

CPS

CREATIVE **PLANNING** SOLUTIONS

ARBORICULTURAL IMPACT ASSESSMENT

45-49 Warriewood Road
Warriewood, NSW 2102

24 APRIL 2020

Prepared for: Archidrome
Suite 601, 90 George Street
HORNSBY NSW 2077
0433 901 701

Prepared by: Greg Tesoriero
Creative Planning Solutions
Dip. Horticulture (Arboriculture) AQF Level 5
B.LArch (Hons)

LGA: Northern Beaches Council
Date: 17 January 2020
Revision: A
Job No: D221



Registered User



CREATIVE PLANNING SOLUTIONS PTY LIMITED

Level 3, 397 Riley Street, Surry Hills NSW 2010 – PO Box 1074 Broadway NSW 2007

+61 2 8039 7461 | info@cpsplanning.com.au | www.cpsplanning.com.au | ABN: 70 135 093 926

TABLE OF CONTENTS

1 EXECUTIVE SUMMARY 1

2 INTRODUCTION 2

 2.1 Background 2

 2.2 Objectives 2

 2.3 Legislation & Regulating Documents 2

 2.4 Limitations 3

 2.5 The Site 3

 2.6 Proposed Development 4

 2.7 Documentation Received 4

3 METHODOLOGY 5

 3.1 Methodology 5

4 OBSERVATIONS 7

 4.1 General 7

 4.2 Tree Preservation Order 7

 4.3 Tree Locations 7

 4.4 The Trees 7

5 DISCUSSION 9

 5.1 Impact Assessment 9

 5.2 Trees Recommended for Removal 9

 5.3 Trees Recommended for Retention & Protection 10

 5.4 Ancillary Construction Related Impacts 11

6 CONCLUSION 12

 6.1 Proposed Development Impact 12

7 RECOMMENDATIONS 13

 7.1 Tree Removals 13

 7.2 Tree Retention and Protection 13

 7.3 Replacement Planting 13

8 REFERENCES 14

APPENDICES

- APPENDIX 1 - TREE ASSESSMENT SCHEDULE
- APPENDIX 2 - TREE LOCATION PLAN
- APPENDIX 3 - IACA SIGNIFICANCE OF A TREE, ASSESSMENT RATING SYSTEM (STARS)
- APPENDIX 4 - EXTRACT FROM AS4970-2009 PROTECTION OF TREES ON DEVELOPMENT SITES
- APPENDIX 5 - GENERAL TREE PROTECTION SPECIFICATION
- APPENDIX 6 - TYPICAL TREE PROTECTION DETAILS

1 EXECUTIVE SUMMARY

This Arboricultural Impact Assessment was commissioned by Mr Tarun Chadha of Archidrome on 22nd November 2019. The report relates to sixty-one (61) trees and groups of trees within and adjoining the site at 43-49 Warriewood Road, Warriewood within Northern Beaches Council local government area. The report provides evaluation of the likely impact to existing trees as a result of the proposed building and construction works associated with the subdivision and residential development.

Should the development proceed in its current form, the following is recommended:

- Removal of one (1) dead tree (**Tree 33**) irrespective of the proposed development given it is considered hazardous with a high likelihood of whole or partial tree failure;
- Removal of thirty-two (32) 'exempt' trees (**Trees 1-7, 11-14, 16-17, 19-22, 25-28, 31-32, 35, 51-52, 54-59**) which are not protected under Section B4.22 of Pittwater 21 DCP due to being undesirable species;
- Removal of fourteen (14) site trees (**Tree 8, 15, 18, 23, 24, 29, 30, 34, 36-40 & 53**) of 'Low', 'Medium' & 'High' retention value due to impacts resulting from the proposed construction and building works;
- Retention and protection of six (6) trees (**Tree 9, 41, 42, 47, 49 & 60**) which are to suffer a major (>10%) incursion to the TPZ;
- Retention and protection of four (4) trees (**Tree 43, 46, 48 & 61**) which are to suffer a minor (<10%) incursion to the TPZ;
- Retention and protection of four (4) trees (**Tree 10, 44, 45 & 50**) which are located sufficiently away from the proposed construction works and are unlikely to be impacted;

Detailed tree protection measures in accordance with **Appendix 5** will be required for those trees outside of the building envelopes and away from the construction works which are to be retained to ensure no inadvertent impacts are sustained from construction related activities.

Replacement planting should be carried out in accordance with the recommendations contained within **Section 7.3** to ensure those trees removed are adequately compensated for.

2 INTRODUCTION

2.1 Background

This Arboricultural Impact Assessment was commissioned by Mr Tarun Chadha of Archidrome on 22nd November 2019 to evaluate the potential impacts of the proposed development works to existing trees located on the subject site at 43-49 Warriewood Road, Warriewood (Refer to **Figure 1**).

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

2.2 Objectives

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

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

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

2.3 Legislation & Regulating Documents

The Arboricultural Impact Assessment Report has considered the following regulatory documents:

- *State Environmental Planning Policy (Vegetation in Non-Rural Areas) 2017*
- *Pittwater Local Environmental Plan 2014 (PLEP2014)*
- *Pittwater 21 Development Control Plan 2012 (PDCCP2004)*
- *Pittwater DCP 21 Appendices*

2.4 Limitations

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

It is noted that a number of large shrub species were observed on site however have not been considered as part of this assessment due to their size or significance not being considered to fall within the definition of a 'tree'.

2.5 The Site

The site is known as 43-49 Warriewood Road, Warriewood and is legally described as Lot 2 DP972209, Lot 2 DP 349085 and Lot 1 DP 349085. The site is located on the southern side of Warriewood Road and consists of two (2) dilapidated dwellings, outbuildings and disused greenhouses which has a rear boundary to Narrabeen Creek. Vehicular access is available from Warriewood Road. (Refer to **Figure 1** below).

The site has an even and consistent grade falling from the Warriewood Road frontage towards the central portion of the site whereby the grade evens and flattens towards the Narrabeen Creek rear boundary. The rear portion of the site is heavily vegetated whilst the central and upper portions are attributed to rows of greenhouses and the existing dwellings.



Figure 1 - Aerial image indicating subject site (highlighted yellow)

2.6 Proposed Development

The proposed development is for demolition of existing structures, subdivision of the existing allotments and construction of a new residential development inclusive of a new roadway, pedestrian through site link, new landscaping and stormwater infrastructure (Refer to **Figure 2** below).

The proposed works are generally restricted to the upper portion of the site fronting Warriewood Road with existing bushland areas to the rear of the site largely to be retained as existing. Those works considered likely to impact the existing trees on site include the significant modification of existing levels (excavation and fill), construction of new dwellings and allotments, new roadway, stormwater infrastructure and the pedestrian through site link.



Figure 2 – Landscape Plan extract showing the proposed development

2.7 Documentation Received

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

| Document Description | Author | Revision No. / Date |
|--------------------------|-----------------------------|---------------------|
| Architectural Plans | Archidrome | R-03 / 20.03.2020 |
| Landscape Plans | Creative Planning Solutions | A / 24.04.2020 |
| Stormwater / Civil Plans | C&M Consulting Engineers | 02 / 16.03.2020 |
| Detail Survey | CMS Surveyors | 1 / 16.12.2016 |

3 METHODOLOGY

3.1 Methodology

3.1.1 Site Inspection

A site inspection was carried out by the author with the subject trees and the general growing environment evaluated on 8th January 2019. The weather at the time of inspection was overcast and dry with fair-poor visibility due to smoke haze.

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

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

3.1.2 Safe Useful Life Expectancy (SULE)

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

The following ranges have been allocated to each tree:

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

3.1.3 Landscape Significance

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

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

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

3.1.4 Retention Value

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

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

3.1.5 AS4970-2009 Protection of Trees on Development Sites

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

3.1.6 Tree Protection Zones

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

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

3.1.7 Structural Root Zone

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

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

4 OBSERVATIONS

4.1 General

The site area subject to this assessment was observed as highly disturbed with a high level of weed infestation. Species observed varied including exotic, native and locally indigenous species. Trees within the front portion of the site appeared to be planted specimens with some potentially remnant trees observed within the rear densely vegetated area which are not to be impacted. Health, vigour and condition was highly varied across the trees forming part of the assessment. Root zones of assessed trees were generally observed as modified groundcover within deep soil areas.

4.2 Tree Preservation Order

The Pittwater 21 Development Control Plan, Section B4.22 Preservation of Trees and Bushland Vegetation applies to all land, waterways and Bushland covered by the Pittwater Local Environmental Plan 2014 which includes the subject site. The provisions generally protect any tree over five (5) metres in height and require a Vegetation Clearing permit for any removal of such trees.

4.3 Tree Locations

The location of existing trees has been based off the Survey Plan prepared by CMS Surveyors dated 16.02.2016 with a Tree Location Plan contained at **Appendix 2**. Where additional trees were observed but not shown on the survey, they have been plotted on the Tree Location Plan using measurements and offsets taken from known points on site. It must be noted that these locations are approximate and are to be used as a guide only. A number of trees indicated on the survey on adjoining allotments were not found on site and are presumed to have been removed since the survey was carried out – these trees are indicated on the Tree Location Plan in a solid red hatch.

4.4 The Trees

A total of sixty-one (61) trees and groups of trees (**Trees 1-61**) were observed within the subject site and adjoining allotments which have been surveyed as part of this assessment. All tree data recorded on site has been tabulated and is contained at **Appendix 1**. Each tree has been provided with an identification number for reference purposes and is denoted on the attached Tree Location Plan at **Appendix 2**.

Trees 1-59 were observed to be located within the site boundaries. These trees were generally located towards the front half of the site and along the north-western boundary of the site.

Thirty-two (32) trees are classified as 'Exempt Species' under Section B4.22 of Pittwater 21 DCP and do not require Council consent for removal. This includes **Trees 1-7, 11-14, 16-17, 19-22, 25-28, 31-32, 35, 51-52, 54-59**.

One (1) tree was observed as being 'dead' (**Tree 33**) and should be removed irrespective of the proposed development given the likelihood of future failure,

Tree 9 & 10 are located on the adjoining allotment to the east at No.41 Warriewood Road and appear to have been retained as part of major subdivision and land clearing works.

Tree 45 is located on the adjoining allotment to the west at No.53 Warriewood Road and is located directly adjacent to the newly constructed pedestrian through site link which is to continue through the subject site.

Tree 60 & 61 were observed to be located outside the site boundaries within the adjoining allotment to the east at No.41 Warriewood Road. A recently constructed roadway and retaining wall have been constructed directly adjacent.

Dense and inaccessible vegetation was observed within the rear portion of the site which does not form part of this assessment given it is not to be impacted by the proposed development works. Trees located on the northern and western fringe of this densely vegetated area have been included within the assessment given the location of a pedestrian through site link and potential for impact.

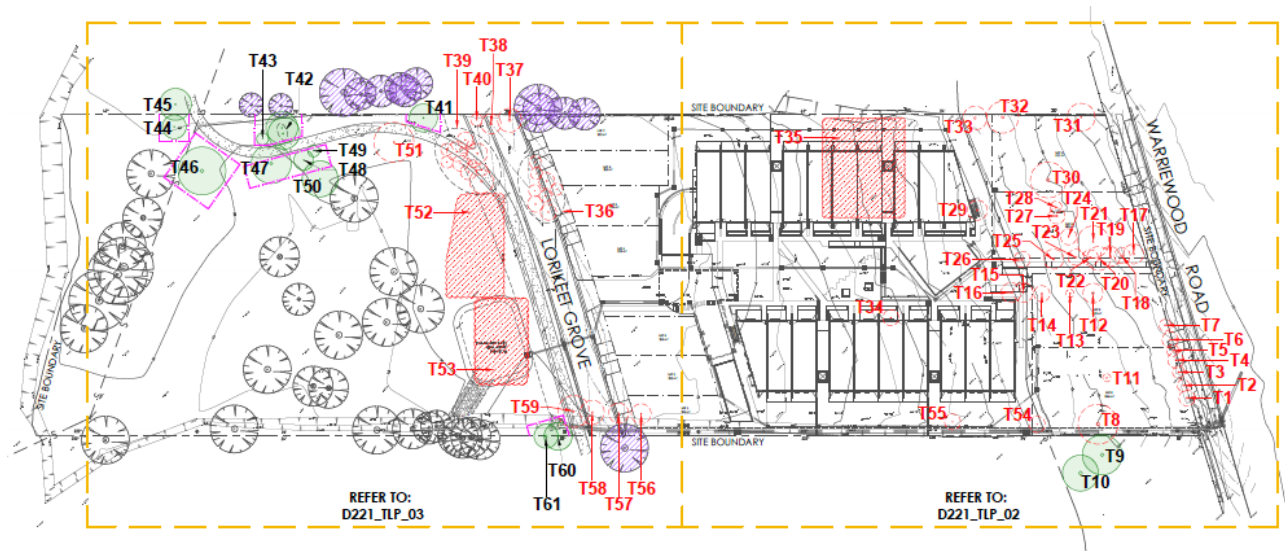


Figure 3 – Tree Location Plan extract: refer to Appendix 2 for full Tree Location Plan

5 DISCUSSION

5.1 Impact Assessment

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

- Existing Relative Levels (R.L.);
- Proposed Relative Levels;
- Tree Protection Zones (TPZ);
- Structural Root Zones (SRZ);
- Existing root mass identified during root mapping investigations;
- Footprint of the proposed development (incl. stormwater and services) and temporary structures (scaffolding, hoardings etc.);
- Incursions to the TPZ & SRZ, including estimated cut & fill beyond the building footprint;
- Incursions to the tree canopy from the building envelope and temporary structures;
- Pruning necessary for building clearance;
- Remediation works for soil contaminants;
- Species tolerance to disturbance; and
- Assessment of the likely impact of the works on existing trees.

5.2 Trees Recommended for Removal

Based on the plans supplied, should the proposed development proceed in its current form it is recommended that a total of forty-seven (47) trees be removed. Removals have been recommended based upon likelihood of unsustainable levels of impact resulting from construction works or poor health, condition and structure or being classified as 'exempt' and undesirable species. Refer to **Appendix 2** for a plan indicating the location of trees that will require removal (dashed red).

5.2.1 Major & Unsustainable Impact – Removal Required

As per AS4970-2009 *Protection of trees on development sites*, fourteen (14) trees are to suffer a major (>10%) and unsustainable level of incursion as a result of the proposed construction works occurring within the nominal TPZ's & SRZ's. This includes **Tree 8, 15, 18, 23, 24, 29, 30, 34, 36-40 & 53** (14 trees). The construction works required to create the necessary site levels, construct new buildings, stormwater infrastructure, roadways, services, car parking and hard landscaping features will necessitate the removal of these trees. The extent of impacts is not considered to be tolerable. None of those trees required for removal are of High retention value nor should be considered a constraint upon the proposed demolition works.

5.2.2 Dead Trees – Removal Recommended

One (1) tree (**Tree 33**) was identified as 'dead' and should be removed irrespective of any development works on site as it is considered hazardous. This tree was identified as being at a high risk of whole or partial tree failure with potential to cause harm to human life and property.

5.2.3 Exempt Species – Removal Recommended

A total of thirty-two (32) trees on site have been identified as 'exempt' from protection under Section B4.22 of Pittwater 21 DCP due to being undesirable species. This includes **Trees 1-7, 11-14, 16-17, 19-22, 25-28, 31-32, 35, 51-52, 54-59** (32 trees). It is recommended that these trees are removed as part of the proposed works.

5.3 Trees Recommended for Retention & Protection

Should the proposed subdivision and construction works proceed in their current form, it is recommended that fourteen (14) trees be retained and protected given the proposed works are unlikely to result in any significant negative impacts to long term health or viability. This includes **Tree 9, 10, 41-43, 45-50, 60 & 61** (14 trees). Refer to **Appendix 2** for a plan indicating the trees that are to be retained and protected (shown shaded green).

5.3.1 Major Impact

As per AS4970-2009 *Protection of trees on development sites*, six (6) trees are to suffer a minor (<10%) and sustainable level of incursion to the TPZ as a result of the construction works occurring within the nominal TPZ's. This includes trees **Tree 9 (21%), 41 (18%), 42 (17%), 47 (15%), 49 (18%) & 60 (16%)**. Works relate to construction of the proposed through-site link pedestrian pathway and new retaining wall and stormwater infrastructure.

Tree 9 is to be impacted by the proposed stormwater and site regrading works (fill) to occur to the north-west. The works are to result in an encroachment to the TPZ of 21% with no works to occur within the SRZ. Excavation for the proposed stormwater must be undertaken in a sensitive manner in accordance with the Section 13 & 14 of **Appendix 5** to mitigate impacts.

Tree 41, 42, 47 & 49 are to be impacted by the new pedestrian pathway proposed to the south which will result in incursion to TPZ's of 18%, 17%, 15% and 18% respectively. Works are also to be undertaken in the SRZ of Tree 47. An existing unsealed roadway access currently exists directly adjacent to these trees which has resulted in a high level of compaction on the TPZ areas. Provided the pathway is constructed above the existing grade in a root sensitive manner as detailed in **Appendix 5**, the works are unlikely to result in any long term impact.

Tree 60 is to be impacted by the proposed stormwater and new roadway works resulting in an encroachment of 16% to the TPZ with works also occurring within the SRZ. Excavation for the proposed stormwater infrastructure must be undertaken in a sensitive manner in accordance with the Section 13 & 14 of **Appendix 5** to mitigate impacts.

5.3.2 Minor Impact

As per AS4970-2009 *Protection of trees on development sites*, four (4) trees are to suffer a minor (<10%) and sustainable level of incursion to the TPZ as a result of the construction works occurring within the nominal TPZ's. This includes **Tree 43 (2%), 46 (7%), 48 (5%) & 61 (7%)**. Works relate to construction of the proposed through-site link pedestrian pathway (**Tree 43, 46 & 48**) and new retaining wall and stormwater infrastructure (**Tree 61**) which is considered tolerable provided the works are carried out

in a root sensitive manner and suitable protection measures are implemented as detailed in **Appendix 5**.

5.3.3 Trees Unaffected by Development

Based on the plans supplied and referenced above, the proposed construction works are unlikely to result in any impact to four (4) existing trees given their distance from the proposed works and nil encroachment to Tree Protection Zones. This includes **Tree 10, 44, 45 & 50** which are considered worthy of retention and indicated in **Appendix 2** (shaded green). Subject to suitable tree protection in accordance with **Appendix 5**, these trees are unlikely to be impacted.

5.4 Ancillary Construction Related Impacts

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

Furthermore storage and stockpiling of material may result in similar impacts and will require management. In this regard, protection for those trees to be retained is to be carried out in accordance with **Appendix 5** including relevant tree protection fencing as shown in **Appendix 2**.

6 CONCLUSION

6.1 Proposed Development Impact

Based on the plans and information supplied, should the development proceed in its current form the proposal would result in the following impacts to existing trees on site:

- Removal of one (1) dead tree (**Tree 33**) irrespective of the proposed development given it is considered hazardous with a high likelihood of whole or partial tree failure;
- Removal of thirty-two (32) 'exempt' trees (**Trees 1-7, 11-14, 16-17, 19-22, 25-28, 31-32, 35, 51-52, 54-59**) which are not protected under Section B4.22 of Pittwater 21 DCP due to being undesirable species;
- Removal of fourteen (14) site trees (**Tree 8, 15, 18, 23, 24, 29, 30, 34, 36-40 & 53**) of 'Low', 'Medium' & 'High' retention value due to impacts resulting from the proposed construction and building works;
- Retention and protection of six (6) trees (**Tree 9, 41, 42, 47, 49 & 60**) which are to suffer a major (>10%) incursion to the TPZ;
- Retention and protection of four (4) trees (**Tree 43, 46, 48 & 61**) which are to suffer a minor (<10%) incursion to the TPZ;
- Retention and protection of four (4) trees (**Tree 10, 44, 45 & 50**) which are located sufficiently away from the proposed construction works and are unlikely to be impacted;

Detailed tree protection measures in accordance with **Appendix 5** will be required for those trees outside of the building envelopes which are to be retained to ensure no inadvertent impacts are sustained from construction related activities.

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

Replacement planting as per **Section 7.3** will be required to compensate for the loss of amenity and impact to landscape character resulting from the proposed tree removal.

7 RECOMMENDATIONS

7.1 Tree Removals

Remove **Tree 1-8, 11-40 & 51-59** (47 trees) to facilitate the proposed construction works.

Development consent and relevant approvals must be obtained from Northern Beaches Council prior to the removal or pruning of any protected tree.

All tree removal work is to be carried out by an experienced Arborist with minimum AQF Level 3 qualifications in accordance with AS4373-2007 Pruning of Amenity Trees, Safe Work Australia Guide for Managing Risks of Tree Trimming and Removal Work (2016) and other applicable legislation.

7.2 Tree Retention and Protection

Retain and protect **Tree 9, 10, 41-43, 45-50, 60 & 61** (14 trees) in accordance with the Tree Location Plan & Tree Protection Specification held at **Appendix 2 & 5** and AS497-2009 *Protection of trees on development sites*. All works within the TPZ of those trees nominated for retention is to be supervised by a Project Arborist with minimum AQF Level 5 qualifications.

Tree protection fencing is required for **Tree 41, 42, 43, 44, 46, 47, 48, 49, 50, 60 & 61** Tree Location Plan & Tree Protection Specification held at **Appendix 2 & 5**.

7.3 Replacement Planting

In order to compensate for loss of amenity resulting from the removal of protected trees on site, replacement planting should be provided on site. This will ensure there is no incremental loss of canopy cover over time & the ecological value of trees on the site is maintained.

Accordingly, thirty (30) large growing (15m+) locally endemic compensatory canopy tree plantings should be provided on site planted at a minimum 45 litre pot size. The following species should be considered for replacement planting:

- *Casuarina glauca* (Swamp Oak)
- *Eucalyptus botryoides* (Bangalay)
- *Eucalyptus robusta* (Swam Mahogany)
- *Melaleuca quinquenervia* (Broad-leaved Paperbark)



Greg Tesoriero

Dip. Hort. (Arboriculture) AQF Level 5
B.LArch (Hons)
24th April 2020



Registered User

8 REFERENCES

Council of Standards Australia, 2009 AS 4970 – 2009 – Protection of Trees on Development Sites Standards Australia, Sydney.

Council of Standards Australia, 2007 AS 4373 – 2007 – Pruning of Amenity Trees Standards Australia, Sydney.

Google Australia. 2019. *Google Maps*. [ONLINE] Available at: <https://www.google.com.au/maps>. [Accessed 7 January 2020].

Pittwater Council, 2004. Pittwater 21 Development Control Plan 2013 – Part B4, Section 4.22 – Preservation of Trees and Bushland Vegetation

Mattheck, C 2007, *Updated Field Guide for Visual Tree Assessment*, 1st Ed., Forschungszentrum Karlsruhe, Germany

SIX Maps. 2019. *SIX Maps*. [ONLINE] Available at: <https://maps.six.nsw.gov.au/>. [Accessed 7 January 2020].

Slee, A.V., Brooker, M.I.H., Duffy, S.M. & West, J.G. 2006, *Euclid: eucalypts of Australia*. 3rd ed. (CSIRO: Canberra.)

APPENDIX 1: TREE ASSESSMENT DATA - 43-49 Warriewood Road, Warriewood NSW 2102

| Tree No. | Genus & species Common Name | Height (m) | Crown Spread (m) | DBH (mm) | DGL (mm) | TPZ Radius (m) | SRZ Radius (m) | Age Class | Health / Vitality | Structure/ Condition | SULE Rating | Landscape Significance | Retention Value | Retain / Remove | Comments |
|----------|--|------------|------------------|----------|----------|----------------|----------------|-----------|-------------------|----------------------|---------------------|------------------------|---------------------|------------------|--|
| 1 | <i>Cupressus sp.</i> Cypress | 10 | 4 | 450 | 500 | 5.40 | 2.47 | M | Good | Average | Long 40yrs + | Low | Consider Removal | Remove | Part of row of 7 x trees, pruned on northern side for powerline clearance |
| 2 | <i>Cupressus sp.</i> Cypress | 10 | 3 | 300 | 350 | 3.60 | 2.13 | M | Good | Average | Long 40yrs + | Low | Consider Removal | Remove | Part of row of 7 x trees, pruned on northern side for powerline clearance |
| 3 | <i>Cupressus sp.</i> Cypress | 10 | 3 | 300 | 350 | 3.60 | 2.13 | M | Good | Average | Long 40yrs + | Low | Consider Removal | Remove | Part of row of 7 x trees, pruned on northern side for powerline clearance |
| 4 | <i>Cupressus sp.</i> Cypress | 10 | 4 | 300 | 380 | 3.60 | 2.20 | M | Good | Average | Long 40yrs + | Low | Consider Removal | Remove | Part of row of 7 x trees, pruned on northern side for powerline clearance |
| 5 | <i>Cupressus sp.</i> Cypress | 10 | 3 | 300 | 350 | 3.60 | 2.13 | M | Good | Average | Long 40yrs + | Low | Consider Removal | Remove | Part of row of 7 x trees, pruned on northern side for powerline clearance |
| 6 | <i>Cupressus sp.</i> Cypress | 10 | 4 | 350 | 450 | 4.20 | 2.37 | M | Good | Average | Long 40yrs + | Low | Consider Removal | Remove | Part of row of 7 x trees, pruned on northern side for powerline clearance |
| 7 | <i>Cupressus sp.</i> Cypress | 10 | 3 | 400 | 450 | 4.80 | 2.37 | M | Good | Average | Long 40yrs + | Low | Consider Removal | Remove | Part of row of 7 x trees, pruned on northern side for powerline clearance |
| 8 | <i>Eucalyptus robusta</i> Swamp Mahogany | 15 | 10 | 800 | 950 | 9.60 | 3.24 | M | Fair | Average | Medium 15-40yrs | High | High | Remove | 15° lean & crown bias to west. Moderate level of medium-large \emptyset deadwood. 70% crown density. |
| 9 | <i>Eucalyptus robusta</i> Swamp Mahogany | 15 | 10 | 950 | 1100 | 11.40 | 3.44 | M | Average | Average | Medium 15-40yrs | High | High | Retain & Protect | 21% incursion to TPZ from stormwater infrastructure and site regarding works. Failed and decayed co-dominant stem from ground level. Appears stable. |
| 10 | <i>Eucalyptus robusta</i> Swamp Mahogany | 13 | 9 | 780 | 1050 | 9.36 | 3.38 | M | Fair | Average | Medium 15-40yrs | High | High | Retain & Protect | Twin included trunks from ground level. Failed stem at 1m with some decay evident & evidence of prior borero attack. Moderate level of epicormic growth. |
| 11 | <i>Cupressus sp.</i> Cypress | 9 | 2 | 420 | 400 | 5.04 | 2.25 | OM | Fair | Poor | Short 5-15yrs | Low | Consider Removal | Remove | Included co-dominant stems from ground level, partially failed with lean to west. |
| 12 | <i>Cupressus sp.</i> Cypress | 6 | 5 | 500 | 600 | 6.00 | 2.67 | OM | Poor | Poor | Very Short <5yrs | Low | Consider Removal | Remove | Significant past pruning, distorted form and low foliage density. |
| 13 | <i>Cupressus sp.</i> Cypress | 7 | 2 | 250 | 300 | 3.00 | 2.00 | OM | Poor | Poor | Short 5-15yrs | Low | Consider Removal | Remove | Low foliage dense, appears to be in decline. |
| 14 | <i>Cupressus sp.</i> Cypress | 8 | 4 | 400 | 400 | 4.80 | 2.25 | M | Average | Average | Medium 15-40yrs | Low | Consider Removal | Remove | Multi-stemmed from 1m, multiple past pruning on western side for driveway clearance. |
| 15 | <i>Araucaria heterophylla</i> Norfolk Island Pine | 10 | 5 | 400 | 500 | 4.80 | 2.47 | SM | Average | Average | Long 40yrs + | Low | Medium | Remove | Appears self-seeded, growing within concrete driveway. |
| 16 | <i>Ficus microcarpa var. hillii</i> Hills Weeping Fig | 5 | 5 | 400 | 450 | 4.80 | 2.37 | SM | Average | Poor | Medium 15-40yrs | Low | Consider Removal | Remove | Appears self-seeded, growing under existing shed, heavily pruned with significant epicormic re-growth. |

| Tree No. | Genus & species Common Name | Height (m) | Crown Spread (m) | DBH (mm) | DGL (mm) | TPZ Radius (m) | SRZ Radius (m) | Age Class | Health / Vitality | Structure/ Condition | SULE Rating | Landscape Significance | Retention Value | Retain / Remove | Comments |
|----------|---|------------|------------------|----------|----------|----------------|----------------|-----------|-------------------|----------------------|------------------|------------------------|------------------|-----------------|--|
| 17 | <i>Ligustrum lucidum</i> Broad-leaved Privet | 6 | 5 | Multi | Multi | - | - | M | Fair | Poor | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 18 | <i>Lagerstroemia indica</i> Crepe Myrtle | 7 | 4 | Multi | Multi | - | - | M | Fair | Poor | Medium 15-40yrs | Low | Low | Remove | Suppressed form from adjacent weed species, multi-stemmed from ground level. |
| 19 | <i>Ligustrum lucidum</i> Broad-leaved Privet | 7 | 5 | Multi | Multi | - | - | M | Fair | Poor | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 20 | <i>Cotoneaster sp.</i> Cotoneaster | 6 | 6 | Multi | Multi | - | - | M | Fair | Poor | Short 5-15yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 21 | <i>Grevillea robusta</i> Silky Oak | 17 | 8 | 350 | 450 | 4.20 | 2.37 | OM | Poor | Poor | Short 5-15yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 22 | <i>Ligustrum lucidum</i> Broad-leaved Privet | 6 | 4 | Multi | Multi | - | - | M | Fair | Poor | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 23 | <i>Araucaria columnaris</i> Cook Pine | 16 | 4 | 500 | 600 | 6.00 | 2.67 | M | Good | Average | Long 40yrs + | Medium | Medium | Remove | Mid & upper crown lean to north. |
| 24 | <i>Acer palmatum</i> Japanese Maple | 5 | 4 | 300 | 200 | 3.60 | 1.68 | S | Poor | Poor | Very Short <5yrs | Low | Consider Removal | Remove | In severe decline, <15% live foliage. |
| 25 | <i>Ligustrum lucidum</i> Broad-leaved Privet | 6 | 5 | Multi | Multi | - | - | M | Fair | Poor | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 26 | <i>Ligustrum lucidum</i> Broad-leaved Privet | 7 | 4 | Multi | Multi | - | - | M | Fair | Fair | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 27 | <i>Cupressus sp.</i> Cypress | 13 | 4 | 450 | 500 | 5.40 | 2.47 | M | Fair | Average | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt species under Part B4.22 of Pittwater 21 DCP. |
| 28 | <i>Cupressus sp.</i> Cypress | 10 | 3 | 350 | 400 | 4.20 | 2.25 | M | Fair | Average | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt species under Part B4.22 of Pittwater 21 DCP. |
| 29 | <i>Macadamia integrifolia</i> Macadamia Nut | 9 | 5 | 400 | 400 | 4.80 | 2.25 | M | Poor | Poor | Medium 15-40yrs | Low | Low | Remove | Multi-stemmed from ground level, moderate level of deadwood with large areas of crown dieback. |
| 30 | <i>Brachychiton dicolor</i> Lacebark Tree | 10 | 9 | 750 | 850 | 9.00 | 3.09 | M | Average | Average | Medium 15-40yrs | Medium | Low | Remove | Co-dominant stems form 1m, sparse foliage density. |
| 31 | <i>Acer negundo</i> Box Elder | 6 | 7 | 350 | 350 | 4.20 | 2.13 | M | Average | Fair | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 32 | <i>Acer negundo</i> Box Elder | 10 | 8 | 600 | 700 | 7.20 | 2.85 | OM | Average | Poor | Short 5-15yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 33 | <i>Dead Tree</i> | 9 | 6 | - | - | - | - | - | - | - | Dead | - | Consider Removal | Remove | Dead tree. |

| Tree No. | Genus & species Common Name | Height (m) | Crown Spread (m) | DBH (mm) | DGL (mm) | TPZ Radius (m) | SRZ Radius (m) | Age Class | Health / Vitality | Structure/ Condition | SULE Rating | Landscape Significance | Retention Value | Retain / Remove | Comments |
|----------|---|------------|------------------|----------|----------|----------------|----------------|-----------|-------------------|----------------------|-----------------|------------------------|------------------|------------------|---|
| 34 | <i>Casuarina glauca</i> Swamp Oak | 7 | 4 | 400 | 250 | 4.80 | 1.85 | SM | Good | Poor | Long 40yrs + | Medium | Medium | Remove | Self-seeded, multi-stemmed from ground level. |
| 35 | <i>Acer negundo</i> Box Elder | 5 | 4 | Multi | Multi | - | - | SM | Average | Fair | Long 40yrs + | Low | Consider Removal | Remove | Large group of self sown Box Elder. Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 36 | <i>Casuarina glauca</i> Swamp Oak | 7 | 3 | 100-300 | 150-350 | - | - | SM | Average | Fair | Long 40yrs + | Medium | Medium | Remove | Group of 8 x self-sown trees. |
| 37 | <i>Casuarina glauca</i> Swamp Oak | 12 | 6 | 670 | 600 | 8.04 | 2.67 | M | Average | Fair | Long 40yrs + | Medium | Medium | Remove | Multi-stemmed from ground level, adjacent retaining wall and new roadway (Lorikeet Grove). |
| 38 | <i>Casuarina glauca</i> Swamp Oak | 12 | 5 | 500 | 450 | 6.00 | 2.37 | M | Average | Fair | Long 40yrs + | Medium | Medium | Remove | Twin trunks from ground level, adjacent retaining wall and new roadway (Lorikeet Grove). |
| 39 | <i>Casuarina glauca</i> Swamp Oak | 8 | 2 | 150-400 | 150-450 | - | - | M | Average | Fair | Long 40yrs + | Medium | Medium | Remove | Group of 13 x self sown small trees, slender forest forms. |
| 40 | <i>Casuarina glauca</i> Swamp Oak | 9 | 3 | 200 | 300 | 2.40 | 2.00 | M | Average | Fair | Long 40yrs + | Medium | Medium | Remove | Adjacent retaining wall and new roadway (Lorikeet Grove). |
| 41 | <i>Casuarina glauca</i> Swamp Oak | 12 | 7 | 500 | 550 | 6.00 | 2.57 | M | Average | Fair | Long 40yrs + | Medium | Medium | Retain & Protect | 18% incursion to TPZ from new pedestrian pathway. 5 x stems from ground level, sharing root plate, adjacent retaining wall. |
| 42 | <i>Eucalyptus robusta</i> Swamp Mahogany | 14 | 8 | 500 | 580 | 6.00 | 2.63 | M | Fair | Average | Long 40yrs + | High | High | Retain & Protect | 17% incursion to TPZ from new pedestrian pathway. Low foliage density, minor mistletoe infestation, shared root plate. |
| 43 | <i>Casuarina glauca</i> Swamp Oak | 8 | 3 | 200 | 300 | 2.40 | 2.00 | SM | Average | Fair | Long 40yrs + | Medium | Medium | Retain & Protect | 2% incursion to TPZ from new pedestrian pathway. Crown bias to south. |
| 44 | <i>Eucalyptus robusta</i> Swamp Mahogany | 14 | 6 | 300 | 400 | 3.60 | 2.25 | M | Fair | Average | Medium 15-40yrs | High | High | Retain & Protect | Crown heavily suppressed by adjacent Coral Tree, low foliage density. |
| 45 | <i>Eucalyptus robusta</i> Swamp Mahogany | 15 | 8 | 400 | 450 | 4.80 | 2.37 | M | Average | Average | Medium 15-40yrs | High | High | Retain & Protect | Upper crown skewed to west, high level of deadwood within canopy. |
| 46 | <i>Eucalyptus robusta</i> Swamp Mahogany | 18 | 12 | 950 | 1100 | 11.40 | 3.44 | M | Average | Average | Medium 15-40yrs | High | High | Retain & Protect | 7% incursion to TPZ from new pedestrian pathway. Significant compaction to TPZ from adjacent informal roadway, appears stressed with low foliage density. |
| 47 | <i>Eucalyptus robusta</i> Swamp Mahogany | 14 | 10 | 800 | 900 | 9.60 | 3.17 | M | Average | Average | Medium 15-40yrs | High | High | Retain & Protect | 15% incursion to TPZ from new pedestrian pathway. Sparse foliage density, cavity @ 7m west side, canker @ 2m south side. |
| 48 | <i>Eucalyptus robusta</i> Swamp Mahogany | 10 | 5 | 300 | 350 | 3.60 | 2.13 | M | Fair | Average | Long 40yrs + | High | High | Retain & Protect | 5% incursion to TPZ from new pedestrian pathway. Lean to west, crown impacted by adjoining T49. |
| 49 | <i>Casuarina glauca</i> Swamp Oak | 12 | 3 | 200 | 250 | 2.40 | 1.85 | SM | Average | Average | Long 40yrs + | Medium | Medium | Retain & Protect | 18% incursion to TPZ from new pedestrian pathway. Impacting T48, growing through canopy. |
| 50 | <i>Eucalyptus robusta</i> Swamp Mahogany | 14 | 9 | 350 | 400 | 4.20 | 2.25 | M | Average | Average | Short 5-15yrs | High | High | Retain & Protect | Sparse foliage density, upper crown dieback, high levels of deadwood. |

| Tree No. | Genus & species Common Name | Height (m) | Crown Spread (m) | DBH (mm) | DGL (mm) | TPZ Radius (m) | SRZ Radius (m) | Age Class | Health / Vitality | Structure/ Condition | SULE Rating | Landscape Significance | Retention Value | Retain / Remove | Comments |
|----------|---|------------|------------------|----------|----------|----------------|----------------|-----------|-------------------|----------------------|--------------------|------------------------|---------------------|------------------|--|
| 51 | <i>Erythrina x sykesii</i> Coral Tree | 12 | 10 | 400 | 500 | 4.80 | 2.47 | M | Good | Fair | Long 40yrs + | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 52 | <i>Erythrina x sykesii</i> Coral Tree | 10 | 5 | 300-400 | 350-450 | - | - | M | Good | Fair | Long 40yrs + | Low | Consider Removal | Remove | Large group of self sown Coral Trees. Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 53 | <i>Casuarina glauca</i> Swamp Oak | 8 | 2 | 100-150 | 150-200 | - | - | SM | Good | Fair | Long 40yrs + | Medium | Medium | Remove | Stand of densley populated self-seeded trees. |
| 54 | <i>Cinnamomum camphora</i> Camphor Laurel | 6 | 4 | 200 | 220 | 2.40 | 1.75 | SM | Fair | Poor | Long 40yrs + | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 55 | <i>Ligustrum lucidum</i> Broad-leaved Privet | 5 | 4 | 250 | 300 | 3.00 | 2.00 | M | Poor | Poor | Medium 15-40yrs | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 56 | <i>Erythrina x sykesii</i> Coral Tree | 7 | 5 | 300 | 300 | 3.60 | 2.00 | M | Good | Poor | Long 40yrs + | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 57 | <i>Erythrina x sykesii</i> Coral Tree | 6 | 5 | 250 | 300 | 3.00 | 2.00 | M | Good | Poor | Long 40yrs + | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 58 | <i>Erythrina x sykesii</i> Coral Tree | 7 | 6 | 300 | 350 | 3.60 | 2.13 | M | Good | Fair | Long 40yrs + | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 59 | <i>Erythrina x sykesii</i> Coral Tree | 8 | 8 | 400 | 500 | 4.80 | 2.47 | M | Good | Fair | Long 40yrs + | Low | Consider Removal | Remove | Exempt weed species under Part B4.22 of Pittwater 21 DCP. |
| 60 | <i>Casuarina glauca</i> Swamp Oak | 18 | 7 | 550 | 600 | 6.60 | 2.67 | M | Fair | Poor | Long 40yrs + | High | High | Retain & Protect | 16% incursion to TPZ from new roadway and stormwater. Neighbouring tree, lean & canopy bias to west, heavily weighted, previous branch failures and some decay evident in basal region north side. |
| 61 | <i>Casuarina glauca</i> Swamp Oak | 16 | 6 | 650 | 800 | 7.80 | 3.01 | M | Fair | Fair | Long 40yrs + | High | High | Retain & Protect | 7% incursion to TPZ from new roadway and stormwater. Neighbouring tree, co-dominant stems from 6m, appears stable. |

APPENDIX 2 - TREE LOCATION PLAN

NOTE: MUST BE READ IN CONJUNCTION WITH ARBORICULTURAL IMPACT ASSESSMENT

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

Verify all dimensions on site prior to construction.

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

LEGEND

-  EXISTING TREE TO BE RETAINED
-  EXISTING TREE TO BE REMOVED
-  EXISTING TREE TO BE RETAINED - NOT ASSESSED*
-  TREE MARKED ON SURVEY BUT UNABLE TO BE LOCATED ON SITE - ASSUMED REMOVED
-  TREE PROTECTION FENCE (AS PER APPENDIX 5)
-  SITE BOUNDARY

*TREE NOT ASSESSED DUE TO BEING AWAY FROM AREA OF PROPOSED WORKS

| Issue Code | Issue Description | By | Chk | Date |
|------------|-------------------|----|-----|----------|
| A | CA FOR APPROVAL | TP | GT | 24.04.20 |

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

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION

45-49
 WARRIEWOOD ROAD
 WARRIEWOOD

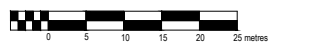
DRAWING TITLE

TREE LOCATION PLAN - OVERALL

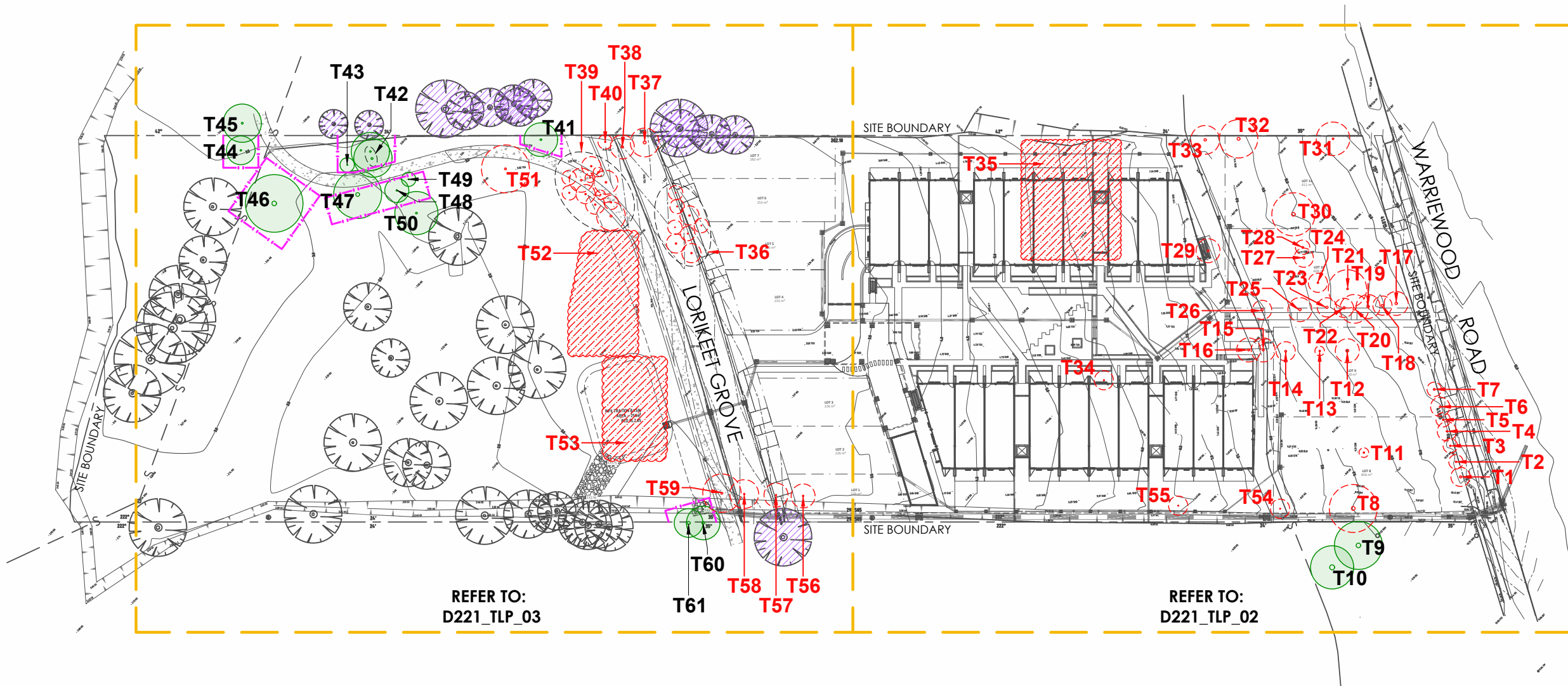
CLIENT

ARCHIDROME

Drawn : TP
 Designed : GT
 Project No. : D221
 Bar Scale



1:1000 @ A3
 SHEET NUMBER : D221_TLP_01
 REVISION : A



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

Verify all dimensions on site prior to construction.

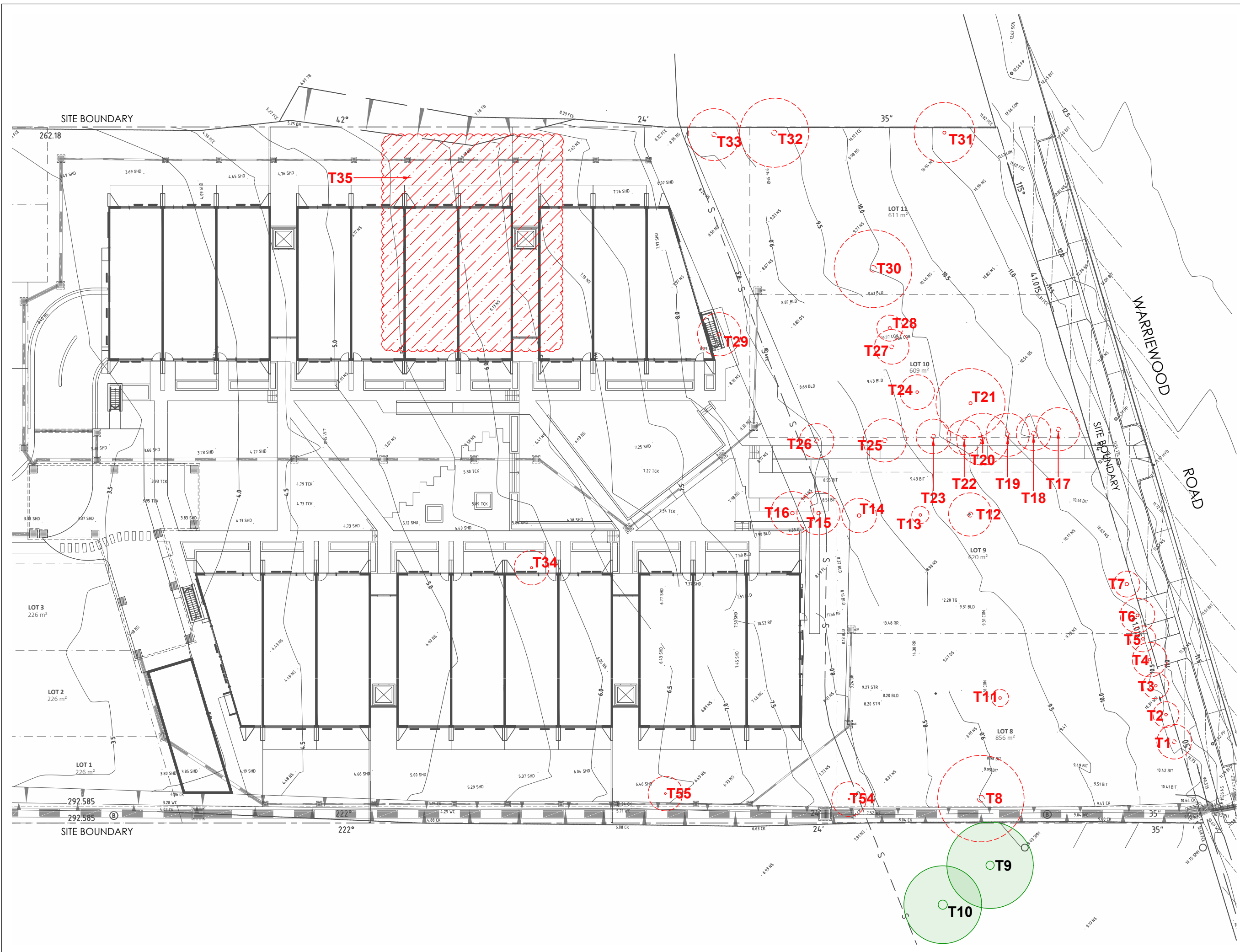
CIVIL, STRUCTURAL, HYDRAULIC, ELECTRICAL AND SPECIALIST WATER FEATURE WORKS:
 Refer to specialist and consultant's drawings for all information contained within these documents relating to and nominated as specialist and consultant work. Specialist and consultant drawing information contained in these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

LEGEND

 **T9** EXISTING TREE TO BE RETAINED

 **T1** EXISTING TREE TO BE REMOVED

--- SITE BOUNDARY



| Issue Code | Issue Description | By | Chk | Date |
|------------|-------------------|----|-----|----------|
| A | CA FOR APPROVAL | TP | GT | 24.04.20 |

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

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION

45-49
 WARRIEWOOD ROAD
 WARRIEWOOD

DRAWING TITLE

TREE LOCATION PLAN - NORTH

CLIENT

ARCHIDROME

Drawn : TP
 Designed : GT
 Project No. : D221
 Bar Scale









1:400 @ A3
 SHEET NUMBER D221_TLP_02
 REVISION A

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

Verify all dimensions on site prior to construction.

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

LEGEND

-  EXISTING TREE TO BE RETAINED
-  EXISTING TREE TO BE REMOVED
-  EXISTING TREE TO BE RETAINED - NOT ASSESSED*
-  TREE MARKED ON SURVEY BUT UNABLE TO BE LOCATED ON SITE - ASSUMED REMOVED
-  TREE PROTECTION FENCE (AS PER APPENDIX 5)
-  SITE BOUNDARY

*TREE NOT ASSESSED DUE TO BEING AWAY FROM AREA OF PROPOSED WORKS

| Issue Code | Issue Description | By | Chk | Date | |
|------------|-------------------|--------------|-----|------|----------|
| A | CA | FOR APPROVAL | TP | GT | 24.04.20 |

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

PROJECT

PROPOSED RESIDENTIAL SUBDIVISION

45-49
 WARRIEWOOD ROAD
 WARRIEWOOD

DRAWING TITLE

TREE LOCATION PLAN - SOUTH

CLIENT

ARCHIDROME

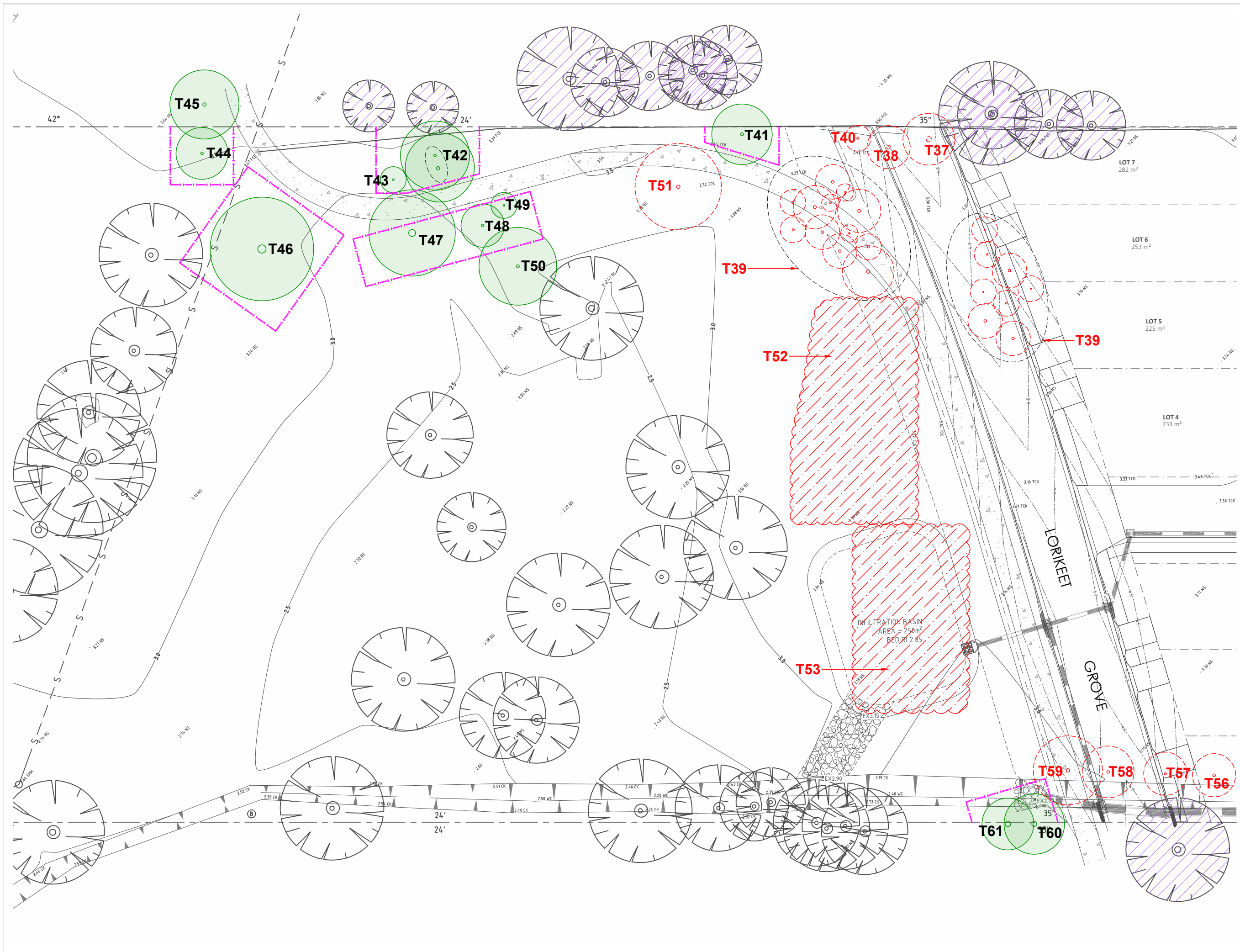
Drawn : TP
 Designed : GT
 Project No. : D221
 Bar Scale



1:400 @ A3

SHEET NUMBER
 D221_TLP_03

REVISION
 A



APPENDIX 3

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

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

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

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

Tree Significance - Assessment Criteria



1. High Significance in landscape

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

2. Medium Significance in landscape

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

3. Low Significance in landscape

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

Environmental Pest / Noxious Weed Species

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

Hazardous/Irreversible Decline

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

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

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

Table 1.0 Tree Retention Value - Priority Matrix.

| | | 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

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

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

Tree Significance

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

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

Significance Scale

- 1 – High
- 2 – Medium
- 3 – Low

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

Tree Retention Value

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

Retention Value

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

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

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

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

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

3.1 Tree protection zone (TPZ)

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

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

3.2 Determining the TPZ

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

$$TPZ = DBH \times 12$$

where

DBH = trunk diameter measured at 1.4 m above ground

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

3.3.5 Structural root zone (SRZ)

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

Determining the SRZ

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

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

where

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

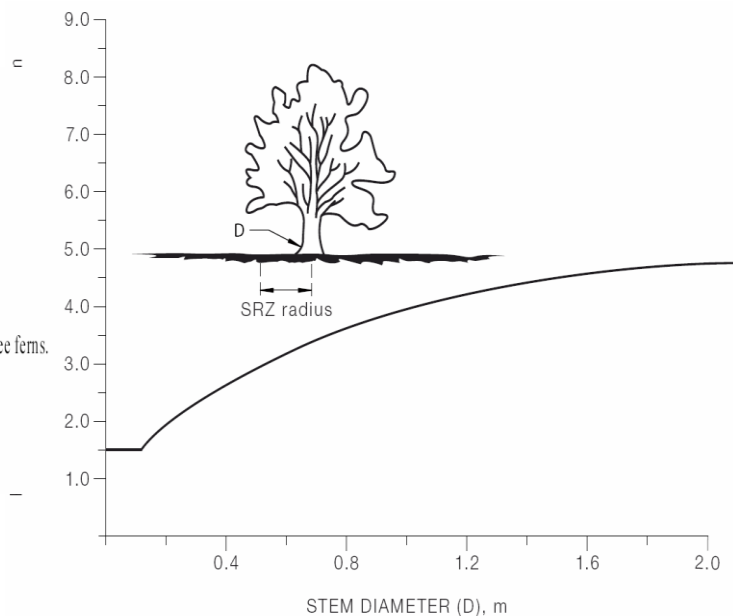
Note: The SRZ for trees with trunk diameters less than 0.15 m will be 1.5 m (see Figure 1).

The curve can be expressed by the following formula:
 $R_{SRZ} = (D \times 50)^{0.42} \times 0.64$

NOTES:

- 1 R_{SRZ} is the structural root zone radius.
- 2 D is the stem diameter measured immediately above root buttress.
- 3 The SRZ for trees less than 0.15 m diameter is 1.5 m.
- 4 The SRZ formula and graph do not apply to palms, other monocots, cycads and tree ferns.
- 5 This does not apply to trees with an asymmetrical root plate.

FIGURE 1 STRUCTURAL ROOT ZONE



APPENDIX 5 – GENERAL TREE PROTECTION SPECIFICATION

1.0 Appointment of Project Arborist

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

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

2.0 Schedule of Works and Responsibilities

| HOLD POINT | TASK | RESPONSIBILITY | CERTIFICATION | TIMING OF INSPECTION |
|------------|--|----------------------|-------------------------|---|
| 1 | Indicate clearly (with spray paint on trunks) trees approved for removal only | Principal Contractor | Project Arborist (AQF5) | Prior to demolition or site establishment |
| 2 | Install tree protection fencing, and additional root, trunk and/or branch protection | Principal Contractor | Project Arborist (AQF5) | Prior to demolition or site establishment |
| 3 | Supervise all excavation works proposed within the TPZ | Principal Contractor | Project Arborist (AQF5) | As required prior to works proceeding within TPZ |
| 4 | Inspection of trees by Project Arborist | Principal Contractor | Project Arborist (AQF5) | Monthly during construction |
| 5 | Final Inspection of trees by Project Arborist | Principal Contractor | Project Arborist (AQF5) | Following removal of tree protection measures prior to Occupation Certificate |

3.0 Compliance

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

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

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

4.0 Tree Removal

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

5.0 Tree Protection Zone

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

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

6.0 Tree Protection Fencing

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

As a minimum, the Tree Protection Fence shall consist of 1.8m high wire mesh panels supported by concrete feet. Panels shall be fastened together and supported to prevent sideways movement. The tree shall not be damaged during the installation of the Tree Protection Fencing. Refer to Typical Tree Protection Details (**Appendix 3**).

7.0 Site Management

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

8.0 Scaffolding

Where possible, scaffolding shall not be located within the TPZ. Scaffolding shall not be in contact with the tree. As necessary, this shall be achieved by erecting scaffolding around branches. Branches shall be tied back and protected as deemed necessary by the Project Arborist. Refer to Typical Tree Protection Details (**Appendix 3**).

9.0 Works within the Tree Protection Zones

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

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

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

10.0 Ground Protection

Where deemed necessary by the Project Arborist, machinery movements shall be restricted to areas of existing pavement or from areas of temporary ground protection such as ground mats or steel road plates. Refer to Typical Tree Protection Details (**Appendix 3**)

11.0 Trunk Protection

Where required by the Project Arborist, trunk protection shall be installed. Trunk protection shall be installed by wrapping padding (either carpet underlay or 10mm thick jute geotextile mat) around the trunk and first order branches to a minimum height of 2m. Timber battens (90 x 45mm) spaced at 150mm centres shall be strapped together and placed over the padding. Timber battens must not be fixed to the trees. Refer to Typical Tree Protection Details (**Appendix 3**).

12.0 Structure & Pavement Demolition

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

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

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

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

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

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

13.0 Underground Services

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

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

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

14.0 Excavations, Root Protection & Root Pruning

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

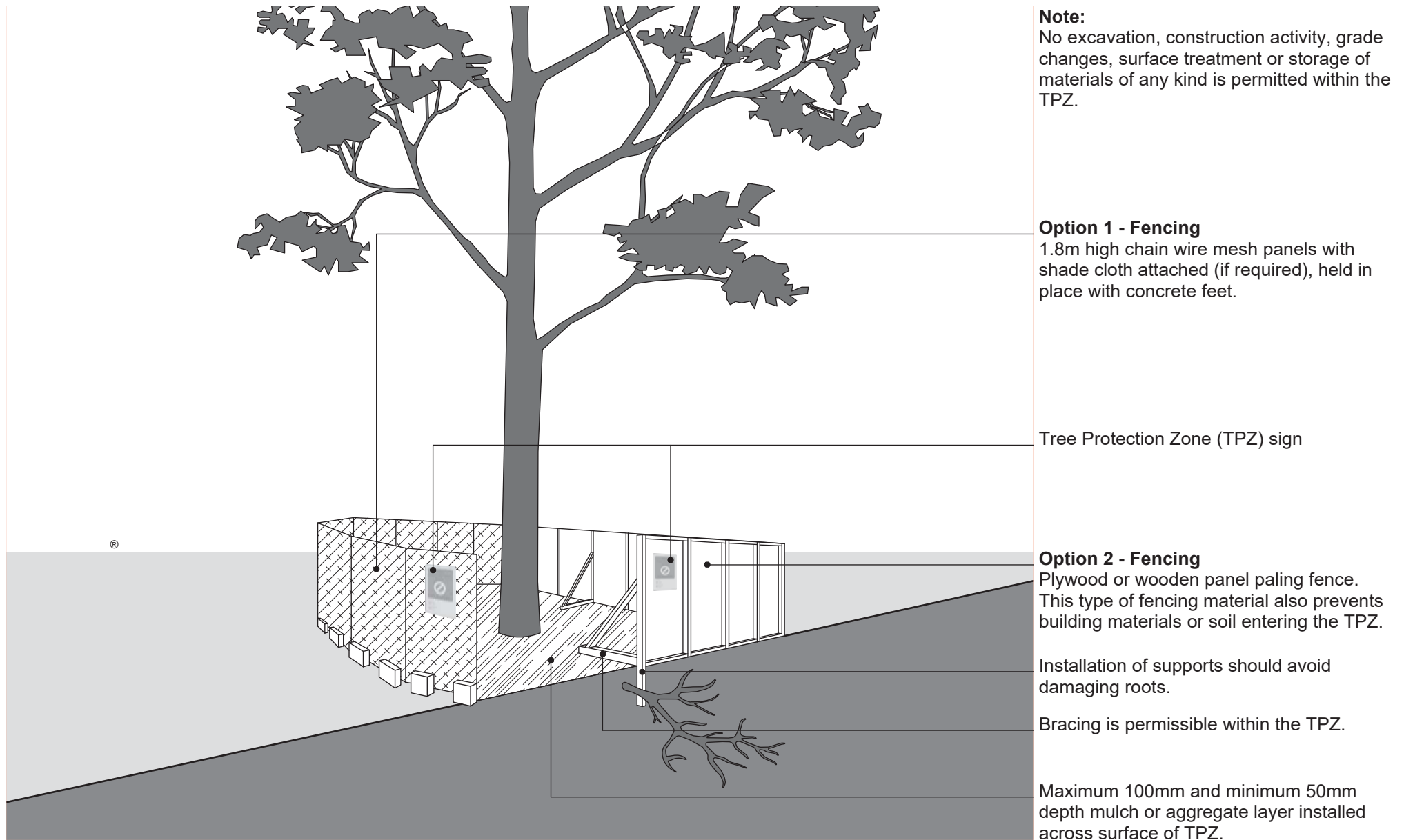
Excavations within the TPZ shall be undertaken by hand or using hydro vacuum excavation methods (or similar approved device) to protect tree roots. If there is any delay between excavation works and backfilling, exposed roots shall be protected from direct sunlight, drying out and extremes of temperature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

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

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

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

APPENDIX 6 - TYPICAL TREE PROTECTION DETAILS



01

Tree Protection Fencing

