

12 ALEXANDRA CRESCENT, BAYVIEW, NSW



ARBORICULTURAL IMPACT ASSESSMENT

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Clients Matt and Lyndal Mannall

LGA Northern Beaches Council - Pittwater

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DISCLAIMER This report is not a hazard or risk assessment report. No aerial or below-ground investigations have been undertaken. The inspection was limited to a visual examination without any dissection, probing, root investigation or other means of investigation. Trees are living structures, are inherently unpredictable and may fail from above-ground and/or below-ground parts. Structural weaknesses may exist within roots, stems and branches. Regular inspections and monitoring are necessary to make informed assessments of trees' condition and development of any problems over time. The recommendations in this report for tree protection aim to reduce risk. However, no responsibility is accepted for damage or injury caused by the trees, nor can responsibility be accepted if the recommendations in this report are not adopted.

1 SUMMARY

This report is an assessment of eight (8) trees growing on the subject site, on a neighbours' site, and on a reserve adjacent to the site that is owned by the RTA.

The site is located at 12 Alexandra Crescent, Bayview, NSW 2104, being Lot A in DP412754 in the Northern Beaches Council - Pittwater local government area.

Development is proposed for the site, and trees over 5 metres high to the west and north of the house were assessed using Stage 1 Visual Tree Assessment methodology. There are no trees on the east side of the house near to proposed works.

The trees' retention values were determined using the STARS© methodology, and discussed in this report; the potential impact of construction on trees was assessed; and recommendations have been made for appropriate management and construction methods so as to enable their viable retention.

The process of assessment, planning and preparation of the report has been undertaken to provide information to other parties with regards tree retention or removal, so as to minimise impacts on retained trees.

1.1 Landscape Significance and Retention Values of site trees

- Three trees, Trees 3a, 3b, and 5 are rated with High Landscape Significance.
- Four trees, Trees 1, 2, 6 and 7 are rated with Medium Landscape Significance.
- One tree, Tree 4 is rated Low Landscape Significance.
- Three trees, Trees 3a, 3b, and 5 are rated with High Retention Value.
- Four trees, Trees 1, 2, 6 and 7 are rated with Medium Retention Value.
- One tree, Tree 4 is rated Low Retention Value.
- Three trees are Exempt – Trees 2, 4 and 7. Exempt trees may be removed without requiring Council permission.

1.2 Trees to be retained and removed in the proposal

- Six trees, Trees 1, 2, 3a, 3b, 5 and 6 are to be retained in the proposal.
- Tree 4 will be required to be removed due its location within the proposed building footprint. This is an exempt species.
- Tree 7 is proposed to be removed in any case, and it is an exempt species.

1.3 Proposed development and impacts on trees

- The proposed new extension (bedroom and ensuite) at the western end of the house is to be constructed on isolated piers, and is to be elevated above existing ground level. The piers are to be located where they will not damage tree roots excessively. Piers must be as few in number as possible, and potentially be able to be relocated if significantly large roots are found.

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- The footprint of the western extension encroaches less than 10% of the Tree Protection Zone (TPZ) areas of Trees 1, 3a and 3b, however if roots over 50mm diameter of any of these trees are found in the location of proposed piers, an arborist shall be required to prune such roots by hand. Roots should not be torn or removed with an excavator or otherwise damaged within the TPZ of ANY retained trees.
- The concept allows natural overland water flow to be altered as little as possible.
- There are no trees within the vicinity of the proposed bedroom extension at the eastern end of the house.
- The proposed new building extensions will have little or no impact on trees to be retained, assuming that standard Tree Protection measures are adopted for works in the vicinity of retained trees.
- There are works proposed within the TPZ of trees with Medium and High Retention Value, Trees 1, 3a and 3b, and Tree Protection Fencing (exclusion fencing) should be installed and maintained for the duration of the building works, so as to protect the roots of trees.
- No trenching for services or other excavation, piers or footings, and/or additional structures below ground, shall be approved in the TPZ areas of any site trees unless it can be proven that the impact on roots is negligible. This may necessitate hand digging and non-damaging, below-ground root investigation prior to design or installation of services/structures to determine the potential impact on the tree and may not be possible – the viability and stability of a retained tree will depend on the size, number and location of roots that may be required to be severed.
- Minor canopy pruning may be required, less than 10% of canopy is allowable. The pruning shall be undertaken according to Australian Pruning Standards by experienced, qualified arborists.
- Planting of new trees, shrubs and groundcovers within the TPZs of retained trees shall be with tube-stock only.

1.4 Tree protection and specification

Tree Protection Fencing to be erected, to exclude construction workers, storage of materials etc from the TPZ of all trees to be retained to a practical extent. Refer to the Tree Protection Plan and Specification in Section 8 for further direction.

2 INTRODUCTION

2.1 Reason for the report

This report has been commissioned by site owners Matt and Laurel Mannall for a Development Application to Northern Beaches Council - Pittwater for proposed alterations and additions to an existing house.

The report is a combined Preliminary Tree Assessment and Arboricultural Impact Assessment and includes a Tree Protection Plan and Specification.

2.2 Aims of the report

The aims of this report are to:

- Provide relevant information to the clients, architect and Northern Beaches Council - Pittwater regarding trees located in areas of the site and/or on properties adjacent to the site, in proximity to proposed development.
- Assess the dimensions, health, condition and other characteristics of subject trees, including any obvious defective structures.
- From the collected data, determine retention values, useful life expectancies, and the contribution to the site in terms of significance and amenity, of subject trees.
- Provide planning and design options to prevent unnecessary removal of trees and to minimise impacts on retained trees.
- Comply with the requirements of *Australian Standard AS 4970 -2009 Protection of Trees on Development Sites*.
- Comply with the requirements of *Australian Standard AS 4373 – 2007 Pruning of Amenity Trees*.
- Review development plans and the impact on trees to be retained. Architectural plans have been designed so as to retain in the proposed development the greatest number of trees with most significance.
- Describe the subject trees that are proposed to be retained and protected, and trees proposed to be removed, based on the plans for proposed development.
- Describe the location of tree protection measures to be installed. These are detailed in Section 7 of this report, the Tree Protection Plan and Specification.

2.3 The proposed works

Proposed building works in the vicinity of trees include:

- Extension to an existing house, being two bedrooms, at eastern and western ends of the house.

2.4 Qualifications of consulting arborist, author of report

The author of this report has arboricultural AQF Level 5 qualification as required by council.

2.5 The site, and relevant development controls

The site is located at 12 Alexandra Crescent, Bayview, NSW 2104, being Lot A in DP412754 in the Northern Beaches Council - Pittwater local government area.

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Development controls contained within the Pittwater Local Environmental Plan 2014 (PLEP 2014) and Pittwater 21 Development Control Plan 2014 (P21 DCP) were referred to in the preparation of this report, in particular the provisions of PDCP, B4.22 Preservation of Trees or Bushland Vegetation and B4.7 Pittwater and Wagstaffe Spotted Gum Forest – Endangered Ecological Community.

- Council's Exempt Tree Species List was referred to.
- Trees within 5 metres of proposed building works were assessed.
- Tree species of the Pittwater and Wagstaffe Spotted Gum Forest plant community are located within close proximity of the property.
- Pittwater and Wagstaffe Spotted Gum Forest is listed in the Biodiversity Conservation Act 2016 No.63, Schedule 2 Threatened Ecological Communities, Part 2 Endangered Ecological Communities.

2.6 Site location and description

The site sits in a valley with a generally northern aspect. The land slopes moderately down from south to north, and from west to east, with vehicle access from Vista Avenue. An adjacent reserve is located on RTA-owned land (part of Alexandra Crescent). The reserve contains many indigenous canopy trees.

The site contains a two storey weatherboard house, driveway and carport.

The site supports a number of mature trees, lawn and shrub plantings in a residential-style garden.

The area is described on the Tree Location Plan TLP 01 (Appendix D) of this report, based on the site survey.



Figure 1: Aerial view of the site, yellow area (image from Six Maps).

2.7 Wind and aspect

The site is generally protected from most winds due to its location in the valley.

3 METHOD

3.1 Trees on development sites

This report refers to the Australian Standard *Protection of Trees on Development Sites AS4970-2009* for guidance on the principles for protecting trees on land subject to development.

3.2 Visual Tree Assessment (VTA)

Site inspection on 16 April 2019 was undertaken to assess trees from ground level only. No aerial inspections were made.

A Stage 1 Visual Tree Assessment (VTA) of the biological and mechanical characteristics of the tree was undertaken (Mattheck, Bethge and Weber 2015). The VTA results are included in Appendix A – Tree Assessment Schedule.

Observations from ground level included, but were not limited to:

- Species identification and tree characteristics.
- Dimensions - height estimated by eye, canopy spread with tape measure,
- Diameter of the stem at breast height of 1.4 metres above ground level at the base of tree (DBH), and diameter of the stem at the base, above the root flare, (DAB) were determined by measuring the circumference with tape at these points, then by calculation.
- Canopy health and condition - foliage density, size and colour; location, size and quantity of dieback; deadwood; epicormic growth; and signs of stress.
- Branches - signs of structural defects, insect and animal activity, and disease. Previous pruning was noted.
- Stem - the base of the stem and root crown area was inspected for signs of cavities, wounds, decay, basal flare, degree of lean, soil upheaval, root damage, surface roots and structural defects.
- Photographs were taken.

3.3 Soils

Soil profile investigation and testing were not undertaken.

3.4 Other site observations

- Proximity of trees to buildings and structures.
- Aspect and protection/exposure to prevailing winds.
- Overland flow path of water.
- Species, dimensions and location of other trees and vegetation in the trees' proximity.
- Signs of erosion, recent excavation, construction works, and level changes.
- Site usage by people and vehicles.

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3.5 Summary of assessment methodologies

Type of assessment	Description	Source	Appendix/Location
VTA	Visual Tree Assessment (VTA) of the biological and mechanical characteristics of trees was undertaken (Mattheck, Bethge and Weber)	Mattheck, Bethge and Weber (2015)	Appendix A
ULE	Useful Life Expectancy (ULE) categories (updated 01/04/01)	Barrell, Jeremy (2001)	Appendix B
Landscape Significance LS	IACA Significance of a Tree, Assessment Rating System (STARS) © based on tree condition and form; heritage, ecological and amenity values; was applied according to the assessment criteria.	IACA Significance of a Tree, Assessment Rating System (STARS)© Institute of Australian Consulting Arborists (IACA 2010)©	Appendix C
Retention Value RV	IACA Significance of a Tree, Assessment Rating System (STARS)© Table 1.0 Tree Retention Value – Priority Matrix combines the Landscape Significance rating with Estimated Life Expectancy (ULE), to determine Retention Value (RV).	IACA Significance of a Tree, Assessment Rating System (STARS)© Institute of Australian Consulting Arborists (IACA 2010)©	Appendix C
TPZ	Tree Protection Zones were calculated from the DBH of trees, where relevant	AS4970-2009	Appendix A
SRZ	Structural Root Zones were calculated from the DAB of trees where relevant.	AS4970-2009	Appendix A

3.6 Plans and diagrams

Assessed trees are shown and numbered on Tree Location Plan TLP-01 (Appendix D), prepared by the author, from measurements and observations taken.

The following plans and drawings were relied upon for this arboricultural assessment.

Author	Title	Reference	Date	Drawing Number and Version
Byrne & Associates	Level and Detail Survey	9712 D	14.9.2004	
Greg Nicol	Proposed Upper Floor Plan	2913	Feb 2019	SK1D

4 RESULTS AND OBSERVATIONS

4.1 Visual Tree Assessment (VTA)

Detailed results are listed in Tree Assessment Schedule (Appendix A).

4.2 Tree Significance Schedule

The following is a summary of assessed and determined values, as per the methodology outlined in 3.5.

Tree No.	Species Name	Common Name	ULE	Landscape Significance (LS)	Retention Value (RV)	TPZ (m)	SRZ (m)
1	*Araucaria heterophylla	Norfolk Island Pine	2B	M	M	9.1	3.2
2	Howea forsterana	Kentia Palm	2A	M	M,E	3.5	-
3a	* Syncarpia glomulifera	Turpentine	2B	H	H	6	2.7
3b	* Syncarpia glomulifera	Turpentine	2B	H	H	3.6	2.5
4	Archontophoenix cunninghamiana	Bangalow Palm	2A	L	L,E	-	-
5	Livistona australis	Cabbage Tree Palm	1A	H	H	4	2
6	Araucaria heterophylla	Norfolk Island Pine	2B	M	M	6.6	2.9
7	Brachychiton acerifolius	Illawarra Flame Tree	2A	M	M,E	-	-

KEY

* Tree located on neighbouring property / property owned by others.

? Further investigation recommended, or difficult to inspect, therefore difficult to assign value at this stage.

H High Retention Value M Medium Retention Value L Low Retention Value R Removal recommended E Exempt

TPZ Tree Protection Zone and SRZ Structural Root Zone, radial distances in metre from tree centre, included where relevant.

4.3 Exempt or weed species

Three assessed trees and palms are categorised as 'exempt' species.

4.4 Tree Protection Zones (TPZ) and Structural Root Zones (SRZ)

TPZ and SRZ of trees in proximity to proposed development, from calculated values in Tree Assessment Schedule (Appendix A).

5 DISCUSSION

5.1 Age and general description of trees

The trees within and adjacent to the site are locally remnant trees and planted trees. The original house was built 50 - 60 years ago and the trees on site would have been planted around this time (Norfolk Island Pines and Illawarra Flame Tree). The Cabbage Tree Palm and Turpentines would be remnant or self-seeded.

5.2 Tree 1 *Araucaria heterophylla* (Norfolk Island Pine)



Figure 2: *Araucaria heterophylla*, Tree 1, centre. Located on or close to the northern boundary, within neighbouring property to the north. Note reduced foliage density in lower canopy, but typical foliage density in upper canopy. This has an impact on reducing the sun available to the house due to the trees' location to the northwest of the house. This tree is currently considered to be of Medium Retention Value and is located where it can be retained with negligible impact into its TPZ, <10% TPZ area encroachment.

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5.3 Tree 3a and Tree 3b *Syncarpia glomulifera* (Turpentine)



Figure 3: Two *Syncarpia glomulifera*, Trees 3a (left arrow) and 3b (right arrow). Located within RTA-owned reserve. These trees are of High Retention Value. These trees are retainable and are located where they can be retained with negligible impact into the TPZ, <10% TPZ area encroachment. Deadwood should be removed.

5.4 Landscape Significance ratings (LS) and Retention Values (RV) of trees

Refer to summary in [Table 4.3 Tree Significance Schedule](#).

- Three trees, Trees 3a, 3b, and 5 are rated with [High Landscape Significance](#).
- Four trees, Trees 1, 2, 6 and 7 are rated with [Medium Landscape Significance](#).
- One tree, Tree 4 is rated [Low Landscape Significance](#).
- Three trees, Trees 3a, 3b, and 5 are rated with [High Retention Value](#).
- Four trees, Trees 1, 2, 6 and 7 are rated with [Medium Retention Value](#).
- One tree, Tree 4 is rated [Low Retention Value](#).
- Three trees are [Exempt](#) – Trees 2, 4 and 7. [Exempt](#) trees may be removed without requiring Council permission.
- Trees assigned [High Retention Value](#) are recommended to be retained as a priority. This may require design, placement of buildings and infrastructure so as to minimise any adverse impact with respect to the Tree Protection Zones. The extent of the canopy with regards to proposed development building height must be considered in site and building design and placement, and significant pruning of canopy or roots of these trees is not generally acceptable.
- Trees with [Medium Retention Value](#) may be retained and protected, however are considered to be less critical for retention. Their retention should remain a priority, however, and removal considered only if all planning and design options for building and other structures have been considered.
- Trees with [Low Retention Value](#) are not considered to be important for retention, and do not require special planning considerations to be implemented to enable their retention.

5.5 Tree Protection Zone (TPZ) and Structural Root Zone (SRZ)

[Table 4.2 Tree Significance Schedule](#) lists the calculated TPZ and SRZ for relevant trees (ie. where works are proposed within the TPZ of retained trees).

The [Tree Location Plan TLP-01 \(Appendix D\)](#) shows the location and numbering for all assessed trees.

[Proposed Works Plan PWP-01 \(Appendix E\)](#) shows the TPZs and SRZs of trees to be retained in the proposal where relevant.

Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) are a radial distance measured from the centre of the trees, based on calculations determined from Australian Standard *Protection of trees on development sites 4970-2009*.

The TPZ defines an area within which construction of buildings and other structures, trenching, soil level changes, use of machinery, storage of site materials, at minimum, should be excluded. The TPZ is the theoretical minimum area which is required for maintaining a viable tree.

The SRZ defines an area within which no excavation or construction should encroach. The SRZ is the area in which roots required for stability are typically found. If an encroachment is considered into the SRZ then this must be proven to be of no impact to the structural roots, by preliminary root mapping.

Some encroachment into the TPZ may be possible depending on site conditions and tree location, species, age, vigour, condition and canopy spread, presence of existing structures (or other trees) that may be limiting or affecting root growth.

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A 10% encroachment into the TPZ may be considered to be allowable provided that there is compensatory area contiguous to the TPZ - this may be advised on a site- and tree-specific basis.

Encroachments over 10% into the TPZ, if contemplated, may require preliminary root mapping to determine the potential impact on the tree and may not be possible – the viability and stability of a retained tree will depend on the size, number and location of roots that may be required to be severed in the proposal.

5.6 Clause 3.3.4 of AS4970

Clause 3.3.4 from the *Australian Standard for Protection of trees on development sites AS4970 2009* describes considerations that may be taken into account when determining encroachments into the TPZ:

- Species' tolerance to root disturbance,
- Age and vigour of tree,
- The presence of existing or past structures or obstacles which may affect root growth,
- Adoption of tree-sensitive construction methods such as pier and beam, suspended slabs, discontinuous footings that would minimise impact on root systems.

A major encroachment is considered to be between 15 – 35% of the TPZ (root zone) impacted. Tree sensitive design must be adopted if a major encroachment into a TPZ is contemplated.

A marginal encroachment of between 10-15% without undertaking root mapping may be considered to be acceptable, but will be dependent upon a tree's vigour etc and tolerance to root disturbance.

6 PROPOSED DEVELOPMENT AND IMPACTS ON TREES

6.1 Trees to be retained and removed

- Trees 1, 2, 3a, 3b, 5 and 6 are to be retained in the proposal.
- Tree 4 will be required to be removed due its location within the proposed building footprint. This is an exempt species.
- Tree 7 is proposed to be removed in any case, and it is an exempt species.

6.2 Proposed development

- The proposed new extension (bedroom and ensuite) at the western end of the house is to be constructed on isolated piers, and is to be elevated above existing ground level.
- **The footprint of the western extension encroaches less than 10% of the Tree Protection Zone (TPZ) areas of Trees 1, 3a and 3b, however if roots over 50mm diameter of any of these trees are found in the location of proposed piers, an arborist shall be required to prune such roots by hand. Roots should not be torn or removed with an excavator or otherwise damaged within the TPZ.**
- The concept allows natural overland water flow to be altered as little as possible.
- There are no trees within the vicinity of the proposed bedroom extension at the eastern end.
- Minor canopy pruning may be required to clear the proposed extension.

7 CONCLUSIONS AND RECOMMENDATIONS

7.1 Site trees and recommended development

- The proposed new building extensions will have little or no impact on trees to be retained, assuming that standard Tree Protection measures are adopted for works in the vicinity of retained trees.
- There are works proposed within the TPZ of trees with Medium and High Retention Value, Trees 1, 3a and 3b, and Tree Protection Fencing (exclusion fencing) should be installed and maintained for the duration of the building works, so as to protect the roots of trees.
- The existing situation of natural overland water flow and air availability to roots of retained trees is to be altered as little as possible. The importance of this must be explained to, and understood by, architects, drainage and structural engineers, and site workers.
- The building extension to the east is to be elevated on isolated piers. The piers are to be located where they will not damage tree roots excessively. Piers must be as few in number as possible, and potentially able to be relocated if significantly large roots are found.
- Planting of new trees, shrubs and groundcovers within the TPZs of retained trees shall be with tube-stock only.
- No trenching for services or other excavation, piers or footings, and/or additional structures below ground, shall be approved in the TPZ areas of any site trees unless it can be proven that the impact on roots is negligible. This may necessitate hand digging and non-damaging, below-ground root investigation prior to design or installation of services/structures to determine the potential impact on the tree and may not be possible – the viability and stability of a retained tree will depend on the size, number and location of roots that may be required to be severed.
- Minor canopy pruning may be required, less than 10% of canopy is allowable. The pruning shall be undertaken according to Australian Pruning Standards by experienced, qualified arborists.

7.2 Tree protection and specification

Tree Protection Fencing to be erected, to exclude construction workers, storage of materials etc from the TPZ of all trees to be retained to a practical extent. Refer to the Tree Protection Plan and Specification in Section 8 for further direction.

7.3 Pruning

Any pruning that is required shall be carried out as per the requirements of *Standards Australia 2007, Pruning of Amenity Trees, AS 4373-2007*.

7.4 Monitoring

All retained site trees should be monitored regularly (annually or bi-annually) by an experienced, qualified arborist to note any change in their vigour and development of defects.

8 TREE PROTECTION PLAN AND SPECIFICATION

8.1 Introduction

This section provides general **Tree Protection Plan and Specification** measures for tree protection works to be implemented at the proposed development, as described in the **Arboricultural Impact Assessment**.

Previous sections of the **Arboricultural Impact Assessment** examined the impact on trees to be retained and removed, and made recommendations as to how the site may be managed in order to minimise negative impacts by construction on trees to be retained.

This stage in planning, the **Tree Protection Plan and Specification**, provides specifications for the required Tree Protection measures to be implemented, as recommended in the **Arboricultural Impact Assessment**.

All works are to comply with the requirements of *Australian Standard Protection of Trees on Development Sites AS 4970-2009*.

8.2 Aims

The aims of this Tree Protection Plan and Specification are to:

- identify the responsibilities of the project arborist for site developers and managers, and to
- recommend general tree protection works required to protect trees retained on the proposed development site.

8.3 The role of the project arborist

An AQF5-qualified consulting arborist (hereafter referred to as 'the project arborist') may be required by certifying authorities to:

- inspect and assess and supervise works within the TPZ of trees,
- specify and supervise any pruning works,
- specify and monitor compliance of tree protection measures,
- specify and certify remediation works, and to
- provide written statement of compliance at specific milestones in accordance with AS4970- 2009.

8.4 Scope of works for the project arborist

PRE-CONSTRUCTION

The project arborist is to:

- Mark trees for pruning, retention, removal or transplanting, with reference to approved plans and documentation.
- Specify all pruning works.
- Certify all pruning, removal and transplanting on completion of these works.
- Tree Protection: the Project arborist shall certify that all tree protection measures have been installed in compliance with the Tree Protection Plan and Specification.

THROUGHOUT THE CONSTRUCTION PROCESS.

The project arborist may be required to provide reports and/or certification to Council at the following specific hold-points/milestones:

- Completion of site establishment.
- Installation of services.

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- Installation of footings or slabs.
- Erection of scaffolding, if required, near trees.
- Works within Tree Protection Zones.

POST- CONSTRUCTION CERTIFICATION

At completion of the defects liability period, the project arborist may be required to certify that all tree protection measures throughout the construction and landscaping works have complied with all plans, specifications, and reports prepared by the project arborist and with the Conditions as specified in Development Application approval/Notification of Determination Conditions of Consent.

8.5 Tree Protection Plans and Details

- Erection of Tree Protection Fencing to enclose a practical TPZ exclusion area for trees prior to any works on the site.
- Work in the vicinity of the retained trees will require additional care and supervision by project arborist so as not to damage the roots within the TPZ during demolition and excavation.
- Sediment control devices may be required to be installed within the on the line of the Tree Protection Fencing, to prevent runoff of construction pollutants or other sediment onto site vegetation.

8.6 Refer to Tree Location Plan TLP-01 (Appendix D) for:

- location of assessed trees, tree numbers, spot levels at the base of trees.

8.7 Refer to Proposed Works Plan – PWP-01 (Appendix E) for:

- location of trees to be retained and protected,
- location and levels of proposed works,
- SRZ and TPZ of retained trees.

8.8 Pre-construction scope of works

- Prior to any construction works, the project arborist is to:
- Mark trees for pruning, retention, removal or transplanting, with reference to approved plans and documentation.
- Specify (and supervise, if required) pruning works.
- Certify all pruning and tree removal on completion of these works.
- Supervise installation of tree protection measures, and certify that all tree protection measures have been installed in compliance with the Tree Protection Plan and Specification.

PRUNING AND TREE REMOVAL

- Approved tree removal and pruning works are to be carried out before the installation of TPF and other protection measures such as may be required when scaffolding is to be installed within the TPZ.
- The project arborist shall mark trees for pruning, retention, removal or transplanting, with reference to approved plans and documentation.
- The project arborist shall supervise any pruning required and tree removal works.
- Pruning works are to be carried out as per AS4373-2007.
- Tree removal work shall not damage trees to be retained.
- Vehicles used for tree removal works may require limited movement within TPZs. The arborist is to supervise.

Arboricultural Impact Assessment

- Stumps to be removed within a TPZ must be removed so as to not damage or disturb roots of trees to be retained. The arborist is to supervise.

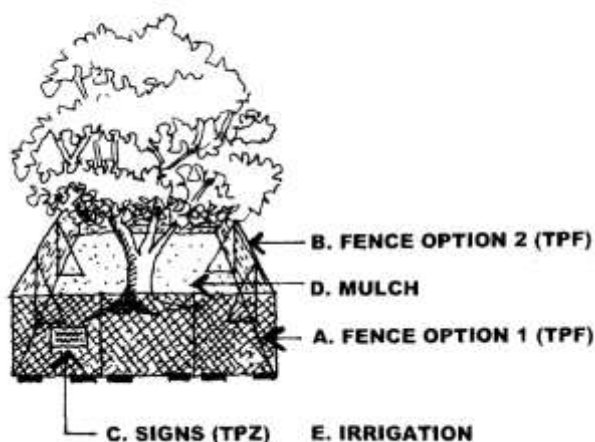
INSTALLATION OF TREE PROTECTION FENCING

- Refer to Diagrams 1 to 3 for types of fencing, and additional ground protection measures if required.
- The TPZ is a restricted area and TPF is to be installed prior to site establishment.
- The TPF is to be retained intact until works are completed.
- Permission for works within the TPZ must be sought and approved by Northern Beaches/Pittwater Council.
- These works are to be supervised by the project arborist, and any additional works that may arise during the progress of site works must be reviewed by the project arborist and be acceptable to Council before the works are carried out.
Failure to do this proactively may result in the arborist being unable to certify the works.

ACTIVITIES THAT ARE RESTRICTED FROM WITHIN THE TPZ (AS PER AS4970-2009)

- Machine excavation including trenching
- Excavation for silt fencing
- Cultivation
- Storage
- Preparation of chemicals, including preparation of cement products
- Parking of vehicles and plant
- Re-fueling
- Dumping of waste
- Wash-down and cleaning of equipment
- Lighting of fires
- Soil level changes
- Temporary or permanent installation of utilities and signs, and
- Physical damage to the tree.

Diagram 1 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.

Arboricultural Impact Assessment

TREE PROTECTION MEASURES TO BE INSTALLED WHEN TPF REQUIRED TEMPORARY REMOVAL, OR WHEN FENCING MUST BE LOCATED WITHIN THE TPZ – TRUNK AND BRANCH PROTECTION

The materials and positioning of protection as shown in [Diagrams 2 and 3](#) are to be specified by the project arborist on site. A minimum of 2 metres in height is recommended. Temporary powerlines, guys and stays are not to be attached to the tree. Nails are not to be driven into the trunks or branches.

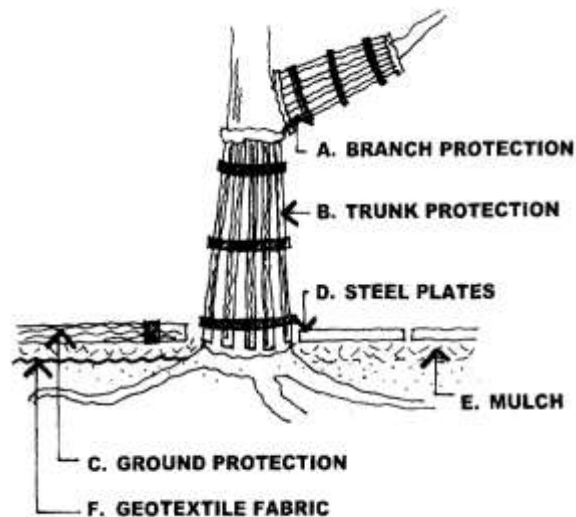


Diagram 2 TYPES OF BRANCH, TRUNK AND GROUND PROTECTION

A. Branch Protection

Prevent bark damage by use of timber boards and padding strapped to branch. (Do not use nails or screws).

B. Trunk Protection

Prevent bark damage by use of timber boards and padding for at least 2 metres above ground level. (Do not use nails or screws). Also refer to Detail Diagram 3.

C. Ground Protection

Install a suitable device eg timber rumble boards strapped together, above mulch or aggregate. The device shall be thick enough to prevent soil compaction and also to prevent compression or damage to roots.

D. Steel Plates

Steel plates (or similar, as approved by arborist) may be laid with, or without, mulch or aggregate under.

E. Mulch

Minimum 50mm thick, maximum 100mm thick, organic mulch or aggregate.

F. Geotextile fabric

Geotextile fabric laid under mulch or aggregate layer.

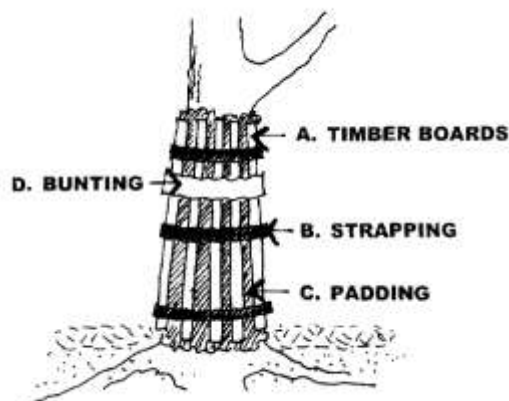


Diagram 3 DETAIL TRUNK PROTECTION

A. TIMBER BOARDS

Pine timber 3 metres x 50mm x 50mm at 150mm centres.

B. STRAPPING

Secure timber at no less than 3 locations with galvanised hoop strapping (or similar). Do not use nails or screws.

C. PADDING

Insert expansion joint padding at minimum of three points to prevent timber from touching trunk.

D. BUNTING

Secure high visibility bunting at around 2 metres above ground level for visual reinforcement.

8.9 Scope of works for tree protection during construction

GENERAL

During construction the following situations will require the arborist's input and on-site supervision. (These may be in addition to the predetermined number of site inspections that shall be agreed upon).

Arboricultural Impact Assessment

- Demolition, bulk earthworks, installation of sediment control works and drainage works near the TPZ.
- Installation of services, footings and slabs near the TPZ.
- Temporary construction work required within TPZs – ground protection, scaffolding (erection and moving).
- Hand excavation of roots at perimeter of TPZs.
- Changes arising from building works that are different to approved plans.
- Landscaping, including installation of landscape structures such as paths, walls, soil topdressing and cultivation, planting, lighting and irrigation.

GROUND PROTECTION

If temporary access for machinery is required into the TPZ, additional ground protection measures will be required (ie. in addition to mulching). Refer to [Diagram 2](#). This is to prevent root damage and soil compaction within the TPZ.

HAND EXCAVATION AND ROOT PROTECTION DURING EXCAVATION

Proposed works where inside Tree Protection Zones, must have minimal impact on root systems. Without prior investigation it is unknown if any large diameter roots are present.

Wounds shall not be treated with dressings or with paints.

Temporary protection of exposed roots may be required, to prevent drying out, by use of jute mesh or hessian sheeting laid in multiple layers over the exposed roots and soil profile, to the full depth of the root zone. This is to be pegged in place and kept moist for the duration of root zone exposure.

INSTALLING UNDERGROUND SERVICES WITHIN THE TPZ

Proposed works have been designed to reduce impacts on root systems. However without prior investigation it is unknown if any large diameter roots are present at the perimeter of, or extend past the TPZ of trees nominated for retention.

Should any large roots be found in locations where proposed services are to be laid then the work methods outlined above are to be adopted. The project arborist must be consulted.

8.10 Maintaining the TPZ

MULCHING

The area within the TPZ shall be mulched. The mulch shall be maintained to a depth of 50-100mm using material that complies with AS4454. However, the arborist may determine if mulch is required in areas where there is existing turf, gardens or mulch, and additional mulching may not be required.

WATERING

Temporary irrigation will be required in the TPZ of all site trees. This is to be maintained for the duration of construction works until final certification. The project arborist shall monitor soil water and adjust if necessary.

WEED REMOVAL

All weeds within the TPZ shall be removed by hand without soil disturbance, or shall be removed by use of species-appropriate herbicides by qualified operators.

8.11 Scope of works post-construction

REMOVAL OF TREE PROTECTION FENCING

TPF shall not be removed until all construction and landscaping works have been completed at Practical Completion.

DEFECTS LIABILITY PERIOD

Should any works be required during the defects liability period, such works shall not injure trees.

9 REFERENCES

9.1 BOOKS AND JOURNALS

Mattheck, C, Bethge, K & Weber, K 2015, *The Body Language of Trees*, Karlsruhe Institute of Technology, Karlsruhe, Germany.

Standards Australia 2009, *Protection of Trees on Development Sites*, AS 4970-2009, Standards Australia, Sydney.

Standards Australia 2007, *Pruning of Amenity Trees*, AS 4373-2007, Standards Australia, Sydney.

9.2 WEBSITES

<https://maps.six.nsw.gov.au/>

www.northernbeaches.nsw.gov.au

APPENDICES

Appendix A	Tree Assessment Schedule
Appendix B	Useful Life Expectancy (ULE) Categories
Appendix C	Methodology for Determining Tree Retention Values (STARS®)
Appendix D	Tree Location Plan – TLP-01
Appendix E	Proposed Works Plan – PWP-01

APPENDIX A TREE ASSESSMENT SCHEDULE

Site address: 12 Alexandra Crescent, Bayview, NSW

Date of assessment: 16 April 2019

Assessed by: Selena Hannan

+ All palm heights are given as height of clear trunk only, + canopy additional

Tree No.	Botanical Name Common Name	Height (m)	Canopy spread (m) N,E,S,W	DBH or multi (mm)	DAB mm	Age	Health/Vigour	Condition	Comments	ULE	LSR	RV	TPZ (m) radius	SRZ (m) radius
1	<i>Araucaria heterophylla</i> Norfolk Island Pine	25	5,5,4,4	760	950	SM	F-G	F-G	Native species, planted. Located close to boundary, in neighbouring site. Sparse lower canopy, less dense in upper canopy than typical for species, shaded out by surrounding trees. Old wounds (probable old pruning flush cuts), around 2 metres AGL on south side, calloused over and around, slight bulge due to reaction wood in wound area. Note large root flare/root heading south – uplifting concrete path, may be heading towards area for piers for proposed house.	2B	M	M	9.1	3.2
2	<i>Howea forsterana</i> Kentia Palm	10	5 total spread	150	300	M	G	G	Native palm species. Slight kink in stem, not detrimental. Species is 'exempt' in Northern Beaches LGA.	2A	M	M	3.5	-
3a	<i>Syncarpia glomulifera</i> Turpentine	18	5,6,6,3 (south tree)	500	600	SM	F	F	Local native species. Located on RTA reserve. Not shown on survey. Approx 2 metres from boundary. >10% medium to large diameter deadwood present. Minor small twig dieback. Form more open than typical of species. Recommendations Remove deadwood.	2B	H	H	6	2.7
3b	<i>Syncarpia glomulifera</i> Turpentine	18	8,3,2,3 (north tree)	300	500	SM	F	F	Local native species. Located on RTA reserve. Not shown on survey. Approx 2 metres from boundary, adjacent to Tree 3a. >10% medium to large diameter deadwood present. Minor small twig dieback. Form more open than typical of species. Poor trunk flare at base on North side.	2B	H	H	3.6	2.5

									Recommendations Remove deadwood.					
Tree No.	Botanical Name Common Name	Height (m)	Canopy spread (m) N,E,S,W	DBH or multi (mm)	DAB mm	Age	Health/Vigour	Condition	Comments	ULE	LSR	RV	TPZ (m) radius	SRZ (m) radius
4	<i>Archontophoenix cunninghamiana</i> Bangalow Palm	9	4 total	200	300	SM	G	G	Native palm species, planted. Species is 'exempt' in Northern Beaches LGA.	2A	L	L	-	-
5	<i>Livistona australis</i> Cabbage Tree Palm	8	6 total	400	500	SM	G	G	Local native palm species, PROTECTED. No obvious defects.	1A	H	H	4	2
6	<i>Araucaria heterophylla</i> Norfolk Island Pine	25	4,4,5,4	550	700	SM	G	G	Native species, planted. Large tension root towards house to south. Good vigour, with denser canopy than Tree 1. Vine starting to grow up trunk. Recommendations Remove vine. Remove several small, lower branches overhanging house deck, up to about 4 metres clear above ground level. This will not be detrimental to the tree. Remove back to stem with correct pruning cuts (not flush cuts or stubs).	2B	M	M	6.6	2.9
7	<i>Brachychiton acerifolius</i> Illawarra Flame Tree	14	5,4,3,3	400	500	M	G	F	Native species, planted. Co-dominant stems from 3 m AGL, with inclusion seam below union. Species is 'exempt' in Northern Beaches LGA. Permission is not required for removal of this tree. Recommendations Remove tree as it is detrimental to solar amenity to house. Tree will continue to grow.	2A	M	M		

APPENDIX A continued.

Key and explanation of table categories, and common abbreviations

Height is the approximate height of the tree in metres, from base of stem to top of crown (Note: Height of palms is measured to top of stem and shaft, not including leaves).

Canopy Spread is the approximate length in metres of the branches/canopy of the tree, measured from the stem/trunk to North, South, East and West.

DBH (in millimetres) is the approximate Diameter of tree stem/s (trunk) measured at Breast Height ie. at 1.4 metres above ground level, unless noted otherwise.

DAB (in millimetres) is the approximate Diameter at the Base of the tree, measured just above the root buttress.

Age classes: I is immature, EM is Early Mature, M is Mature, LM is Late Mature, OM is Over Mature, D is Dead.

Health is classed as P Poor, F Fair, G Good. Tree vigour is an indication of health. Assessment includes crown density, leaf colour, pest and disease presence/resilience, dieback amount and type.

Condition is classed as P Poor, F Fair, G Good. A tree may be in good health but have poor condition due to structural defects such as weak branch/stem junctions, cavities, cracks, signs of root plate failure etc. The tree's environment (proximity to other trees, soil types and profiles, water supply, aspect and topography) may modify its form and growth habit, and its condition.

ULE Useful Life Expectancy – Barrell. Refer to Appendix B for detail of categories.

LSR Landscape Significance Rating, of High, Medium and Low, based on IACA SIGNIFICANCE OF A TREE - ASSESSMENT RATING SYSTEM (STARS)© (IACA2010) ©. This rating system utilises structured qualitative criteria to assist in determining the retention value for a tree.

RV Retention Value, of High, Medium, Low, or Removal, is based on Useful Life Expectancy and Landscape Significance, as derived from the matrix of IACA SIGNIFICANCE OF A TREE - ASSESSMENT RATING SYSTEM (STARS)© (IACA2010) ©

E 'Exempt' species under Council's tree management order or policies.

TPZ Tree Protection Zone, expressed as a radial distance in metres, measured from the centre of the tree. It is defined in the Australian Standard *Protection of Trees on Development Sites*, AS 4970-2009 as 'a specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development'.

SRZ Structural Root Zone, expressed as a radial distance in metres, measured from the centre of the tree. It is defined in the Australian Standard *Protection of Trees on Development Sites*, AS 4970-2009 as 'the area around the base of a tree required for a tree's stability in the ground. The woody growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres. This zone considers a tree's structural stability only, not the root zone required for a tree's vigour and long-term viability, which will usually be a much larger area'.

AGL Above Ground Level (distance)

LGA Local Government Area

N (North), **S** (South), **E** (East), **W** (West)

APPENDIX B ULE

USEFUL LIFE EXPECTANCY (ULE) CATEGORIES (after Barrell, updated 01/04/01)

- 1 Long ULE:** Trees that appeared to be retainable at the time of assessment for **more than 40 years** with an acceptable level of risk, assuming reasonable maintenance:
 - A** Structurally sound trees located in positions that can accommodate future growth.
 - B** Trees that could be made suitable for retention in the long term by remedial tree care.
 - C** Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.

- 2 Medium ULE:** Trees that appeared to be retainable at the time of assessment for **15–40 years** with an acceptable level of risk, assuming reasonable maintenance:
 - A** Trees that may only live between 15 and 40 more years.
 - B** Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.
 - C** Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
 - D** Trees that could be made suitable for retention in the medium term by remedial tree care.

- 3 Short ULE:** Trees that appeared to be retainable at the time of assessment for **5–15 years** with an acceptable level of risk, assuming reasonable maintenance:
 - A** Trees that may only live between 5 and 15 more years.
 - B** Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.
 - C** Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
 - D** Trees that require substantial remedial tree care and are only suitable for retention in the short term.

- 4 Remove:** Trees that should be removed **within the next 5 years**.
 - A** Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
 - B** Dangerous trees because of 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 that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
 - F** Trees that are damaging or may cause damage to existing structures within 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 C METHODOLOGY FOR DETERMINING TREE RETENTION VALUES

IACA SIGNIFICANCE OF A TREE - ASSESSMENT RATING SYSTEM (STARS) © (IACA2010) ©

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

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

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

TREE SIGNIFICANCE - ASSESSMENT CRITERIA

The tree is to have a minimum of three (3) criteria in a category to be classified in that group. Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

1. HIGH SIGNIFICANCE IN LANDSCAPE

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ - tree is appropriate to the site conditions.

2. MEDIUM SIGNIFICANCE IN LANDSCAPE

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ.

3. LOW SIGNIFICANCE IN LANDSCAPE

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

Environmental Pest / Noxious Weed Species

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

Hazardous/Irreversible Decline

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

TABLE 1.0 TREE RETENTION VALUE - PRIORITY MATRIX

		Significance				
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					
Legend for Matrix Assessment						
		Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . 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.				

USE OF THIS DOCUMENT AND REFERENCING

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

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

REFERENCES

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

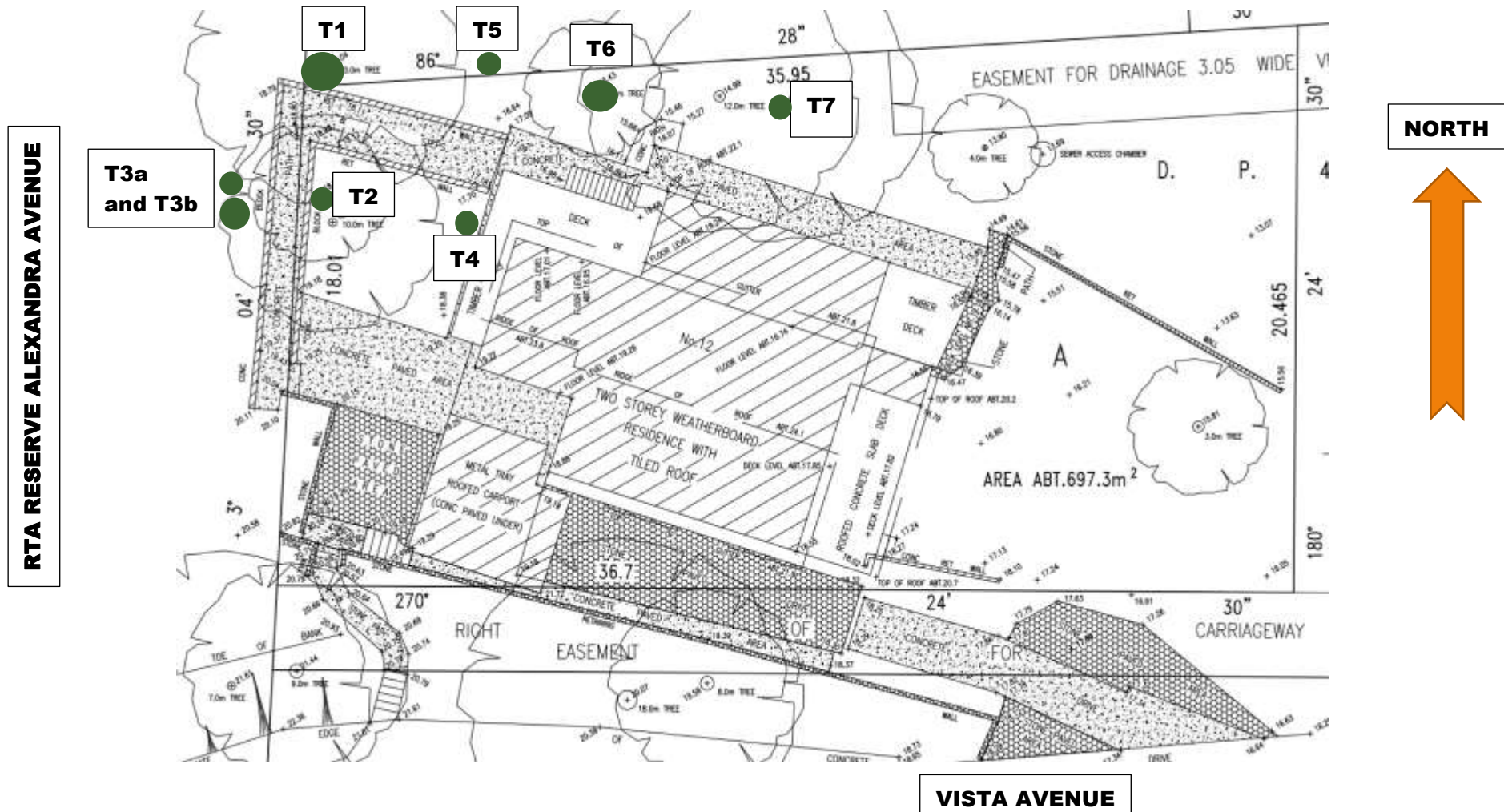
Draper BD and Richards PA 2009, Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

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

APPENDIX D TREE LOCATION PLAN -TLP01

Not to scale. Trees T3a, T3b, T4 and T5 are not on the site survey, and locations shown are estimated. Trees T2, T4 and T7 are exempt species.

Note the site survey is dated 2004 and several trees have since been removed. Canopies shown on survey do not depict existing tree canopy dimensions accurately.



APPENDIX E PROPOSED WORKS PLAN - PWP01

