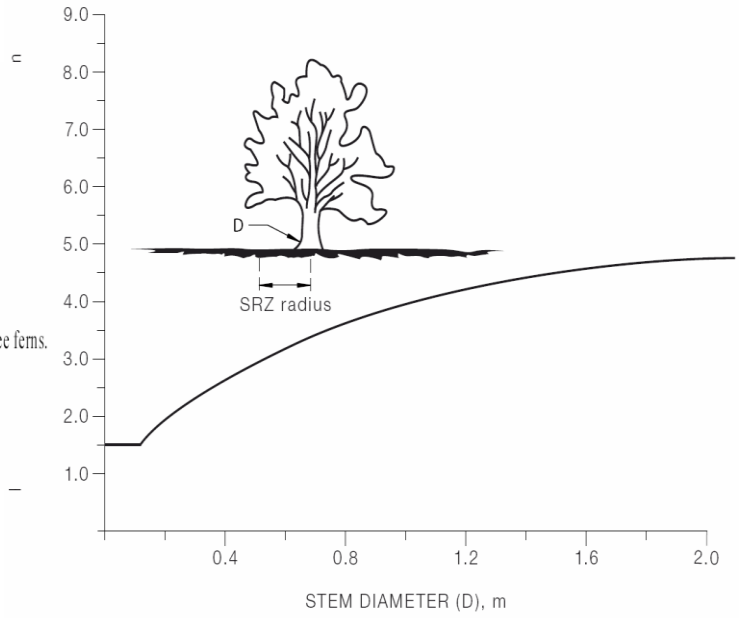


FIGURE 1 STRUCTURAL ROOT ZONE

APPENDIX 5 – GENERAL TREE PROTECTION SPECIFICATION

1.0 Appointment of Project Arborist

A Project Arborist shall be engaged prior the commencement of work on-site and monitor compliance with the protection measures. The Project Arborist shall inspect the tree protection measures and Compliance Certification shall be prepared by the Project Arborist for review by the Principal Certifying Authority prior to the release of the Compliance Certificate.

The Project Arborist shall have a minimum qualification equivalent (using the Australian Qualifications Framework) of Level 5 or above in Arboriculture.

2.0 Compliance

Contractors and site workers shall receive a copy of these specifications a minimum of 3 working days prior to commencing work on-site. Contractors and site workers undertaking works within the Tree Protection Zone shall sign the site log confirming they have read and understand these specifications, prior to undertaking works on-site.

The Project Arborist shall undertake regular site inspections and certify that the works are being undertaken in accordance with this specification.

Compliance Documentation shall be prepared by the Project Arborist following each site inspection. The Compliance Documentation shall include documentary evidence of compliance with the tree protection measures and methods as outlined within this Specification. Upon the completion of the works, a final assessment of the trees shall be undertaken by the Project Arborist and future recommended management strategies implemented as required.

3.0 Tree Removal

The trees to be removed shall be removed prior to the establishment of the tree protection measures. Tree removal works shall be undertaken in accordance with the *Workcover Code of Practice for the Amenity Tree Industry (1998)*. Tree and vegetation removal shall not damage the trees to be retained.

4.0 Tree Protection Zone

The trees to be retained shall be protected prior and during construction from activities that may result in an adverse effect on their health or structural condition. The area within the Tree Protection Zone (TPZ} shall exclude the following activities, unless otherwise stated:-

- Modification of existing soil levels, excavations and trenching
- Mechanical removal of vegetation
- Movement of natural rock
- Storage of materials, plant or equipment or erection of site sheds
- Affixing of signage or hoarding to the trees
- Preparation of building materials, refuelling or disposal of waste materials and chemicals
- Lighting fires
- Movement of pedestrian or vehicular traffic
- Temporary or permanent location of services, or the works required for their installation
- Any other activities that may cause damage to the tree

5.0 Tree Protection Fencing

TPZ fencing shall be located at the perimeter of the TPZ. Where TPZ areas overlap, TPZ fencing may be combined to form a single larger TPZ area. The exact location of the fencing shall be confirmed through consultation between the Head Contractor/Project Manager and the Project Arborist prior to the commencement of works. Fencing may be setback to allow for demolition/construction access and for the installation of pavements only where appropriate ground protection is installed and approved by the Project Arborist.

As a minimum, the Tree Protection Fence shall consist of 1.8m high wire mesh panels supported by concrete feet. Panels shall be fastened together and supported to prevent sideways movement. The tree shall not be damaged during the installation of the Tree Protection Fencing. Refer to Typical Tree Protection Details (***Appendix 6***).

6.0 Site Management

Materials, waste storage, and temporary services shall not be located within the TPZ.

7.0 Scaffolding

Where possible, scaffolding shall not be located within the TPZ. Scaffolding shall not be in contact with the tree. As necessary, this shall be achieved by erecting scaffolding around branches. Branches shall be tied back and protected as deemed necessary by the Project Arborist. Refer to Typical Tree Protection Details (***Appendix 6***).

8.0 Works within the Tree Protection Zones

In some cases works within the TPZ may be authorized by the determining authority. These works shall be supervised by the Project Arborist. When undertaking works within the TPZ, care should be taken to avoid damage to the tree's root system, trunks and lower branches.

If roots (>25mm¢) are encountered during the demolition, excavation and construction works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Adjustment of final levels and design shall remain flexible to enable the retention of roots (>25mm¢) where deemed necessary by the Project Arborist.

Drilling/piling machinery shall be of a suitable size to not damage the tree's roots, trunk, branches and crown. No clearance pruning is permitted to allow for machinery access. Machinery shall work in conjunction with an observer to ensure that adequate clearance from trees is maintained at all times.

9.0 Ground Protection

Where deemed necessary by the Project Arborist, machinery movements shall be restricted to areas of existing pavement or from areas of temporary ground protection such as ground mats or steel road plates. Refer to Typical Tree Protection Details (***Appendix 6***)

10.0 Trunk Protection

Where required by the Project Arborist, trunk protection shall be installed. Trunk protection shall be installed by wrapping padding (either carpet underlay or 10mm thick jute geotextile mat) around the trunk and first order branches to a minimum height of 2m. Timber battens (90 x 45mm) spaced at 150mm centres shall be strapped together and placed over the padding. Timber battens must not be fixed to the trees. Refer to Typical Tree Protection Details (***Appendix 6***).

11.0 Structure & Pavement Demolition

Demolition of existing structures/pavement within the TPZ shall be supervised by the Project Arborist. Machinery is to be excluded from the TPZ unless operating from the existing slabs, pavements or areas of ground protection (refer to Section 9.0). Machinery should not contact the tree's roots, trunk, branches and crown.

The existing pavement shall be carefully lifted to minimise damage to the underlying soil profile (or sub-base materials) and to prevent damage to tree roots. Wherever possible, existing sub-base materials shall remain in-situ.

When removing slab sections within TPZ, machinery shall work backwards out of the TPZ to ensure machinery remains on un- demolished sections of slab at all times. Wherever possible, footings or elements below grade shall be retained to minimise disturbance to the tree's roots.

Where deemed necessary by the Project Arborist, the structures shall be shattered prior to removal with a hand-operated pneumatic/electric breaker.

If roots (>25mmØ) are encountered during the demolition works, these roots must be retained in an undamaged condition and advice sought from the Project Arborist. Where the Project Arborist determines that the tree is using underground elements (i.e footings, pipes, rocks etc.) for support, these elements shall be left in-situ.

12.0 Underground Services

Underground service installation within the TPZ shall be supervised by the Project Arborist.

The installation of underground services shall be located outside of the TPZ. Where this is not possible, they shall be installed using either hydrovac or hand excavation methods with the services installed around/below roots (>25mm⌀, or as determined by the Project Arborist).

Alternatively, boring methods may be used for underground service installation where the installation depth is greater than 800mm below existing grade. Excavations for starting and receiving pits for boring equipment shall be located outside of the TPZ or located to avoid roots (>25mm⌀, or as determined by the Project Arborist).

13.0 Excavations, Root Protection & Root Pruning

Excavations and root pruning within the TPZ shall be supervised by the Project Arborist. Excavations within the TPZ shall be avoided wherever possible.

Excavations within the TPZ shall be undertaken by hand or using hydro vacuum excavation methods (or similar approved device) to protect tree roots. If there is any delay between excavation works and backfilling, exposed roots shall be protected from direct sunlight, drying out and extremes of temperature by covering with a 10mm thick jute mat. The mat shall be kept in a damp condition at all times.

Hand excavation and root pruning shall be undertaken along the excavation line prior to the commencement of mechanical excavation to prevent tearing and shattering damage to the roots from excavation equipment. Roots (>25mm⌀) shall be pruned by the Project Arborist only. Roots (<25mm⌀) may be pruned by the Principal Contractor. Root pruning shall be undertaken with clean, sharp secateurs or a pruning saw to ensure a smooth wound face, free from tears.

No over-excavation, battering or benching shall be undertaken beyond the footprint of any structure unless approved by the Project Arborist.

Damaged roots shall be pruned behind the damaged tissues with the final cut made to an undamaged part of the root.

APPENDIX 6 - TYPICAL TREE PROTECTION DETAILS

Note:
No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.

Option 1 - Fencing
1.8m high chain wire mesh panels with shade cloth attached (if required), held in place with concrete feet.

Tree Protection Zone (TPZ) sign

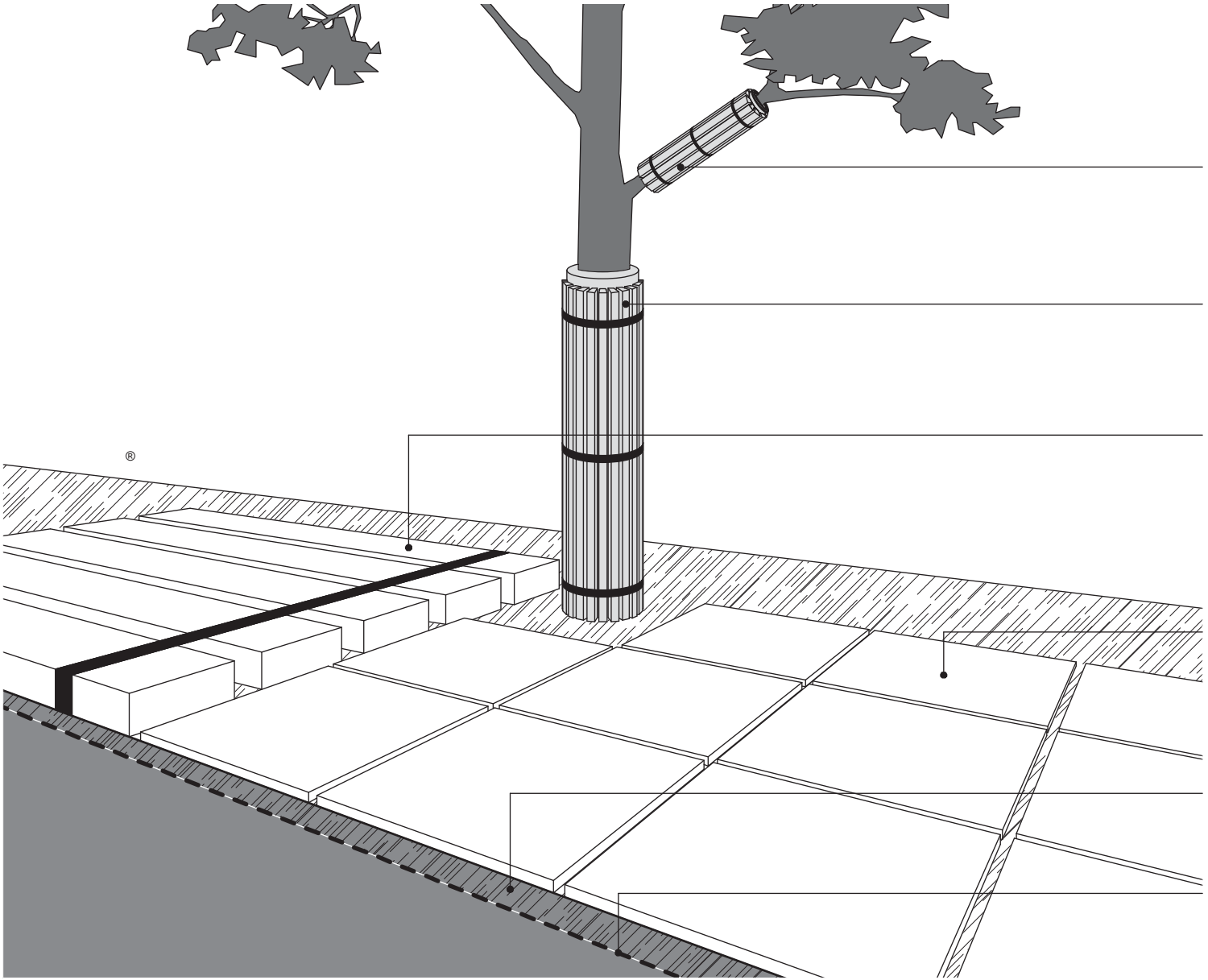
Option 2 - Fencing
Plywood or wooden panel paling fence. This type of fencing material also prevents building materials or soil entering the TPZ.

Installation of supports should avoid damaging roots.

Bracing is permissible within the TPZ.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer installed across surface of TPZ.

01 Tree Protection Fencing



Branch Protection - use boards and padding to prevent damage to bark on branch. Boards are to be strapped, not screwed or nailed to the branch.

Trunk Protection - use boards and padding to prevent damage to bark (minimum 2m). Boards are to be strapped, not screwed or nailed to the trunk.

Ground Protection - use device strapped over mulch or aggregate layer. Ground protection device should be of a suitable thickness to prevent soil compaction and root damage.

Steel plates (or approved equivalent) with or without mulch or aggregate layer below.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer.

Geotextile fabric underneath mulch or aggregate layer.

02 Examples of Branch, Trunk and Ground Protection

Branches may require pruning to erect scaffolding. Pruning may be subject to local regulations. Flexible branches should be tied back in preference to pruning.

Minimum 1.8m high hoarding. Temporary fencing may be incorporated into scaffolding as either containment screening or as hoarding.

Note:
If excavation is required for installation of support post for fencing, the Project Arborist should assess any pruning of roots greater than 20mm diameter.

Scaffold planks

Boards or plywood to be installed over mulch or aggregate layer for any areas requiring access within the TPZ.

Soleplate over geotextile. No excavation for soleplate within TPZ.

Maximum 100mm and minimum 50mm depth mulch or aggregate layer within TPZ.

Geotextile fabric

03 Indicative Scaffolding within a Tree Protection Zone (TPZ)