ADVANCED TREESCAPE CONSULTING
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Issue 3: 10/04/2026
Issue: 2: 12/02/2026
Issue 1.1: 01/09/2025
Issue 1: 26/08/2025

UPDATED

ARBORICULTURAL IMPACT ASSESSMENT

INCLUDES

TREE PROTECTION SPECIFICATIONS (TPS)

5-9 Cowan Road
ST IVES NSW 2075

prepared for

Prosper 5-9 Cowan Road St Ives Pty Ltd

assessed by

Russell Kingdom

AQF5 Arboriculturist – Hortus Australia
AQF8 Horticulturist – University of Western Sydney

Principal: Russell Kingdom
Fully insured: Public Liability $20M, Professional Indemnity $5M.
Advanced Treescape Consulting is committed to providing a safe working environment for its employees in accordance with the Work Health and Safety Act 2011 (NSW), as amended, and the Work Health and Safety Regulation 2025.

DISCLAIMER

- The author and Advanced Treescape Consulting take no responsibility for actions taken and their consequence if contrary to those expert and professional instructions are given as recommendations pertaining to safety. The conclusions and recommendations contained in this report refer to the tree(s) condition on the inspection day. All care has been taken using the most up to date Arboricultural information in the preparation of this report. The report is based on a visual inspection only. Tree health and environmental conditions can change irreversibly at any time due to unforeseen circumstances or events. Due to Myrtaceae family hybridisation, some tree species are difficult to accurately identify. Unless trees are in full flower identification is only probable.

- This report is NOT to be viewed as consent to remove any trees subject of this report. Formal approval MUST be given by Council for any tree removal (unless exempt in relevant Development Control Plan).

- The receipt of this Arboricultural Impact Assessment (AIA) does not constitute an automatic appointment of Advanced Treescape Consulting as the project arborist. Our involvement in the assessment is limited to evaluating the potential impacts of the proposed development on existing trees and providing recommendations accordingly. Any appointment as the project arborist would require a separate agreement, outlining the scope of services, responsibilities, and terms of engagement. Until such an agreement is formally established, Advanced Treescape Consulting does not assume any ongoing role or obligations related to arboricultural supervision, monitoring, or compliance for the project.

Limitations Of Tree Risk Assessment

- *Tree risk assessment is limited in scope to the specific risk(s) of interest and does not include any and all risks.*
- *Tree risk assessment considers significant known and/or assigned targets and visible or detectable tree conditions.*
- *Tree risk assessments represent the condition of the tree and site at the time of inspection.*
- *Not all defects are detectable, and not all failures are predictable.*

(Dunster, Lilly, Matheny, & Smiley, 2025)

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PHOTOGRAPHS IN THIS DOCUMENT

Unless otherwise noted, all photographs included in this document were captured by or on behalf of Advanced Treescape Consulting on the date of the site inspection.

CITING THIS DOCUMENT

This document may be cited as:

Advanced Treescape Consulting,
Kingdom, R.
25-076b-03 (2026) 5-9 Cowan Road, ST IVES NSW 2075.docx,
Ku-ring-gai Council Local Government Area,
dated 10/04/2026.

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1.0 Executive Summary/Proposal

This Arboricultural Impact Assessment has been prepared by Advanced Treescape Consulting to accompany a detailed State Significant Development Application (SSDA) for a residential development (including in-fill affordable housing) at 5-9 Cowan Road, St Ives within the Ku-ring-gai Local Government Area (LGA).

This report has been prepared to address the Secretary's Environmental Assessment Requirements (SEARs) issued for the project (SSD-88948458) on 25 July 2025.

This report concludes that the proposed residential development is suitable and warrants approval subject to the implementation of the following mitigation measures:

Apply all recommendations contained within this report.

Following the implementation of the above mitigation measures, the remaining impacts are considered appropriate.

The plans supplied are from PBD Architects, Drawing No. DA102 & DA103, Issue 04, dated 9/04/2026; EI Australia, Drawing NO. C203, Revision 1, dated 25/08/2025 *and* Rygate Surveyors, Plan No. 80743-D.DWG, dated 16/04/2025. The site plan in Appendix 1a illustrates the location of all surveyed trees.

This assessment has been conducted by Russell Kingdom: Diploma in Arboriculture (AQF5), Graduate Diploma of Horticulture (AQF8) - Australian Qualification Framework (AQF) (Department of Education and Training, Australian Government) (see Appendix 11).

1.1 Introduction

The SSD application seeks development consent for a proposed residential flat building, including in-fill affordable housing at 5-9 Cowan Road, St Ives (the site). The proposed works include demolition of existing structures, site preparation works, excavation and construction of the building and associated landscaping works.

Specifically, the SSDA seeks development consent for:

- demolition of the existing row of 10 attached townhouses at the site;
- construction of an 9-storey residential flat building comprising:
    - 77 new dwellings
    - 3 basement levels for car parking
    - Communal open space at Ground Level and Levels 7 and 8
- landscaping; and
- associated site works.

The proposal also incorporates 15% of the total gross floor area for affordable housing and seeks to utilise the incentive controls under Chapter 2, Part 2, Division 1, Section 16 of State Environmental Planning Policy (Housing) 2021 (Housing SEPP) to achieve 30% additional building height and 30% additional floor space ratio (FSR).

This report has been prepared in response to the requirements contained within the Secretary's Environmental Assessment Requirements (SEARs) dated 25 July 2025 and issued for the SSDA (SSD-88948458). Specifically, this report has been prepared to respond to the SEARs requirement issued below.

Item 8. Trees and Landscaping: Assess the number, location, condition, and significance of trees to be removed and retained and note any existing canopy coverage to be retained on-site.

1.2 Subject Site

The site is located at 5-9 Cowan Road, St Ives, within the Ku-ring-gai Local Government Area, and is legally described as SP30097. The site has an area of approximately 3,467.7sqm and is rectangular in shape.

The site currently contains a single row of ten, two-storey attached townhouses. The site is defined by large mature trees along the northern, eastern, and western boundaries. Vehicular access to the site is provided at the southern boundary of the site from Cowan Road. The site is relatively flat.
The site adjoins St Ives Shopping Village to the north and east. Existing residential development (No. 3 Cowan Road) and St Ives Christ Church border the site to the south. To the west, two storey detached houses are located along Cowan Road.

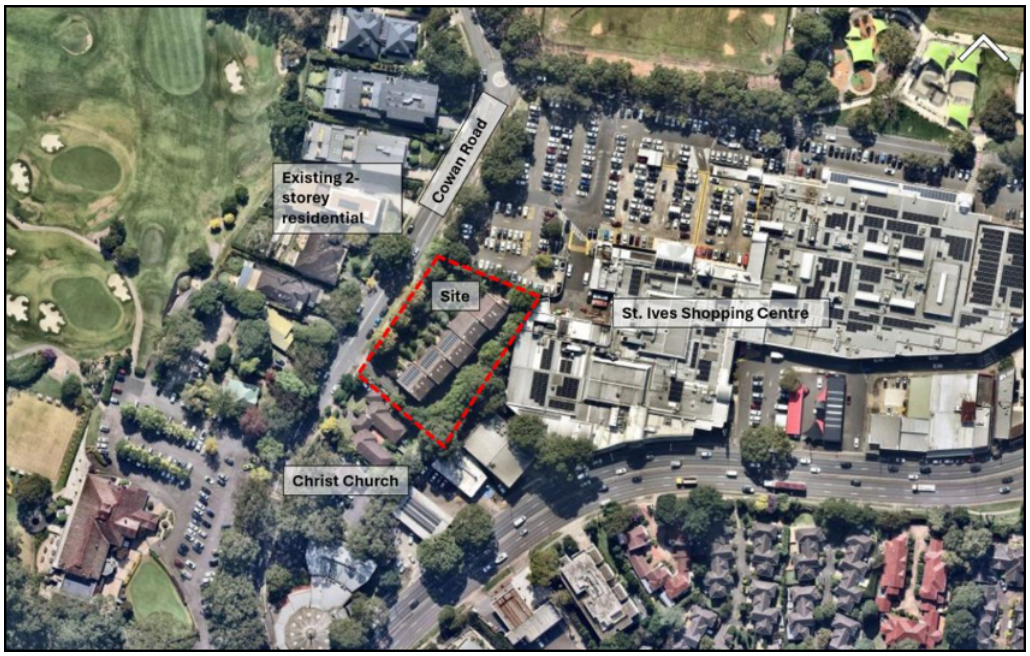

Figure 1: Site Location (Source: Nearmap 2025).

1.3 Surrounding Context

The site is located 800-metres east of Cowan Creek which is separated from the site by Pymble Golf Club. The site is also located within 105-metres of Emerald Fitness Centre, 245-metres from St Ives Village Green, and 210-metres from St Ives Playground. The building heights in the immediate locality are generally single to two-storeys, with increased heights of up to 5-storeys on Mona Vale Road, opposite St Ives Christ Church.

The site is accessible via bus services with stops located along Mona Vale Road which is a 4-minute walk to the south, and along Killeaton Street, which is a 9-minute walk to the north. The bus routes connect the site to Mona Vale, Gordon, and the Northern Suburbs.

Figure 2: Broader Site Context (Base source: Nearmap).

2.0 Scope of Report

- Assess the trees on site and located in adjoining sites if the NRZ enters the site or is possibly impacted by the proposed works.
- Assess the impact of the proposed development on the trees.
- Identify trees to be retained and those that require removal to facilitate the proposed development plans.
- Make recommendations to ensure the impact on the retained trees is acceptable and complies with AS 4970:2025 Protection of trees on development sites (Australian Standard®, 2025) — hereafter referred to as “AS 4970”.

3.0 Site Inspection

The subject site was inspected on 05/05/2025. The property faces west and is a residential developed block. The land is slopes from west to east. See sections 1.2 & 1.3 (above) for additional information.

The soil texture was observed to be clay-based Glenorie soils (Chapman, Murphy, Tillie, Atkinson, & Morse, 2009).

> *Glenorie soil limitations are* high soil erosion hazard localised impermeable highly plastic soil and moderately reactive.

Drainage characteristics are considered to be good.

This site is **NOT** within a NSW Rural Fire Service (RFS) 10/50 Clearing Area.

3.1 Site Assessment

ENVIRONMENTAL

- The microclimate is considered good as all trees appear to have reached their genetic potential.
- There are no re-reflected heat load issues.
- There are no sunlight level issues.
- There is no irrigation visible on the site.
- The site is exposed to all winds.

4.0 Method of Assessment

- An objective visual inspection was made from the ground of the health and condition of the trees based on the Levels of Visual Assessment method – 'Level 2: Basic Assessment Process' (Dunster, Lilly, Matheny, & Smiley, 2025) - Appendix 4.
- Estimation of tree heights by Silva Clino Master/Heightmeter™ plus visual estimates of canopy spreads.
- Distances of trees, etc. were measured using a Leica Disto™ D2 Laser Distance Meter.
- Calculation of Notional Root Zones (NRZ) and Structural Root Zones (SRZ) using AS 4970 - Appendices 5 & 6.
- The application of NRZs and SRZs using AS 4970 - Appendices 7 & 8.
- Hazard and significance ratings for all trees - refer to Failure Potential, Size of Defective Part & Target Rating = Hazard Rating is out of 12 (detailed in Appendix 4 and shown in the Tree Schedule below - section 5.
- Significance of a Tree, Assessment Rating System (STARS) (IACA, 2010) - section 5.3.
- Any additions, mark-ups and/or calculations to plans included in this report have been made using Bluebeam® Revu® (http://www.bluebeam.com).
- All photographs that appear in this report are unaltered originals which were taken during site inspection - Appendix 2.
- Glossary - Appendix 10.

It should be noted that this objective assessment and related visual tree assessments are based upon health and condition of the trees that were observed at the time of inspection.

The recommendations of this report regarding retention, works or removal are based upon Useful Life Expectancy (ULE – see Appendix 9) and hazard ratings being applied.

This information has guided the conclusions in this report.

5.0 Assessment of VTA, Impact & Tree Protection Measures required by Proposed Plans

Accepted tree management practices recommend removal of trees where ULE ratings are 3 (or listed as dead), and/or where hazard ratings are high [where ratings adapted from Matheny and Clark range from low=3 to dangerous=12] (Matheny & Clark, 1994). A detailed explanation of ULE ratings is provided in Appendix 9. Height/Diameter Ratio should not exceed 1:30 (Mattheck & Breloer, 1994).

The trees contained within the Tree Schedule (see below) range from having short to long ULEs. These trees also have a broad range of hazard ratings which limits the retention of such trees within development sites. Appendix 3 provides explanations of abbreviations and assessment criteria.

Notional Root Zones for each of the trees that are assessed to be retained and protected are shown in the Tree Schedule below. It should be noted that distance stated is a radius, not a diameter. AS 4970 states that: an encroachment of the NRZ of less than 10% is considered minor; an encroachment is considered moderate if it is greater than 10% and less than or equal to 20% of the area of the NRZ and is outside of the SRZ; and an encroachment is considered major if it is greater than 20% of the area of the NRZ or is inside the SRZ. No above-ground intrusion into the NRZ is to exceed 20% of total NRZ area (e.g., cantilevered building, balcony etc.).

Tree Schedule

ABBREVIATIONS: m-metres, **mm**-millimetres, **NRZ**-notional root zone – radius (m), **SRZ**-structural root zone – radius (m), **DSH**-trunk diameter at standard height (1.4m), **DGL**-trunk diameter at ground level, **VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good, **CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-quad-dominant trunk, **Multi**-5+ trunks/leaders, **NSEW**-north south east west, **Ra**-radial, **J**-juvenile, **YM**-young mature, **SM**-semi mature, **M**-mature, **VM**-very mature, **OM**-over mature, **S**-save, **R**-remove, **T**-transplant, **W**-work needed to be carried out, **Mon**-monitor, **VTA**-visual tree assessment, **Hazard Rating**-3=low hazard ~ 12=dangerous, **N/A**-not applicable, **ULE**-useful life expectancy, **STARS**-Significance of a Tree, Assessment Rating System, **TPZ**-tree protection zone.

TREE NO.	SPECIES	HEIGHT (m)	DSH (mm)	DGL (mm)	NRZ (m)	SRZ (m)	HEALTH/VIGOUR	STRUCTURE	CANOPY SPREAD (m)	AGE CLASS	VTA	HAZARD RATING	SIGNIFICANCE	ULE	STARS	COMMENT OF TREE ASSESSMENT	ASSESSMENT OF IMPACT	RECOMMENDATION
1	*Jacaranda mimosifolia* (Jacaranda)	12	800	940	9.6	3.2	G	G	8 N 8 S 8 E 10 W	M	Pass	6	Medium	2	Medium	This tree is located in the adjacent site.	There will be a tiny intrusion into the NRZ of this tree from the proposed substation and building footprint of 3.78m^2 (1.31%). The SRZ of this tree will not be impacted by the proposed works. All works within the NRZ of this tree MUST be supervised by the project arborist. TPZ fencing is required (as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S

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2	*Lophostemon confertus* (Brush Box)	12	800	940	9.6	3.2	G	G	8 N 8 S 8 E 10 W	M	Pass	6	Medium	2	Medium	This tree is located in a raised garden bed. It is 5.4m to the retaining wall.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
3	*Archontophoenix cunninghamiana* (Bangalow Palm)	9	200	460	**3.0	N/A	G	G	2 Ra	M	Pass	4	Medium	2	Medium	This tree is located in a raised garden bed. The tree is 500mm to the retaining wall.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
4	*A. cunninghamiana* (Bangalow Palm)	10	210	450	**3.0	N/A	G	G	2 Ra	M	Pass	4	Medium	2	Medium	This tree is located in a raised garden bed.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
5	*Washingtonia robusta* (Mexican Fan Palm)	9	460	590	**4.0	N/A	G	G	3 Ra	M	Pass	4	Medium	2	Medium	This tree is located in a raised garden bed.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
6	*Fraxinus* sp. (Ash)	12	410	500	4.9	2.5	F	G	6 Ra	M	Pass	5	Medium	2	Medium	The crown of this tree is over the roof.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R

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7	**Group of 3x** *Syagrus romanzoffiana* (Cocos Palm)	9	280	400	**3.0	N/A	G	G	2 Ra	M	Pass	4	Low	2	Low	This tree species is listed as exempt in Part 13, section 13.2 'Exemptions for Tree and Vegetation Works' of Ku-ring-gai Council's Tree and Vegetation Preservation document.	Removal is required. **Justification for removal:** This tree species is callused as exempt *and* is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
8	*Cupressus macrocarpa 'Aurea Saligna'* (Golden Weeping Monterey Cypress)	7	150	220	2.0	1.8	F	F	0.5 Ra	M	Pass	4	Low	2	Low	This is a small tree.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
9	**Group of 2x** *Syzygium australe* (Brush Cherry)	5	60	120	2.0	1.5	G	G	1 Ra	YM	Pass	4	Low	2	Low	This is a small tree.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
10	*Magnolia × soulangeana* (Saucer Magnolia)	9	220	300	2.6	2.0	G	G	3 Ra	M	Pass	5	Medium	2	Medium	This tree is in good health and structural condition.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
11	**Group of 3x** *S. australe* (Brush Cherry)	6	100	150	2.0	1.5	G	F	1 Ra	YM	Pass	4	Low	2	Low	This group displays forest architecture. It is <150mm to the brick wall.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R

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12	**Group of 2x** *Camellia sasanqua* (Sasanqua)	7	120	140	2.0	1.5	G	G	2 Ra	M	Pass	4	Low	2	Low	This tree is in good health and structural condition.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
13	**Group of 3x** *Callistemon viminalis* (Weeping Bottlebrush)	5	<150	<250	2.0	1.9	G	F	3 Ra	M	Pass	5	Low	2	Low	These trees have all been lopped.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
14	*C. sasanqua* (Sasanqua)	6	150	200	2.0	1.7	G	G	2 Ra	M	Pass	4	Low	2	Low	There is a retaining wall more than 2m to the west.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
15	*Platanus x hispanica 'Acerifolia'* (London Plane)	15	730	900	8.8	3.2	G	G	10 Ra	M	Pass	6	Medium	2	Medium	This tree has powerlines to the west.	There will be an intrusion into the NRZ of this tree from the proposed development of 40.57m^2 (16.68%). This is an acceptable, moderate level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development. **It must be noted that London Plane Trees are very resilient** to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.	S

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16	*P. x hispanica 'Acerifolia'* (London Plane)	9	320	400	3.8	2.3	G	G	6 Ra	YM	Pass	6	Medium	2	Medium	This tree has powerlines to the west. This young tree is being suppressed by Tree 15.	There will be an intrusion into the NRZ of this tree from the proposed development of 9.06m^2 (19.97%). This is an acceptable, moderate level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development. **It must be noted that London Plane Trees are very resilient** to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.	S
17	*P. x hispanica 'Acerifolia'* (London Plane)	15	460	560	5.5	2.6	G	G	8 Ra	M	Pass	6	Medium	2	Medium	This tree has powerlines to the west.	There will be an intrusion into the NRZ of this tree from the proposed development of 18.25m^2 (19.2%). This is an acceptable, moderate level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development. **It must be noted that London Plane Trees are very resilient** to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.	S

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18	*P. x hispanica 'Acerifolia'* (London Plane)	15	800	1030	9.6	3.4	G	G	8 N 6 S 10 E 6 W	M	Pass	6	Medium	2	Medium	This tree has powerlines to the west.	There will be an intrusion into the NRZ of this tree from the proposed development of 39.68m^2 (13.7%). This is an acceptable, moderate level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development. **It must be noted that London Plane Trees are very resilient** to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.	S
19	*Melaleuca myrtifolia* (Sweet scented Paperbark)	9	CD 310 250 (400)	460	4.8	2.4	G	F	4 Ra	M	Pass	6	Medium	2	Medium	This tree has an inclusive main fork union.	Removal is required. **Justification for removal:** The SRZ of this tree will be intruded by the proposed development. This is an unacceptable impact. The removal of this tree is required to facilitate the proposed development plans.	R
20	*Tibouchina lepidota 'Alstonville'* (Alstonville Tibouchina)	4	TD 3x<100 (170)	250	2.0	1.9	G	P	1 N 1 S - E 2 W	M	Pass	4	Low	3	Low	There are previous failure sites.	Removal is required. **Justification for removal:** The SRZ of this tree will be intruded by the proposed development. This is an unacceptable impact. The removal of this tree is required to facilitate the proposed development plans.	R

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TREE NO.	SPECIES	HEIGHT (m)	DSH (mm)	DGL (mm)	NRZ (m)	SRZ (m)	HEALTH/VIGOUR	STRUCTURE	CANOPY SPREAD (m)	AGE CLASS	VTA	HAZARD RATING	SIGNIFICANCE	ULE	STARS	COMMENT OF TREE ASSESSMENT	ASSESSMENT OF IMPACT	RECOMMENDATION
21	*Howea forsteriana* (Kentia Palm)	6	180	250	**3.0	N/A	G	G	2 Ra	M	Pass	4	Medium	2	Medium	This tree is in good health and structural condition.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
22	*Hymenosporum flavum* (Native Frangipani)	8	190	220	2.3	1.8	G	G	2 Ra	M	Pass	4	Medium	2	Medium	This tree is in good health and structural condition.	Removal is required. **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.	R
23	*Cryptomeria japonica.* (Japanese Cedar)	9	320	400	3.8	2.3	F	F	3 Ra	M	Pass	4	Medium	2	Medium	This tree is located in the adjacent site. There is a sandstone retaining wall on the boundary.	There is a sandstone retaining wall between this tree and the boundary. There will be no additional intrusion in the NRZ of this tree from the proposed development. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
24	*J. mimosifolia* (Jacaranda)	12	400	460	4.8	2.4	G	G	6 N 4 S 4 E 8 W	M	Pass	6	Medium	2	Medium	The crown of this tree is over the boundary.	There will be an intrusion into the NRZ & SRZ of this tree from the proposed stormwater works. Any excavation within the NRZ & SRZ of this tree will need to be either **hand-dug** or **under-bored** using a vacuum truck. All works within the NRZ & SRZ of this tree **MUST** be **supervised** by the **project arborist**. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S

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TREE NO.	SPECIES	HEIGHT (m)	DSH (mm)	DGL (mm)	NRZ (m)	SRZ (m)	HEALTH/VIGOUR	STRUCTURE	CANOPY SPREAD (m)	AGE CLASS	VTA	HAZARD RATING	SIGNIFICANCE	ULE	STARS	COMMENT OF TREE ASSESSMENT	ASSESSMENT OF IMPACT	RECOMMENDATION
25	*Syncarpia glomulifera* (Turpentine)	10	380	460	4.6	2.4	G	G	6 N 2 S 2 E 6 W	M	Pass	6	Medium	2	Medium	This tree is located in the adjacent site. It is <200mm to the boundary.	The proposed stormwater works will use the same footprint as the existing stormwater pipes. There will be no additional intrusion into the NRZ of this tree. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
26	*Ligustrum lucidum* (Large-leaved Privet)	8	200	300	2.4	2.0	G	G	2 Ra	M	Pass	4	Low	2	Low	This tree is located in the adjacent site. It is <200mm to the boundary. This tree species is listed as exempt in Part 13, section 13.2 'Exemptions for Tree and Vegetation Works' of Ku-ring-gai Council's Tree and Vegetation Preservation document.	The full NRZ of this tree will not be impacted by the proposed stormwater works. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
27	*Syzygium paniculatum* (Magenta Lilly Pilly)	6	60	120	2.0	1.5	F	G	1 Ra	YM	Pass	4	Low	2	Low	This tree is in the adjacent site. It is 300mm to the fence. There are *Psyllidae* (Psyllids) and sooty mould.	The full NRZ of this tree will not be impacted by the proposed stormwater works. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S

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28	*J. mimosifolia* (Jacaranda)	12	360	450	4.3	2.4	G	F	- N 8 S - E 10 W	M	Pass	6	Medium	2	Medium	This tree has a tropism to the southwest. There is decay in an old wound in the trunk.	This tree has an existing intrusion into its NRZ from the existing development. There is a small intrusion into the NRZ of this tree from the proposed stormwater works of 2.12m^2 (3.65%). This is an acceptable, low level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
29	*Leptospermum petersonii* (Lemon-scented Teatree)	5	QD 150 3x60 (180)	460	2.4	2.4	G	F	6 N - S 2 E 4 W	M	Pass	4	Low	2	Low	This tree has a tropism to the north.	Removal is required. **Justification for removal:** This tree is located within the proposed stormwater works. Removal is required to facilitate the proposed development plans.	R
30	*Citharexylum* (Fiddlewood)	12	CD 420 210 (470)	600	5.6	2.7	F	VP	12 N 4 S 2 E 4 W	M	**Fail**	10	Low	3	Low	There is decay in a crack in the trunk of this tree.	Removal is recommended. **Justification for removal:** This tree is in very poor condition and is dangerous. It fails the visual tree assessment and is not suitable to be considered for retention.	R
31	*Citharexylum* (Fiddlewood)	12	CD 230 200 (300)	350	3.6	2.1	F	F	3 N 6 S 4 E 2 W	M	Pass	6	Medium	2	Medium	This tree is in good health and structural condition.	The full NRZ of this tree will not be impacted by the proposed development. Retain and protect.	S
32	**Group of 2x** *Eucalyptus botryoides* (Bangalay)	22	800	1000	9.6	3.3	G	G	10 Ra	VM	Pass	8	High	2	High	These two large trees are located in the adjacent site. There are extensive root plate intrusions. They are 500mm from the edge of trunk/s to the fence.	The full NRZ of these trees will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8.	S

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33	*Citharexylum* (Fiddlewood)	16	QD 420 280 250 140 (580)	800	7.0	3.0	G	F	4 N 6 S 6 E 10 W	VM	Pass	8	Medium	2	Medium	This tree has been previously lopped. There are multiple branch attachments and decay.	Removal is required. **Justification for removal:** This tree is located where the proposed onsite detention tank is to be installed. Numerous locations for the OSD where considered, but this was the area chosen as it has the impact on the least number of trees (this tree only). The removal of this tree will be required to facilitate the proposed development.	R
34	*Citharexylum* (Fiddlewood)	16	QD 3x340 200 (620)	850	7.4	3.1	G	F	4 N 4 S 6 E 8 W	M	Pass	8	Medium	2	Medium	This tree has been previously lopped. There are multiple branch attachments and decay.	Removal is required. **Justification for removal:** This tree is located within the proposed stormwater works. Removal is required to facilitate the proposed development plans.	R
35	*Citharexylum* (Fiddlewood)	16	CD 400 360 (540)	580	6.5	2.6	G	F	4 N 4 S 4 E 8 W	M	Pass	8	Medium	2	Medium	This tree has been previously lopped. There are multiple branch attachments and decay.	This tree currently has hard landscaping and stormwater pipes which are to be slightly moved. There will be a tiny intrusion into the NRZ of the tree from the realigned stormwater pipes of 0.99m^2 (1.31%). This is an acceptable, low level of impact. Retain and protect. All works within the NRZ of this tree MUST be supervised by the project arborist. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S

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36	*S. romanzoffiana* (Cocos Palm)	14	400	730	**4.0	N/A	G	G	3 Ra	M	Pass	5	Medium	2	Medium	This tree is <500mm to the fence. This tree species is listed as exempt in Part 13, section 13.2 'Exemptions for Tree and Vegetation Works' of Ku-ring-gai Council's Tree and Vegetation Preservation document.	Removal is recommended. **Justification for removal:** This tree species is classed as exempt.	R
37	*Citharexylum* (Fiddlewood)	16	TD 450 340 330 (650)	760	7.8	3.0	G	F	8 Ra	M	Pass	6	Medium	2	Medium	This tree has been previously lopped and there is decay present. The tree is 500mm to the boundary fence.	There is existing hard landscaping within the NRZ of this tree, which is proposed to be removed. There will be no additional impact on this tree from the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
38	*S. romanzoffiana* (Cocos Palm)	10	290	360	**4.0	N/A	G	G	3 Ra	M	Pass	4	Low	2	Low	This tree species is listed as exempt in Part 13, section 13.2 'Exemptions for Tree and Vegetation Works' of Ku-ring-gai Council's Tree and Vegetation Preservation document.	Removal is recommended. **Justification for removal:** This tree species is classed as exempt.	R

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39	*Citharexylum* (Fiddlewood)	12	520	650	6.2	2.8	G	F	6 Ra	M	Pass	6	Medium	2	Medium	This tree has been previously lopped. There are multiple branch attachments and decay present. The crown is over the adjacent roof. The tree is 500mm from the edge of the trunk to the fence.	There is existing hard landscaping within the NRZ of this tree, which is proposed to be removed. There will be no additional impact on this tree from the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
40	*L. petersonii* (Lemon-scented Teatree)	6	CD 210 160 (260)	350	3.1	2.1	G	G	3 Ra	M	Pass	4	Low	2	Low	This tree is located at the front of the site.	There is existing hard landscaping within the NRZ of this tree, which is proposed to be removed. There will be no additional impact on this tree from the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
41	*Citharexylum* (Fiddlewood)	14	CD 260 250 (360)	450	4.3	2.4	G	F	6 Ra	M	Pass	6	Medium	2	Medium	This tree has been previously lopped. There are multiple branch attachments and decay present. The crown is over the adjacent roof. The tree is 500mm from the edge of the trunk to the fence.	The full NRZ of this tree will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
42	*Citharexylum* (Fiddlewood)	14	CD 390 280 (480)	510	5.8	2.5	G	F	6 Ra	M	Pass	7	Medium	2	Medium	This tree has been previously lopped. The tree is 700mm to the adjacent building. The crown is over the roof, and there is decay present.	The full NRZ of this tree will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S

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43	*Citharexylum* (Fiddlewood)	14	CD 250 220 (330)	410	4.0	2.3	G	F	4 Ra	M	Pass	4	Low	2	Low	This tree has been previously lopped. There are multiple branch attachments and decay present.	The full NRZ of this tree will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
44	*L. petersonii* (Lemon-scented Teatree)	6	190	260	2.3	1.9	G	G	2 Ra	M	Pass	4	Low	2	Low	The crown of this tree is over the fence.	The full NRZ of this tree will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
45	*Citharexylum* (Fiddlewood)	16	680	750	8.2	1.9	G	F	10 N 6 S 4 E 10 W	M	Pass	7	Medium	2	Medium	This tree has been previously lopped. There are multiple branch attachments and decay present.	There is existing hard landscaping within the NRZ of this tree, which is proposed to be removed. There will be an intrusion into the NRZ of this tree from the proposed stormwater pipes and pit of 6.07m^2 (2.87%). The SRZ of this tree will NOT be intruded. This is an acceptable, low level of impact. Retain and protect. All works within the NRZ of this tree MUST be supervised by the project arborist. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S

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46	*Eucalyptus acmenoides* (White Mahogany)	30	900	1100	10.8	3.4	G	G	10 Ra	M	Pass	9	High	2	High	This tree is located in the adjacent site. The tree is 1.642m from the edge of trunk to the existing fence.	This tree currently has hard landscaping (much of which is to be removed) and stormwater pipes (which are to be slightly moved) within the NRZ of this tree. There will be a tiny intrusion into the NRZ of the tree from the realigned stormwater pipes of 2.27m^2 (0.62%). This is an acceptable, low level of impact. Retain and protect. All works within the NRZ of this tree MUST be supervised by the project arborist. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.	S
47	*Dracaena* sp. (Narrow Leaf Dracena)	5	Multi 10x<40 (130)	300	2.0	2.0	G	G	0.5 Ra	M	Pass	4	Low	3	Low	This is an ornamental.	Removal is required. **Justification for removal:** This tree is within the proposed driveway and will require removal to facilitate the proposed driveway.	R

** *As stated in Section 3 of AS 4970, "The NRZ for palms, cycads, tree ferns and the like, is not calculated but shall not be less than 2m (clause 3.2). The SRZ calculation does not apply to palms, cycads, tree ferns and the like (clause 3.4).*

5.1 Summary of Tree Schedule

TREES TO BE RETAINED

TREES (ONSITE) - TO BE RETAINED: ..... 15, 16, 17, 18, 24, 28, 31, 35, 37, 39, 40, 41, 42, 43, 44 & 45 = 16 trees.
TREES LOCATED IN THE ADJACENT SITE(S): ..... 1, 23, 25, 26*, 27, 32 & 46 = 7 trees.
Total: 23 trees.

TREES TO BE REMOVED:

TREES CLASSED AS EXEMPT BY COUNCIL* – AND MAY BE REMOVED: ..... 7, 36 & 38 = 3 trees.
TREES THAT FAIL THE VTA - RECOMMENDED FOR REMOVAL: ..... 30 = 1 tree.
TREES THAT REQUIRE REMOVAL TO FACILITATE PROPOSED DEVELOPMENT : 2-14, 19-22, 29, 30, 33, 34, 36, 38, 47 = 20 trees.
Total: 24 trees.

** While Tree 26 is also classed as exempt, it is in the adjacent site and must be retained.*

5.2 Tree Significance (Appendix 4)

TREES LISTED IN THIS REPORT WITH A SIGNIFICANCE RATING THAT IS:

- **HIGH**: ..... 32 & 46.
- **MEDIUM**: ..... 1- 6, 10, 15-19, 21-25, 28, 31, 33-37, 39, 41, 42 & 45.
- **LOW**: ..... 7-9, 11-14, 20, 26, 27, 29, 30, 38, 40, 43, 44 & 47.

5.3 Significance of a Tree, Assessment Rating System (STARS)

IACA Significance of a Tree, Assessment Rating System (STARS)© (2010) © (IACA, n.d.)
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' (Draper & Richards, 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

1. **HIGH SIGNIFICANCE IN LANDSCAPE**
   - The tree is in good condition, or normal vigour and form typical of 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 grand age.
   - The tree is listed as a Heritage Item, Threatened Species or part of a Threatened Community or listed on council's significant tree register.
   - The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape by bulk and scale and makes a positive contribution to the local amenity.
   - The tree has been influenced by historic figures, events, or part of the heritage development of the place.
   - The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group, or has commemorative values. (ICOMOS, n.d.)
   - The growing environment supports the tree to its full dimensions above and below ground without conflict or constraint.

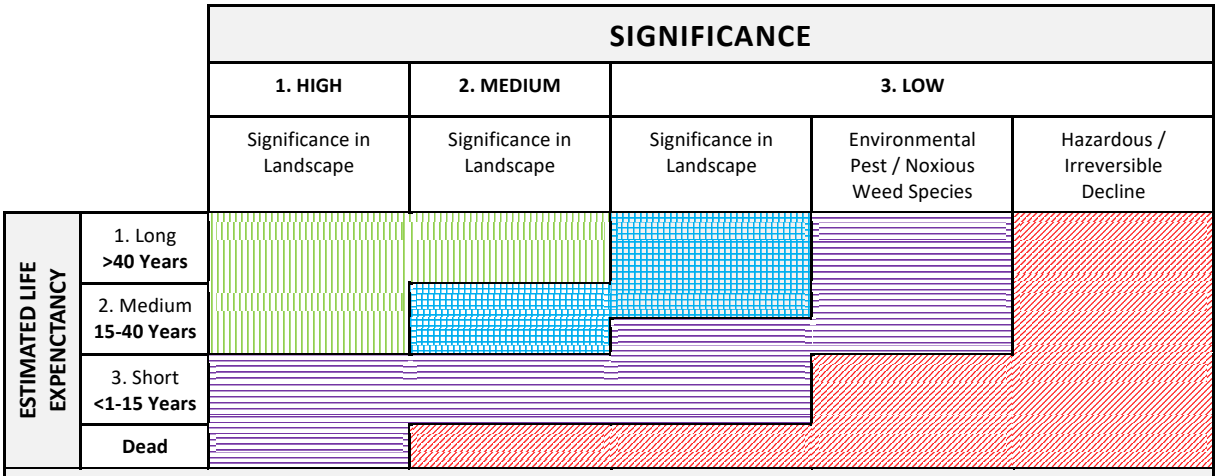
2. **MEDIUM SIGNIFICANCE IN LANDSCAPE**
   - The tree is in fair-good condition, or normal or low vigour and form typical or atypical of the species.
   - The tree is a planted locally indigenous or a common species with its taxa readily planted in the local area.
   - The tree is visible from surrounding 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 area.
   - The tree is moderately constrained by above or below ground influences of the built environment to reach full dimensions.

3. **LOW SIGNIFICANCE IN LANDSCAPE**
   - The tree is in fair-poor condition, or normal or low vigour and form typical or atypical of the species,
   - The tree is not visible or is partly 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 area.
   - The tree is severely constrained by above or below ground by influences of the built environment and therefore will not reach full dimensions; the tree is inappropriate to the site conditions.
   - The tree is listed as exempt under the provisions of the local Council Tree Preservation Order.
   - The tree has a wound or defect that has the potential to become structurally unsound.

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.

TREE RETENTION VALUE - PRIORITY MATRIX



Legend for Matrix Assessment

	Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or relocation of building/s should be considered to accommodate the setbacks as detailed in Table 2. Special construction works must be implemented e.g. pier and beam, etc if works are to proceed within the Notional Root Zone.
	Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however, their retention should remain a 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.

SUMMARY OF STARS RECOMMENDATIONS

(This information is to be used in assessment of impacts)

TREES LISTED IN THIS REPORT THAT HAVE A 'STARS' RATING THAT IS:

- **HIGH** (Priority for Retention): .....32 & 46.
- **MEDIUM** (Consider for Retention): .....1-6, 10, 15-19, 21-25, 28, 31, 33-37, 39, 41, 42 & 45.
- **LOW** (Consider for Removal): .....7, 8, 9, 11-14, 20, 26, 27, 29, 30, 38, 40, 43, 44 & 47.
- **PRIORITY FOR REMOVAL**: .....None.

These ratings are to be used for design guidance. Refer to the 'Tree Retention Value - Priority Matrix' (above) for details.

5.4 Gradient of Impacts[1]

Percentage of NRZ encroached
0 to 10% - minor: Tree 1 (1.31%), Tree 28 (3.65%), Tree 35 (0.75%), Tree 45 (2.87%), Tree 46 (0.62%).
>10 to 20% - moderate: Tree 15 (16.68%), Tree 16 (19.97%), Tree 17 (19.2%), Tree 18 (13.7%).
>20% - major: None.

5.5 Discussion

Tree 1 is a *J. mimosifolia* (Jacaranda). This tree is located in the adjacent site. There will be a tiny intrusion into the NRZ of this tree from the proposed substation and building footprint of 3.78m^2 (1.31%). The SRZ of this tree will not be impacted by the proposed works. All works within the NRZ of this tree MUST be supervised by the project arborist. TPZ fencing is required (as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 2 is a *L. confertus* (Brush Box). This tree is located in a raised garden bed. It is 5.4m to the retaining wall. Removal is required.

> **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 3 is an *A. cunninghamiana* (Bangalow Palm). This tree is located in a raised garden bed. The tree is 500mm to the retaining wall. Removal is required.

> **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 4 is an *A. cunninghamiana* (Bangalow Palm). This tree is located in a raised garden bed. Removal is required.

> **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 5 is a *W. robusta* (Mexican Fan Palm). This tree is located in a raised garden bed. Removal is required.

> **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 6 is a *Fraxinus* sp. (Ash). The crown of this tree is over the roof. Removal is required.

> **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

'Tree' 7 is a group of 3x *S. romanzoffiana* (Cocos Palm). These trees species are listed as exempt in Part 13, section 13.2 'Exemptions for Tree and Vegetation Works' of Ku-ring-gai Council's Tree and Vegetation Preservation document. Removal is required.

> **Justification for removal:** These trees species are callused as exempt and are within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 8 is a *C. macrocarpa* 'Aurea Saligna' (Golden Weeping Monterey Cypress). This is a small tree. Removal is required.

[1] *As per sections 3.3.4, 3.3.5 & 3.3.6 of AS 4970.*

Justification for removal: This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

'Tree' 9 is a group of 2x *S. australe* (Brush Cherry). These are small trees. Removal is required.

Justification for removal: These trees are within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 10 is a *Magnolia* × *soulangeana* (Saucer Magnolia). This tree is in good health and structural condition. Removal is required.

Justification for removal: This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

'Tree' 11 is a group of 3x *S. australe* (Brush Cherry). These trees display forest architecture. They are <150mm to the brick wall. Removal is required.

Justification for removal: This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

'Tree' 12 is a group of 2x *C. sasanqua* (Sasanqua). These trees are in good health and structural condition. Removal is required.

Justification for removal: These trees are within the proposed building footprint and will require removal to facilitate the proposed development plans.

'Tree' 13 is a group of 3x *C. viminalis* (Weeping Bottlebrush). These trees have all been lopped. Removal is required.

Justification for removal: These trees are within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 14 is a *C. sasanqua* (Sasanqua). There is a retaining wall more than 2m to the west. Removal is required.

Justification for removal: This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 15 is a *P. x hispanica* 'Acerifolia' (London Plane). This tree has powerlines to the west. There will be an intrusion into the NRZ of this tree from the proposed development of 40.57m^2 (16.68%). This is an acceptable, moderate level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development. It must be noted that London Plane trees are very resilient to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.

Tree 16 is a *P. x hispanica* 'Acerifolia' (London Plane). This tree has powerlines to the west. This young tree is being suppressed by Tree 15. There will be an intrusion into the NRZ of this tree from the proposed development of 9.06m^2 (19.97%). This is an acceptable, moderate level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development. It must be noted that London Plane trees are very resilient to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.

Tree 17 is a *P. x hispanica* 'Acerifolia' (London Plane). This tree has powerlines to the west. There will be an intrusion into the NRZ of this tree from the proposed development of 18.25m^2 (19.2%). This is an acceptable, moderate level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and

described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development. It must be noted that London Plane trees are very resilient to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.

Tree 18 is a *P. x hispanica* 'Acerifolia' (London Plane). This tree has powerlines to the west. There will be an intrusion into the NRZ of this tree from the proposed development of 39.68m^2 (13.7%). This is an acceptable, moderate level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development. It must be noted that London Plane trees are very resilient to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.

Tree 19 is an *M. myrtifolia* (Sweet scented Paperbark). This tree has an inclusive main fork union. Removal is required.

> **Justification for removal:** The SRZ of this tree will be intruded by the proposed development. This is an unacceptable impact. The removal of this tree is required to facilitate the proposed development plans.

'Tree' 20 is a group of 3x *T. lepidota* 'Alstonville' (Alstonville Tibouchina). There are previous failure sites. Removal is required.

> **Justification for removal:** The SRZ of these trees will be intruded by the proposed development. This is an unacceptable impact. The removal of these trees is required to facilitate the proposed development plans.

Tree 21 is a *H. forsteriana* (Kentia Palm). This tree is in good health and structural condition. Removal is required.

> **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 22 is a *H. flavum* (Native Frangipani). This tree is in good health and structural condition. Removal is required.

> **Justification for removal:** This tree is within the proposed building footprint and will require removal to facilitate the proposed development plans.

Tree 23 is a *C. japonica.* (Japanese Cedar). This tree is located in the adjacent site. There is a sandstone retaining wall on the boundary. There is a sandstone retaining wall between this tree and the boundary. There will be no additional intrusion in the NRZ of this tree from the proposed development. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 24 is a *J. mimosifolia* (Jacaranda). The crown of this tree is over the boundary. There will be an intrusion into the NRZ & SRZ of this tree from the proposed stormwater works. Any excavation within the NRZ & SRZ of this tree will need to be either hand-dug or under-bored using a vacuum truck. All works within the NRZ & SRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 25 is a *S. glomulifera* (Turpentine). This tree is located in the adjacent site. It is <200mm to the boundary. The proposed stormwater works will use the same footprint as the existing stormwater pipes. There will be no additional intrusion into the NRZ of this tree. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as

shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 26 is a *L. lucidum* (Large-leaved Privet). This tree is located in the adjacent site. It is <200mm to the boundary. This tree species is listed as exempt in Part 13, section 13.2 'Exemptions for Tree and Vegetation Works' of Ku-ring-gai Council's Tree and Vegetation Preservation document. The full NRZ of this tree will not be impacted by the proposed stormwater works. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 27 is a *S. paniculatum* (Magenta Lilly Pilly). This tree is in the adjacent site. It is 300mm to the fence. There are Psyllidae (Psyllids) and sooty mould. The full NRZ of this tree will not be impacted by the proposed stormwater works. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 28 is a *J. mimosifolia* (Jacaranda). This tree has a tropism to the southwest. There is decay in an old wound in the trunk. This tree has an existing intrusion into its NRZ from the existing development. There is a small intrusion into the NRZ of this tree from the proposed stormwater works of 2.12m^2 (3.65%). This is an acceptable, low level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 29 is a *L. petersonii* (Lemon-scented Teatree). This tree has a tropism to the north. Removal is required.

> **Justification for removal:** This tree is located within the proposed stormwater works. Removal is required to facilitate the proposed development plans.

Tree 30 is a *Citharexylum* (Fiddlewood). There is decay in a crack in the trunk of this tree. Removal is recommended.

> **Justification for removal:** This tree is in very poor condition and is dangerous. It fails the visual tree assessment and is not suitable to be considered for retention.

Tree 31 is a *Citharexylum* (Fiddlewood). This tree is in good health and structural condition. The full NRZ of this tree will not be impacted by the proposed development. Retain and protect.

'Tree' 32 is a group of 2x *Eucalyptus botryoides* (Bangalay). These two large trees are located in the adjacent site. There are extensive root plate intrusions. They are 500mm from the edge of trunks to the fence. The full NRZ of these trees will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8.

Tree 33 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped. There are multiple branch attachments and decay. Removal is required.

> **Justification for removal:** This tree is located where the proposed onsite detention tank is to be installed. Numerous locations for the OSD where considered, but this was the area chosen as it has the impact on the least number of trees (this tree only). The removal of this tree will be required to facilitate the proposed development.

Tree 34 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped. There are multiple branch attachments and decay. Removal is required.

> **Justification for removal:** This tree is located within the proposed stormwater works. Removal is required to facilitate the proposed development plans.

Tree 35 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped. There are multiple branch attachments and decay. This tree currently has hard landscaping and stormwater pipes which are to be slightly moved. There will be a tiny intrusion into the NRZ of the tree from the realigned stormwater pipes of 0.99m^2 (1.31%). This is an acceptable, low level of impact. Retain and protect. All works within the NRZ of this tree MUST be supervised by the project arborist. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 36 is a *S. romanzoffiana* (Cocos Palm). This tree is <500mm to the fence. This tree species is listed as exempt in Part 13, section 13.2 'Exemptions for Tree and Vegetation Works' of Ku-ring-gai Council's Tree and Vegetation Preservation document. Removal is recommended.

Justification for removal: This tree species is classed as exempt.

Tree 37 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped and there is decay present. The tree is 500mm to the boundary fence. There is existing hard landscaping within the NRZ of this tree, which is proposed to be removed. There will be no additional impact on this tree from the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 38 is a *S. romanzoffiana* (Cocos Palm). This tree species is listed as exempt in Part 13, section 13.2 'Exemptions for Tree and Vegetation Works' of Ku-ring-gai Council's Tree and Vegetation Preservation document. Removal is recommended.

Justification for removal: This tree species is classed as exempt.

Tree 39 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped. There are multiple branch attachments and decay present. The crown is over the adjacent roof. The tree is 500mm from the edge of the trunk to the fence. There is existing hard landscaping within the NRZ of this tree, which is proposed to be removed. There will be no additional impact on this tree from the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 40 is a *L. petersonii* (Lemon-scented Teatree). This tree is located at the front of the site. There is existing hard landscaping within the NRZ of this tree, which is proposed to be removed. There will be no additional impact on this tree from the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 41 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped. There are multiple branch attachments and decay present. The crown is over the adjacent roof. The tree is 500mm from the edge of the trunk to the fence. The full NRZ of this tree will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 42 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped. The tree is 700mm to the adjacent building. The crown is over the roof, and there is decay present. The full NRZ of this tree will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 43 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped. There are multiple branch attachments and decay present. The full NRZ of this tree will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 44 is a *L. petersonii* (Lemon-scented Teatree). The crown of this tree is over the fence. The full NRZ of this tree will not be impacted by the proposed development. Retain and protect. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 45 is a *Citharexylum* (Fiddlewood). This tree has been previously lopped. There are multiple branch attachments and decay present. There is existing hard landscaping within the NRZ of this tree, which is proposed to be removed. There will be an intrusion into the NRZ of this tree from the proposed stormwater pipes and pit of 6.07m^2 (2.87%). The SRZ of this tree will NOT be intruded. This is an acceptable, low level of impact. Retain and protect. All works within the NRZ of this tree MUST be supervised by the project arborist. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 46 is an *E. acmenoides* (White Mahogany). This tree is located in the adjacent site. The tree is 1.642m from the edge of trunk to the existing fence. Retain and protect. This tree currently has hard landscaping (much of which is to be removed) and stormwater pipes (which are to be slightly moved) within the NRZ of this tree. It will have a tiny intrusion into the NRZ from the realigned stormwater pipes of 2.27m^2 (0.62%). This is an acceptable, low level of impact. All works within the NRZ of this tree MUST be supervised by the project arborist. TPZ fencing is required as shown in section 7.0 and described in Appendix 8. The TPZ fencing may be removed at the landscaping phase of the development.

Tree 47 is a *Dracaena* sp. (Narrow Leaf Dracena). This is an ornamental. Removal is required.

> **Justification for removal:** This tree is within the proposed driveway and will require removal to facilitate the proposed driveway.

6.0 Tree Protection Specifications

for 5-9 Cowan Road, ST IVES NSW 2075

These Tree Protection Specifications are in accordance with section 2.2.5 of AS 4970 showing the Notional Root Zones (NRZ) of trees to the retained, and protection measures. All tree work specified in this document are to comply with AS 4373:2007 Pruning of amenity trees (Australian Standard®, 2007) — hereafter referred to as "AS 4373".

TREE NO.	SPECIES	NRZ (m)	SRZ (m)	CANOPY SPREAD N S E W	TREE PROTECTION MEASURES
1	*J. mimosifolia* (Jacaranda)	9.6	3.2	8 8 8 10	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
15	*P. x hispanica 'Acerifolia'* (London Plane)	8.8	3.2	10 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
16	*P. x hispanica 'Acerifolia'* (London Plane)	3.8	2.3	6 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
17	*P. x hispanica 'Acerifolia'* (London Plane)	5.5	2.6	8 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
18	*P. x hispanica 'Acerifolia'* (London Plane)	9.6	3.4	8 6 10 6	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
23	*C. japonica* (Japanese Cedar)	3.8	2.3	3 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
24	*J. mimosifolia* (Jacaranda)	4.8	2.4	6 4 4 8	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
25	*S. glomulifera* (Turpentine)	4.6	2.4	6 2 2 6	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
26	*L. lucidum* (Large-leaved Privet)	2.4	2.0	2 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
27	*S. paniculatum* (Magenta Lilly Pilly)	2.0	1.5	1 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
28	*J. mimosifolia* (Jacaranda)	4.3	2.4	- 8 - 10	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
31	*Citharexylum* (Fiddlewood)	3.6	2.1	3 6 4 2	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
32	**[Group of 2x]** *E. botryoides* (Bangalay)	9.6	3.3	10 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
35	*Citharexylum* (Fiddlewood)	6.5	2.6	4 4 4 8	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
37	*Citharexylum* (Fiddlewood)	7.8	3.0	8 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
39	*Citharexylum* (Fiddlewood)	6.2	2.8	6 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
40	*L. petersonii* (Lemon-scented Teatree)	3.1	2.1	3 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
41	*Citharexylum* (Fiddlewood)	4.3	2.4	6 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
42	*Citharexylum* (Fiddlewood)	5.8	2.5	6 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
43	*Citharexylum* (Fiddlewood)	4.0	2.3	4 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
44	*L. petersonii* (Lemon-scented Teatree)	2.3	1.9	2 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
45	*Citharexylum* (Fiddlewood)	8.2	1.9	10 6 4 10	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.
46	*E. acmenoides* (White Mahogany)	10.8	3.4	10 radial	TPZ fencing is required as shown in section 7.0 and described in Appendix 8.

a) Project Arborist (AQF5)

A project arborist (AQF5) is to be engaged to supervise implementation of works for the duration of construction.

b) Induction for Tree Protection

All workers entering the site involved in construction must be advised of the tree protection measures and specifications outlined within this report during the site induction. This is to be verbally acknowledged and signed off before the commencement of works.

c) Tree Works

- All tree work is to be conducted by a suitably qualified and insured arborist (AQF3).
- Any crown reduction/management works required must comply with AS 4373.
- Specify if any tree works are necessary (location and amount of works required).
- Approved tree removal and pruning should be conducted before the installation of tree protection measures.

d) Identify Further Potential Impacts on Trees by Proposed Plans

- No machine excavation or trenching in any TPZ unless approved by the project arborist.
- No fill soils be used in any TPZ unless approved by Ku-ring-gai Council.
- No cultivation in any TPZ (especially at the landscaping phase of the development).
- Soil cuts are not permitted in any TPZ unless approved by Ku-ring-gai Council.
- Services should not be in or run through any TPZ unless approved by Ku-ring-gai Council.
- Site Office/Toilet, etc., are not to be located within any TPZ unless approved by Ku-ring-gai Council.
- All materials must not be stored in any TPZ unless approved in the above-mentioned DA.
- Aeration of the soil is managed by the TPZ fencing and ground protection measures. Refer to AS 4970.
- An area is to be set aside for tradespeople to wash down equipment away from any TPZ. The location of the wash down point should be approved by the project arborist unless approved by Ku-ring-gai Council.
- No soil level changes in any TPZ.
- No refuelling in any TPZ.
- No dumping of waste in any TPZ.
- No lighting of fires in any TPZ.
- No physical damage to trees.

e) Tree Protection Zones using AS 4970

DSH – Diameter at Standard Height (1.4 metres)
DGL – Diameter at Ground Level
NRZ = DSH (stem) x 12 (radius)
SRZ radius = $(D \times 50)^{0.42} \times 0.64$

See Appendices 5 & 6
Refer to Tree Schedule (section 5) for NRZ & SRZ details.

* Minimum NRZ is 2 metres – Maximum NRZ is 15 metres | # Minimum SRZ is 1.5 metres

f) Tree Protection Works

- TPZ fencing is to be erected around Trees 1, 15-18, 23-28, 31, 32, 35, 37 & 39-46 before construction commences (see Appendix 8).
- The NRZ (distance from the centre of the tree trunk - radius) is specified in the Tree Schedule (section 5). The location of the TPZ fencing required is shown on the Tree Protection Plan (section 7.0).
- The TPZ fence is to be constructed of two (2) metres high temporary chain wire fencing. This is preferable to star pickets as it would require them to be hammered into the ground which could damage roots. This action will greatly reduce the stress on the trees. The TPZ fence should be left in place until the landscaping phase of construction begins as per AS 4687.2:2022 Temporary fencing and hoardings, Part 2 (Australian Standard®, 2022) — hereafter referred to as "AS 4687.2".
- Temporary ground protection should be used around works area where TPZ fencing is unable to be installed due to limited space.
- TPZ signage as per Appendix 7 to be attached to TPZ fencing. The lettering should comply with AS 1319:1994 Safety signs for the occupational environment (Australia Standard®, 1994) — hereafter referred to as "AS 1319".

g) Maintaining the TPZ

- Area within TPZ should be mulched if there is no existing ground cover e.g., grass or plants etc. Mulch should be maintained at 50-100mm using material that complies with AS 4454:2012 Composts, soil conditioners and mulches (Australian Standard®, 2012).
- Watering - soil moistures levels should be monitored by project arborist. Temporary irrigation may be required.
- Weeds should be removed by project arborist.

h) Scaffolding Installation (if required)

- Identify location of scaffolding.
- Potential impacts on retained trees.
- Specify works required to minimise impacts on retained trees.
- Inspect scaffolding at the start of installation so as to ascertain whether there will be any conflicts with trees.

See 'AS 4970 (Figure 6) Indicative scaffolding with a TPZ.' in Appendix 8: Tree Protection on Construction Sites.

i) Preliminary Site Works

- The arboriculturist appointment letter is to be provided and the site is to be regularly inspected at monthly intervals unless otherwise specified in approved DA.
- All trees within the site are to be marked for removal or protection (retention) as per the approved development application.
- Tree removal/transplanting to be completed.
- Tree removal works can be conducted during demolition by a suitably qualified and insured arborist (AQF3).
- Inspect site after tree removal and certify trees identified for retention are still there - certification letter required.
- All TPZ fencing is to be installed prior to any demolition or construction works.
- TPZ fencing is to be inspected by the Project Arborist (AQF5) and a letter certifying compliance is to be sent to the Principal Certifying Authority.

j) Works During Demolition

- All TPZ fencing must be maintained during demolition works.
- A project arborist certification letter to be provided to the principal certifying authority (PCA) that the tree protection measures, specified in the approved DA, have been complied with.

k) Construction: Excavation/Earthworks

- There will be earthworks to level the site. Any tree roots encountered within the works area need to be correctly terminated by the project arborist, which is cut by a hand saw and not smashed off with an excavator bucket. Correctly terminating a root will ensure that the tree roots do not suffer from decay.
- TPZ fencing to be maintained during works and regularly inspected by the project arborist.
- Supervision of in-ground works as specified in the DA e.g., root cutting trenching, pipe installation etc. - certification letter required.

l) Construction Works

- Installation of services in TPZs to be supervised by the project arborist - certification letter required.
- TPZ fencing to remain in place during construction and regularly inspected by the project arborist.
- At the completion of works all tree protection measures are to be inspected, and when appropriate, authorised to be removed - certification letter required.

m) Post Construction

- At the completion of works all tree protection measures are to be inspected, and when appropriate, authorised to be removed - certification letter required.

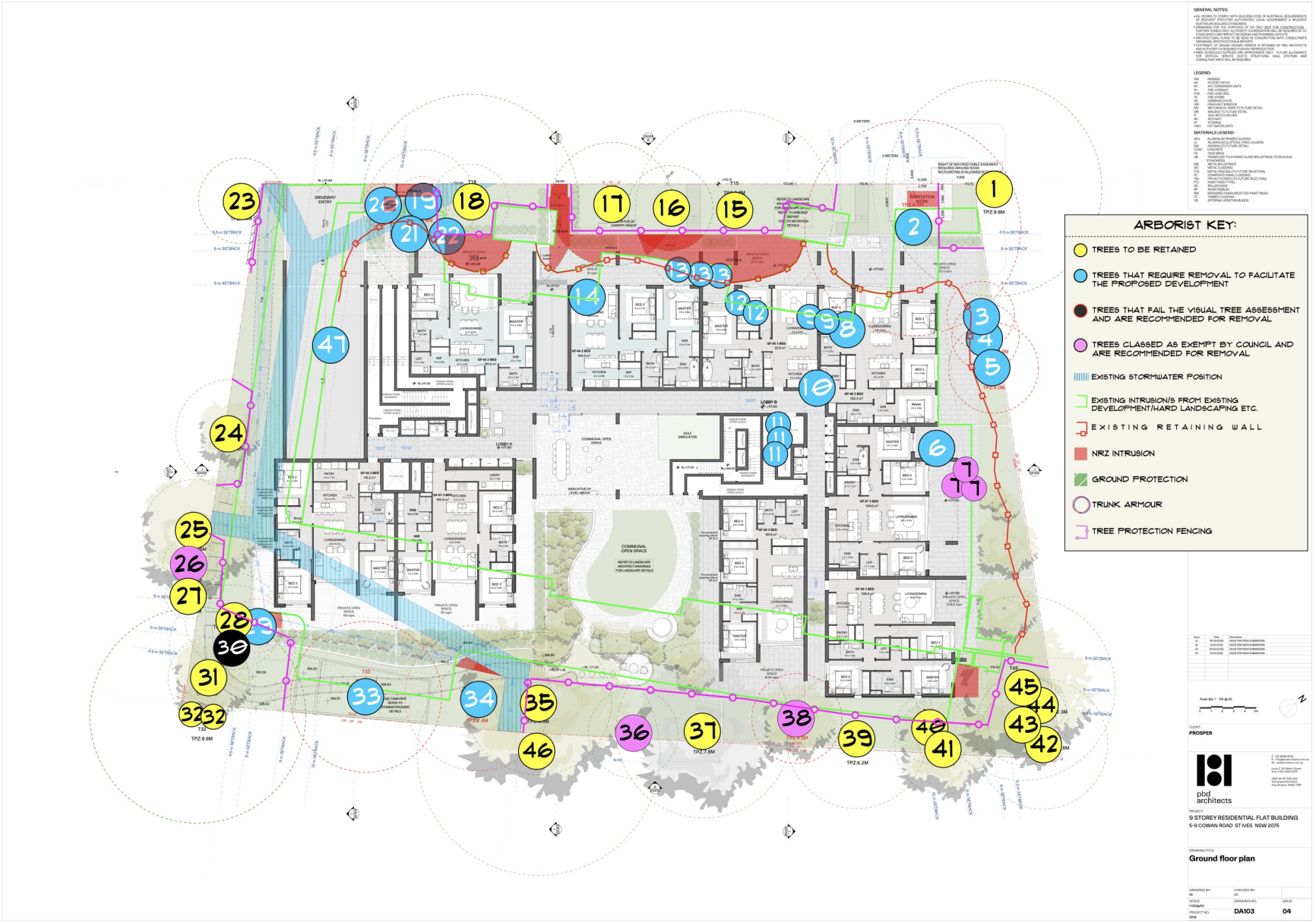
n) Landscaping Phase

- The TPZ fencing may be removed during the landscaping phase.
- All trees removed should, where practicable, be replaced at the landscaping phase as part of the proposed DA.
- At the landscaping phase, the retained trees must only have tube stock plants planted with the structural root zone (SRZ). No additional (fill) soil is to be added within the TPZ of any retained tree.
- The project arborist should supervise planting with TPZ areas of retained trees.
- Supervision of landscaping in-ground works within the TPZs of retained trees.
    - certification of correct planting and landscaping procedures required.
- Certification of correct planting methods for replacement trees as specified in an approved landscape plan.
    - certification for planting of replacement trees required.

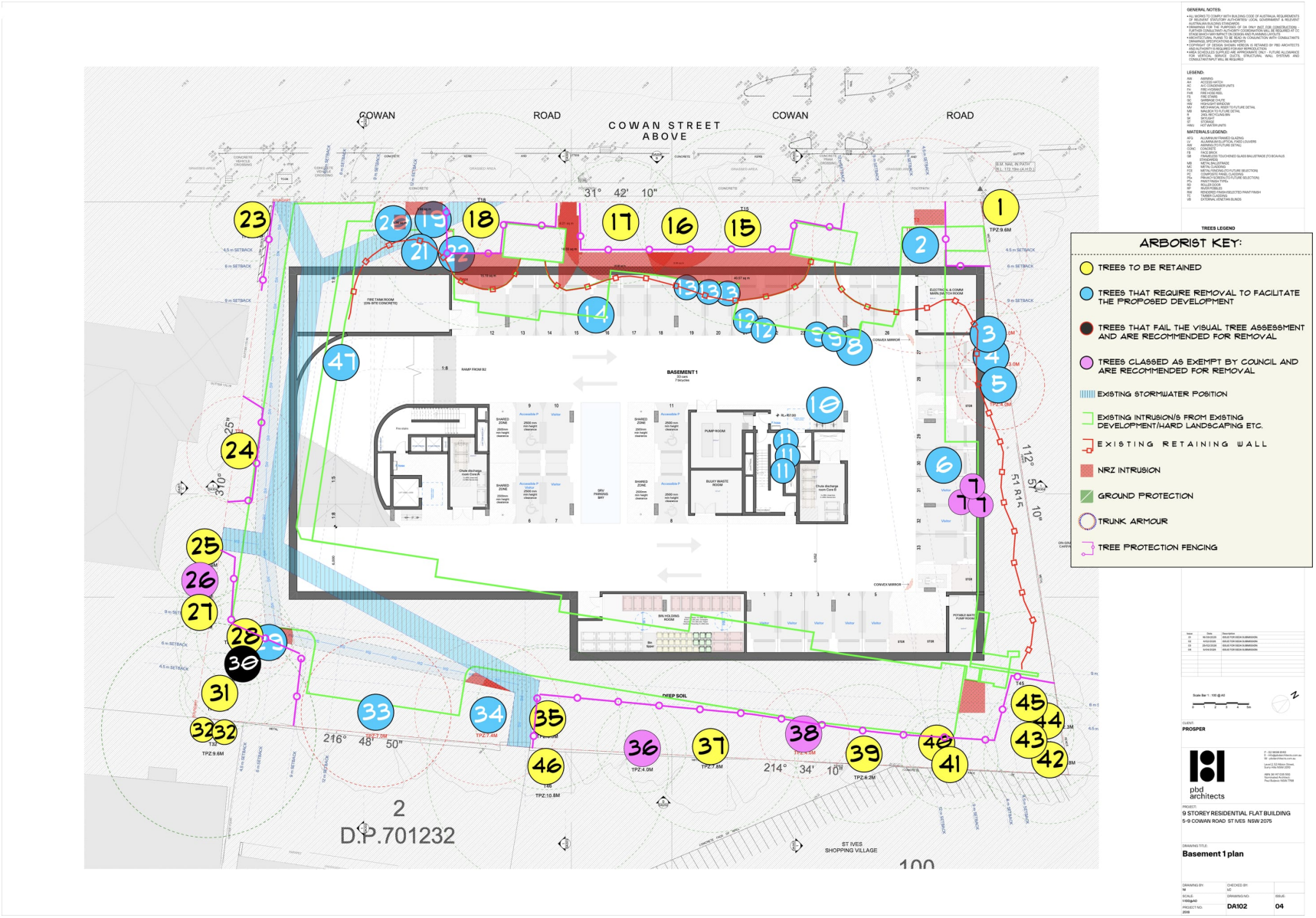
o) Hold Points

NO WORKS ARE TO CONTINUE UNTIL AN INSPECTION IS COMPLETED AND A CERTIFICATION LETTER IS FORWARDED TO THE CERTIFIER.	**Completed**
Preliminary Site Works	
• Inspect site after tree removal and certify trees identified for retention are still there.	☐
• Installed TPZ fencing is to be inspected by the Project Arborist (AQF5).	☐
Construction: Excavation/Earthworks	
• Supervision of in-ground works as specified in the DA e.g., root cutting trenching, pipe installation etc. for the following trees (Trees 1, 15-18, 23-28, 31, 32, 35, 37 & 39-46).	☐
Construction Works	
• Installation of services in TPZs of Trees 1, 15-18, 23-28, 31, 32, 35, 37 & 39-46 to be supervised by the project arborist - certification letter required.	☐
• TPZ fencing of Trees 1, 15-18, 23-28, 31, 32, 35, 37 & 39-46 to remain in place during construction and regularly inspected by the project arborist.	☐
• At the completion of works all tree protection measures are to be inspected, and when appropriate, authorised to be removed.	☐
Post Construction	
• At the completion of works all tree protection measures are to be inspected, and when appropriate, authorised to be removed.	☐
Landscaping Phase	
• Supervision of landscaping in-ground works within the TPZs of retained trees and certification of correct planting and landscaping procedures required.	☐
• Certification of correct planting methods for replacement trees as specified in an approved landscape plan and certification for planting of replacement trees required.	☐
FINAL CERTIFICATION	☐

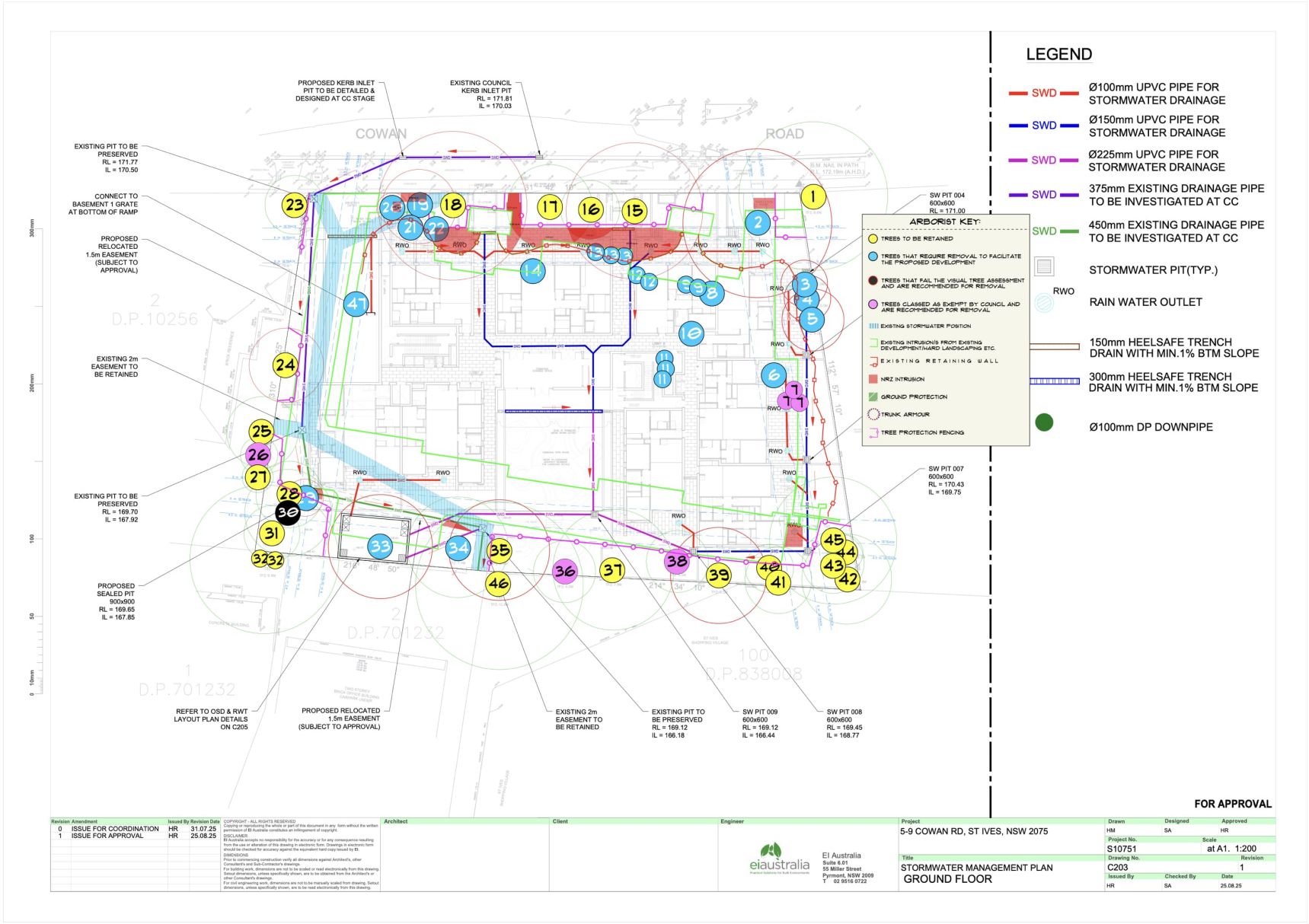
7.0 Tree Protection Plan - Proposed Architectural Plan (Ground Floor)



7.0.1 Tree Protection Plan - Proposed Architectural Plan (Basement 1)



7.1 Tree Protection Plan - Proposed Civil Plan (Stormwater)



8.0 Conclusions

The proposed stormwater positions, and architectural design plans have been updated with arboricultural input to allow for an acceptable impact (and retention) of high significance trees.

Trees 15, 16, 17 & 18 are all *P. × hispanica* 'Acerifolia' (London Plane). It must be noted that London Plane Trees are very resilient to intrusions into their notional root zones and structural root zones which is why they are so often used as street trees in cities.

As at the time of completing this assessment a bulk earthworks, underground services plans were not supplied and have not been assessed in relation to this project.

Any trees removed should be included in landscaping plans and replaced at the landscaping phase of the development. This will ensure ongoing amenity and wildlife resources.

9.0 Recommendations

Implement all recommendations contained in section 5.0, 5.5, 6.0 & 7.0.

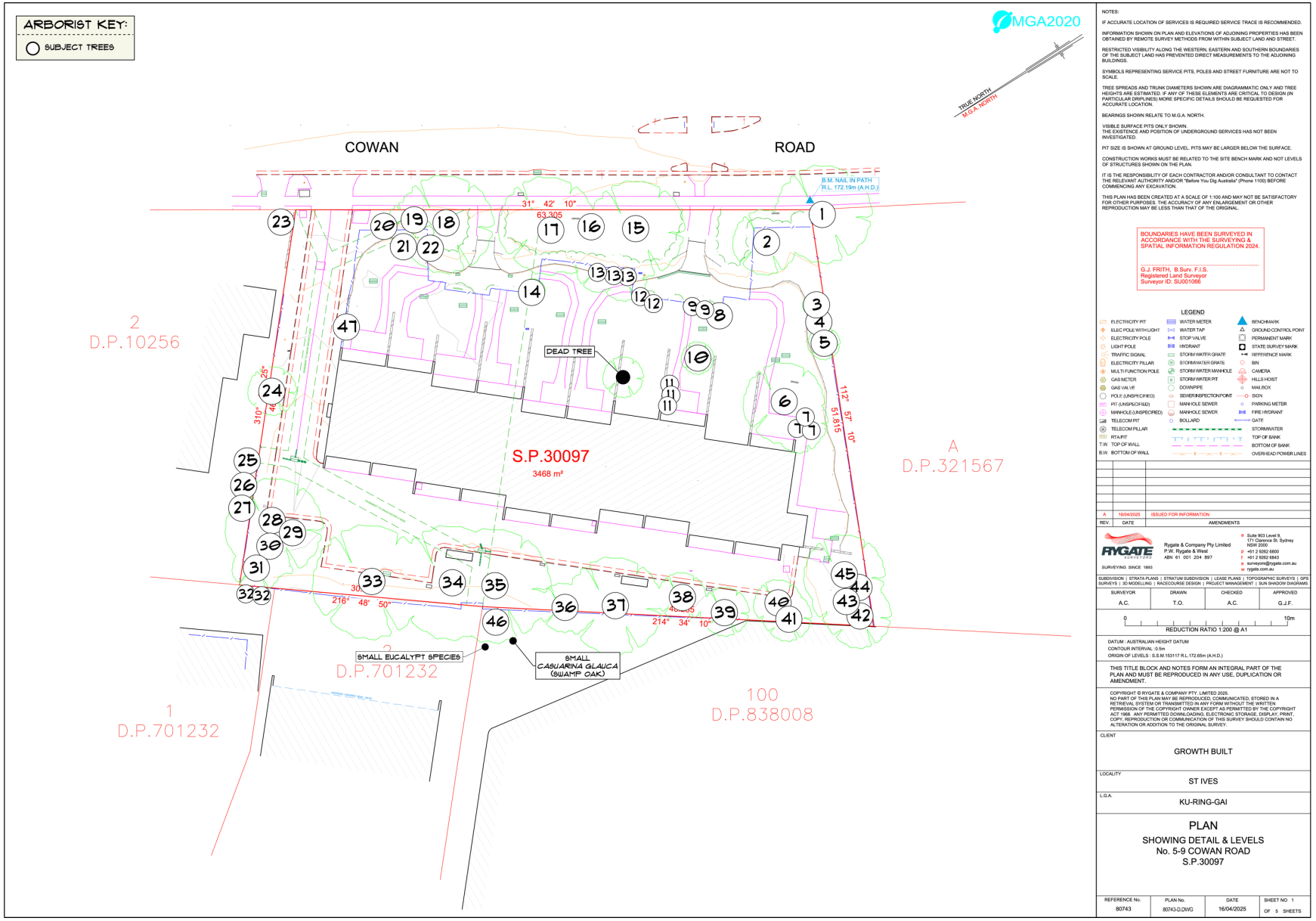
Reason: These recommendations have been developed in accordance with AS 4970 to reduce the impact of the proposed development on the retained trees.

NB: This report is NOT to be viewed as consent to remove any trees subject of this report. Formal approval MUST be given by Council for any tree removal (unless exempt in relevant Development Control Plan).

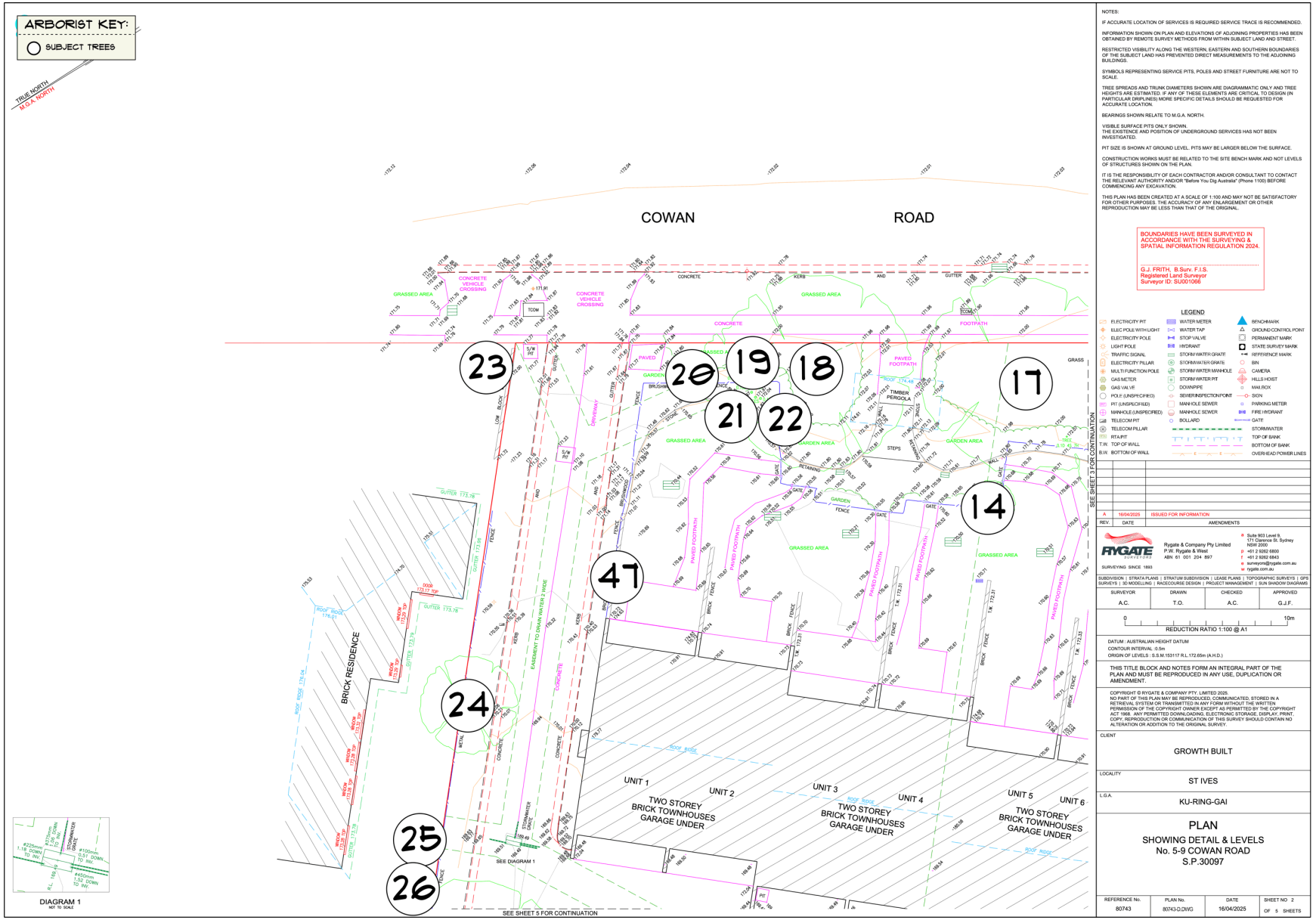
Russell Kingdom
Arboriculturist & Horticulturist
Diploma of Arboriculture (AQF5), Graduate Diploma of Horticulture (AQF8)

Member of: International Society of Arboriculture (ISA)
Australian Institute of Horticulture
Arboriculture Australia
Quantified Tree Risk Assessment (QTRA)

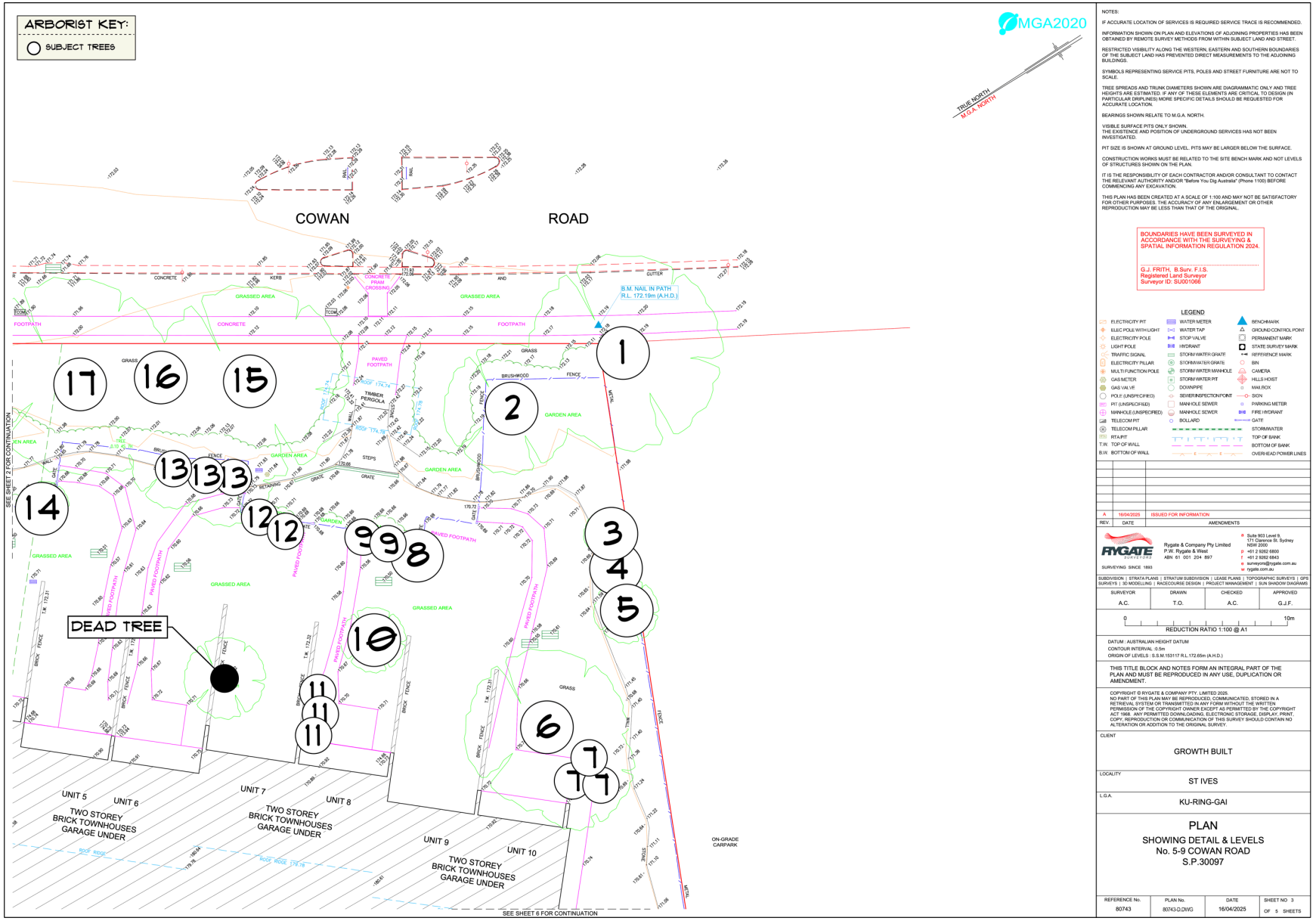
Appendix 1: Site Survey (Entire Site - Sheet 1 of 5)



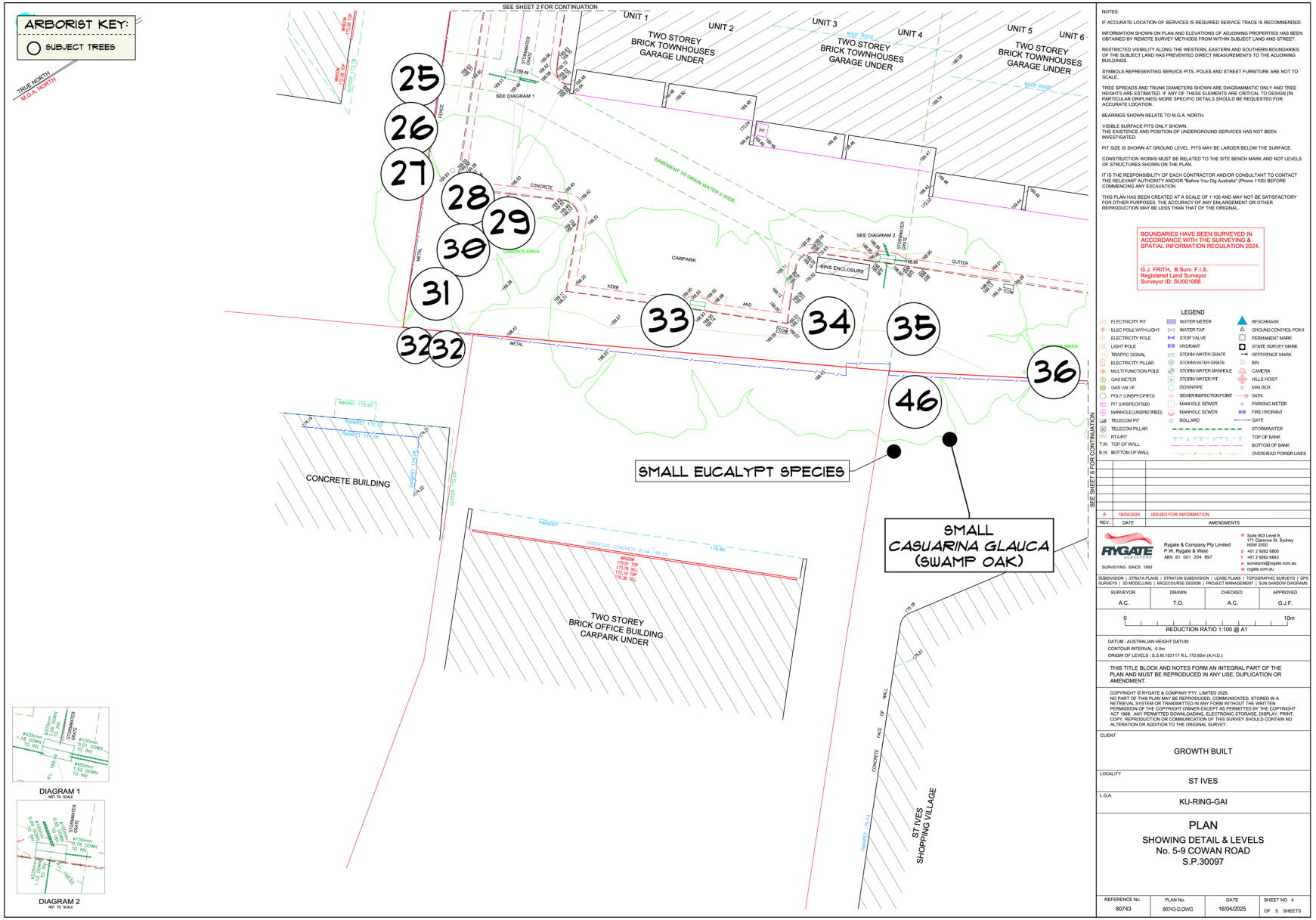
Appendix 1a: Site Survey (Sheet 2 of 5)



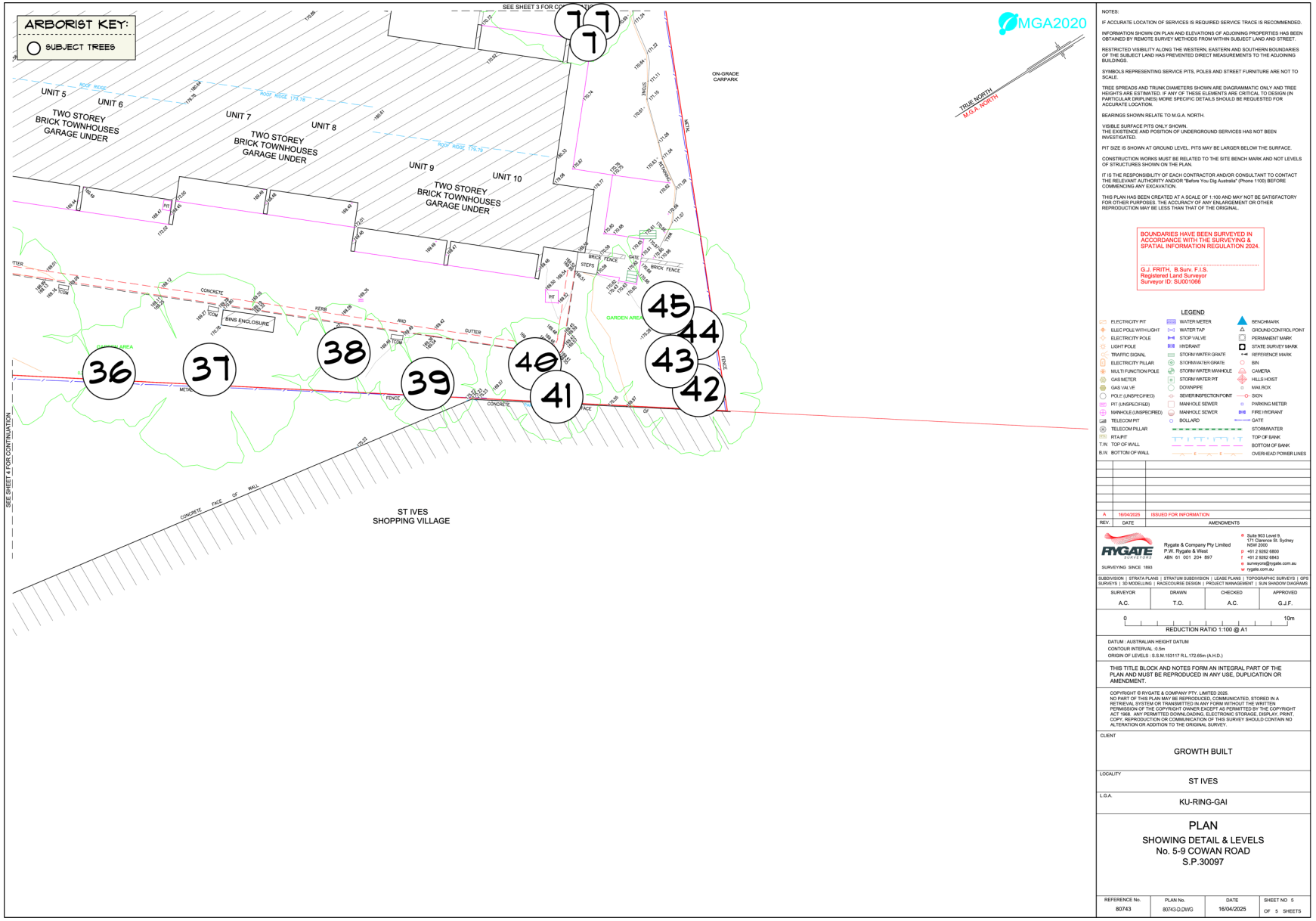
Appendix 1b: Site Survey (Sheet 3 of 5)



Appendix 1c: Site Survey (Sheet 4 of 5)



Appendix 1d: Site Survey (Sheet 5 of 5)



Appendix 2: Photographs

Figure 3: Raised Garden bed

Figure 4: Trees 3 & 4.

Figure 5: Tree 5.

Figure 6: Tree 6.

Figure 7: 'Trees' (group) 7.

Figure 8: Tree 2.

Figure 9: Tree 9.

Figure 10: Tree 10.

Figure 11: 'Trees' (group) 11.

Figure 12: Dead tree.

Figure 13: Tree 12.

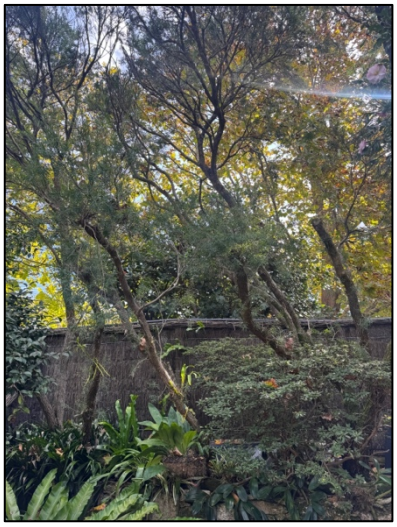


Figure 14: Tree 13.

Figure 15: Base of Tree 1.

Figure 16: Crown of Tree 1.

Figure 17: Trees 15, 16 & 17.

Figure 18: Tree 15.

Figure 19: Tree 16.

Figure 20: Tree 17.

Figure 21: Tree 18.

Figure 22: Trees 18-22.

Figure 23: Tree 19.

Figure 24: Tree 20.

Figure 25: Tree 20.

Figure 26: Tree 22 & Tree 19.

Figure 27: Tree 23.

Figure 28: Trunk of Tree 23 – Viewed from adjoining property. Note retaining wall between tree & site.

Figure 29: Trunk of Tree 23 – Viewed from driveway.

Figure 30: Tree 24.

Figure 31: Crown of Tree 24.

Figure 32: Tree 25.

Figure 33: 'Trees' 32.

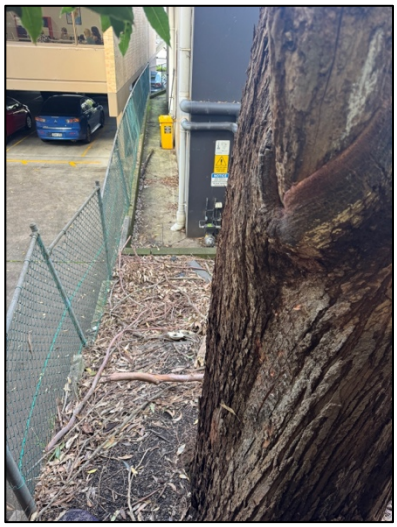


Figure 34: 'Trees' 32.

Figure 35: 'Trees' 32.

Figure 36: Tree 25, 26 & 27.

Figure 37: Tree 28.

Figure 38: Tree 29.

Figure 39: Trees 29, 30 & 31.

Figure 40: Base of Tree 30.

Figure 41: Tree 30.

Figure 42: Trees 30 & 31.

Figure 43: Tree 32 – Note the excavation in TPZ in adjoining site.

Figure 44: Canopy of Tree 32.

Figure 45: Tree 33.

Figure 46: Crown of 33.

Figure 47: Tree 36 & 37.

Figure 48: Tree 38.

Figure 49: Tree 39.

Figure 50: Tree 39.

Figure 51: Trees 40 & 41.

Figure 52: Crown of Trees 40 & 41.

Figure 53: Trees 42, 43, 44 & 45.

Figure 54: Tree 45.

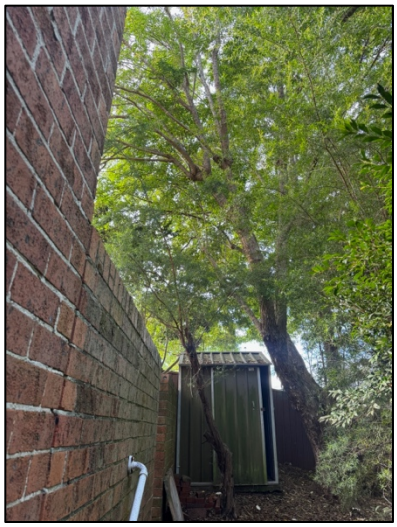


Figure 55: Crown of Tree 45.

Figure 56: View of rear parking area.

Figure 57: Tree 46.

Figure 58: Crown of Tree 46.

Figure 59: Trunk of Tree 46.

Figure 60: Tree 46.

Appendix 3: Notes on Tree Assessment

Key	Criteria
Measurements	**m**-Metres, **mm**-Millimetres.
Tree No	As shown on Tree Protection Plans.
Species	Botanical *and* common name of tree.
Diameter of Trunk	**DSH**-diameter at standard height (1.4m), **DGL**-diameter at ground level.
Multiple Trunks	**CD**-co-dominant trunk, **TD**-tri-dominant trunk, **QD**-quad-dominant trunk, **Multi**-5+ trunks/leaders.
Zones (radius)	**NRZ**-notional root zone, **SRZ**-structural root zone, TPZ-tree protection zone.
Canopy Spread	**NSEW**-north south east west, **Ra**-radial.
Crown Condition	*Overall Vigour and Vitality* **0** Dead, **1** Severe decline (<20% canopy; major dead wood) **2** Declining (20-60% canopy density; twig and branch dieback) **3** Average/low vigour (60-90% canopy density; twig dieback) **4** Good (90-100% crown cover; little or no dieback or other problems) **5** Excellent (100% crown cover, no deadwood, or other problems). ***Comment:*** *This requires knowledge of species.*
Health/Vigour abbreviations	**VP**-very poor, **P**-poor, **F**-fair, **G**-good, **VG**-very good
Age Class	**J**-Juvenile, **Y**-Young (recently planted), **YM**-Young mature, **SM**-Semi mature, **M**-Mature (20-80% of life expectancy), **VM**-Very mature, **OM**-Over mature (> 80% of life expectancy).
Failure Potential	Identifies the most likely failure and rates the likelihood that the structural defect(s) will result in failure within the inspection period. **1.** **Low** – Defects are minor (e.g., dieback of twigs, small wounds with good wound wood development) **2.** **Medium** – Defects are present and obvious (e.g., cavity encompassing 10-25% of circumference of trunk), **3.** **High** – Numerous and/or significant defects present (e.g., cavity encompassing 30-50% of circumference of trunk, major bark inclusions), **4.** **Severe** – Defects are very severe (e.g., heart rot fruiting bodies, cavity encompassing >50% of trunk) ***Comment:*** *This requires specialist knowledge.*
Size of Defective Part	Rates the size of the part most likely to fail. The larger the part that fails, the greater the potential for damage. **1.** Most likely failure less than 150mm in diameter **2.** Most likely failure 150-450mm in diameter **3.** Most likely failure 450-750mm in diameter **4.** Most likely failure more than 750mm in diameter
Target Rating*	Rates the use and occupancy of the area that would be struck by the defective part. **1.** Occasional use (e.g., jogging/cycle track) **2.** Intermittent use (e.g., picnic area, day use parking) **3.** Frequent use, secondary structure (e.g., seasonal camping area, storage facilities) **4.** Constant use, structures (e.g., year-round use for several hours each day, residences)
Hazard Rating*	Failure potential + size of part + target rating. Add each of the above sections for a number between 3 & 12. ***Comments:*** *The final number identifies the degree of risk. The next step is to determine a management strategy. A rating in this column does not condemn a tree but may indicate the need for more investigation and a risk management strategy.*
Recommendations	**S**-save, **R**-remove, **T**-transplant, **W**-work needed to be carried out, **Mon**-monitor.
Additional Abbreviations	**VTA**-visual tree assessment, **ULE**-useful life expectancy, **STARS**-Significance of a Tree, Assessment Rating System.

Appendix 4: Levels of Visual Assessment

The following Visual Assessment information is from 'Tree Risk Assessment Manual', published by International Society of Arboriculture (Dunster, Lilly, Matheny, & Smiley, 2025). The level of assessment used in this report is specified in section 4.0 'Method of Assessment'.

Level 1: Limited Visual Assessment Process

- Review available information on tree and site history, target, and occupancy rates provided by the tree risk manager
- Define the scope of work with the tree risk manager
- Locate and identify the tree(s) to be assessed
- Assess the specified tree(s) from the perspective defined in the scope of work
- Identify defects and conditions that are included in the scope of work
- Inform the tree risk manager if prompt action is recommended to reduce risk
- When included in the scope of work, identify trees that need a higher level of assessment
- Report tree locations and mitigation recommendations

Level 2: Basic Assessment Process

- Review available information on tree and site history, target, and occupancy rates provided by the tree risk manager
- Define the scope of work with the tree risk manager
- Locate and identify the tree(s) to be assessed
- Determine location(s) of targets) in relation to the tree (target zone) and estimate occupancy rates based on the information provided by the tree risk manager and site assessment
- Visually inspect the tree (i.e., visible roots, trunk, and branches)
- Assess defects and conditions of concern, and response growth
- Assess general tree health
- Assess expected loads, or changes in load
- Assess targets
- Use simple tool(s) as desired or as specified in the scope of work
- Record relevant observations of tree and site conditions of concern, defects, outward sign of possible internal defects, response growth and other factors
- Analyse the data to categorize the likelihood of failure and impact, and their consequences to the specified target(s)
- Determine risk rating(s)
- Inform the tree risk manager if prompt action is recommended to reduce risk
- Develop mitigation option(s) and estimate residual risk when the risk rating exceeds the tree risk manager's level of acceptable risk
- Recommend a time to reassess, if appropriate
- Recommend advanced assessment, if appropriate
- Prepare and submit a report according to the scope of work

Level 3: Advanced Techniques

Many techniques can be considered for advanced risk assessment. *Some situations may be assessed with multiple techniques. Advanced assessment techniques include:

- Aerial assessment and evaluation of structural defects higher in the crown
  - visual assessment from (1) within the tree crown, (2) a step ladder, or (3) an aerial lift
  - unoccupied aerial vehicle (UAV) photographic assessment
  - decay and response growth testing of branches
- Detailed target analysis
  - property value
  - use and occupancy statistics
  - potential disruption of activities
- Detailed site evaluation
  - history evaluation
  - soil profile inspection to estimate root depth
  - soil mineral and structural testing
- Decay testing
  - increment coring
  - drilling with small-diameter bit
  - resistance-recording drilling
  - single-path sonic (stress) wave
  - sonic tomography
  - pulsed electrical current meter/tomography
  - radiation (radar, X-ray)
  - diagnostic analysis for fungal identification
- Health evaluation
  - tree ring analysis (in temperate zone trees)
  - shoot length measurement
  - detailed health analysis (e.g., colour evaluation, water potential, chlorophyll fluorescence)
  - starch assessment
- Root inspection and evaluation
  - root and root collar excavation
  - root decay evaluation
  - ground-penetrating radar
- Storm/wind load analysis
  - detailed assessment of tree exposure and protection
  - computer-based estimations according to engineering models
  - wind reaction monitoring over a defined interval
- Measuring and assessing the change in trunk lean
  - direct stem lean measurement
  - 3D stem scans and interpretation of point clouds
  - analysis of calibrated stem pictures
- Load testing
  - hand pull
  - measured static pull
  - measured tree dynamics
- Weather analysis
  - wind rose chart
  - historical storm data
- Mathematical/computer modelling of strength or stability loss

**Inclusion of specific techniques in this list should not be considered an endorsement of those techniques.*

Appendix 5: Extract from AS 4970, Section 3: Determining Protection Zones, 3.1 Tree Protection Zone; 3.2 Notional Root Zone

"3.1 Tree Protection Zone (TPZ)

Establishing and maintaining a TPZ is the most important part of protecting trees during the onsite stages of work (e.g. site establishment, demolition, construction). The TPZ is the zone determined by the project arborist using the process set out below. It shall be shown on the TPP to be isolated or managed so that the tree remains viable.

The NRZ is the starting point for determining the TPZ, along with the considerations in Clause 3.3.2. Alternatively, the TPZ may be specified by the consent authority.

3.2 Calculating the Notional Root Zone (NRZ)

The radius of the NRZ is calculated for each tree by multiplying its diameter at standard height (DSH) by 12.

Radius of the NRZ = DSH × 12

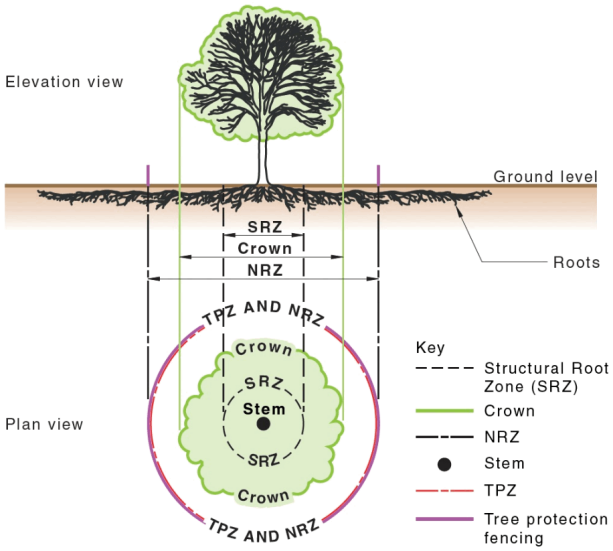
where

DSH = trunk diameter measured at 1.4 m above ground

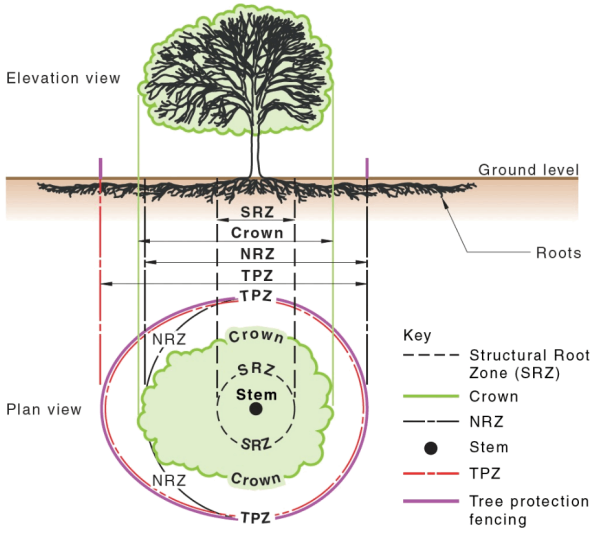
The radius of the NRZ is measured from the centre of the stem.

The NRZ for palms, cycads, tree ferns and the like, is not calculated but shall not be less than 2m.

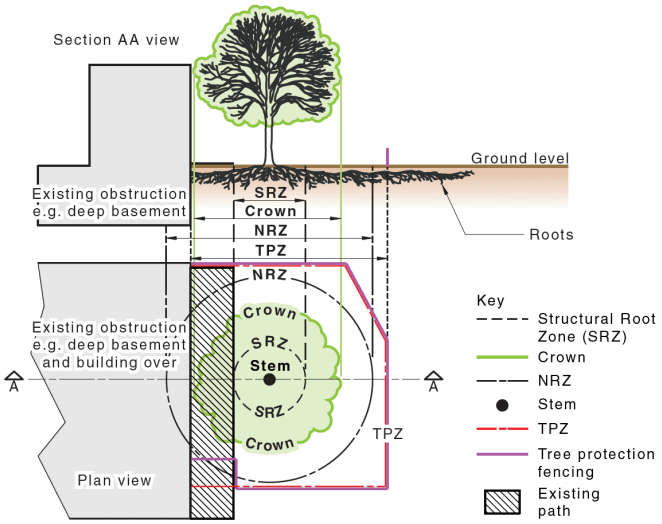
Any NRZ radius shall not be less than 2m nor greater than 15m. Clause 3.3 details the methods to produce the TPZ based on the NRZ."



(a) No development within NRZ

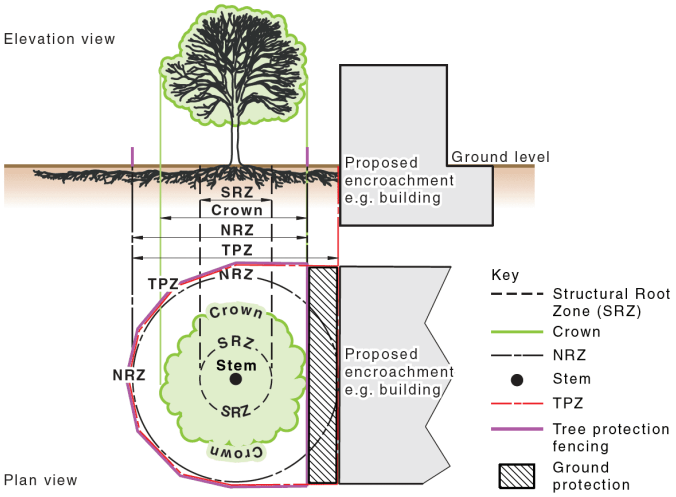


(b) No development within NRZ but with crown protection required



NOTE The project arborist has determined a suitable location for the tree protection fence. They have included a portion of the path as ground protection.

(c) TPZ compensatory area shown for existing structures



(d) TPZ compensatory area shown for proposed development

AS 4970 (Figure 3) Protection areas.

Appendix 6: Extract from AS 4970, Section 3: Determining Protection Zones, 3.4 Structural Root Zone (SRZ)

"3.4 Structural Root Zone (SRZ)

The SRZ is a notional area required for tree stability. A larger area is required to maintain a viable tree.

The SRZ shall be calculated when major encroachment (greater than 20%) into an NRZ is proposed. SRZ locations and dimensions may be included on arboriculture documentation.

Many factors affect the size of the SRZ (e.g. tree height, crown area, soil type, soil moisture). Natural or built structures, such as rocks and footings, can also influence the SRZ. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the root buttress using the following formula. Root investigation can provide more information on the extent of these roots.

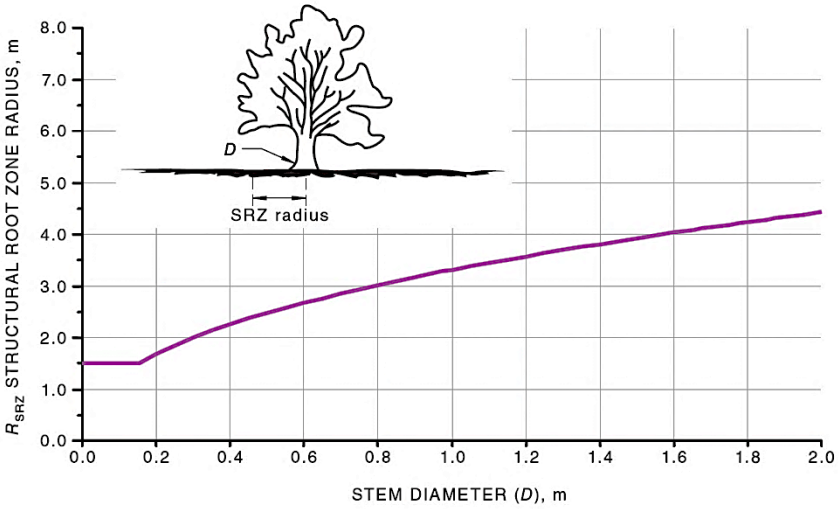
SRZ radius= $(D \times 50)^{0.42} \times 0.64$

where

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

Where the tree is multi-stemmed, the project arborist should determine if they will measure around all stems or work out the cross-sectional area and provide their reasons for the method selected. The SRZ calculation does not apply to palms, cycads, tree ferns and the like.

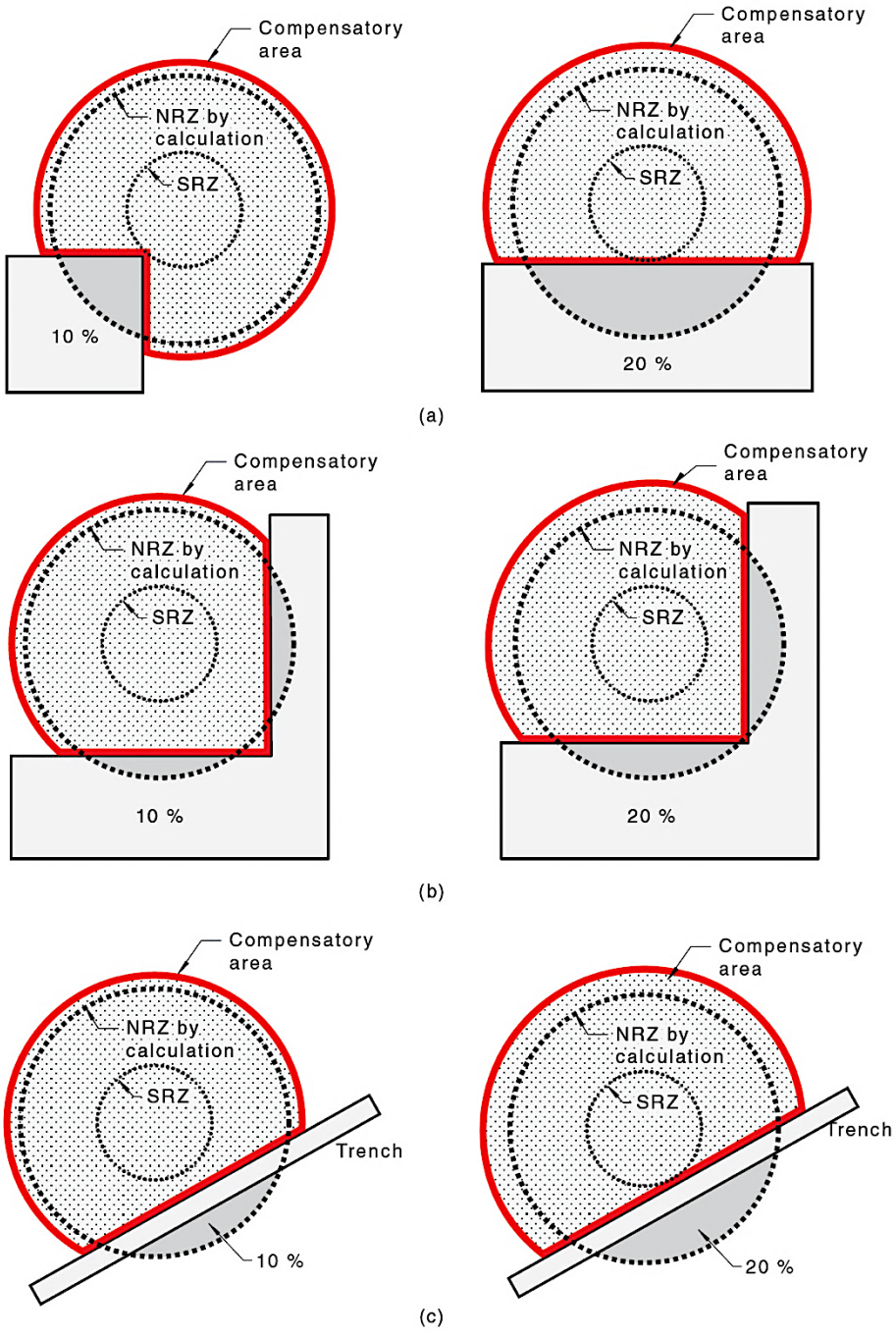
NOTE The SRZ for trees with trunk diameters less than 0.15m is 1.5 m."



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

AS 4970 (Figure 2) Structural Root Zone (SRZ) Calculation.

NOTE These examples are not to scale and are for illustrative purposes. The proposed encroachment is considered minor if it is less than or equal to 10% of the area of the NRZ, has not had recent TPZ encroachments and is outside of the SRZ (see Clause 3.4). The proposed encroachment is considered moderate if it is greater than 10 % and less than or equal to 20 % of the area of the NRZ and is outside of the SRZ (see Clause 3.4)



AS 4970 (Figure 1) Sample minor and moderate encroachment.

NRZ & SRZ TABLE

DSH for NRZ DGL for SRZ (mm)	NRZ (m^R)	SRZ (m^R)
100	**2.0**	**1.5**
110	2.0	1.5
120	**2.0**	**1.5**
130	2.0	1.5
140	**2.0**	**1.5**
150	2.0	1.5
160	**2.0**	**1.5**
170	2.0	1.6
180	**2.2**	**1.6**
190	2.3	1.7
200	**2.4**	**1.7**
210	2.5	1.7
220	**2.6**	**1.8**
230	2.8	1.8
240	**2.9**	**1.8**
250	3.0	1.9
260	**3.1**	**1.9**
270	3.2	1.9
280	**3.4**	**1.9**
290	3.5	2.0
300	**3.6**	**2.0**
310	3.7	2.0
320	**3.8**	**2.1**
330	4.0	2.1
340	**4.1**	**2.1**
350	4.2	2.1
360	**4.3**	**2.1**
370	4.4	2.2
380	**4.6**	**2.2**
390	4.7	2.2
400	**4.8**	**2.3**
410	4.9	2.3
420	**5.0**	**2.3**
430	5.2	2.3
440	**5.3**	**2.3**
450	5.4	2.4
460	**5.5**	**2.4**
470	5.6	2.4
480	**5.8**	**2.4**
490	5.9	2.5

DSH for NRZ DGL for SRZ (mm)	NRZ (m^R)	SRZ (m^R)
500	**6.0**	**2.5**
510	6.1	2.5
520	**6.2**	**2.5**
530	6.4	2.5
540	**6.5**	**2.6**
550	6.6	2.6
560	**6.7**	**2.6**
570	6.8	2.6
580	**7.0**	**2.6**
590	7.1	2.7
600	**7.2**	**2.7**
610	7.3	2.7
620	**7.4**	**2.7**
630	7.6	2.7
640	**7.7**	**2.7**
650	7.8	2.8
660	**7.9**	**2.8**
670	8.0	2.8
680	**8.2**	**2.8**
690	8.3	2.8
700	**8.4**	**2.9**
710	8.5	2.9
720	**8.6**	**2.9**
730	8.8	2.9
740	**8.9**	**2.9**
750	9.0	2.9
760	**9.1**	**3.0**
770	9.2	3.0
780	**9.4**	**3.0**
790	9.5	3.0
800	**9.6**	**3.0**
810	9.7	3.0
820	**9.8**	**3.0**
830	10.0	3.1
840	**10.1**	**3.1**
850	10.2	3.1
860	**10.3**	**3.1**
870	10.4	3.1
880	**10.6**	**3.1**
890	10.7	3.2

DSH for NRZ DGL for SRZ (mm)	NRZ (m^R)	SRZ (m^R)
900	**10.8**	**3.2**
910	10.9	3.2
920	**11.0**	**3.2**
930	11.2	3.2
940	**11.3**	**3.2**
950	11.4	3.2
960	**11.5**	**3.3**
970	11.6	3.3
980	**11.8**	**3.3**
990	11.9	3.3
1000	**12.0**	**3.3**
1010	12.1	3.3
1020	**12.2**	**3.3**
1030	12.4	3.4
1040	**12.5**	**3.4**
1050	12.6	3.4
1060	**12.7**	**3.4**
1070	12.8	3.4
1080	**13.0**	**3.4**
1090	13.1	3.4
1100	**13.2**	**3.4**
1110	13.3	3.5
1120	**13.4**	**3.5**
1130	13.6	3.5
1140	**13.7**	**3.5**
1150	13.8	3.5
1160	**13.9**	**3.5**
1170	14.0	3.5
1180	**14.2**	**3.6**
1190	14.3	3.6
1200	**14.4**	**3.6**
1210	14.5	3.6
1220	**14.6**	**3.6**
1230	14.8	3.6
1240	**14.9**	**3.6**
1250	15.0	3.6
1260	**15.0**	**3.7**
1270	15.0	3.7
1280	**15.0**	**3.7**
1290	15.0	3.7

Appendix 7: Tree Protection Zones – Standard Procedure

1.0 Tree Protection Zones - Standard Procedure

1.1 Protective fencing where required may delineate the NRZ and should be located, as determined by the project arborist, either in accordance with the specific Council's guidelines or if no guidelines are given by the Council, then using AS 4970. Section 4, clause 4.3 of AS 4970 - 'Protective Fences' states that,

"Fences should be erected before any machinery or materials are brought onto the site and before the commencement of works, including demolition, or in accordance with the TPS and as shown on the TPP. Once erected, protective fencing shall not be removed or altered without approval by the project arborist except in accordance with the TPS.

The fence should restrict access to the enclosed portion of the TPZ. Semi-permanent fences or options that make it difficult to move the fence should be considered where appropriate.

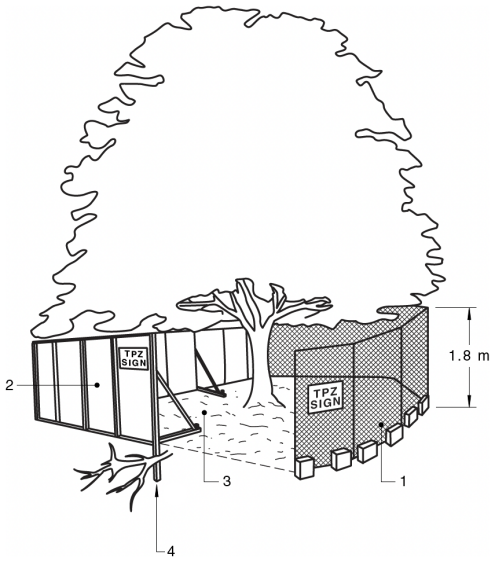
AS 4687.2 specifies applicable requirements where temporary fence panels are used. Where semi-permanent fences are used, the posts should be driven into the soil 600mm (1000mm in sand), and top rails should be used as required.

Existing perimeter fences and other structures may be used as part of the protective fence if suitable."

1.2 Section 4, clause 4.2 of AS 4970 - 'Activities generally excluded from the TPZ' states that the below are included but limited to,

" (a) Excavation, cultivation, or disturbance of the soil, including scraping of the surface.
(b) Equipment and material storage.
(c) Preparation of chemicals, including preparation of cement products.
(d) Movement or parking of vehicles and plant.
(e) Dumping of waste.
(f) Spreading or stockpiling of fill.
(g) Refuelling.
(h) Washing down and cleaning of equipment or hard surfaces.
(i) Fires.
(i) Physical damage to the tree.

Activities specified in items (a) to (e) may be permitted with appropriate protection measures, as detailed in the TPS and TPP."



AS 4970 (Figure 4) Protective fences.

KEY:

1. *Chain wire mesh panels that are held in place with concrete feet.*
2. *Alternatively, plywood or wooden paling fence panels may be used. This fencing material also prevents building materials or soil from entering the TPZ.*
3. *Mulch installation across the surface of the TPZ (as detailed in the TPS). No excavation, construction activity grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ other than those indicated in the TPS.*
4. *Bracing may be used within the TPZ. Installation of posts or supports should avoid damaging roots.*

1.3 Section 4, clause 4.4 of AS 4970 - 'Signs' states that,

"Signs identifying the TPZ should be placed around the edge of the TPZ and be visible from within the development site. The lettering on the sign should conform to AS 1319."

See example below.

TREE PROTECTION ZONE

NO ACCESS

Activities excluded from the TPZ include —

(a) Excavation or disturbance of the soil, including scraping of the surface
(b) Spreading or stockpiling of fill
(c) Cultivation
(d) Equipment and material storage
(e) Preparation of chemicals, including preparation of cement products
(f) Parking of vehicles and plant
(g) Refuelling
(h) Dumping of waste
(i) Wash down and cleaning of equipment
(j) Fires
(k) Physical damage to the tree

Contact:

Contact Project Manager for copy of the Tree Protection Specifications (TPS).

THIS SIGN SHOULD BE MINIMUM A3 SIZE.
AS 4970:2025 PROTECTION OF TREES ON DEVELOPMENT SITES (AUSTRALIAN STANDARD®, 2025).

A printable version of this sign can be found as 'Attachment 1' at the rear of this report. This sign should be minimum A3 size.

1.4 Where a tree is to be retained and a Tree Protection Zone cannot be adequately established due to restricted access e.g. tree located alongside an access way, the trunk and branches in the lower crown will be protected by wrapping 2 layers of hessian or carpet underfelt around the trunk and branches for a minimum of 2m or as lower branches permit, then wire or rope secures 90 x 50 x 2000mm hardwood battens together around the trunk (do not nail or screw to the trunk or branches). The number of battens to be used is as required to encircle the trunk and the planks are to extend to the base of the tree. See example.

1.5 If a tree is growing downslope from an excavation, a silt fence located along the contours of the site in the area immediately above the Tree Protection Zone fencing may need to be installed and regularly maintained to prevent burial and asphyxiation of the roots of the tree. To allow for the maintenance of both fences, the silt fence must be constructed separately to the tree protection fence and the 2 fences must be constructed independently of each other and standalone. To reduce competition with the tree the area within the Tree Protection Zone is to be kept free of weeds. These are best removed by the application of foliar herbicide with Glyphosate as the active constituent. This is the preferred method rather than removal by the cultivation of the soil within the dripline, to minimise root disturbance to the tree. The removal of woody weeds such as Privet should use the cut and paint method of herbicide application. Weeds are to be controlled within the Tree Protection Zone, for the duration of the project.

1.6 The area of the Tree Protection Zone to be mulched to a depth of 50mm with the organic material being 75% leaf litter and 25% wood, and this being composted material. The depth of mulch and type as indicated, to be maintained for the duration of the project. Where deep excavation will expose the soil profile to drying out the root plate is to be protected by pegging jute matting across the ground surface 2 m back from the edge of the profile and 2m down the face of the profile and is to be in one continuous sheet or layers up to 5mm thick and overlapped 300mm and pegged. Pegs are to be a minimum length of 200mm and spaced at 500mm increments in a grid pattern. Once installed mulch is to be placed on top of the jute matting previously described.

1.7 No services either temporary or permanent are to be located within the Tree Protection Zone. If services are to be located within the Tree Protection Zone, special details will need to be provided by a qualified Consulting Arboriculturist for the protection of the tree regarding the location of the service/s. Works within the TPZ should be hand dug or tunnelled.

1.8 A tree will not be fertilised during its protection within the Tree Protection Zone, as this may hasten its decline if it were to decline. If a tree is to be fertilised this should be in consultation with a qualified Consulting Arboriculturist.

1.9 In the event of prolonged dry periods, or where a tree has been transplanted, or where excavation nearby, especially up slope, leads to drying out of a soil profile, or modification to ground water flow, or flows across an existing ground surface to the tree and its growing environment; deep root watering thoroughly at least twice a week is to be undertaken to irrigate the tree. The need for such watering is determined readily by observing the dryness of the soil surface within the dripline of the tree by scraping back some mulch. Mulch is to be reinstated afterwards. In the event of disrupted ground or surface water flows to the tree due to excavation, filling or construction, a reticulated irrigation system may be required to be installed within the Tree Protection Zone. If an irrigation system is to be installed, consideration must be given to volume, frequency, and drainage of water delivered, and this should be in consultation with a qualified Consulting Arboriculturist.

See 'AS 4970 (Figure 5) Examples of trunk, branch, and ground protection.' below.

Appendix 8: Tree Protection on Construction Sites

1.0 Tree Protection of Construction Sites

1.1.0 **General Notes**

1.1.1 The application of any measures for the protection of trees on development sites is determined by the species characteristics of the subject tree, and the existing physical constraints of the growing environment on site both above and below ground.

1.1.2 This report considers where applicable, AS 4970.

1.1.3 This report applies the Tree Protection Zone - Standard Procedure, however, this does not restrict the author from applying additional or alternative conditions where it is deemed appropriate by the author for the protection of trees on development sites. Such additional or alternative conditions may be founded upon professional judgement based on:

- the experience of the Consulting Arboriculturist
- scientific research
- new technology
- industry best practice
- consideration of the individual tree species and their relative tolerance to development impacts
- the individual or cumulative factors present or proposed to impact upon the growing environment essential for the trees' survival.

1.1.4 Where this report refers to the retention of subject trees it is for their incorporation into the landscaping works for the site, and they are to be documented on a landscape plan for the site.

1.2.0 **Cautionary Notes for the Protection of Retained Trees**

1.2.1 **Installing Underground Services within TPZ**
If an underground utility service is to be located within the area of the TPZ, AS 4970, Section 4, clause 4.5.5 Installing underground services within TPZ states the following,

"All services should be routed outside the TPZ. If underground services need to be routed within the TPZ, they should be installed by directional drilling, hand-excavated pits, and trenches, or as specified by the project arborist.

The upper surface of the directional drilling bore should be at least 0.6m deep and preferably outside the SRZ. Assessment of the likely impacts of boring, launch pits and exit pits on retained trees should be undertaken.

For manual excavation of trenches, the project arborist should advise on roots to be retained and should monitor the works. Manual excavation may include using hand tools and other minimally destructive equipment."

1.2.1.1 **Location of Services - Option B** (Driveway Construction)
If a service is to be located within the area of the dripline of a protected tree or within the Tree Protection Zone, and site conditions such as shallow bedrock or if mass rooting has occurred from multiple trees growing near each other, the service trench is to be elevated and positioned above natural ground level within the new driveway structure. The existing driveway surface is to be scabbled and a reinforced concrete topping is to be provided with downturned thickened edges constructed under the kerb edging to prevent lateral movement. A suitable subgrade material to manufacturers' recommendations is to be utilised if and where appropriate. Construction is to occur in a manner so as not to cause damage to the subject trees' root system. All works to be in accordance with engineers' details.

1.2.2 **Precautions in Respect of Temporary Work**
For precautions in respect of temporary work, AS 4970, Section 4, Tree protection measures, 4.5 Other tree protection measures, states the following,

"***4.5.3 Ground protection***

Ground protection measures shall be implemented if regular pedestrian access or temporary access for machinery is required within the TPZ. Ground protection aims to prevent root damage and soil compaction within the TPZ.

These measures may be applied to root zones beyond the TPZ.

4.5.6 Scaffolding

Where scaffolding is required, it should be erected outside the TPZ. When this is not possible, branch removal should be minimized. This may be achieved by designing or narrowing the scaffolding to avoid branches or tying branches back. Where the relevant authority provides consent, pruning shall be performed as specified and following the process outlined in AS 4373.

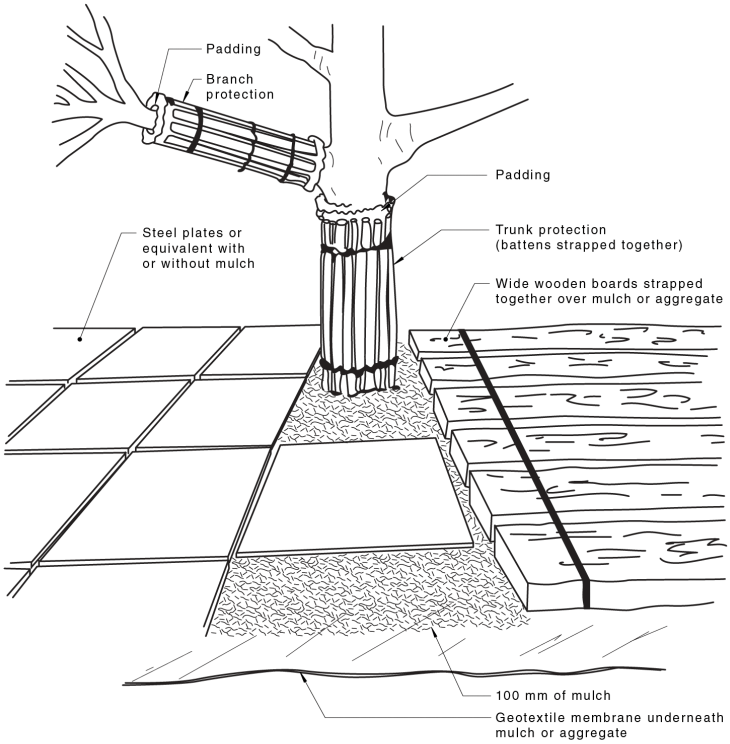
The ground below the scaffolding should be protected by boarding (e.g. scaffold board or plywood sheeting), to collect falling contaminants such as mortar, render, etc. Where access is required, ground protection should be installed to minimize soil compaction. The ground protection should be left in place until the scaffolding is removed; see Clause 4.5.3 of AS 4970 (above) for details of ground protection measures.

Excavation for sole plates or footings of the scaffold should be minimised or otherwise specified by the project arborist where within NRZ."

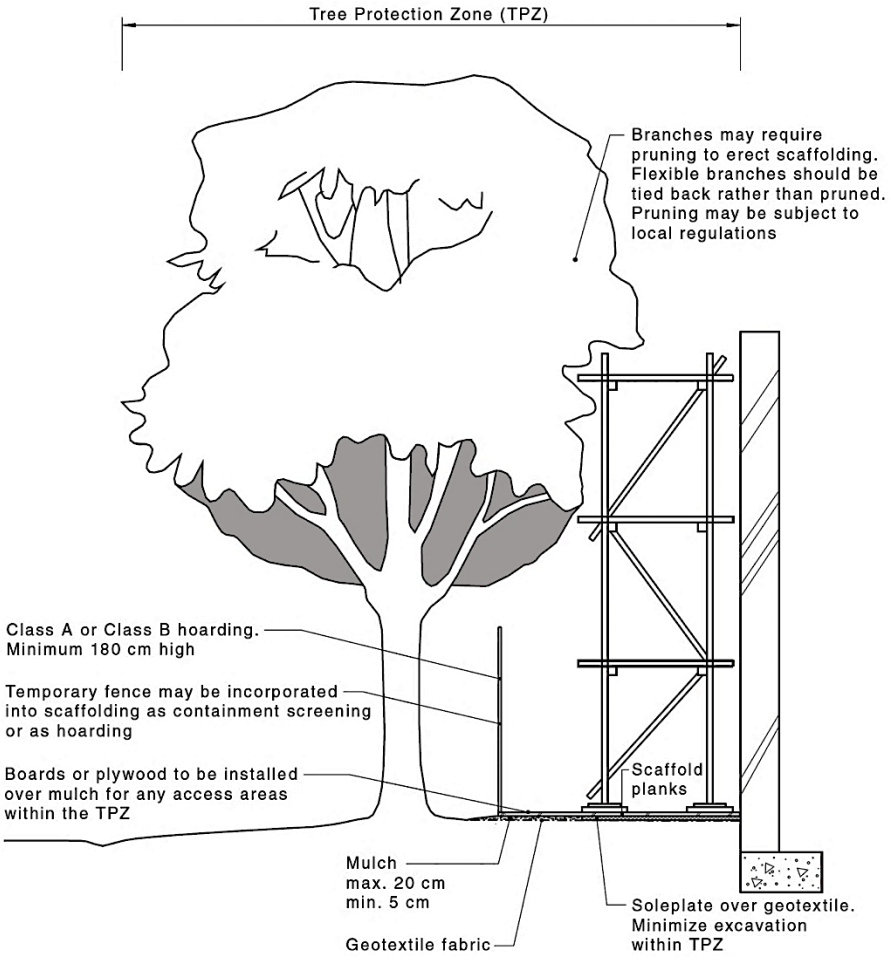
Notes:

1. *For trunk and branch protection, boards and padding may be used to prevent damage to bark. Boards shall be joined to each other using hoop straps and screws or similar. They shall not be screwed or nailed to the tree.*

2. *Wide wooden boards or plastic or metal plates should be of a suitable thickness to spread the load and prevent soil compaction and root damage.*



AS 4970 (Figure 5) Examples of trunk, branch, and ground protection.



AS 4970 (Figure 6) Indicative scaffolding with a TPZ.

1.3.0 **Demolition of Built Structures - Precautions to Protect Trees**

1.3.1 **Demolition of Existing Buildings**

The demolition of the buildings should be undertaken with access restricted to the driveway and the building platform for each of the existing buildings, or to areas of the land where no trees are growing within 6m of any tree to be retained. Where access or space for a safe working environment is restricted, or where the area of the 6m setback must be compromised, a 100mm layer of Eucalyptus wood mulch must be laid over the area of encroachment. Where vehicular access is required across the mulch layer further root protection should be provided by laying a temporary pathway over the mulch. The temporary pathway should be constructed of a grated steel material capable of supporting the vehicles used during demolition e.g., like ramps used to load vehicles onto the backs of trucks. Trunks of trees are to be protected from vehicular damage as per section 1.2.2 above.

1.3.2 **Demolition of Landscape Structures**

The demolition of walls, driveways retaining walls, paths, and pools etc. within 6m of a tree to be retained should be undertaken manually using hand tools. Where a driveway is to be demolished being of concrete strip or slab type construction, it should be undertaken by working from the end of the driveway closest to the building back towards the street by utilising the driveway as a stable platform to prevent soil compaction. Where a concrete slab driveway passes less than 1m from the base of a tree and the area beneath the driveway is to be undisturbed and incorporated into the landscape works for the site, the volume of space previously occupied by the driveway must be replaced with local top soil from the site or otherwise a loamy sand, to replace the mass of the concrete on the root plate which may be critical to the ballast and centre of mass for the stability of the tree. If the tree becomes unstable immediately contact the Consultant Arboriculturist.

1.3.3 **Removal of Existing Trees near Trees to be Retained**

Removal of a tree within 6m of a tree to be retained should be undertaken only by cutting down such a tree without damaging the trees to be retained, and by grinding out its stump. Where possible the structural roots of 20mm diameter or greater of the tree to be cut down should not be removed, to minimise soil disturbance and to reduce the impact on the roots of any tree to be retained nearby. Where structural roots are to be removed this should be undertaken manually by the use of non-motorized hand tools after the stump has been ground out when such roots are often easier to locate from the site of the stump from which they have been severed.

1.4.0 **Excavation and Construction close to Tree Protection Zones**

1.4.0.1 Where structural woody roots with a diameter of 20mm or greater are to be pruned outside the area of the tree protection zone, they are to be excavated manually first by using hand tools to determine their location. A Water knife or Airknife can be used as a mechanised alternative to locate such structural woody roots. Once located those roots to be severed are to be cut cleanly with a final cut to undamaged woody tissue and this will prevent tearing damage to the roots from excavation equipment which can extend beyond the point of excavation back towards the tree.

1.4.0.2 Where a large vigorous tree is to be retained near to a built structure, and dependent upon its taxa, age class and propensity for its roots system to regenerate, it may be prudent to install a root barrier immediately adjacent to the footing of the new building, or to deepen and strengthen the footings themselves to act as a root barrier, but for such structural advice an appropriately qualified chartered structural engineer should be consulted.

1.4.1 **Root Location and Protection where Structures are to be Positioned near a Retained Tree**

1.4.1.1 If walls or a driveway or other structures are to be constructed near a protected tree, careful excavation is to be undertaken manually by using non-motorized hand tools to determine the location of 1st order and lower order structural roots with a diameter of 20mm (*structural woody roots*) or greater, without damaging them. Boundary walls or fences should use columns or posts within fill panels, or a wall to be constructed with suspended sections 100mm clear above or beside any structural woody root or further as required, or any new wall to be built only to the depth of that existing. Structural woody roots to be further protected by utilising the construction techniques of pier or bridge footings, or screw piles between or over them with a minimum clearance above or beside of 100mm, or further as required to allow for future and on-going growth.

1.4.1.2 Where a driveway or footpath is to pass by the tree a suspended slab is to be constructed or approved similar, to protect the roots that may be encountered at, near, or above ground, and may be constructed on gap graded fill. Where such a driveway or footpath is to be constructed the edge of the structure closest to the tree is to terminate no closer than 0.5 m from the closest edge of trunk, or further depending on the species and its likely further growth to allow for future development and expansion of the trunk, buttresses, and first order and lower order roots as may be advised by a Consultant Arboriculturist. The side of the driveway closest to a tree is to be edged with a concrete kerb of minimum dimensions of 150 x 150mm, to prevent vehicular collision with the trunk. Here a *Water knife* or an *Airknife* can be used as a mechanised alternative to locate first order and lower order structural woody roots.

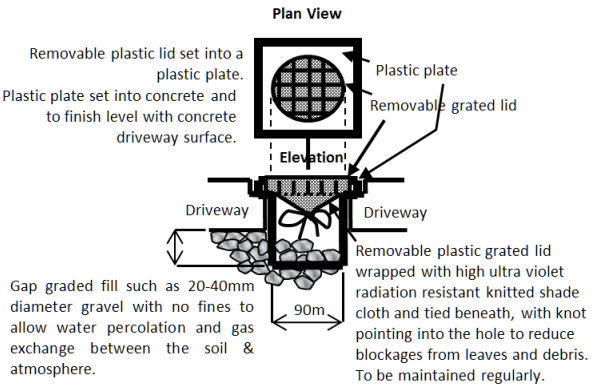
1.4.1.3 Alternatively a footpath or driveway may be constructed at or above ground level without any excavation, removing turf by raking, having sprayed with herbicide first if time permits. Here the path or driveway section is to extend for a distance past the tree equivalent to the lateral spread of the crown of that tree alongside the footpath, or driveway.

1.4.1.4 Watering / Gaseous exchange vents are to be installed in the driveway that passes within the dripline of the tree or the prescribed ***Tree Protection Zone*** area and the number and location are to be determined by a Consultant Arboriculturist and the driveway design approved by a Certified Engineer. Exposed edges of the path are to be concealed with the finished level beside the path equivalent to the top of the path by minimal filling with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation, or other landscape treatments as appropriate. (See image below)

1.4.2 **Root Protection where a Driveway close to a Tree is to be Demolished and a New Driveway Constructed in a Similar Location to a Previous Driveway.**

After demolition of an existing driveway as per section 1.3.2 (above), the level of the base for the new driveway should be located at the same existing level as that of the base of the previous driveway and should extend for a distance past the tree equivalent to the lateral spread of the crown of that tree alongside the driveway. To prevent excavation from damaging the existing roots which may be located at, near or above the surface of the soil beneath the base of the previous driveway, the new driveway may need to be raised by constructing it on pier or bridge footings between or over them or based on a gap graded fill and the driveway constructed with any exposed edges concealed to the top of the driveway by minimal filling with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation, or other landscape treatments as appropriate. Where roots have grown to occupy the soil between the concrete strips of a concrete, stone, or brick strip driveway, they and the soil may be excavated to the level of the base of the concrete strips, but where such roots have a diameter of 20mm or greater, a Consulting Arboriculturist should be contacted prior to such works being undertaken. Where roots are to be severed, they are to be cut cleanly with a final cut to undamaged woody tissue.

Irrigation / Gaseous Exchange Vent



NOTE: Such vents can be installed in a grid pattern at 1 per 1 m^2 and their planning and construction utilised in consultation with an appropriate structural or civil engineer.

1.4.3 **Root Protection where a Footpath is to be Constructed close to a Tree.**

1.4.3.1 A footpath may be constructed at ground level without any excavation, by first killing with herbicide the plants to be removed from the pathway area, and then removing that plant material by cutting the trunks of woody shrubs to ground level and by raking all other plant material to expose the topsoil surface without organic matter. This will remove the need for physically disturbing the soil and the roots of the tree. The path section is to extend for a distance past each tree equivalent to the lateral spread of the crown of that tree where it extends alongside the footpath.

1.4.3.2 To prevent excavation from damaging the existing roots which may be located at, near, or above the surface of the soil, a gap graded fill as a fill material of a media as appropriate to a depth of 100mm above the soil surface, or above the top of the root of any tree to be retained, or above the soil surface may be utilised as a base treatment to construct the footpath. Any exposed edges to be concealed to the top of the edges of the footpath and tapering back to the base of the trunk of each tree by minimal filling at each trunk of no greater than 100mm with a sandy soil and turf, or mulch, or a garden bed with minimal cultivation with ground covers, or other landscape treatments as appropriate. A Consultant Arboriculturist should be contacted prior to such works being undertaken or if any structural roots are considered appropriate to be severed being those roots of 20mm diameter or greater.

1.4.4 **Structural Soil to Accommodate Load Bearing Conditions**

A structural soil should only be considered as a new media into which the trees could be planted if the planting was into a new area where the area surrounding was to be load bearing such as a footpath, driveway, or road.

1.4.5 **Gap Graded Fill to Accommodate Compacted Sub Grade and Root Growth**

To further protect woody roots with a diameter of 20mm or greater, a gap graded fill with no fines such as gravel 40mm diameter should only be considered as a fill media above existing grade when soil levels are to be increased near existing trees and the roots can utilise the new media to develop on-going and future root growth and provide for gaseous exchange between the soil and the atmosphere.

Appendix 9: ULE (Useful Life Expectancy)

There are several ULE categories that indicate the useful life anticipated for each tree. Factors such as the location, age, condition, and health of the tree are significant to determining this rating. Other influences such as the tree's effect on better specimens and the economics of managing the tree successfully in its location are also relevant to ULE - *adapted from:* (Barrell, 1993 - 2009).

ULE CATEGORIES AND SUBGROUPS

1 = Long ULE OF > 40 years

A	**B**	**C**
Structurally sound trees located in positions that can accommodate future growth.	Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery.	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

2 = Medium ULE of 15-40 years

A	**B**	**C**	**D**
Trees that may only live between 15 and 40 more years.	Trees that may live for more than 40 years but would be removed to allow the development of more suitable individuals.	Trees that may live for more than 40 years but would be removed during normal management for safety or nuisance reasons.	Storm damaged or defective trees that can be made suitable for retention in the medium term by remedial work.

3 = Short ULE of 1-15 years

A	**B**	**C**	**D**
Trees that may only live between 1 and 15 more years.	Trees that may live for more than 15 years but would be removed to allow the development of more suitable individuals.	Trees that may live for more than 15 years but would be removed during normal management for safety or nuisance reasons.	Storm damaged or defective trees that require substantial remedial work and are only suitable for retention in the short term.

(4) Dead (and dying)

A	**B**	**C**	**D**	**E**	**F**
Dead trees.	Dying or suppressed and declining trees through disease or inhospitable conditions.	Dangerous trees through instability or recent loss of adjacent trees.	Dangerous trees through structural defects including cavities, decay, included bark, wounds or poor form.	Damaged trees that are considered unsafe to retain.	Trees that will become dangerous after removal of other trees for the reasons given in (a) to (e).

The ULE rating given to any tree in this report assumes that reasonable maintenance will be provided by a qualified Arboriculturist (AQF3) using the correct and acknowledged techniques. Retained trees are to be protected from root damage. Incorrect tree work practices can significantly accelerate tree decline and increase hazard potential.

Appendix 10: Glossary

All Glossary items adapted from Dictionary for Managing Trees in Urban Environments, Institute of Australian Consulting Arboriculturists (IACA) ©2009. (Draper & Richards, 2009), unless otherwise cited.

VIGOUR

The ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g., dormant, deciduous, or semi-deciduous trees. Vigour can be categorised as Normal Vigour, High Vigour, Low Vigour and Dormant Tree Vigour.

Normal Vigour: The ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

High Vigour: Accelerated growth of a tree due to incidental or deliberate artificial changes to its growing environment that are seemingly beneficial, but may result in premature aging or failure if the favourable conditions cease, or promote prolonged senescence if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feedlot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.

Low Vigour: Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.

Dormant Tree Vigour Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last *extension growth* is distinct from those most recently preceding it, evident by bud scale scars. Good vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.

AGE OF TREES

Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as Young, Mature and Over-mature (British Standard®, 1991) p.13 & (Harris, et al. 2004) p.262.

Young: Tree aged less than <20% of life expectancy, in situ.

Mature: Tree aged 20-80% of life expectancy, in situ.

Over-mature: Tree aged greater than >80% of life expectancy, in situ, or senescent with or without reduced vigour, and declining gradually or rapidly but irreversibly to death.

CONDITION OF TREES

A tree's *crown form* and growth habit, as modified by its *environment* (aspect, suppression by other trees, soils), the *stability* and *viability* of the *root plate*, trunk, and structural branches (first [1st] and possibly second [2nd] order branches), including structural defects such as wounds, cavities or hollows, *crooked* trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with *vigour,* and it is possible for a tree to be of *normal vigour* but in *poor condition*. The condition can be categorised as *Good Condition*, *Fair Condition*, *Poor Condition* and *Dead*.

Good Condition: Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability, or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent of or contributed to by vigour.

Fair Condition: Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over time, or in response to the implementation of beneficial changes to its local environment. This may be independent of or contributed to by vigour.

Poor Condition: Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent of or contributed to by vigour.

Senescent / Moribund: The advanced state of decline, dying or nearly dead.

Dead: Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms.

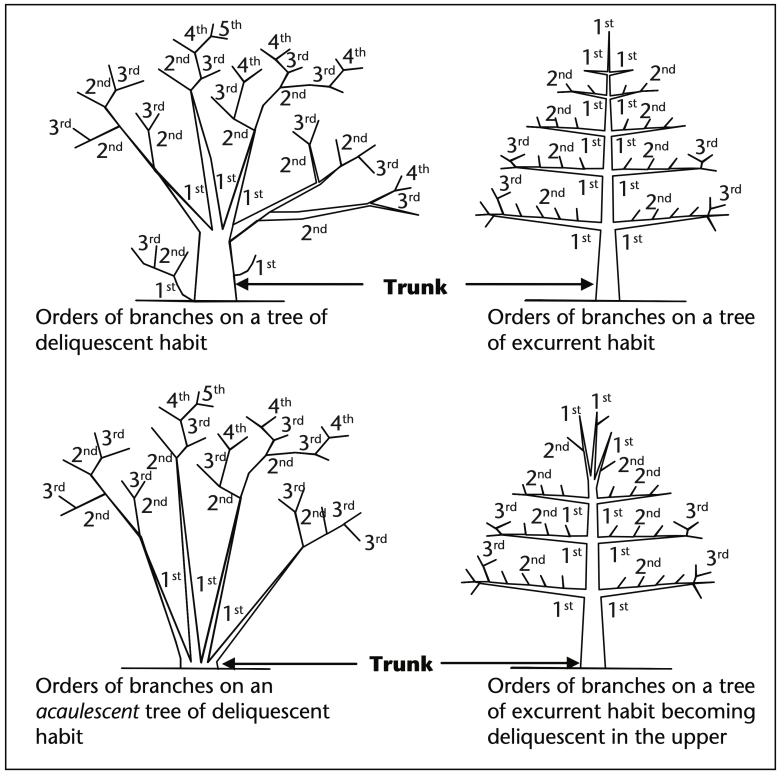
Processes: Photosynthesis via its foliage crown (as indicated by the presence of moist, green, or other coloured leaves); Osmosis (the ability of the root system to take up water); Turgidity (the ability of the plant to sustain moisture pressure in its cells); Epicormic shoots or epicormic strands in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a lignotuber).

Symptoms: Permanent leaf loss: Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots); Abscission of the epidermis (bark desiccates and peels off to the beginning of the sapwood).

Removed: No longer present, or tree not able to be located or having been cut down and retained on a site or having been taken away from a site prior to site inspection.

BRANCH

An elongated woody structure arising initially from the trunk to support leaves, flowers, fruit, and the development of other branches. A branch may itself fork and continue to divide many times as successive orders of branches with the length and taper decreasing incrementally to the outer extremity of the crown. These may develop initially as a gradually tapering continuation of the trunk with minimal division as in a young tree or a tree of excurrent habit, or in a sapling, or may arise where the trunk terminates at or some distance from the root crown, dividing into first order branches to form and support the foliage crown. In an acaulescent tree, branches arise at or near the root crown. Similarly, branches may arise from a sprout mass from damaged roots, branches, or trunk.



Orders of branches on a tree of deliquescent habit

Orders of branches on a tree of excurrent habit

Orders of branches on an *acaulescent* tree of deliquescent habit

Orders of branches on a tree of excurrent habit becoming deliquescent in the upper

Orders of Branches: The marked divisions between successively smaller branches (James, 2003) p. 168, commencing at the initial division where the trunk terminates on a deliquescent tree or from lateral branches on an excurrent tree. Successive branching is generally characterised by a gradual reduction in branch diameters at each division, and each gradation from the trunk can be categorised numerically, e.g., first order, second order, third order etc. (See image above.)

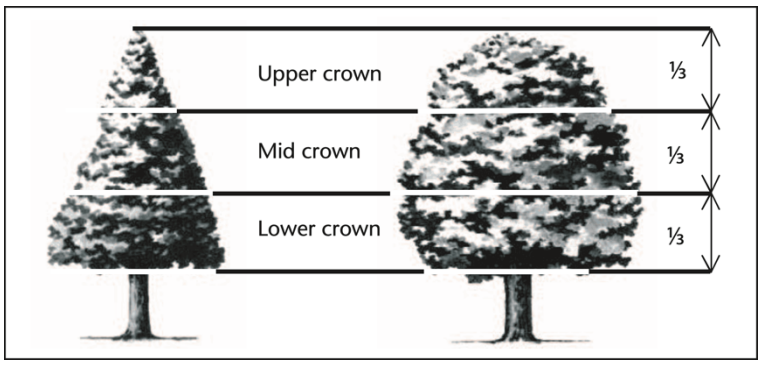
Branch tear out: Dislodging of a branch from its point of attachment where it is torn away from the branch collar snapping the branch tail causing a laceration, usually to the underside of the branch union of the branch or trunk to which it was attached forming a tear out wound.

Sudden branch drop: The failure and collapse of live, usually horizontal branches, seemingly without any noticeable cause in calm hot, dry weather conditions generally after rain. Theorised to be caused by altered moisture content in the branch disturbing the longitudinal pre-stressing of the wood that normally helps support the load as formed by reaction wood in branches tending to horizontal (Lonsdale, 1999) p. 30, or incipient failure from the lengthening of existing internal cracks as the wood cools (Shigo, 1986) p. 248, or influenced by branch creep under its own weight and by wind (Mattheck, et al., 1994) p. 126, or fractures to vascular rays if pulled at right angles to their longitudinal orientation forming from subsidence cracks (Mattheck, et al., 1994) p. 169, or a combination of these factors. Such branch breakages usually occur at some distance from the branch collar leaving a stub. See also *Branch tear out*.

Canopy:

1. Of multiple trees, the convergence, or merging in full or part, of the crowns of two or more trees due to their proximity, or where competition for light and space available in a forest environment is limited as each tree develops forming a continuous layer of foliage.
2. Used as a plural for the crown.
3. Sometimes synonymously used for the crown (USA).

Crown: Of an individual tree all the parts arising above the trunk where it terminates by its division forming branches, e.g., the branches, leaves, flowers, and fruit; or the total amount of foliage supported by the branches. The crown of any tree can be divided vertically into three sections and can be categorised as lower crown, mid crown, and upper crown (see image to the right).



For a leaning tree these can be divided evenly into crown sections of one-third from the base to apex. The volume of a crown can be categorised as the inner crown, outer crown, and outer extremity of the crown.

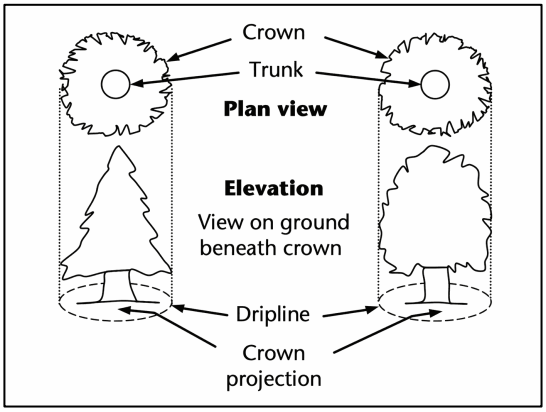
Lower Crown: The proximal or lowest section of a crown when divided vertically into one-third (⅓) increments.

Mid Crown: The middle section of a crown when divided vertically into one-third (⅓) increments.

Upper Crown: The distal or highest section of a crown when divided vertically into one-third (⅓) increments.

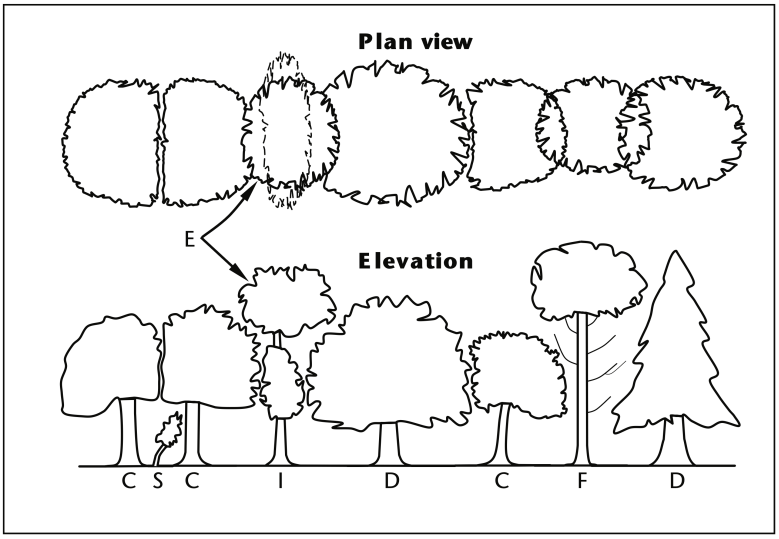
Crown Projection (CP): Area within the dripline or beneath the lateral extent of the crown (Geiger, 2004) p.2.

Dripline: A line formed around the edge of a tree by the lateral extent of the crown. Such a line may be evident on the ground with some trees when exposed soil is displaced by rain shed from the crown.



CROWN FORM

The shape of the crown of a tree as influenced by the availability or restriction of space and light, or other contributing factors within its growing environment. Crown Form may be determined for tree shape and habit generally as Dominant, Codominant, Intermediate, Emergent, Forest and Suppressed. The habit and shape of a crown may also be considered qualitatively and can be categorised as Good Form or Poor Form.



Crown form: D = Dominant; F = Forest; C = Codominant; E = Emergent; I = Intermediate; S = Suppressed. (Source: D, C, I and S, and Elevation, Matheny and Clark 1998, E, F and Plan View, IACA 2005).

Good Form: Tree of typical crown shape and habit with proportions representative of the taxa considering constraints such as origin e.g., indigenous, or exotic but does not appear to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, or cultural practices such as lopping and competition for space and light.

Poor Form: Tree of atypical crown shape and habit with proportions not representative of the species considering constraints and appears to have been adversely influenced in its development by environmental factors in situ such as soil water availability, prevailing wind, cultural practices such as lopping and competition for space and light; causing it to be misshapen or disfigured by disease or vandalism.

Crown Form - Codominant:
Crowns of trees restricted for space and light on one or more sides and receiving light primarily from above e.g., constrained by another tree/s or a building.

Crown Form - Dominant: Crowns of trees generally not restricted for space and light receiving light from above and all sides.

Crown Form - Emergent: Crowns of trees restricted for space on most sides receiving most light from above until the upper crown grows to protrude above the canopy in a stand or forest environment. Such trees may be crown form dominant or transitional from crown form intermediate to crown form forest asserting both apical dominance and axillary dominance once free of constraints for space and light.

Crown Form - Forest: Crowns of trees restricted for space and light except from above forming tall trees with narrow spreading crowns with foliage restricted generally to the top of the tree. The trunk is usually erect, straight, and continuous, tapering gradually, crown often excurrent, with first order branches becoming structural, supporting the live crown concentrated towards the top of the tree, and below this point, other first order branches arising radially with each inferior and usually temporary, divergent, and ranging from horizontal to ascending, often with internodes exaggerated due to competition for space and light in the lower crown.

Crown Form - Intermediate: Crowns of trees restricted for space on most sides with light primarily from above and on some sides only.

Crown Form - Suppressed: Crowns of trees generally not restricted for space but restricted for light by being overtopped by other trees and occupying an understorey position in the canopy and growing slowly.

DEADWOOD

Dead branches within a tree's crown and considered quantitatively as separate to crown cover and can be categorised as Small Deadwood and Large Deadwood according to diameter, length, and subsequent risk potential. The number of dead branches on a tree can be categorised as Low Volume Deadwood, Medium Volume Deadwood and High-Volume Deadwood. See also Dieback.

Deadwooding: Removing of dead branches by pruning. Such pruning may assist in the prevention of the spread of decay from dieback or for reasons of safety near an identifiable target.

Small Deadwood - dw: A dead branch up to 10mm diameter and usually <2 metres long, generally considered of low-risk potential.

Large Deadwood - DW: A dead branch >10mm diameter and usually >2 metres long, generally considered of high-risk potential.

DIEBACK

The death of some areas of the crown. Symptoms are leaf drop, bare twigs, dead branches, and tree death, respectively. This can be caused by root damage, root disease, bacterial or fungal canker, severe bark damage, intensive grazing by insects, abrupt changes in growth conditions, drought, water-logging or over-maturity. Dieback often implies reduced resistance, stress or decline which may be temporary. Dieback can be categorised as Low Volume Dieback, Medium Volume Dieback and High-Volume Dieback.

High Volume Dieback: Where >50% of the crown cover has died.

Medium Volume Dieback: Where 10-50% of the crown cover has died.

Low Volume Dieback: Where <10% of the crown cover has died. See also Dieback, High Volume Dieback and Medium Volume Dieback.

EPICORMIC SHOOTS

Juvenile shoots produced at branches or trunk from epicormic strands in some Eucalypts (Burrows, 2002) pp. 111-131, or sprouts produced from dormant or latent buds concealed beneath the bark in some trees. Production can be triggered by fire, pruning, wounding, or root damage but may also be as a result of stress or decline. Epicormic shoots can be categorised as Low Volume Epicormic Shoots, Medium Volume Epicormic Shoots and High Volume Epicormic Shoots.

High Volume Epicormic Shoots: Where >50% of the crown cover is comprised of live epicormic shoots.

Medium Volume Epicormic Shoots: Where 10-50% of the crown cover is comprised of live epicormic shoots.

Low Volume Epicormic Shoots: Where <10% of the crown cover is comprised of live epicormic shoots.

LEANING TREES

A tree where the trunk grows or moves away from upright. A lean may occur anywhere along the trunk influenced by a number of contributing factors e.g., genetically predetermined characteristics, competition for space or light, prevailing winds, aspect, slope, or other factors. A leaning tree may maintain a static lean or display an increasingly progressive lean over time and may be hazardous and prone to failure and collapse. The degrees of leaning can be categorised as Slightly Leaning, Moderately Leaning, Severely Leaning and Critically Leaning.

Slightly Leaning: A leaning tree where the trunk is growing at an angle within 0°-15° from upright. - Low Risk.

Moderately Leaning: A leaning tree where the trunk is growing at an angle within 15°-30° from upright. - Medium Risk.

Severely Leaning: A leaning tree where the trunk is growing at an angle within 30°-45° from upright. - High Risk.

Critically Leaning: A leaning tree where the trunk is growing at an angle greater than >45° from upright. - Very High Risk.

Progressively Leaning: A tree where the degree of leaning appears to be increasing over time. - Lodging.

Static Leaning: A leaning tree whose lean appears to have stabilised over time.

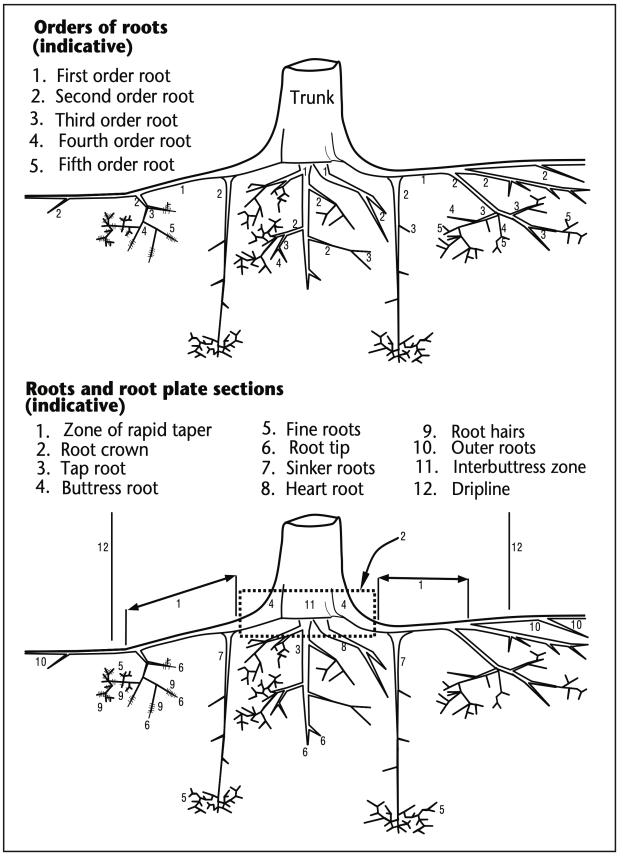
SYMMETRY

Balance within a crown, or root plate, above or below the axis of the trunk of branch and foliage, and root distribution respectively and can be categorised as Asymmetrical and Symmetrical.

Asymmetrical: Imbalance within a crown, where there is an uneven distribution of branches and the foliage crown or root plate around the vertical axis of the trunk. This may be due to Crown Form Codominant or Crown Form Suppressed as a result of natural restrictions e.g., from buildings, or from competition for space and light with other trees, or from exposure to the wind, or artificially caused by pruning for clearance of roads, buildings, or power lines. An example of an expression of this may be, crown asymmetrical, bias to the west.

Symmetrical: Balance within a crown, where there is an even distribution of branches and the foliage crown around the vertical axis of the trunk. This usually applies to trees of Crown Form Dominant or Crown Form Forest. An example of an expression of this may be crown symmetrical.

ROOTS



First Order Roots (FOR): Initial woody roots arising from the root crown at the base of the trunk, or as an adventitious root mass for structural support and stability. Woody roots may be buttressed and divided as a marked gradation, gradually tapering and continuous or tapering rapidly at a short distance from the root crown. Depending on soil type these roots may descend initially and not be evident at the root crown or become buried by changes in soil levels. Trees may develop 4-11 (Perry, 1982) pp. 197-221, or more first order roots which may radiate from the trunk with a relatively even distribution, or be prominent on a particular aspect, dependent upon physical characteristics e.g., leaning trunk, asymmetrical crown, and constraints within the growing environment from topography e.g., slope, soil depth, rocky outcrops, exposure to predominant wind, soil moisture, depth of water table etc.

Orders of Roots: The marked divisions between woody roots, commencing at the initial division from the base of the trunk, at the root crown where successive branching is generally characterised by a gradual reduction in root diameters and each gradation from the trunk and can be categorized numerically, e.g., first order roots, second order roots, third order roots etc. Roots may not always be evident at the root crown, and this may be dependent on species, age class and the growing environment. Palms at maturity may form an adventitious root mass.

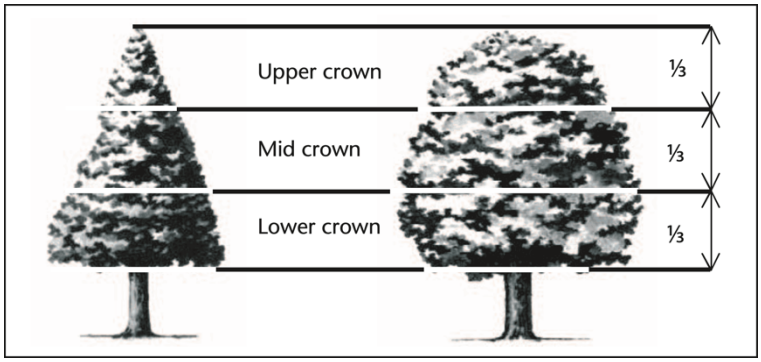
Root Plate: The entire root system of a tree generally occupying the top 300-600mm of soil including roots at, or above ground, may extend laterally at more than twice the height of the tree (Perry, 1982) pp. 197-221. The development and extent of roots is dependent on water availability, soil type, soil depth, and the physical characteristics of the surrounding landscape.

Root Crown: Roots arising at the base of a trunk.

Zone of Rapid Taper: The area in the root plate where the diameter of structural roots reduces substantially over a short distance from the trunk. Considered to be the minimum radial distance to provide structural support and root plate stability. See also Structural Root Zone (SRZ).

Structural Roots: Large diameter woody roots close to the stem that provide stability and support to the tree, mostly found within the Structural Root Zone (SRZ).

TRUNK



A single stem extending from the root crown to support or elevate the crown, terminating where it divides into separate stems forming first order branches. A trunk may be evident at or near the ground or be absent in acaulescent trees of deliquescent habit or may be continuous in trees of excurrent habit. The trunk of any caulescent tree can be divided vertically into three (3) sections and can be categorised as Lower Trunk, Mid Trunk, and Upper Trunk. For a leaning tree, these may be divided evenly into sections of one-third along the trunk.

Co-Dominant: Equal in size and relative importance, usually associated with either trunk/stems or scaffold limbs/branches in the crown; in the context of crown class, trees whose crowns form the bulk of the upper layer of the canopy, but which are crowded by adjacent trees (Matheny, et al., 1994).

Diameter at Standard Height (DSH): Trunk diameter at 1.4m above ground level. Note: Previously referred to as Diameter at Breast Height (DBH).

Dominant: One of four types of crown class; tree whose crown extends above the height of nearby trees in the stand, receiving light from above and the side.

Leader: The topmost portion of the tree trunk (stem) that is able to grow more than the laterals below. (Harris, et al. 2004).

GENERAL TERMS

Cavity: A usually shallow void often localised initiated by a wound and subsequent decay within the trunk, branches, or roots, or beneath bark, and may be enclosed or have one or more opening.

Decay: The process of degradation of wood by microorganisms and fungus.

Hazard: The threat of danger to people or property from a tree or tree part resulting from changes in the physical condition, growing environment, or existing physical attributes of the tree, e.g., included bark, soil erosion, or thorns or poisonous parts, respectively.

Included Bark: The bark on the inner side of the branch union or is within a concave crotch that is unable to be lost from the tree and accumulates or is trapped by acutely divergent branches forming a compression fork. The growth of bark at the interface of two or more branches on the inner side of a branch union or in the crotch where each branch forms a branch collar, and the collars roll past one another without forming a graft where no one collar is able to subsume the other. The risk of failure is worsened in some taxa where branching is acutely divergent or acutely convergent and ascending or erect.

Hollow: A large void initiated by a wound forming a cavity in the trunk, branches or roots and usually increased over time by decay or other contributing factors, e.g., fire, or fauna such as birds or insects e.g., ants or termites. A hollow can be categorised as an Ascending Hollow or a Descending Hollow.

Kino: The extractive polyphenols (tannins) formed in veins in the cambial zone as a defence in response to wounding in eucalypts. Often visible as an exudate when the kino veins rupture or are injured (Boland, et al., 2006) p. 691.

Notional Root Zone (NRZ): Zone enclosed by a radius of 12 times Diameter at Standard Height (DSH) that is a primary trigger for arboricultural input on a development site.

Occupancy Rating: The frequency of use of a likely target and possibility that people will be present when tree failure or collapse occurs.

Risk: The random or potentially foreseeable possibility of an episode causing harm or damage.

Significant Tree: A tree considered important, weighty, or more than ordinary. Example: due to prominence of location, or in situ, or contribution as a component of the overall landscape for amenity or aesthetic qualities, or curtilage to structures, or importance due to uniqueness of taxa for species, subspecies, variety, crown form, or as an historical or cultural planting, or for age, or substantial dimensions, or habit, or as remnant vegetation, or habitat potential, or a rare or threatened species, or uncommon in cultivation, or of aboriginal cultural importance, or is a commemorative planting.

Structural Root Zone (SRZ): Theoretical area around the base of a tree required for the tree's stability in the ground. Note 1 to entry: The woody root growth and soil cohesion in the SRZ are necessary to hold the tree upright. The SRZ is an area with the trunk at its centre and is expressed by its radius; Note 2 to entry: The SRZ considers a tree's structural stability only, not the root zone required for a tree's health and long-term viability, which is typically a much larger area.

Target: People or property likely to be harmed or damaged, respectively, by being struck by a failed or collapsed tree in full or part.

Tree: Long-lived woody perennial plant usually greater than 3m in height with one or relatively few main stems or trunks or as determined by the relevant authority.

Tree Protection Zone (TPZ): Specified zone above and below ground and at given offsets from the trunk set aside to protect a tree's roots and crown where these might be damaged by development. Note 1 to entry: The TPZ for each retained tree shall be shown on the Tree Protection Plan (TPP), including the dimensions or area in metres. This is the area to which the Tree Protection Specifications (TPS) apply.

Tree Protection Plan (TPP): Scaled drawing that shows trees to be retained, the location of the Tree Protection Zones (TPZ(s)), and any tree protection devices specified. Note 1 to entry: It is possible that several different plans will need to be drawn up for various stages of development.

Tree Protection Specifications (TPS): Written document that provides the instructions required to protect the tree(s) and includes the Tree Protection Plan (TPP). Note 1 to entry: The TPS may need to be amended as development progresses.

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Appendix 11: Curriculum Vitae

University of Western Sydney (Hawkesbury)
Graduate Diploma in Horticulture (AQF8)
Diploma in Horticulture (AQF5)

Hortus Australia
Diploma of Arboriculture (AQF5) (RTF50203-6522-6/12/2005)

Ryde School of Horticulture
Tree Surgery
Arboriculture Techniques

Workcover
OHS General Induction for Construction Work in NSW (CGI00871464SEQ1)
St Johns Ambulance First Aid Certificate

Central Coast Community College
Excel Module 1 & 2
Excel – Advanced

CONFERENCE ATTENDANCE & TRAINING

2022	ISA Tree Risk Assessment Qualification – The International Society of Arboriculture
2016	IACA Root Mapping Seminar - Ryde TAFE IACA Report Writing Seminar - Ryde TAFE IML Resistograph® Users Course - Belmont TAFE
2015	Quantified Tree Risk Assessment System - Estimating Probability of Failure Aboriginal Scar Trees: Significance Conservation and Management of Veteran Eucalypts in the Landscape - Griffith University
2012	Australian Institute of Horticulture Inc. - 'Don Burke Field Day' Professional Development Workshop
2011	Institute of Australian Consulting Arboriculturists (IACA) AS 4970 Forum Ecological Consultants Association of NSW - Impacts of Invasive Species
2010	Root Barrier Field Day
2009	Matheny & Clark: Arboriculture
2008	Quantified Tree Risk Assessment System - Principals and Application
2007	Quantified Tree Risk Assessment System - Principals and Application Quantified Tree Risk Assessment System - A Practitioners Guide to Visual Tree Assessment
2006	Barrell Tree A-Z 2 Day Workshop IML Resistograph® F500S Training Course
2005	Urban Tree Forum – Sydney City Council Urban Tree Risk Management – Treelogic DA Workshop Preparing Development Applications for Local Council –AIH Urban Forest – The New Imperative – Parks and Leisure Australia
2004	Visual Tree Assessment Workshop – Professor Doctor Claus Mattheck
2003	Urban Trees - Our Urban Urgency – Parks and Leisure Australia
1999	Tree Hazard Assessment – Parramatta Park – NAAA
1990	Aero Advanced Climbers Seminar NSW

INDUSTRY BACKGROUND

2001 to present	Proprietor - **Advanced Treescape Consulting** (Formerly known as RJK Consulting
2002 - 2005	Part Time Horticulturist - Acorn/Bushlands Nursery/Aquarium Centre, Erina Heights
1997 to present	Consultant – Horticulturist Public Speaker - Horticulturist/Arboriculturist Topics
1997 - 2001	Part Time Horticulturist - Flower Power, Glenhaven
1991 - 1995	Proprietor - KAC Peninsula Firewood
1990 - 1996	Proprietor/Climber - Kingdom's Arbor Care (until its sale)
1986 – 1990	Tree Worker - Arbor 2000 Pro-Climb, Sydney
1972 to present	Bonsai enthusiast

BUSINESS ACHIEVEMENT

Finalist in Central Coast Advocate Community Business Awards 2005 for Specialised Business category.

MEMBERSHIPS

- International Society of Arboriculture (ISA)
- Australian Institute of Horticulture
- Arboriculture Australia
- Quantified Tree Risk Assessment (QTRA)
- Gosford City Council Tree Protection Committee - Committee Member - August 1998 to June 2004.

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Attachment 1

SIGN EXAMPLE

As stated in AS 4970, Appendix C - Tree Protection Zone sign,

"A TPZ sign provides clear and readily available information to indicate that a TPZ has been established. The sign should be minimum A3 size."

TREE PROTECTION ZONE

NO ACCESS

Activities excluded from the TPZ include —

(a) Excavation or disturbance of the soil, including scraping of the surface
(b) Spreading or stockpiling of fill
(c) Cultivation
(d) Equipment and material storage
(e) Preparation of chemicals, including preparation of cement products
(f) Parking of vehicles and plant
(g) Refuelling
(h) Dumping of waste
(i) Wash down and cleaning of equipment
(j) Fires
(k) Physical damage to the tree

Contact:

Contact Project Manager for copy of the Tree Protection Specifications (TPS).

THIS SIGN SHOULD BE MINIMUM A3 SIZE.

AS 4970:2025 PROTECTION OF TREES ON DEVELOPMENT SITES (AUSTRALIAN STANDARD®, 2025).