Arboricultural Impact Assessment

TREEISM
Arboricultural Services

Prepared For
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18 The Serpentine
BILGOLA BEACH NSW 2107

SITE ADDRESS
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JANUARY 2023

Contents

1 Introduction

1.1 Brief

1.1.1 This Arboricultural Impact Assessment (AIA) was prepared by Chantalle Hughes of Treeism Arboricultural Services. This report was commissioned by Rob Miller, owner of the subject site. The Site is identified as Lots 4A, 4B and 5 of DP361236 and is known as 18 and 20 The Serpentine, Bilgola beach, New South Wales.

1.1.2 The purpose of this report is to identify the species of each assessed tree, assess their vigour, condition, landscape prominence and ascribe a Retention Value to each tree.

1.1.3 This report identifies the potential impacts the proposal will have on the retention or long-term viability of each tree and aims to provide guidelines for tree protection and maintenance during development.

1.2 Context

1.2.1 Acknowledgement of the original inhabitants of the Northern Sydney area is complex. The Aboriginal Heritage Office (AHO) states…' Clan names which can be found on most maps for the northern Sydney region of the AHO partner Councils are the following: Gayamaygal, Gamaragal, Garigal, Darramurragal and many more'…..exact clan name knowledge has been lost, or at the very least is hard to find, as traditional inhabitants of Australia were told to 'give up their language, stop practicing ceremony and hide their Aboriginality'.

1.2.2 The Department of Planning, Industry and Environment 'Espade' states the site geology as 'Narrabeen Group of sediments. Mostly interbedded laminite and shale with quartz to lithic quartz sandstone. Minor red claystones occur north of the Hawkesbury River. Clay pellet sandstone occurs south of the Hawkesbury River (Herbert, 1983)'.

1.2.3 Details of vegetation 'Mostly uncleared, tall eucalypt open-forest (wet sclerophyll) and closed-forest (rainforest). Much of the native vegetation on the Northern Beaches peninsula has been cleared (sic). Tall eucalypt open-forests occur on drier and more exposed slopes and crests. Tree species include *Eucalyptus* (sic) *maculata*, E. *paniculata*, E. *saligna*, *Syncarpia glomulifera*, E. *botryoides*, *Angophora floribunda* and *Allocasuarina torulosa*. Rainforest occurs on sheltered slopes. Characteristic tree species include *Acmena smithii, Glochidion ferdinandi*, *Ceratopetalum apetalum* and *Livistona australis'*.

1.3 Methodology

1.3.1 In preparation for this report, ground level, visual tree assessments[1] or limited VTA (e.g. where access was limited), of fourteen (14) trees was completed by Chantalle Hughes of Treeism Arboricultural Services on 25th January 2023. Inspection details of these trees are provided in Appendix 4 — Schedule of Assessed Trees.

1.3.2 The tree heights were visually estimated or measured using a Nikon ForestryPro, unless otherwise noted in Appendix 4, the trunk Diameter at Breast Height were measured at 1.4 metres above ground level (DBH) using a diameter tape unless indicated otherwise. Tree canopy spreads were stepped out with field observations written down, and photographs of the site and trees were taken using an iPhone 13.

1.3.3 The Structural Root Zone (SRZ) and the Tree Protection Zone (TPZ) of each tree is calculated using the formula provided within the Australian Standard 4970-2009 Protection of trees on development sites (AS4970).

1.3.4 Tree data and field observations were entered into a data dictionary on a Trimble TDC600. Data was managed through Terraflex Trimble Connect.

1.4 Plans and Documents Referenced

1.4.1 Architectural Drawings, Project no. 2238, Drawing no's. A-00 to A-06, Revision A, dated 17 January 2023, authored by Gartner Trovato Architects.

1.4.2 Survey Plan, Reference no. 22044 005DT, dated 3 November 2020, authored by LTS Surveying.

1.4.3 AS4970-2009 Protection of trees on development sites, Standards Australia.

1.4.4 AS4373-2007 Pruning of amenity trees, Standards Australia

1.4.5 Section B4 Controls relating to the Natural Environment, Pittwater 21 Development Control Plan (P21DCP).

1.4.6 This AIA takes account Chapter 2 *Vegetation in Non-Rural Areas* of the State Environmental Planning Policy (Biodiversity and Conservation) 2021 'The SEPP' and Section B4 Controls relating to the Natural Environment, Pittwater 21 Development Control Plan (P21DCP).

[1] Visual Tree Assessment (VTA) is a procedure of defect analysis developed by Mattheck and Breloer (1994) that uses the growth response and form of trees to detect defects.

1.5 Limitations

1.5.1 Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible; however, I can neither guarantee nor be responsible for the accuracy of information provided by others.

1.5.2 This report is not intended to be a comprehensive tree risk assessment; however, the report may make recommendations, where appropriate, for further assessment, treatment or testing of trees where potential structural problems have been identified, or where below ground investigation may be required.

1.5.3 No aerial inspections, root mapping or woody tissue testing were undertaken as part of this tree assessment.

1.5.4 Information contained in this report only reflects the condition of the trees at the time of inspection. Trees are dynamic, living things which can be subject to change without notice in certain circumstances.

1.5.5 No Landscape or Hydraulic Plans were viewed as part of this assessment.

1.5.6 This AIA is not intended as an assessment of any impacts on the trees by any proposed future development of the site.

2 Observations and Discussion

2.1 Assessed Trees

2.1.1 Fourteen (14) trees were assessed or identified and are included in this report. Details of these are included in the Schedule of Assessed Trees—Appendix 4.

2.1.2 **Tree numbers**—of the fourteen (14) assessed trees, the following is noted:

- Eight (8) trees are prescribed and located within the subject site—Tree 1-6, 13 and 14.
- Six (6) trees are located on Council managed property—Tree 7-12.

2.1.3 **Species origin** — Of the fourteen (14) assessed street/subject site trees, the following is noted:

- Two (2) trees are introduced exotic species— Tree 1 and 10.
- Twelve (12) trees are locally native species —Tree 2-9 and 11-14.

2.1.4 The fourteen (14) assessed trees, and their respective **Retention Value (RV)** are identified in Table 1, below. Note: Refer to Appendix 3 for the methodology used to assess the Retention Value of a tree.

Table 1—Tree Identification and RV, where L = Low, M = Medium, H = High, R = proposed removal.

Tree No.	*Genus & species* **Common Name**	RV	Tree No.	*Genus & species* **Common Name**	RV
1	*Pinus halepensis* **Aleppo Pine**	H	8	*Casuarina glauca* **Swamp she-oak**	M
2	*Banksia integrifolia* **Coast Banksia**	H	9	*Casuarina glauca* **Swamp she-oak**	M
3	*Casuarina glauca* **Swamp she-oak**	L	10	*Lagunaria patersonia* **Norfolk Island Hibiscus**	M
4	*Casuarina glauca* **Swamp she-oak**	L	11	*Casuarina glauca* **Swamp she-oak**	M
5	*Casuarina glauca* **Swamp she-oak**	L	12	*Casuarina glauca* **Swamp she-oak**	M
6	*Casuarina glauca* **Swamp she-oak**	L	13	*Casuarina glauca* **Swamp she-oak**	M
7	*Cupaniopsis anacardoides* **Tuckeroo**	M	14	*Casuarina glauca* **Swamp she-oak**	M

2.2 Threatened Species

2.2.1 No species of assessed tree is subject to threatened conservation status under Australian and/or State Government legislation (i.e. NSW Threatened Species Conservation Act 1995 and the Commonwealth Environment Protection and Biodiversity Conservation Act 1999).

3 Impact of the Proposed Development

3.1 Prescribed Trees Proposed for Removal

3.1.1 Seven (7) prescribed or Council managed street trees are proposed for removal:

3.1.2 ***Banksia integrifolia* (Coast Banksia – Tree 2)** – This ascribed high RV subject site tree is located within the footprint of the proposed driveway and could not be safely retained. Locating the driveway in the proposed location ensures retention of several more trees located in the Council nature-strip to the north of the subject site.

3.1.3 ***Casuarina glauca* (Swamp She-oak – Tree 3)** – This ascribed low RV subject site tree is located within the footprint of the proposed driveway and could not be safely retained.

3.1.4 ***Casuarina glauca* (Swamp She-oak – Tree 4)** – This ascribed low RV subject site tree is located within the footprint of the proposed Car Platform and could not be safely retained.

3.1.5 ***Casuarina glauca* (Swamp She-oak – Tree 5 and 6)** – These ascribed low RV subject site trees are in poor condition and should be removed irrespective of the development. Although the proposed Studio/Car Platform just encroaches the TPZ/SRZ of Tree 5, the proposed stairs leading to the pool area will be well within the SRZ of both specimens. Whilst compacted crushed granite stairs and platforms are currently in place in this area, the new stairs will be of a more permanent construction.

3.1.6 ***Cupaniopsis anacardoides* (Tuckeroo – Tree 7) –** This ascribed medium RV street tree is located within the footprint of the proposed driveway and could not be safely retained. Locating the driveway in the proposed location ensures retention of several more trees located in the Council nature-strip to the north of the subject site/The Serpentine. This species is exempt under Councils DCP (on private properties).

3.1.7 ***Lagunaria patersonia* (Norfolk Island Hibiscus – Tree 10)** – This ascribed medium RV street tree will incur a TPZ encroachment in excess of 35% and works will fall within the calculated SRZ (major impact under AS4970). Extensive pruning would also be required to facilitate works, as such this tree could not be safely retained.

3.1.8 This species of tree also is exempt under Councils DCP (on private properties). Council has previously set precedent removing this species in public areas where people are likely to be impacted by the known irritant fibres within the seed pods.

3.2 Potential Impacts on Trees Proposed for Retention

3.2.1 Under the Australian Standard 4970-2009 Protection of trees on development sites (AS4970), encroachments less than 10% of the Tree Protection Zone (TPZ) are considered to be minor. No specifications are provided in AS4970 for potential impacts of 10% or greater. This 10% is interpreted as the threshold figure, if the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree(s) would remain viable.

3.2.2 When determining the potential impacts of encroachment into the TPZ, the project arborist should consider the following items listed under Clause 3.3.4 of AS4970-2009:

(a) Location and distribution of the roots to be determined through non-destructive investigation methods (pneumatic, hydraulic, hand digging or ground penetrating radar). Photographs should be taken, and a root zone map prepared.

(b) The potential loss of root mass resulting from the encroachment: number and size of roots.

(c) Tree species and tolerance to root disturbance.

(d) Age, vigour and size of the tree.

(e) Lean and stability of the tree. NOTE: Roots on the tension side are likely to be most important for supporting the tree and are likely to extend for a greater distance.

(f) Soil characteristics and volume, topography and drainage.

(g) The presence of existing or past structures or obstacles affecting root growth.

(h) Design factors.

3.2.3 Disturbance within the Structural Root Zone (SRZ), and extent of encroachments into the TPZ's of prescribed trees to be retained are summarised in Table 2 below/next page.

Table 2: Estimated encroachments of permanent structures into the SRZ and TPZ of trees proposed for retention. Note 1: These figures are based on the SRZ and TPZ's offsets of the trees as calculated under AS4970 and do not necessarily reflect the actual root zones of the trees. Existing at or below ground structures, site topography and soil hydrology will influence the presence, spread and direction of tree root growth.

Tree No.	Tree	Tree located on site	SRZ affected	TPZ area (m^2)	TPZ encroachment (approx. m^2)	TPZ encroachment (approx. %)
1	Aleppo Pine	✓	**x**	255	6.0	2.4
8	Swamp She-oak	**x**	**x**	13	0	0.0
9	Swamp She-oak	**x**	**x**	31	0.5	1.6
11	Swamp She-oak	**x**	**x**	55	1.1	2.0
12	Swamp She-oak	**x**	**x**	88	1.37	1.6
13	Swamp She-oak	✓	**x**	13	0	0.0
14	Swamp She-oak	✓	✓	13	0.65	5.0

NOTE: Discussions with the Architect and subject site owner stipulate that the retaining wall along the north-western boundary is to be retained. Encroachment calculations in Table 2 and discussion below assumes this retaining wall is to remain.

3.2.4 **Tree 1** Aleppo Pine – located on subject site.

Structural Root Zone impacts:

- No ground level changes will occur within the SRZ of this tree.

Tree Protection Zone impacts:

- The proposed driveway and Car Platform/Studio fall within the calculated TPZ of this tree. An encroachment of 6.0m^2 or 2.4% has been estimated (see Figure 1 below). Under AS4970 encroachments less than 10% are considered minor encroachment and are unlikely to impact tree health or condition.

Pruning impacts:

- Some minor to moderate pruning of this tree may be required for clearance over the driveway and Car Platform/Studio. However, works could be carried out to comply with AS4373 Pruning of amenity trees and would be less than 15% of the total live canopy.

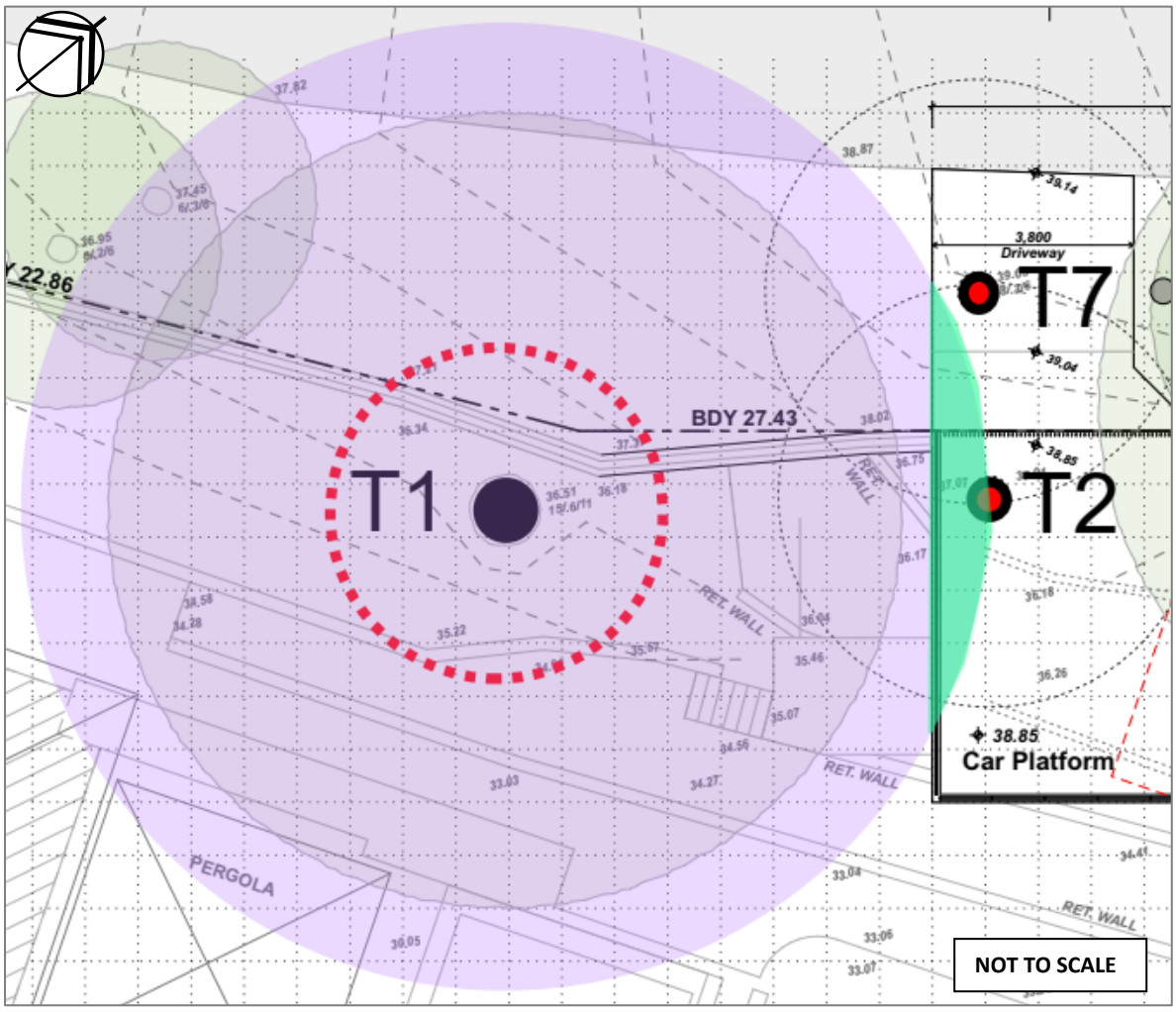


Figure 1 – Tree 1 – Red dotted circle indicates SRZ, purple shading denotes the TPZ. Aqua shading notes estimated encroachment. Mark up of Car Platform Plan, dwg no. A.02, 17/1/23 authored by Gartner Trovato Architects. Marked up by C Hughes.

3.2.5 **Tree 8** Swamp She-oak - located on Council managed land.

Structural Root Zone impacts:

- No ground level changes will occur within the SRZ of this tree.

Tree Protection Zone impacts:

- No works are proposed within the TPZ of this tree (see Figure 2 below/page 11).

Pruning impacts:

- Some minor pruning of this tree may be required for clearance over the driveway. However, works could be carried out to comply with AS4373 Pruning of amenity trees and would be less than 10% of the total live canopy.

3.2.6 **Tree 9** Swamp She-oak - located on Council managed land.

Structural Root Zone impacts:

- No ground level changes will occur within the SRZ of this tree.

Tree Protection Zone impacts:

- The proposed Studio/Car Platform fall within the calculated TPZ of this tree. An encroachment of 0.5m^2 or 1.6% has been estimated (see Figure 3 below/page 11). Under AS4970 encroachments less than 10% are considered minor encroachment and are unlikely to impact tree health or condition.

Pruning impacts:

- The canopy is orientated over the roadway to the west (away from the proposed works), no pruning is required to accommodate the proposed works.

3.2.7 **Tree 11** Swamp She-oak - located on Council managed land.

Structural Root Zone impacts:

- No ground level changes will occur within the SRZ of this tree.

Tree Protection Zone impacts:

- The proposed Studio/Car Platform fall within the calculated TPZ of this tree. An encroachment of 1.1m^2 or 2% has been estimated (see Figure 3 below/page 11). Under AS4970 encroachments less than 10% are considered minor encroachment and are unlikely to impact tree health or condition.

Pruning impacts:

- The canopy is orientated over the roadway to the west, no pruning is required to accommodate the proposed works.

3.2.8 **Tree 12** Swamp She-oak - located on Council managed land.

Structural Root Zone impacts:

- No ground level changes will occur within the SRZ of this tree.

Tree Protection Zone impacts:

- The proposed stairs leading from the Car Platform/Studio to the pool/residence fall within the calculated TPZ of this tree.
- An encroachment of 1.4m^2 or 1.6% has been estimated (see Figure 2 below/next page). Under AS4970 encroachments less than 10% are considered minor encroachment and are unlikely to impact tree health or condition.

Pruning impacts:

- Again, the canopy of this tree is orientated over the roadway to the west, no pruning is foreseen.

3.2.9 **Tree 13** Swamp She-oak - located on the subject site.

Structural Root Zone impacts:

- No ground level changes will occur within the SRZ of this tree.

Tree Protection Zone impacts:

- No ground level changes will occur within the TPZ of this specimen.

Pruning impacts:

- No pruning is foreseen to be required to accommodate the works.

3.2.10 **Tree 14** Swamp She-oak - located on the subject site.

Structural Root Zone impacts:

- The proposed stairs leading from the Car Platform/Studio to the pool/residence fall within the calculated SRZ of this tree. This incursion into the SRZ is considered a *major* encroachment under AS4970 and triggers Clause 3.3.4 - TPZ encroachment considerations under AS4970 (see TPZ impacts discussion below).

Tree Protection Zone impacts:

- An encroachment of 0.65m^2 or 5% has been estimated (see Figure 2 below/next page) for the stairs leading from the Car Platform/Studio to the pool/residence, however, as this incursion falls within the SRZ, it is considered a *major* encroachment under AS4970 and triggers Clause 3.3.4 - TPZ encroachment considerations under AS4970 - 2009.

  The primary considerations most relevant for this tree under Clause 3.3.4 of AS4970-2009 are (c) Tree species and tolerance to root disturbance, (d) Age, vigour and size of the tree, (f) Soil characteristics and volume, topography and drainage, and (g) The presence of existing or past structures or obstacles affecting root growth.
- Swamp She-oaks are known to have an aggressive, vast root network that sucker readily, this species is extremely tolerant to root disturbance. The tree is mature, of good to fair vigour aiding in tolerance to disturbance.
- The tree is growing relatively upright on steeply sloping ground, the soil is most likely shallow, and roots will proliferate where they find adequate soil depth. However, there is an existing retaining wall between the tree stem and the proposed stairway. This work could be considered a 'remove and replace'.
- As such, only minor impact on tree health in the medium to long term is expected.

Pruning impacts:

- No pruning is foreseen to be required to accommodate the works.

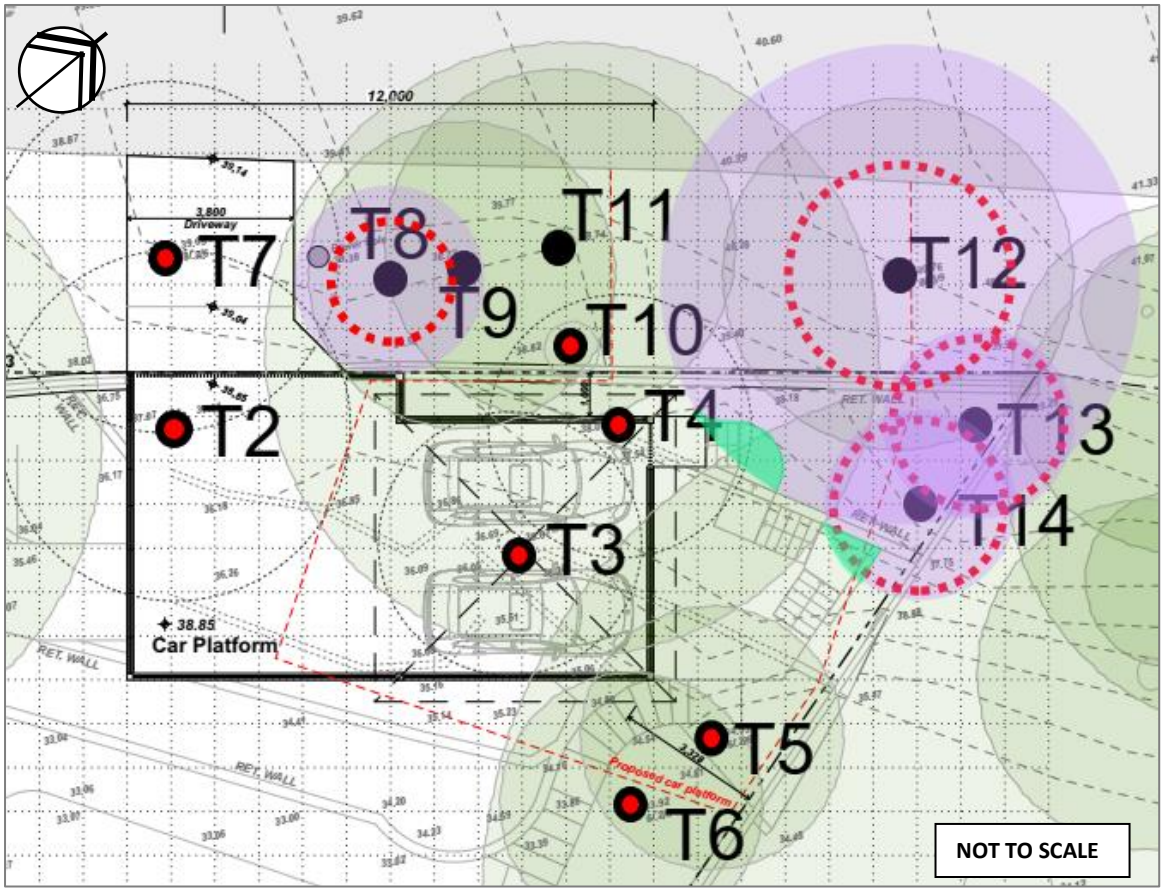


Figure 2 – Tree 8, 12-14 – Red dotted circle indicates SRZ, purple denotes the TPZ. Aqua shading notes estimated encroachment. Mark up (by C Hughes) of Car Platform Plan, dwg no. A.02, 17/1/23 authored by Gartner Trovato Architects.

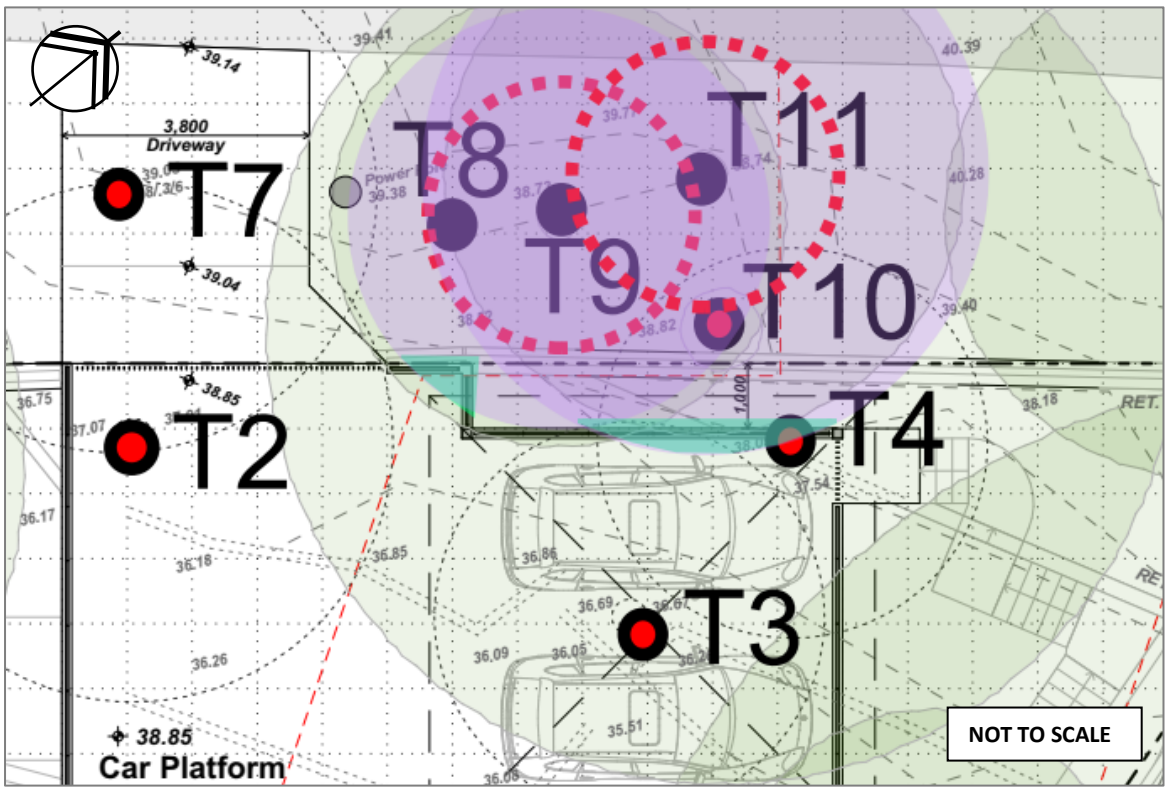


Figure 3 – Tree 9 & 11 – Red dotted circle indicates SRZ, purple denotes the TPZ. Aqua shading notes estimated encroachment. Mark up of Car Platform Plan, dwg no. A.02, 17/1/23 authored by Gartner Trovato Architects. Marked up by C Hughes. Red dotted trees are proposed for removal.

4 Conclusions

4.1.1 A total of fourteen trees (14) are included in this Arboricultural Impact Assessment.

4.1.2 No assessed tree has been identified as endangered or threatened under State or Federal Government legislation.

4.1.3 Six (6) assessed trees (Trees 1, 8, 9, 11-13) will incur no or minor encroachment into the calculated TPZ, impacts to tree health and condition are not foreseen.

4.1.4 One (1) assessed tree (Trees 14) technically incurs major encroachment as stated under AS4970, however existing encroachments and species tolerance dramatically reduce the impacts the encroachment will have to this specimen.

4.1.5 Seven (7) trees would require removal to accommodate the proposal. Of these only one (1) has been ascribed a high RV (Tree 2), one (1) ascribed a medium RV (Tree 10) and five (5) have been ascribed a Low RV (Tree 3-7). Of these five (5) low RV trees, two (2) trees should – in the authors opinion - be removed irrespective of the development due to poor condition.

4.1.6 Provided the recommendations of this report are adhered to, all trees proposed for retention shall remain viable.

5 Recommendations

5.1 Trees Proposed for Removal

5.1.1 Tree removal is to be undertaken in accordance with the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998) and Safe Work Guide to Managing Risks of Tree Trimming and Removal Work 2016.

5.1.2 Tree removal is subject to permit from the relevant consent authority.

5.2 Project Arboriculturist

5.2.1 A Project Arboriculturist (PA) shall be engaged prior to works commencing on the site.

5.2.2 A specific Tree Protection Plan, once Councils Conditions of Consent are issued, shall be established to ensure compliance with the Notice of Determination.

5.2.3 The PA must have a minimum Australian Qualification Framework Level 5 (AQF5) or above in Arboriculture.

5.2.4 Duties of the PA shall include, but not be limited to:

- Liaising with the Project Manager/Head Contractor/Site Manager to confirm the tree protection and other specific tree protection requirements prior to site works commencing.
- Inspection of Tree Protection Devices and supervision of works as recommended in this report or as specified in any Conditions of Consent associated with an approved development application.
- Provision of Compliance Certification if, and when required.

5.3 Minimising Impacts on Trees to be Retained.

5.3.1 TREE 1 ALEPPO PINE - Located on subject site.

- Protect tree by placing tree protection fencing/measures (see Appendix 5, Figure 1 and 2 for specifications) a minimum 6m from the tree stem or as directed by Council/PA outside the active work zone.
- Any canopy pruning is to be less than 15% of the total live canopy and a maximum of 100mm branch diametre at the branch/stem junction. Works shall comply with AS4373 - 2007 Pruning of Amenity Trees and be undertaken by a minimum AQF Level 3 Arborist or as directed by the Council/PA.
- Refer to Section 5.4 for further information on tree protection measures.

5.3.2 TREE 8, 9, 11 and 12 SWAMP SHE-OAK - Located on Council managed land.

- Trees are to be protected as a group by placing tree protection fencing (see Appendix 5, Figure 1 and 2 for specifications) a minimum 1.5m from the stem of Tree 8 to the south, blocking access to the remaining trees to the north or as directed by PA/Council.
- No canopy pruning is considered necessary for Trees 9, 11 or 12. Tree 8 is to be less than 10% of the total live canopy and a maximum of 80mm branch diametre at the branch/stem junction. Works shall comply with AS4373 -2007 Pruning of Amenity Trees and be undertaken by a minimum AQF Level 3 Arborist or as directed by the Council/PA.
- Refer to Section 5.4 for further information on tree protection measures.

5.3.3 TREE 13 & 14 SWAMP SHE-OAK - Located on subject site.

- Trees are to be protected by placing tree protection fencing (see Appendix 5, Figure 1 and 2 for specifications) a minimum 2m from the stems but outside active work zones or as directed by PA/Council.
- No canopy pruning is considered necessary.
- Refer to Section 5.4 for further information on tree protection measures.

5.4 Arboricultural advice

5.4.1 Tree and Root Pruning

- Any pruning required is to be assessed and approved by the Council/PA, prior to undertaking any of this type of work.
- Pruning shall not be undertaken by unqualified site personnel at any time.
- Pruning of branches must be undertaken by a minimum AQF Level 3 arborist in accordance with the Australian Standard AS4373-2007 *Pruning of amenity trees*,
- Unless otherwise approved by the Conditions of Development Consent, or by separate application and approval by the consent authority, pruning is to be limited to cutting of limbs less than 80mm diameters, and no more than 10% total live material removed.

5.4.2 Stockpiling and location of site sheds

- The project arboriculturist must be consulted prior to placing any items within a tree's TPZ.
- Where stockpiling must be located within the TPZ offset of trees to be retained, the existing/undisturbed natural ground must be covered with thick, coarse mulch to a minimum 75-100mm thickness.

- Large, or bulky materials (non-contaminating) can be stacked on wooden pallets or boards placed over the mulch.
- Tarpaulins (or similar) placed on boards or pallets on top of mulch shall be used to prevent loose or potentially contaminating materials from moving into the soil profile within the TPZ of trees or within 10m upslope of trees.
- Where site sheds must be located within the TPZ offset of a tree/s, the shed must be fully elevated on all sides with a minimum 300m between existing ground and the floor/floor bearers. Isolated pad footings must be carefully dug by hand and not damage or sever any roots greater than 20mm diameters.
- Any conflict between footing locations and larger roots (i.e. 20mm Ø plus) must be brought to the attention of the project arboriculturist who is to provide practical alternatives that do not include unnecessary tree root removal.

5.4.3 Fill Material

- Placement of fill material within the TPZ of trees to be retained should be avoided where possible. Where placement of fill cannot be avoided, the material should be a coarse, gap graded material such as 20 — 50mm crushed basalt or equivalent to provide some aeration to the root zone. Note that roadbase or crushed sandstone or other material containing a high percentage of fines is unacceptable for this purpose.
- The fill material should be consolidated with a non-vibrating roller to minimise compaction of the underlying soil.
- Permeable geotextile may be used beneath the sub-base to prevent migration of the stone into the sub-grade. No fill material shall be placed in direct contact with the trunk.

5.4.4 Pavements

- Pavements should be avoided within the TPZ of trees to be retained where possible.
- Proposed paved areas within the TPZ of trees to be retained is to be placed above grade to minimise excavations within the root zone, avoiding root severance and damage.

5.4.5 Fencing and walls within the SRZ and TPZ of retained trees.

- Where fencing and/or masonry walls are to be constructed along site boundaries, they must provide for the presence of any living woody tree roots greater than 50mm diameter.
- Hand digging must occur within the SRZ of trees to be retained.
- For masonry walls/fences it may be acceptable to delete continuous concrete strip footings and replace with suspended in-fill panels (e.g. steel or timber pickets, lattice etc) fixed to pillars.

5.4.6 Landscaping within tree root zones.

- The level of introduced planting media into any proposed landscaped areas within the TPZ is not to be greater than 75mm depth, and be of a coarse, sandy material to avoid development of soil layers that may impede water infiltration.
- Appropriate container size of proposed plants within the SRZ of trees should be determined prior to purchase of plants. Otherwise, any proposed landscaping within the SRZ must consist of tubestock only. This is required to ensure that damage to tree roots is avoided.

- Mattocks and similar digging instruments must not be used within the TPZ of the trees. Planting holes should be dug carefully by hand with a garden trowel, or similar small tool.
- Where possible, do not plant canopy trees beneath, or within 6 - 8m of overhead lines.

5.4.7 Other

- No washing or rinsing of tools or other equipment, preparation of any mortars, cement mixing, or brick cutting is to occur within 8m upslope of any palms or trees to be retained.
- Regular monitoring of the trees during development works for unforeseen changes or decline will help maintain the trees in a healthy state.

6 References

6.1.1 Barrell, J (1995) Pre-development Tree Assessment from Trees and Building Sites, Eds. Watson & Neely, International Society of Arboriculture, Illinois.

Hadlington, P. & Johnston, J. (1988) Australian Trees: Their Care & Repair. University of NSW Press, Kensington.

Mattheck, C. & Breloer, H. (1994) The Body Language of Trees: A handbook for failure analysis. Research for Amenity Trees No. 4, The Stationery Office, London.

Standards Australia AS4373-2007: Pruning of Amenity Trees, Standards Australia, Sydney.

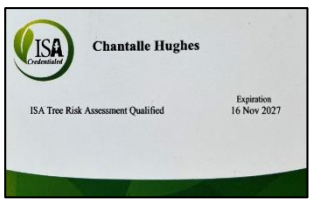
Standards Australia AS4970-2009 Protection of trees on development sites, Standards Australia, Sydney.

www.treetec.net.au/tpz_srz_dbh_calculator - accessed 30/1/2023.

7 Acknowledgements

7.1.1 Credit to Urban Forestry Australia Pty Ltd for some areas of text and general report layout.

Report prepared by Chantalle Hughes – January 2023



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Advanced Certificate Urban Horticulture
Diploma of Horticulture (Arboriculture) *Credit*
ISA Tree Risk Assessment Qualification (TRAQ) updated 2022
Accredited Member of Institute of Australian Consulting Arboriculturists (IACA)
Affiliate Member of the Local Government Tree Resources of Australia (LGTRA)
Member of the International Society of Arboriculture (ISA)

8 Appendices

Appendix 1 – Terms and Definitions

Age classes

Y Young refers to an established but juvenile tree.
SM Semi-mature refers to a tree at growth stages between immaturity and full size.
EM Early-mature refers to a tree close to full sized still actively growing.
M Mature refers to a full sized tree with some capacity for further growth.
LM Late-Mature refers to a full sized tree with little capacity for growth that is not yet about to enter decline.
OM Over-Mature refers to a full sized tree with little capacity for growth that is entering or has entered decline.

Co-dominant: refers to stems or branches equal in size and relative importance.

Condition/Structure: refers to the tree's form and growth habit, as modified by its environment (aspect, suppression by other trees, soils) and the state of the scaffold (i.e. trunk and major branches), including structural defects such as cavities, crooked trunks or weak trunk/branch junctions. These are not directly connected with health and it is possible for a tree to be healthy but in poor condition/structure.

Deadwood: refers to any whole limb that no longer contains living tissues (e.g. live leaves and/or bark). Some dead wood is common in a number of tree species.

Diameter at Breast Height (DBH): Refers to the tree trunk diameter at breast height (1.4 metres above ground level).

Epicormic growth: adventitious branches that are considered to be a weak attachment in the short term due to minimal wood formation. There are generally formed following storm-related branch breakage or poor pruning practices. Should sufficient holding wood form in the long-term this growth is less of an issue.

Hazard: refers to anything with the potential to harm health, life or property.

Health: Refers to the tree's vigour as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion, and the degree of dieback.

Secondary Stem: refers to stems or branches with one of unequal size and relative importance.

SRZ: refers to the Structural Root Zone of the tree, this is the area required for tree stability.

TPZ: refers to the Tree Protection Zone of the tree, this is the primary method of protecting trees, it is a combination of the root area and the canopy and the SRZ is located within it.

Visual Tree Assessment (VTA): a procedure of defect analysis developed by Mattheck and Breloer (1994) that uses the growth response and form of trees to detect defects.

Appendix 2 – ULE Guide

ULE categories (after Barrell 1996, Updated 01/04/01)

The five categories and their sub-groups are as follows:

1. Long ULE - tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance:
    a) Structurally sound trees located in positions that can accommodate future growth
    b) Trees which could be made suitable for long term retention by remedial care
    c) Trees of special significance which would warrant extraordinary efforts to secure their long term retention

2. Medium ULE - tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance:
    a) Trees which may only live from 15 to 40 years
    b) Trees which may live for more than 40 years but would be removed for safety or nuisance reasons
    c) Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
    d) Trees which could be made suitable for retention in the medium term by remedial care

3. Short ULE - tree appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance:
    a) Trees which may only live from 5 to 15 years
    b) Trees which may live for more than 15 years but would be removed for safety or nuisance reasons
    c) Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
    d) Trees which require substantial remediation and are only suitable for retention in the short term.

4. Removal - trees which should be removed within the next 5 years:
    a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions
    b) dangerous trees through instability or recent loss of adjacent trees
    c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form
    d) Damaged trees that are clearly not safe to retain
    e) Trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting
    f) Trees which are damaging or may cause damage to existing structures within the next 5 years
    g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f)
    h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review

5. Small, young or regularly pruned - Trees that can be reliably moved or replaced:
    a) small trees less than 5m in height
    b) young trees less than 15 years old but over 5m in height
    c) formal hedges and trees intended for regular pruning to artificially control growth

Appendix 3 – STARS – Significance of a Tree Assessment Rating System (IACA 2010)©

The landscape significance of a tree is an essential criterion for establishing 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.
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 and *Useful Life Expectancy* of an individual tree has been defined, the retention value can be determined.

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.

Appendix 3 – STARS – Significance of a Tree Assessment Rating System (IACA 2010)©

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.

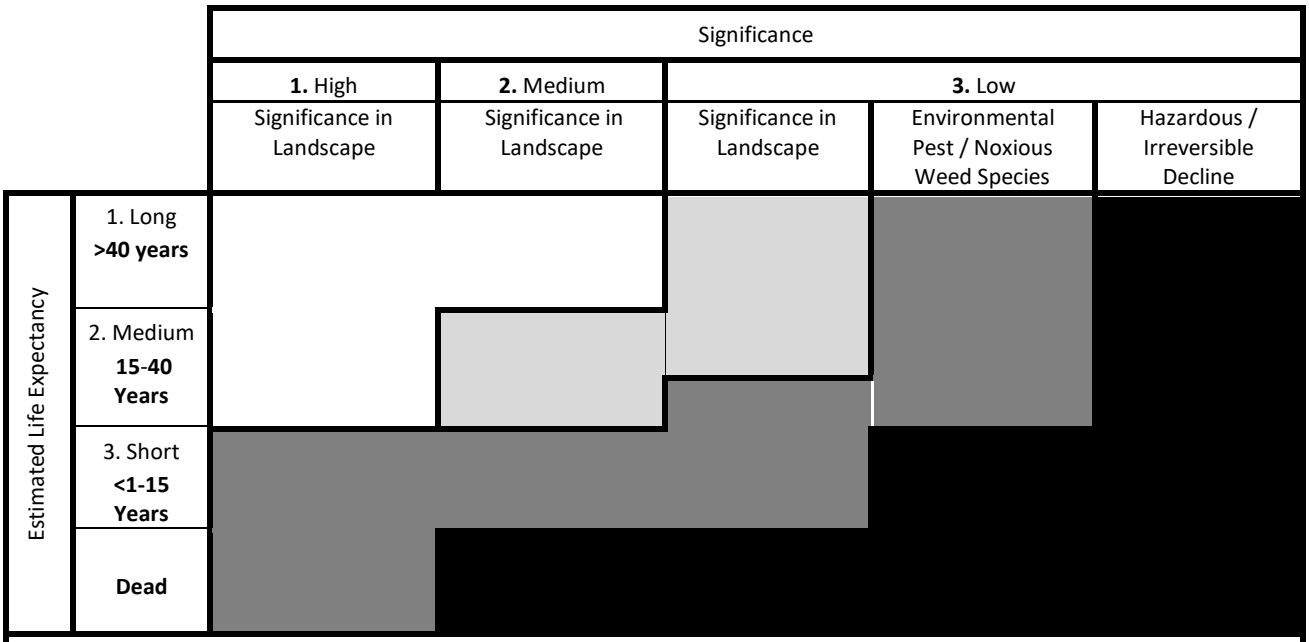
Hazardous/Irreversible Decline:

- 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 designed for individual trees only but can be applied to a monocultural stand in its entirety e.g. hedge.

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 and Andrew Morton in June 2001.



Legend for Matrix Assessment

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

Table 1 - Tree Retention Value - Priority Matrix.

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

Appendix 4 – Schedule of Assessed Trees – Site inspection 25/1/2023, 20 The Serpentine, Bilgola Beach

Tree No.	*Genus & species* **Common Name**	Ht (m)	Sp (m)	DBH (m)	AB (m)	Age	V	C	Comments	ULE	TSR	RV	SRZ (m)	TPZ (m)	TPZ (area)
1	*Pinus halepensis* **Aleppo Pine**	14	14	0.48/ 0.58 (0.75)	0.78	M	G	G	Introduced exotic species. Located on subject site. Codominant stems @ 1.2m AGL. Canopy broadly spreading over roadway and house. One (1) to two (2) low branches over proposed driveway.	2A	H	H	3.0	9.0	255
2	*Banksia integrifolia* **Coast Banksia**	10	7	0.38	0.46	M	G	G	Locally native species. Located on subject site. Unsurveyed 7m tall *Strelitzia* sp. to north of stem.	2A	H	H	2.4	4.6	65
3	*Casuarina glauca* **Swamp she-oak**	12	7	0.2	0.28	M	F-P	F-P	Locally native species. Located on subject site. Appears 'propped' in ground.	3A	M	L	1.9	2.4	18
4	*Casuarina glauca* **Swamp she-oak**	7	14	0.16/ 0.2/ 0.225 (0.34)	0.34	M	F-P	F-P	Locally native species. Located on subject site. Three stems at root crown, poor form. Hard against stone wall. Unsurveyed *Strelitzia* sp. to north.	3A	L	L	2.1	4.1	52
5	*Casuarina glauca* **Swamp she-oak**	11	4	0.13	0.25	M	F-P	P	Locally native species. Located on subject site. Die back and broken branches in canopy.	3A	L	L	1.9	2.0	13
6	*Casuarina glauca* **Swamp she-oak**	8	4	0.18	0.25	M	F-P	P	Locally native species. Located on subject site. Hangers in canopy. Dieback of upper canopy noted.	3A	L	L	1.9	2.2	15
7	*Cupaniopsis anacardioides* **Tuckeroo**	7	5	0.3/ 0.22/ 0.12 (0.39)	0.39	M	G-F	G	Locally native species. Located on Council manage land. Tear outs noted.	2A	M	M	2.2	4.7	69
8	*Casuarina glauca* **Swamp she-oak**	6	4	0.12	0.15	SM	G	G-F	Locally native species. Located on Council manage land. Suppressed.	2A	M	M	1.5	2.0	13

Tree No.	*Genus & species* **Common Name**	Ht (m)	Sp (m)	DBH (m)	AB (m)	Age	V	C	Comments	ULE	TSR	RV	SRZ (m)	TPZ (m)	TPZ (area)
9	*Casuarina glauca* **Swamp she-oak**	10	6	0.26	0.36	M	G	G-F	Locally native species. Located on Council manage land. Canopy orientated over roadway, suppressed.	2A	M	M	2.2	3.1	31
10	*Lagunaria patersonia* **Norfolk Island Hibiscus**	16	12	0.15/ 0.4 (0.43)	0.58	M	G	G	Introduced exotic species. Located on Council manage land.	2A	M	M	2.6	5.2	84
11	*Casuarina glauca* **Swamp she-oak**	15	8	0.35	0.44	M	G	G-F	Locally native species. Located on Council manage land. Canopy completely orientated over roadway, suppressed. Mechanical damage to stem noted on roadside. Two smaller trees to north suckering off base of this tree or Tree 12.	2A	M	M	2.3	4.2	55
12	*Casuarina glauca* **Swamp she-oak**	15	8	0.44	0.52	M	G	G	Locally native species. Located on Council manage land. Canopy over road, tree has a twisted form and is suppressed.	2A	M	M	2.5	5.3	88
13	*Casuarina glauca* **Swamp she-oak**	12	6	0.15	0.21	M	G-F	G-F	Locally native species. Located on subject site. Not on survey.	2A	M	M	1.7	2.0	13
14	*Casuarina glauca* **Swamp she-oak**	11	6	0.12	0.2	M	G-F	G-F	Locally native species. Located on subject site. Not on survey.	2A	M	M	1.7	2.0	13

KEY

Trees to be retained.

Dead/non-prescribed tree or palm on site that may be removed or retained without Development Consent or Tree Management Permit.

Trees proposed for removal.

L	Low Retention Value-These trees are not considered important for retention.	**M**	Medium Retention Value-These trees may be retained & protected.	**H**	High Retention Value -These trees are considered important for retention and should be retained and protected.

* DBH is visually estimated (usually adjoining trees or those that are hard to access). AB – above *buttress roots*. AGL - above ground level.

Figures in brackets indicates the determined DBH and TPZ for a multi-stemmed tree based on the formula shown in Appendix A of AS4970-2009.

NOTE: According to AS4970, the TPZ of palms, other monocots, cycads, and tree ferns should not be less than 1m outside the crown projection. The AS4970 formula for calculating the SRZ of a tree does not apply to palms, other monocots, cycads, and tree ferns.

H refers to the approximate height of a tree in metres, from base of stem to top of tree crown.

Sp refers to the approximate and average spread in metres of branches/canopy (the 'crown') of a tree.

DBH refers to the approximate diameter of tree stem at breast height i.e. 1.4 metres above ground (unless otherwise noted) and expressed in metres. Figures in brackets indicate the minimum TPZ allowable as per Section 3.2 Determining the TPZ with AS4970-2009.

Age refer to Appendix 1 -Terms and Definitions for more detail.

V refers to the tree's vigour (health) Refer to Appendix 1 -Terms and Definitions for more detail.

C refers to the tree's structural condition. Refer to Appendix 1 -Terms and Definitions for more detail.

ULE refers to the estimated *Useful Life Expectancy* of a tree. Refer to Appendices 2 and 3 for details.

TSR The *Tree Significance Rating* considers the importance of the tree because of its prominence in the landscape and its amenity value, from the point of view of public benefit. Refer to Appendix 3 – Significance of a Tree Assessment Rating for more detail.

RV Refers to the retention value of a tree, based on the tree's ULE *and* Tree Significance. Refer to Appendix 3 – Significance of a Tree Assessment Rating for more detail.

SRZ Structural Root Zone (SRZ) refers to the critical area required to maintain stability of the tree. Refer to Appendix 1 -Terms and Definitions for more detail. This is not calculated/does not apply for palms, cycads, tree ferns or monocot species.

TPZ Tree Protection Zone (TPZ) refers to the *tree protection zones* for trees to be retained. Refer to Appendix 1 -Terms and Definitions for more detail. For palms, cycads, tree ferns or monocot species it is calculated to be no less than 1m outside the crown projection

Appendix 5 – Tree Protection Devices

Figure 1 – Tree Protection Zone Fencing Key

1. 1.8m high chain wire mesh panels with appropriate feet such as concrete or water filled base blocks.
2. Inside TPZ fencing , 75-100mm deep layer of suitable, organic mulch is to be installed. No excavation, grade change, construction activity or material storage is permitted.
3. Alternate fencing option of 1.8m plywood/wooden panels can also be used, (with above ground bracing) to ensure prevention of soil build up/building materials entering TPZ.
4. Appropriate Tree Protection Zone signage must be displayed – see Figure 2.

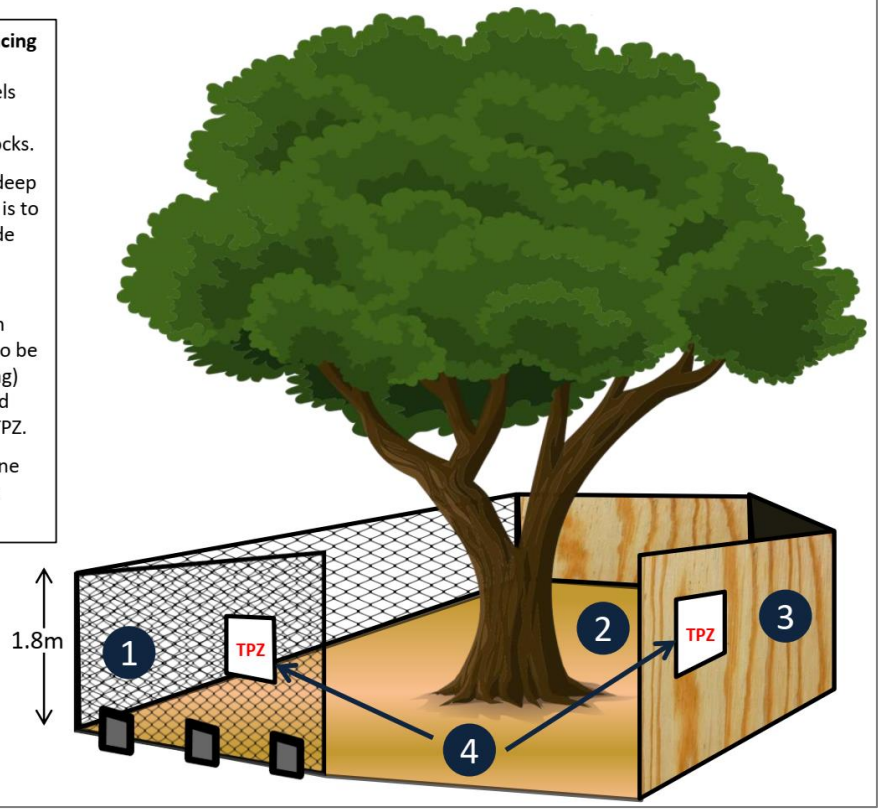


Figure 2
Suitable Tree Protection Zone Signage

Figures 1 & 2 – Tree Protection Fencing and appropriate signage.

Figure 3 - Stem, Branch & Ground protection measures

Key

1. Padding (such as geotextile membrane, natural hessian, rubber, or carpet to protect bark).
2. Battens/boards for branch/stem protection, strapped together NOT nailed into bark/tree. Minimum 2m in height on stem where feasible.
3. Ground protection base 75-100mm of fit for purpose mulch.
4. If machinery is required to move within the TPZ then steel rumble boards (4a) or wide, timber sheeting/boards thrashed together (4b) is to be placed over mulch layer (preferably with geotextile base layer), this to spread the weight and minimise soil compaction

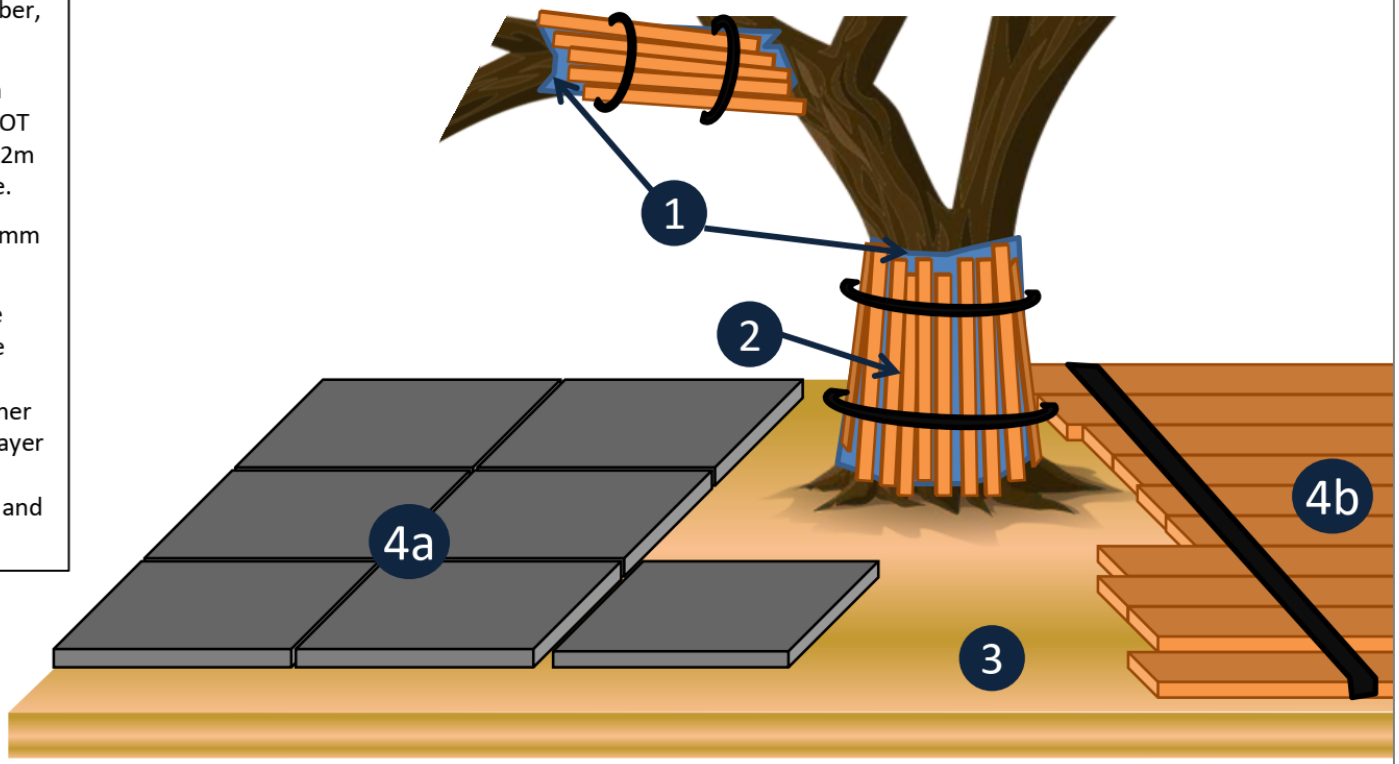


Figure 3 – Stem and ground protection measures.

Appendix 6 – Photographs

Plate 1 – Tree 1 – This tree (noted with arrow) would incur minimum impacts only and is to be retained. It has been ascribed a high RV given it can be seen from the roadway and is in good health and condition.

Plate 2 – Tree 2 – This high RV tree will require removal as it is located within the footprint of the proposal.

Plate 3 – Tree 4 – Arrow notes root crown of Tree 4. It has three sprawling stems , two are hard against retaining wall and one appears almost partially failed previously. Tree has been ascribed a low RV.

Plate 4 – These two trees (noted with arrows) were not picked up on the survey plan. It is likely they are suckers from either Tree 11 or 12. They will be protected and retained during works.

Plate 5 – Tree 7 – This ascribed medium RV tree is located on the Council nature-strip. It would require removal for the proposed driveway cross-over.

Plate 6 – Tree 12 – This ascribed medium RV tree is located on the Council nature-strip. It can be protected and retained and would not require pruning as the canopy is orientated over the roadway.

Plate 7 – Unsurveyed Strelitzia sp. noted with arrow. Would require removal to allow the proposed works.

Appendix 7 – Tree Location Plan

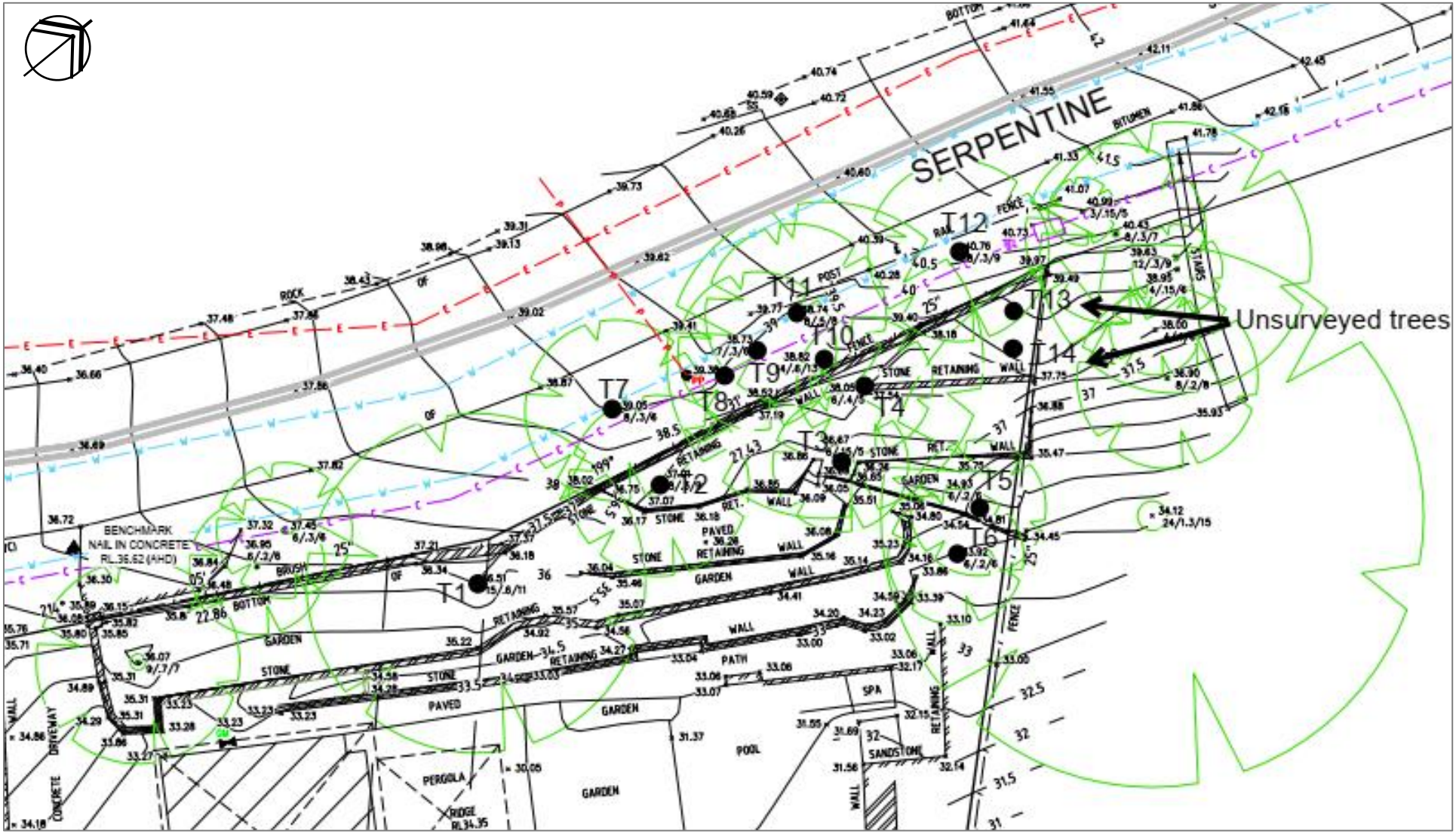


Figure 4 –Excerpt of Survey Plan, Reference no. 22044 005DT, dated 3 November 2020, authored by LTS Surveying. Marked up by C Hughes (NOT TO SCALE).