URBAN FORESTRY AUSTRALIA

TREE MANAGEMENT CONSULTING ARBORICULTURISTS

ARBORICULTURAL IMPACT ASSESSMENT

for

Anthony Cassar
231 Whale Beach Road
WHALE BEACH NSW 2107

SITE ADDRESS

231 WHALE BEACH ROAD
WHALE BEACH NSW

JULY 2021

Prepared by
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1 INTRODUCTION

1.1 This Arboricultural Impact Assessment (**AIA**) prepared by Urban Forestry Australia (UFA) was commissioned by Anthony Cassar, on behalf of the owner of the subject site. "The site" is identified as Lot B in D.P. 316404 and known as 231 Whale Beach Road, Whale Beach., New South Wales

1.2 This AIA is to accompany a development application to Northern Beaches Council for a proposed shop-top housing development including retail premises, basement carparking and landscaping on the site.

1.3 The purpose of this report is to assess the *vigour* and *condition* of the surveyed trees, and identify the potential impacts the proposed development may have on those trees to be retained in proximity to the works.

1.4 This report gives recommendations for tree retention or removal and provides guidelines for tree protection and maintenance.

1.5 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.

1.6 This AIA is not intended as an assessment of any impacts on trees by any proposed future development of the site, other than the current development application.

1.7 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.

2 METHODOLOGY

2.1 In preparation for this report, ground level, *visual tree assessments*[1] of eight (8) trees were undertaken by Catriona Mackenzie and Mark Jamieson for Urban Forestry Australia, on 28 April 2020. Inspection details of these trees are provided in Appendix E—*Schedule of Assessed Trees.*

2.2 This AIA takes account of prescribed trees pursuant to Part B4.22 *Tree Preservation Order and Bushland Vegetation* of the Pittwater 21 Development Control Plan (PDCP), and non-prescribed (exempt) trees as specified in Table 1 of B4.22 of the PDCP.

2.3 Tree heights and canopy spreads were visually estimated or measured using a Nikon ForestryPro Laser measurer. Unless otherwise noted in Appendix E, all trunk diameters were measured at approximately 1.4 metres above ground level ("the DBH"), using a Yamiyo diameter tape.

2.4 Field observations were written down, and photographs of the site and trees were taken using an iphone 6 and/or Canon EOS SLR digital camera.

2.5 No *aerial inspections*, *root mapping* or woody tissue testing were undertaken as part of this tree assessment. Information contained in this tree report covers only the trees that were examined and reflects the condition of those trees at the time of inspection.

2.6 Plans and documents reviewed or referenced for the preparation of this report include:

- Details and Levels Plan (Survey), Ref No. 78743, Rev D, prepared by Rygate Surveyors, dated 23/10/2019.
- Architectural Plans DA03 – DA14, Rev.T, prepared by Richard Cole Architecture, dated 30/06/2021.
- Arboricultural Impact Assessment by Urban Forestry Australia dated April 2020.
- Stormwater Asset Relocation Investigation & Report by Barrenjoey Consulting Engineers.
- Landscape Plans DA-L01, L02, L07 – L09, Revision B, prepared by Trish Dobson Landscape Architecture, dated 24/04/2020.
- State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017.
- Australian Standard 4373-2007 Pruning of amenity trees (AS4373).
- Australian Standard 4970-2009 Protection of trees on development sites (AS4970).
- Pittwater Local Environment Plan 2014 (PLEP).
- Pittwater 21 Development Control Plan (PDCP).

[1] Visual Tree Assessment (VTA) is a ground level inspection procedure of symptom analysis developed by Mattheck and Breloer (1994) that uses the growth response and form of trees to detect existing or potential issues with structural stability of a tree or any of its parts. VTA may identify features of concern that require advanced assessment techniques such as aerial and rootcrown inspections, decay testing, and specialised fungal, soil or chemical analysis.

2.7 The subject trees are shown on a marked-up excerpt of the survey plan. This marked-up plan is attached as Appendix F—Tree Location Plan.

2.8 In considering the amended plans revision T, I have undertaken a 'side-by-side' desktop comparative analysis with the revision M plans, on which my previous AIA was prepared.

2.9 Due to the current COVID-19 lockdown in Greater Sydney, I have not undertaken additional site visits; a visit was intended to assess the vigour of the adjoining Tree 4 *Lagunaria patersonia* (Norfolk Island Hibiscus) following past deep excavation within the tree's Structural Root Zone (SRZ) carried out some time before my initial assessment in April 2020.

2.10 In lieu of a site visit, I have viewed eight Nearmap aerial images of Tree 4 between 13 April 2020 and 2 June 2021. No apparent crown decline or discolouration that would indicate loss of vigour were noted.

2.11 Reviewing the revision T plans, the proposed plan amendments that are relevant from an arboricultural perspective are:

- Increased setback from the south boundary for excavation from less than 1m to the now proposed 2m.
- Driveway footprint from Surf Road has moved closer to the south boundary.
- Retention of the street tree Tree 1 on Whale Beach Road.

3 OBSERVATIONS AND DISCUSSION

3.1 Assessed Trees

3.1.1 Eight (8) trees (prescribed and non-prescribed) were assessed or identified and are included in this report. Details of these are included in the Schedule of Assessed Trees—Appendix E.

3.1.2 The assessed trees and their respective *Retention Values* (RV) are identified in Table 1. Note: Refer to Appendix B for the methodology used to assess the RV of a tree.

Table 1: Tree Identification and Retention Value, where L = Low, M = Medium, H = High. # = Removal proposed.

Tree No.	*Genus & species* **Common Name**	RV	Tree No.	*Genus & species* **Common Name**	RV
1	*Ficus benjamina* **Weeping Fig**	L	5	*Strelitzia nicolai* **Giant White Bird of Paradise**	L
2	*Melaleuca viminalis* **Weeping Bottlebrush**	M	6	*Olea europaea* subsp. *cuspidata* **African Olive**	L
3	*Melaleuca viminalis* **Weeping Bottlebrush**	M	7	*Banksia integrifolia* **Coastal Banksia**	L
4	*Lagunaria patersonia* **Norfolk Island Hibiscus / Cow Itch Tree**	L	8	*Agonis flexuosa* **Willow Myrtle**	M

3.1.3 Tree numbers—of the 12 assessed trees, the following is noted:

- No trees are located within the site.
- Three (3) trees are located on the adjoining land at 229 Wale Beach Road (No.229).
- Five (5) trees are street/public trees—Trees 1, 2, 3, 7 and 8.

3.1.4 Species assemblage—of the 8 assessed trees, the following is noted:

- One (1) tree is locally indigenous – Tree 7.
- Four (4) trees are introduced Australian native species – Trees 2, 3, 6 and 8.
- Three (3) are introduced, exotic species—Trees 4 and 5.

3.1.5 Of the above 8 assessed trees, three (3) are listed in Table 1 at B4.22 of the PDCP and on the Northern Beaches Exempt Species List. This listing is due to the undesirable characteristics of these species – Trees 1, 4 and 6.

3.1.6 No species of assessed tree is subject to threatened conservation status under Australian and/or State Government legislation (i.e. Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, and NSW *Biodiversity Conservation Act* 2016).

3.2 Proposed Removal of Trees

3.2.1 No tree is proposed to be removed.

3.3 Proposed Tree Retention

3.3.1 The remaining six (6) trees are proposed to be retained – Tree 1 (Weeping Fig), Tree 4 (Norfolk Island Hibiscus/Cow Itch Tree), Tree 5 (Giant White Bird of Paradise), Tree 6 (African Olive), Tree 7 (Coastal Banksia) and Tree 8 (Willow Myrtle)

3.4 Potential Impacts on Trees Proposed for Retention

3.4.1 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 and the trigger where arboricultural investigations into TPZ encroachments beyond this figure need to be considered.

3.4.2 The potential extent of root zone impacts to protected trees to be retained can be generally rated using the *Impact Level Rating* (ILR) in Table 2, below.

Table 2: Guideline to the rating of impacts on trees to be retained.
Based on discussions with executive members of the Institute of Australian Consulting Arboriculturists.

IMPACT LEVEL RATING	
0	0 – 0.9% of root zone impacted – **no** impact of significance
L	1 to 10% of root zone impacted – **low** (minor) level of impact
L - M	>10 to 15% of root zone impacted – **low** (minor) **to moderate** level of impact
M	>15 to 20% of root zone impacted – **moderate** level of impact
M – H	>20 to 25% of root zone impacted – **moderate to high** level of impact
H	>25 to 35% of root zone impacted – **high** level of impact
S	>35% of root zone impacted – **significant** level of impact

3.4.3 Disturbance within the *Structural Root Zone* (SRZ), and extent of encroachments into the TPZ's of protected site trees to be retained are summarised in Table 3.

Table 3: *Estimated encroachments into the SRZ and TPZ of trees proposed for retention*.

Tree No.	Tree	Tree located on site	SRZ affected	TPZ area (m^2)	TPZ encroachment (approx. m^2)	TPZ encroachment (approx. %)	ILR
1	Weeping Fig	×	likely	150.0	54.5*	36.3*	S*
4	Norfolk Island Hibiscus	×	unlikely	222.0	83*	37*	S*
5	Giant White Bird of Paradise	×	×	50.2	18	36	S
6	African Olive	×	×	55.0	8.2	<15	L-M

N

* These figures are based on the *notional* 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. * Further explanation provided.

3.4.4 **Tree 1**—Weeping Fig (Low RV)

This tree is to be retained. The theoretical encroachment of new works is well into the major category under AS4970. Despite this, the species is very robust and tolerant of disturbance.

A new wall, separating the excavation for the retail forecourt area, is proposed at the boundary and within 800mm from the tree. This wall would form one side of the indicative planter shown on the plan set. The planter is much greater in area than the existing and will provide better growing conditions. However, the retention of parts of the existing low wall, over which some roots close to the tree trunk have grown, is recommended to prevent any destabilising of the tree's root system.

The final planter design will need to be developed after removal of the surrounding structures and pavements and the positions of the tree's main roots are understood.

A low planter is preferable to one with high sides to avoid too much depth of soil in the planter, which could adversely affect the health of existing roots. Coarse, free draining soil to a depth of no more than 200mm depth will be recommended.

3.4.5 **Trees 2 and 3**—Weeping Bottlebrushes (Medium RV)

The footpath and levels are to be maintained around these trees. No impacts are anticipated.

3.4.6 **Trees 7 and 8**—Coastal Banksia (Medium RV) and Willow Myrtle (Low RV)

The site boundary is outside the TPZ of both trees, so no impacts on these trees' root zones are identified or expected. However, it is quite possible the crown of Tree 8 will require reduction pruning to clear the area where driveway construction would take place. Depending on the extent of pruning required, it would be prudent to consider removal and replacement of the tree with a locally occurring species, such as the Coastal Banksia. The land around these trees should be temporarily fenced off to prevent any activities related to construction, such as parking of vehicles or delivery and/or stockpiling of construction materials and the like.

3.4.7 **Tree 4**—Norfolk Island Hibiscus (Low RV)

Species characteristics:

- The species is a hardy coastal tree, although its use as an urban street tree or garden specimen has dramatically declined in the last few decades due to its undesirable traits. The species is known to be quite robust and tolerant of changes and disturbance; this is one of the reasons it was very popular as a street tree planting with local government agencies.
- This species is listed as an exempt species (i.e. is not a 'protected' tree) in many Australian LGA's due to its highly irritant, fine hairs that can cause skin irritation and extreme discomfort or pain, as well as eye damage when wind or brushing past the tree causes the hairs (which resemble fibreglass) to fall onto or across the face.
- Seeds are toxic to humans and animals.

Structural Root Zone impacts:

- Excavation for piers to accommodate the existing raised lawn area had occurred parallel to the site boundary some time ago, adjacent to the tree. About one month earlier, tree roots inside the site were cut at approximately 1.5m from the centre of the tree.
- Location of concrete footings for the overland flow path wall will need to allow for the low likelihood that woody roots are encountered – an arboriculturist will need to supervise these works.

Tree Protection Zone impacts:

- Past pier excavations and fill up to 900mm depth, and recent root investigation and cutting, have removed approximately 44m^2 (19.8%) of the non-woody roots within the TPZ. Despite this, these activities have not visibly affected the tree's health. This may be due to the slope of the land in No.229 allowing movement of soil water, runoff and soil resources being available to the tree as they move from west to east.
- A high to significant level of encroachment is calculated within the notional TPZ for the tree; it is possible the tree will experience a decline in health due to further non-woody root loss with the notional TPZ offset. This is not so much an issue as it could be for a desirable species of good vigour and condition and access to reliable soil resources within its root zone.

Pruning impacts:

- This tree has had quite significant crown raising pruning and removal of limbs towards the dwelling on No.229. This pruning to clear branches away from the windows and terrace facing the tree has led to the greater volume of crown held to the north over the site. The species is highly undesirable for retention in gardens, particularly where it is located near windows and outdoor living areas. In particular, southerly and easterly winds during autumn, when the pods open and release their irritant hairs, will carry those hairs across the site and into any openings, including doors and windows.
- Approximately 40 - 50% of the overhanging crown will need to be removed to provide construction access, clearance from the built structure, and reduce the risk of injury or nuisance caused by the irritant hairs of the seedpods.
- Each autumn, the tree will require pruning of the flowers to prevent the formation of the irritant seed pods, given there will several bedrooms located adjacent to the tree.

3.4.8 **Tree 5**—Giant White Bird of Paradise (Low RV)

Species characteristics:

- The species is a hardy plant consisting of many stems that emerge from an expanding base of shoots and stems (suckers). Care needs to be taken planting this species near structures as the enlarging base may place pressure on them and cause damage.
- The species is not a true 'tree' but is related to grasses. It does not form a woody root system, rather a dense mass of small diameter fleshy roots emerge from its base.

Structural Root Zone impacts:

- The species does not have a SRZ. Cutting into the base rarely causes any decline in tree vigour.
- There is a low concrete wall between this plant and the site boundary. No major issues are expected during excavation or construction within the site.

Tree Protection Zone impacts:

- Despite a 'notional' TPZ encroachment in the significant range, the tolerance of this type of plant to restriction in soil resources is high. Also, the remaining ample soil areas west and south of the tree will allow for soil moisture and other resources to reach its root zone and support continued growth.

Pruning impacts:

- The species forms very tall stems that eventually become heavy and often fail and collapse, as one has recently onto the site building.
- Although it is unlikely to require pruning for construction, it should have excessively tall stems cut to ground to avoid the failure of tall, top heavy stems.
- Pruning of stems to ground will not affect the plant; new shoots will invariably form and grow.

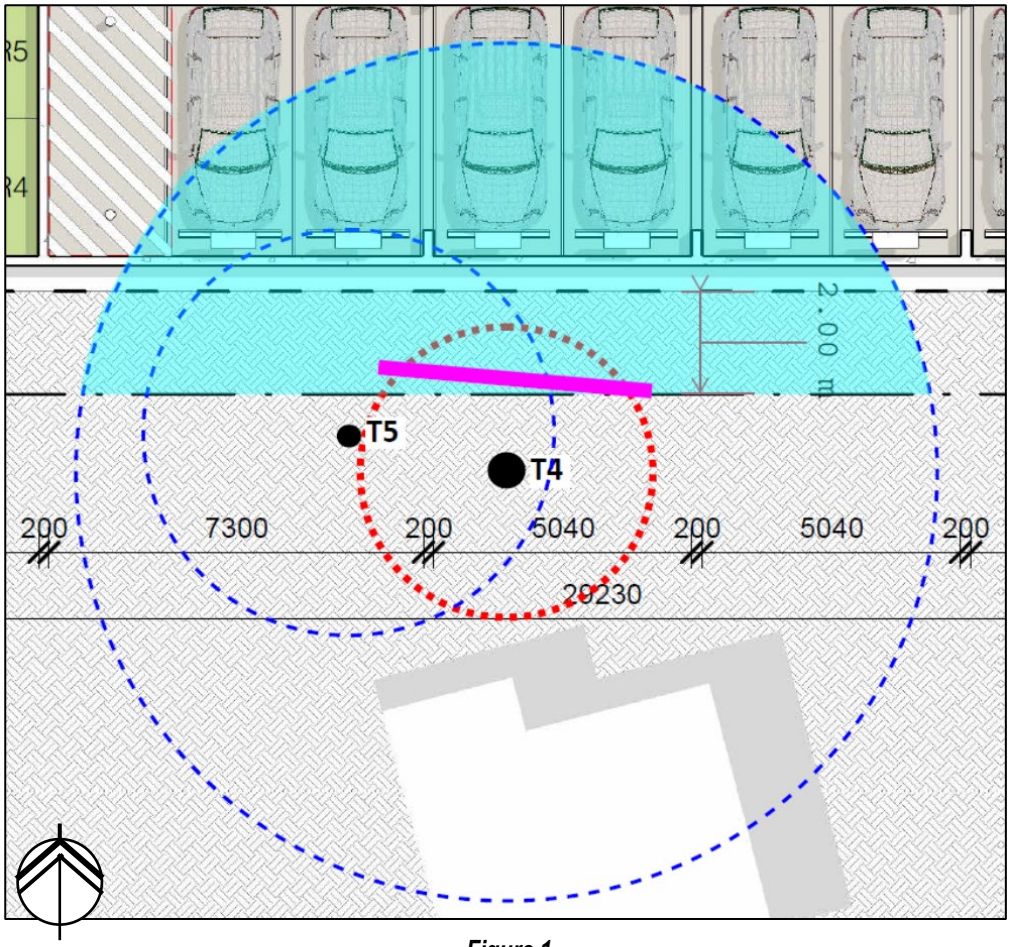

Figure 1

Illustrates the TPZ (dashed blue outer circles) of Tree 4 (Norfolk Island Hibiscus) and Tree 5 (Giant Bird of Paradise), and includes the SRZ (inner, red circle) of Tree 4. The shaded cyan area indicates the notional TPZ encroachment via excavation to boundary for the overland flow path. The heavy pink line adjacent to Tree 4 depicts the location of past trenching and the woody roots cut to the north of the tree.
Not to scale. Excerpt of Basement Plan DA03, marked up by C. Mackenzie.

3.4.9 **Tree 6**—African Olive (Low RV)

Species characteristics:

- The species is a known weed due to its invasiveness of bushland, outcompeting many indigenous species. It is listed as an exempt species (i.e. is not a 'protected' tree) in many Australian LGA's due to its undesirable traits.

Structural Root Zone impacts:

- The existing stone wall is just within the national 2.2m SRZ radius of the tree. This wall has likely prevented root ingress into the pavement to the north beyond.

Tree Protection Zone impacts:

- Despite a low to moderate, 'notional' TPZ encroachment the tree has ample area to the south, east and west to continue to access soil resources. It is not expected to have any long-term adverse impacts on its retention.

Pruning impacts:

- No pruning anticipated.

4 CONCLUSIONS

- A total of eight (8) trees are included in this Arboricultural Impact Assessment. Of these:
    - Three (3) trees have undesirable species traits and are listed on Council's Exempt Species List – Tree 1 (Weeping Fig), Tree 4 (Norfolk Island Hibiscus) and Tree 6 (African Olive).
    - None of the assessed trees are identified as having a *High* Retention Rating (RV).
- No assessed tree on the site or on adjoining properties was identified as an endangered species.
- No assessed tree on the site or on adjoining properties was identified as, or associated with, a heritage item.
- Tree 1 (Weeping Fig) has a theoretical high level of TPZ encroachment and will require further investigation of the impacts of the proposal and the form the new planter will take. These investigations can only take place after removal of existing structures and pavements.
- Tree 4 (Norfolk Island Hibiscus) has already had TPZ encroachments in the past which have not resulted in obvious issues with tree health. The proposal will result in an estimated high to significant TPZ encroachment, which may cause decline in tree health and viability.
    - To reduce the impact on this tree to a minor one would require at least 4.5m setback from the south boundary. Due to the tree's Low RV it would not normally be considered important for retention, nor require special works or design modification to be implemented for its retention.
    - Past pruning to the south has encouraged crown spread over the site and substantial pruning is required to clear the site and reduce the irritants and toxic seeds produced by the tree falling into the site.
- Trees 5 (Giant White Bird of Paradise), Tree 6 (African Olive) and Tree 7 (Coastal Banksia), have minor or negligible impacts expected as a result of the proposal.
- Tree 8 (Willow Myrtle) may require pruning that could result in the tree's' removal. If so, replacement of the tree would be a suitable option.
- Provided the recommendations of this report are adopted, and a site arboriculturist provides appropriate supervision and management of the trees during development, adverse impacts on tree vigour and structural condition of trees to be retained will be managed as practically as possible.

5 RECOMMENDATIONS

5.1 Project Arboriculturist

5.1.1 A Project Arboriculturist (PA) shall be engaged prior to works commencing on the site, including demolition of structures, site clearing and the like.

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

5.1.3 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 fencing locations, construction access, 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 as and when required.

5.2 Tree Protection

5.2.1 The Tree Protection is to be in accordance with the following:

- Tree Protection Devices (TPD) may include mulching, tree guards and other devices other than fencing (Appendix D).
- The TPD must be in place prior to any site works commencing, including clearing, demolition or grading.
- The most appropriate fencing for tree protection is 1.8m chainlink with 50mm metal pole supports. During installation, care must be taken to avoid damage to significant roots. The practicality of providing this fencing on this site must be addressed by the arboriculturist.
- Locate large primary roots by careful removal of soil within the fencing area. ***Do not drive any posts or pickets into tree roots.*** Replace soil back over tree roots.
- It is recommended that the arboriculturist provide written certification that the TPD is/are installed and will satisfy tree protection requirements.
- Nothing should occur inside the tree protection fenced areas, so therefore all access to personnel and machinery, storage of fuel, chemicals, cement or site sheds is prohibited.
- Signage should explain exclusion from the area defined by TPD and carry a contact name for access or advice (see Appendix D – Tree Protection Devices).
- The TPD cannot be removed, altered, or relocated without the project arborists' prior assessment and approval.

5.2.2 Tree 1 – Weeping Fig

- Excavation opposite to the tree must be supervised by the PA (or other AQF5 arborist) to minimise root cutting or other damage.
- Planter design will need to be finalised following the removal of existing structures under the advice and supervision of the PA or other AQF5 arborist.
- The PA or other AQF5 arborist is to provide appropriate tree protection advice that does not conflict with Council's policies for protection of trees on public streets. In this regard, liaison between the PA and Council is recommended.

5.2.3 Trees 2 and 3 – Weeping Bottlebrushes

- Protection fencing and/or trunk and branch wrapping will be required to prevent impact damage during works. The PA or other AQF5 arborist is to provide appropriate tree protection advice that does not conflict with Council's policies for protection of trees on public streets. In this regard, liaison between the PA and Council is recommended.

5.2.4 Tree 4 – Norfolk Island Hibiscus

- Pruning of the crown is to be undertaken prior to any works commencing on the site. See 5.4.2, below.
- A tree guard is to be provided to the trunk of the tree, either by directly placing a guard around the trunk (Fig 2, Appendix D) if permitted to do so, or erecting an approved barrier along the boundary to prevent any contact between site activities and the tree's stem (Fig 1, Appendix D).
- Mulch to a depth of 100mm depth and a 6m radius is to be placed between the tree and the excavation line.
- The PA or other AQF5 arborist is to directly supervise excavation for a minimum 6m radius of the tree and ensure initial excavation to a depth of 700mm is undertaken using hand tools. The remainder of the excavation may be carried out by machinery after approval of the PA or other AQF5 arborist.
- The boundary wall should be designed to avoid any conflict between tree roots and the location of the wall in the event roots greater than 30mm diameter are encountered during the PA's supervision. The PA is to assist with any redesign, ensuring the efficacy of the overland flow path is not compromised.

5.2.5 Tree 5 – Giant White Bird of Paradise

- Removal of all stems growing over the site is recommended. As the plant is generally protected by a low wall it does not require any specific protection measures.

5.2.6 Tree 6 – African Olive.

- As the plant is generally protected by a low wall it does not require any specific protection measures.
- Light pruning of the crown may be required. This will be limited to very small branchlets on the north side and will not affect the tree.

5.2.7 Trees 7 and 8 – Coastal Banksia and Willow Myrtle

- Tree Protection Fencing should be located at least 3m from the trees, essentially creating an exclusion zone to prevent construction activities, including parking of vehicles, within the TPZ of either tree.
- The PA is to inspect and certify these measures to protect the trees are in place and fit-for-purpose.
- Pruning requirements to clear the proposed driveway works needs to be assessed and established. If removal of the canopy of Tree 8 is deemed too great to allow the tree to remain as an amenity tree, we recommend it is removed and replaced with a suitable, locally occurring tree species, such as *Banksia integrifolia* (Coastal Banksia).

5.3 Arboricultural advice

5.3.1 Tree and Root Pruning

- Any pruning required is to be assessed and approved by the 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.

5.3.2 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.

5.3.3 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.

5.3.4 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.

5.3.5 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.

5.3.6 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.

5.3.7 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.

Report prepared by Catriona Mackenzie

July 2021

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APPENDIX A

TERMS AND DEFINITIONS

TERMS AND DEFINITIONS

The following relates to terms or abbreviations that may have been used in this report and provides the reader with a detailed explanation of those terms.

Aerial inspection Where the subject tree is climbed by a professional tree worker or arborist specifically to inspect and assess the upper stem and crown of the tree for signs or symptoms of defects, disease, etc.

Age classes

- **Y** *Young* refers to a well-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 that is more or less full sized and vigourously 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, not yet about to enter decline
- **OM** *Over-mature* refers to a tree about to enter decline or already declining.

Buttress A flange of adaptive wood occurring at a junction of a trunk and root or trunk and branch in response to loading.

Condition 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.

Crown All the parts of a tree arising above the trunk where it terminates by its division forming branches, e.g. the branches, leaves, flowers and fruit: or the total amount of foliage supported by branches.

Crown raise pruning Pruning technique where lower limbs are removed, thereby lifting the overall crown above the ground.

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, i.e. measured at 1.4 m above ground level.

Dieback Death of growth tips/shoots and partial limbs, generally from tip to base. Dieback is often an indicator of stress and tree health.

Form refers to the crown shape of the tree as influenced by the availability or restriction of space and light, or other contributing factors within its environment. Crown form may be determined by tree shape, species and habit and described as Dominant, Codominant, Intermediate, Emergent, Forest and Suppressed, as well as Forest Form or Open Grown. May also be described qualitatively as Good Form or Poor Form.

Growth crack / split Longitudinal crack/split that may develop as a rupture in the bark from normal growth. Longitudinal crack/split that may develop in the trunk of some fast growing palms.

Habit The shape of a tree when its growth is unencumbered by constraints for space and light, e.g. idealized by an isolated field grown specimen with consideration of the species and the type of environment in which it evolved e.g. rainforest, open forest, etc.

Habitat A habitat is an ecological or environmental area that is inhabited by a particular species of animal, plant or other type of organism. It is the natural environment in which an organism lives, or the physical environment that

surrounds (influences and is utilised by) a species population. In restoration ecology of native plant communities or habitats, some invasive species create monotypic stands that replace and/or prevent other species, especially indigenous ones, from growing there.

Health (syn. vigour) 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.

Inclusion - the pattern of development at branch or stem junctions where bark is turned inward rather than pushed out. This fault is located at the point where the stems/branches meet. This is normally a genetic fault and potentially a weak point of attachment as the bark obstructs healthy tissue from joining together to strengthen the joint.

Indigenous Native to an area, and not introduced.

Impact Level Rating (ILR) refers to the estimated percentage of the Tree Protection Zone (TPZ) affected by development impacts. These figures may vary due to the specific conditions and constraints on a particular site, tree species tolerance to impacts, age, vigour, condition of the tree, etc.

IMPACT LEVEL RATING	
0	0 – 0.9% of root zone impacted – **no** impact of significance
L	1 to 10% of root zone impacted – **low** (minor) level of impact
L - M	>10 to 15% of root zone impacted – **low** (minor) **to moderate** level of impact
M	>15 to 20% of root zone impacted – **moderate** level of impact
M – H	>20 to 25% of root zone impacted – **moderate to high** level of impact
H	>25 to 35% of root zone impacted – **high** level of impact
S	>35% of root zone impacted – **significant** level of impact

Note: This is a general guide only. These figures may vary due to the specific conditions and constraints on a particular site, tree species tolerance to impacts, age, vigour, condition of the tree, etc.

Lopping Cutting between branch unions (not to branch collars), or at internodes on a tree, with the final cut leaving a stub. Lopping may result in dieback of the stub and can create infection courts for disease or pest attack.

Root Mapping The exploratory process of recording the location of roots usually in reference to a datum point where depth, root diameter, root orientation and distance from trunk to existing or proposed structures are measured. It may be slightly invasive (disturbs or displaces soil to locate but not damage roots, e.g. hand excavation, or use of air or water knife), or non-invasive (does not disturb soil, e.g. ground penetrating radar).

Scaffold branch/root A primary structural branch of the crown or primary structural root of the tree.

Structural Root Zone (SRZ) Refers to the radial distance in metres, measured from the centre of the tree stem, which defines the critical area required to maintain stability of the tree. Only thorough investigation into the location of structural roots within this area can identify whether any minor incursions into this protection zone are feasible. Note: The SRZ is calculated on the diameter measured immediately above the root/stem buttress (DAB). Where this measurement is not taken in the field, it is calculated by adding 12.5% to the stem diameter at breast height (DBH). Note: The SRZ may not be symmetrical in shape/area where there is existing obstruction or confinement to lateral root growth, e.g. structures such as walls, rocky outcrops, etc).

Snub-nosed rib Adaptive wood formed over a crack, included bark or enclosed bark and may be a round edged (snub-nosed) rib where a broad convex swelling is formed over the crack by the addition of new growth increments, and the cracking is slowed or prevented from developing further (Or, may be a sharp-edged rib as an elongated protuberance where a crack continues to develop).

Suppressed In crown class, trees which have been overtopped, whose crown development is restricted from above.

Sweep A curve in the trunk, generally near the ground. This usually occurs when a tree is partially wind thrown when young, but then stabilises itself and straightens due to reaction wood. Stem sweep can also be a naturally developed feature of some tree species. e.g. *Araucaria columnaris* (Cook Pine), that has no relationship to a defect or partial windthrow.

Tree Protection Zone (TPZ). Refers to the radial distance in metres, measured from the centre of the tree stem which defines the *tree protection zone* for a tree to be retained. This is generally the minimum distance from the center of the tree trunk where protective fencing or barriers are to be installed to create an exclusion zone. The **TPZ** surrounding a tree aids the tree's ability to cope with disturbances associated with construction works. Tree protection involves minimising root damage that is caused by activities such as construction. Tree protection also reduces the chance of a tree's decline in health or death and the possibly damage to structural stability of the tree from root damage.
To limit damage to the tree, protection within a specified distance of the tree's trunk must be maintained throughout the proposed development works. No excavation, stockpiling of building materials or the use of machinery is permitted within the TPZ. Note: In many circumstances the tree root zone does not occupy a symmetrically radial area from the trunk, but may be an irregular area due to the presence of obstructions to root spread or inhospitable growing conditions.

Tree Risk Assessment is the systematic process to identify, analyze, and evaluate tree risk. A tree risk rating of Low, Moderate, High or Extreme is derived by categorising or quantifying both the *likelihood* (probability) of tree or tree part(s) failure and impact on a target(s) and the severity of consequences of the impact on the target(s).

USEFUL LIFE EXPECTANCY (ULE) In a planning context, the time a tree can expect to be usefully retained is the most important long-term consideration. ULE i.e. a system designed to classify trees into a number of categories so that information regarding tree retention can be concisely communicated in a non-technical manner. ULE categories are easily verifiable by experienced personnel without great disparity. A tree's ULE category is the life expectancy of the tree modified first by its age, health, condition, safety and location (to give the life expectancy); then by economics (i.e. cost of maintenance - retaining trees at an excessive management cost is not normally acceptable); and finally, effects on better trees, and sustained amenity (i.e. establishing a range of age classes in a local population). ULE assessments are not static but may be modified as dictated by changes in tree health and environment. Trees with a short ULE may at present be making a contribution to the landscape, but their value to the local amenity will decrease rapidly towards the end of this period, prior to them being removed for safety or aesthetic reasons. For details of ULE categories see Appendix B, modified from Barrell 2001.

Vigour (syn. health) refers to the tree's health as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion, and the degree of dieback.

Woody roots usually used in reference to the first order roots i.e. structural (anchor) roots and woody lateral roots within the Structural Root Zone. Damage, disturbance to, or severing of these roots can compromise the stability of the tree.

APPENDIX B

TREE RETENTION VALUE ASSESSMENT

APPENDIX B—TREE RETENTION VALUE ASSESSMENT

Part 1 of 3—Useful Life Expectancy (ULE)

In a planning context, the time a tree can expect to be usefully retained is the most important long-term consideration. ULE i.e. a system designed to classify trees into a number of categories so that information regarding tree retention can be concisely communicated in a non-technical manner. ULE categories are easily verifiable by experienced personnel without great disparity.
A tree's ULE category is the life expectancy of the tree modified first by its age, health, condition, safety and location (to give the life expectancy); then by economics (i.e. cost of maintenance - retaining trees at an excessive management cost is not normally acceptable); and finally, effects on better trees, and sustained amenity (i.e. establishing a range of age classes in a local population).
ULE assessments are not static but may be modified as dictated by changes in tree health and environment. Trees with a short ULE may at present be making a contribution to the landscape, but their value to the local amenity will decrease rapidly towards the end of this period, prior to them being removed for safety or aesthetic reasons.

ULE categories (modified from Barrell 2001) 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

Part 2 of 3—IACA Significance of a Tree, Assessment Rating System (STARS)©

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.
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.

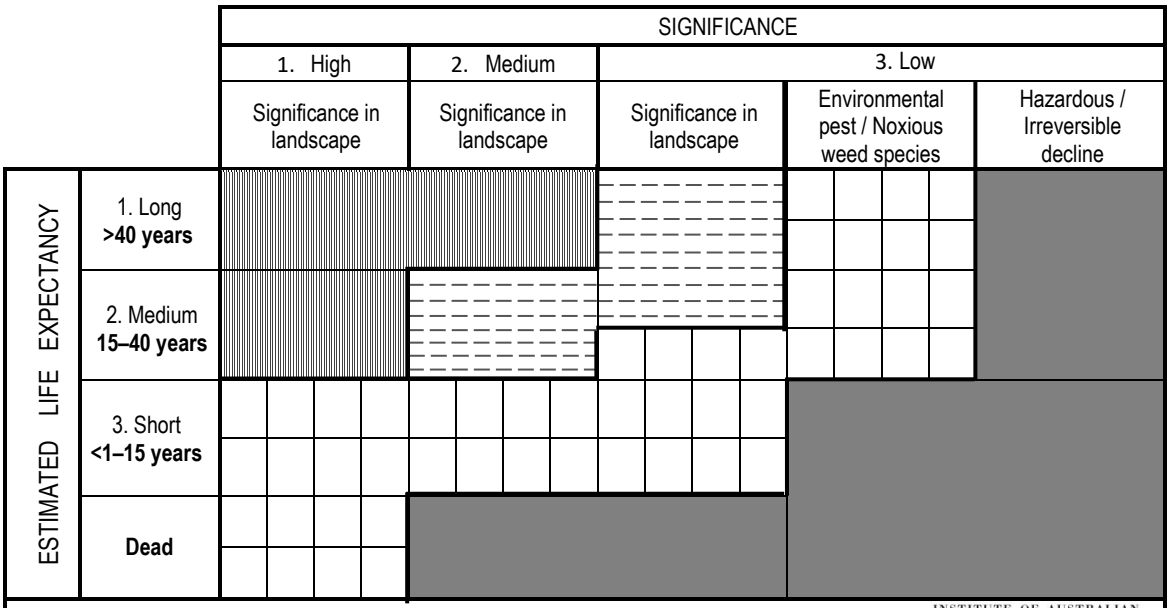
Tree Significance - Assessment Criteria

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 a form typical or atypical for the species
The tree is a planted locally indigenous or a common species with its taxa commonly planted in the 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 and/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 a form atypical for 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.

The assessment criteria are for individual trees only, however, 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 Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd and Andrew Morton in June 2001.

Part 3 of 3—Tree Retention Value Priority Matrix



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 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.
	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.

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

APPENDIX C

PHOTOGRAPHS

Plate 1
View of Tree 1 looking NNE from Whale Beach Road.

Plate 2
View of Tree 2 and 3 – 26 looking east from Whale Beach Road.

Plate 3
Raised garden bed adjacent to Tree 4. Although not particularly clear in this image, the tree's crown grows substantially over the site and is currently laden with maturing and opening seed pods releasing thousands of irritant hairs. (Looking SE from site).
A stem of Tree 5 (Giant White Bird of Paradise) is also visible and growing through the crown of T4.

Plate 4
Three woody roots apparent at 700mm below grade, adjacent to Tree 4 (Looking east along approximate boundary alignment).

Plate 5
Looking west to Tree 4, from The Strand.
The straight yellow line depicts the approximate boundary alignment in this area.
The curved line illustrates the removal of branches and foliage from the south of the tree to keep its crown away from the dwelling.
Most of the pruning is confined to the interior of the crown area, so it is not readily observable in this image, or from where it was taken
The removal of the tree parts is more obvious when directly under, or near the tree.

Plate 6
View of Tree 6, looking SSE from Whale Beach Road.

Plate 7
View of Trees 7 and 8, looking west from The Strand. The crown of Tree 8 extends over the proposed driveway area and may require pruning or removal and replacement.

APPENDIX D

TREE PROTECTION DEVICES

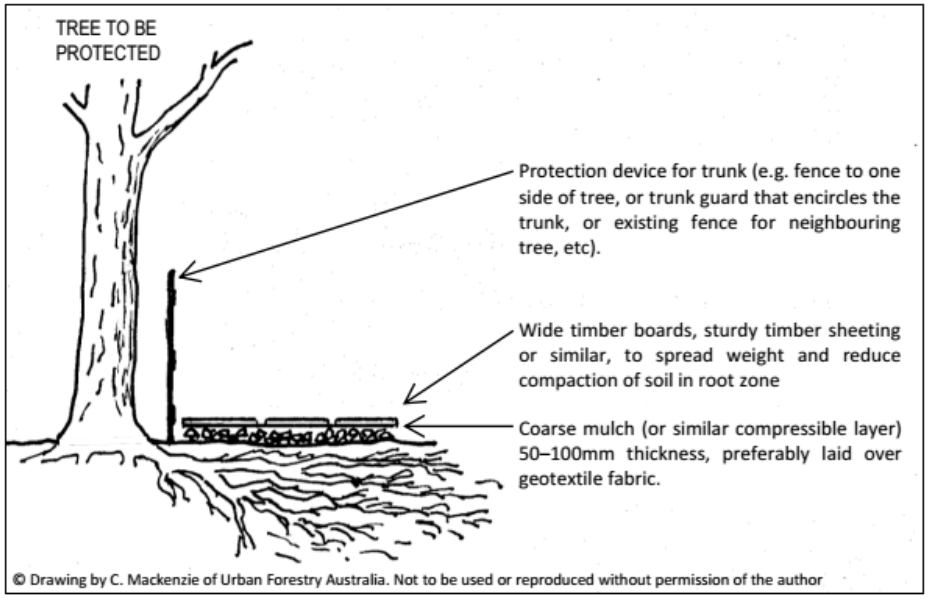


Figure 1
A method of reducing risk of root damage and soil compaction within the tree's Structural Root Zone.

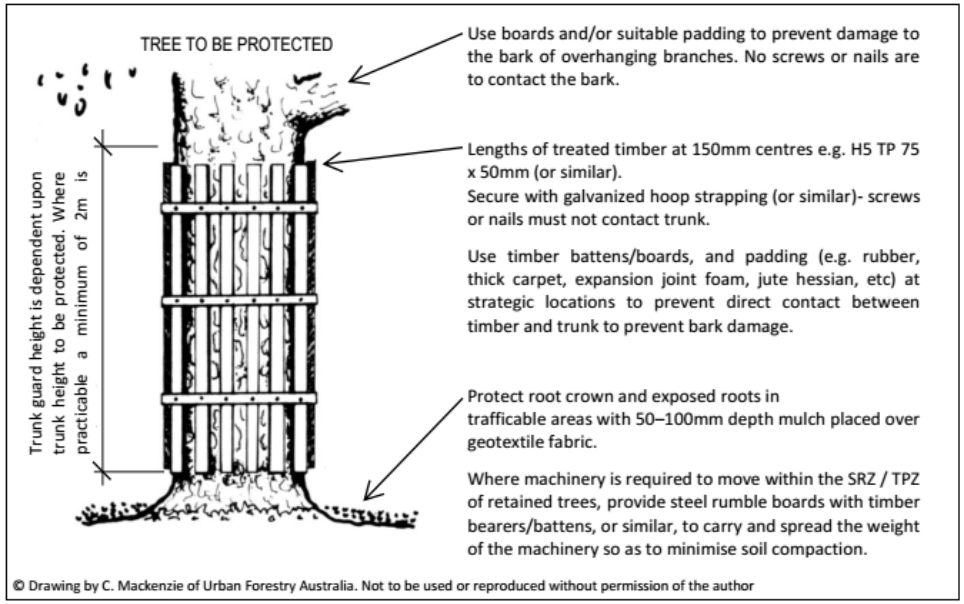


Figure 2
Example of tree trunk and tree branch protection.

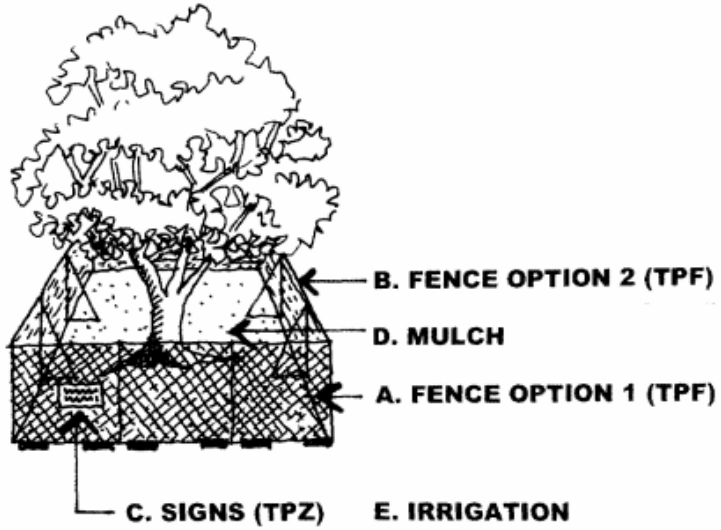
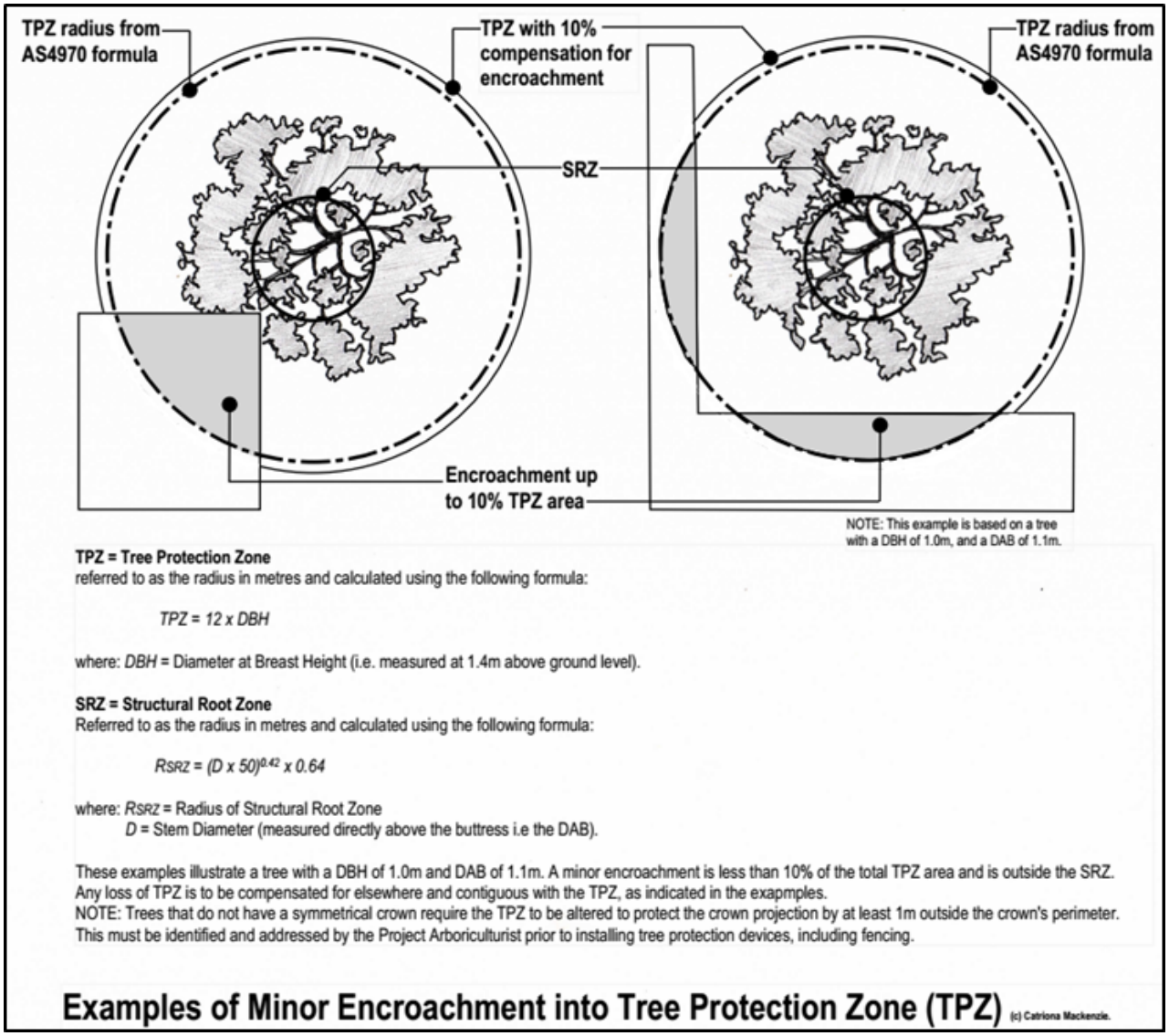


Figure 3
TREE PROTECTIVE FENCING (TPF)
A. Fence Option 1 (TPF)
1.8 metre high chain wire mesh panels with shade cloth attached if required, to be held in place with concrete blocks.
B. Fence Option 2 (TPF)
1.8 metre high plywood or wooden panel/paling fence (prevents soil or building contaminants from coming under fence when panels are laid flush to ground).
C. Signs (TPZ)
Tree Protection Zone Signs
D. Mulch
50mm to 100mm thick layer of organic mulch, or aggregate, installed across surface area of TPZ.
E. Irrigation
Irrigation to arborist's advice.
© Drawing by Selena Hannan. Used with permission.

TREE PROTECTION ZONE SIGNAGE

Size: Approximate dimensions 225 x 300mm.
Material: Polypropylene or colourbond steel.



Include the Project Arboriculturist's details in the 'Contact' panel.

APPENDIX E

SCHEDULE OF ASSESSED TREES

Schedule of Assessed Trees—231 Whale Beach Road, Whale Beach. 28 April, 2020

Tree No.	*Genus & species* **Common Name**	Ht (m)	Sp (m)	DBH (mm)	Age	V	C	Comments	ULE	TSR	RV	SRZ (m)	TPZ (m)	TPZ (m^2)
1	*Ficus benjamina* **Weeping Fig**	8	14.5	575	EM	G	F	Introduced exotic species. Street tree. Species considered undesirable in Pittwater/Northern Beaches LGA due to species characteristics (vigorous roots) and included in Council's Exempt Species List at B4.22 of PDCP. Root mass over existing structures, past root confinement.	2B	M	L	2.8	6.9	150.0
2	*Melaleuca viminalis* **Weeping Bottlebrush**	7	9	525 DAB	M	G	F	Introduced native species. Street tree. Restricted/confined root system. Close to kerb and gutter. Basal shoots from poorly pruned limb.	2A	M	M	2.5	6.3	124.0
3	*Melaleuca viminalis* **Weeping Bottlebrush**	6	4	275 DAB	M	G	F	Introduced native species. Street tree. Restricted root zone.	2A	H	M	2.0	3.3	35.0
4	*Lagunaria patersonia* **Norfolk Island Hibiscus**	13	12 EW 7 NS	300, 400, 500 (700)	LM	G	F-P	Introduced native species. Within adjoining property. Species considered undesirable in Pittwater/Northern Beaches LGA due to species characteristics (irritant seed pods) and included in Council's Exempt Species List at B4.22 of PDCP. Highly confined root area with limited space for stable root plat – currently running in linear direction EW between site and No.229. Heavily pruned over dwelling of 229. Lopped. Decay noted in stem to E. Heavily laden with pods beginning to open, with highly irritant hairs.	4E	M	L	2.9	8.4	222.0
5	*Strelitzia nicolai* **Giant White Bird of Paradise**	12	6	*800 DGL	M	G	F	Introduced exotic species. Within adjoining property. One tall stem has collapsed to northwest onto site building and remains in contact.	2B	L	L	NA	4.0	50.20
6	*Olea europaea* subsp. *cuspidata* **African Olive**	6	8	*350 DAB	EM	G	P	Introduced exotic species. Straddles boundary at street. Species considered undesirable in Pittwater/Northern Beaches LGA due to species characteristics (invasive, out-competes native bushland) and included in Council's Exempt Species List at B4.22 of PDCP. Partial stem collapse, tension side decay.	2B	M	L	2.2	4.2	55.0
7	*Banksia integrifolia* **Coastal Banksia**	4	5.5	*250	EM	G	F-G	Locally indigenous species. Off-site tree, in front of adjoining land at No.229. Routinely topped and trimmed for views.	2A	L	M	2.0	3.0	28.0
8	*Agonis flexuosa* **Willow Myrtle**	2	6	175	SM	G	F-P	Introduced native species. Off-site tree, in front of adjoining land at No.229. Low, sprawled habit with bias to N. Basal shots.	2B	L	L	1.7	2.1	14.0

KEY

Prescribed trees to be retained	Prescribed trees proposed to be removed.	Non-prescribed trees exempt from preservation controls under GDCP
L — LOW Retention Value-These trees are not considered important for retention.	M — MEDIUM Retention Value-These trees may be retained and protected.	H — HIGH Retention Value -These trees are considered important for retention and should be retained and protected.

DETAILS FOR HEADINGS AND SYMBOLS USED IN TREE SCHEDULE

DAB—The trunk/stem diameter measured *above the buttress* (i.e. root and trunk confluence), using a diameter tape
DGL—The trunk/stem diameter measured *at ground level*, using a diameter tape.

AGL—*above* ground level.
GL—*at* ground level.

? —a tentative result due to inspection and/or assessment limitations, e.g. limited visual 'in-the-round' access to an adjoining tree, very dense vegetation obscuring tree parts or preventing visual access, a tree that requires more detailed assessment, such as an aerial inspection, decay diagnostic tests, pathology tests, etc.

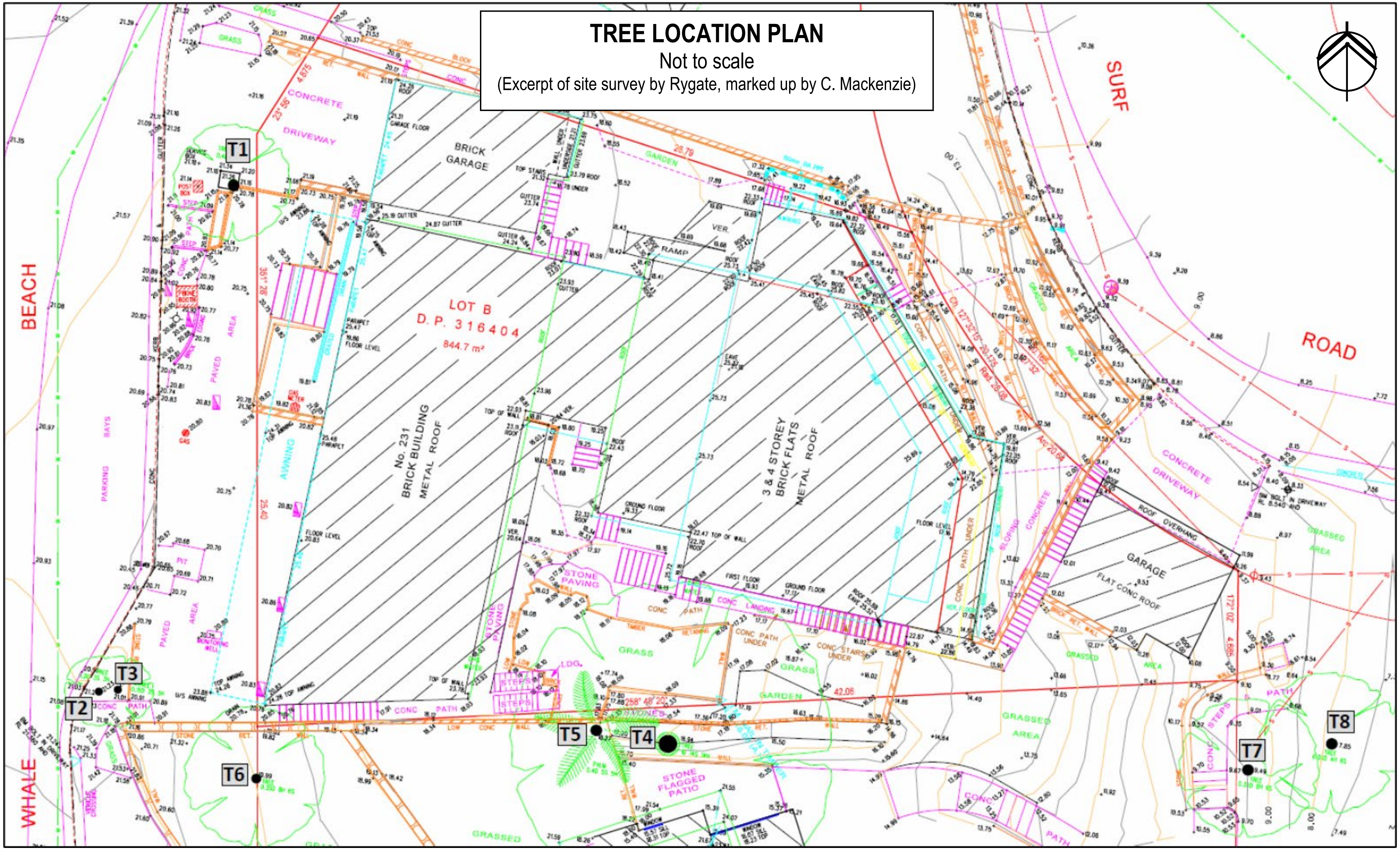
sp. indet. = species indeterminate (not determined).

Ht 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/or average diameter spread in metres of branches/canopy (the 'crown') of a tree.
DBH refers to the 'Diameter at Breast Height', being the diameter of the tree stem measured at 1.4 metres above ground (unless otherwise noted) and is expressed in millimetres.
***** Denotes those situations where the tree's DBH has been *visually* estimated (usually adjoining trees or those that are hard to access and/or physically measure).
****** Denotes when the tree's DBH is the measurement provided by the surveyors on the survey plan (usually adjoining trees where access limits visual estimation).
( ) The numerical figure in parentheses is the calculated DBH for a multiple stemmed tree, using the AS4970 formula, *or,* is the calculated DBH where the measurement cannot be made at the standard 1.4m above ground level, e.g. where the diameter of the stem is measured at ground level (DGL) or above the buttress (DAB). All calculated figures are rounded up to the nearest 25mm to determine the tree's TPZ offsets.

Age refer to Appendix A -Terms and Definitions for more detail.
V refers to the tree's vigour (health) Refer to Appendix A -Terms and Definitions for more detail.
C refers to the tree's structural condition. Refer to Appendix A -Terms and Definitions for more detail.
ULE refers to the estimated *Useful Life Expectancy* of a tree. Refer to Appendices A and B for details.
TSR The *Tree Significance Rating* considers the importance of the tree as a result of its prominence in the landscape and its amenity value, from the point of public benefit. Refer to Appendix B – 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 B – 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 A -Terms and Definitions for more detail.
NOTE: The AS4970 formula for calculating the SRZ of a tree does not apply to palms, other monocots, cycads and tree ferns.
TPZ Tree Protection Zone (TPZ) refers to the *tree protection zones* for trees to be retained. Refer to Appendix A -Terms and Definitions for more detail.
According to AS4970, the TPZ of palms, other monocots, cycads and tree ferns should not be less than 1m outside the crown projection.
TPZ area the calculated area within the TPZ radius.

APPENDIX F

TREE LOCATION PLAN


TREE LOCATION PLAN
Not to scale
(Excerpt of site survey by Rygate, marked up by C. Mackenzie)
T1
T2
T3
T4
T5
T6
T7
T8
LOT B
D. P. 316404
844.7 m²
No. 231
BRICK BUILDING
METAL ROOF
3 & 4 STOREY
BRICK FLATS
METAL ROOF
BRICK GARAGE
GARAGE
FLAT CONC ROOF
CONCRETE DRIVEWAY
WHALE
BEACH
SURF
ROAD
STONE PAVING
STONE FLAGGED PATIO
GRASS
GRASSED AREA