Tree Impact Assessment Report
Sydenham To Bankstown;
Southwest Metro Conversion and Station Work Package scope 2 & 3 – Station Precincts

SMCSWSSJ-JHL-WEC-EM-REP-000036

Document and Revision History

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05	21/03/2025	Updated for removal of trees in council land in Bedford Crescent near Dulwich Hill Station	TB	LD
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Management reviews

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1. Introduction

1.1 Purpose

This report has been produced to assess impacts to vegetation and detail the species and number of trees that will be removed within the Station Precincts as part of the Southwest Metro Conversion and Station Work Package scope 2 (SWM2) & 3 (SWM3).

The report has been written in accordance with the requirements of the *Sydney Metro City & Southwest - Sydenham to Bankstown Interim Tree Management Strategy* and *Sydney Metro City & Southwest - Sydenham to Bankstown - Instrument of Approval*, Condition of Approval E5.

1.2 Project Overview and Location

Sydney Metro City & Southwest is a new 30km metro line extending metro rail from the end of Sydney Metro Northwest at Chatswood under Sydney Harbour, through new CBD stations and southwest to Bankstown. It is due to open in 2026 with the capacity to run a metro train every two minutes each way through the centre of Sydney. The Sydney Metro City & Southwest comprises of two components;

- Chatswood to Sydenham Project
- Sydenham to Bankstown upgrade

1.2.1 SWM2 Scope

The Southwest Metro Conversion and Station Work Package scope 2 (construct only) referred to as “the Project” or ‘the works” in this document, will be undertaken in accordance with the *Sydney Metro City & Southwest Sydenham to Bankstown Upgrade Instrument of Approval* (SSI_8256). The SWM2 Project site is located on the T3 Bankstown line between Sydenham and Bankstown stations, NSW. The SWM2 Scope of Works relevant to this Tree Report consists of the Fencing package within the station precincts.

SWM 2 is expected to be finished in 2025.

The ‘construct only’ works will be undertaken by a John Holland Group Pty Limited (John Holland) and Laing O’Rourke Construction Pty Limited (Laing O’Rourke) joint venture referred to as JHLORJV.

The SWM2 scope of works include permanent new infrastructure and modifications to existing infrastructure, as part of the construction of Sydenham to Bankstown station upgrade works. The permanent new infrastructure and modifications to existing infrastructure to be constructed include;

- The fencing works as follows:
  - Provision of two fences (a Boundary Fence and UTO Fence) on both sides of the UTO zone where possible to deter and delay intruders into the corridor; including at:
    - Sydenham Station to Marrickville Station (Sydney Metro Chainage 6km 740 TO 6km 980);
    - Campsie Station to Belmore Station (Sydney Metro Chainage 12km 505 TO 13km 690);
    - Belmore Station to Lakemba Station (Sydney Metro Chainage 14km 020 TO 14km 975);
    - Wiley Park Station to Punchbowl Station (Sydney Metro Chainage 16km 210 TO 16km 885); and

        - The balance of the chainages for the SWM Corridor Works as set out in section 2.1(e);
    - Access gates and associated LV and DEC provisions to be provided in accordance with Appendix E01 - Interface Requirement Specifications;
    - A Segregation Fence to segregate the Goods Line from the Sydney Metro line; and
    - Assessment of the works required on the existing fences to provide an appropriate second barrier and meet requirements of the Boundary Fence.
- ARTC Trackside equipment enabling works
- Guard Rail rectification work

1.2.2 SWM3 Scope

Sydney Metro City and Southwest – Sydenham to Bankstown works, as per Project CEMP, includes the following;

- **Permanent Works**

Bankstown Station and Precinct Works: New, and modification to existing, infrastructure and systems to facilitate a new cross-corridor plaza between The Appian Way (north of the rail corridor) and Restwell Street (south of rail corridor) retail facilities and Station Precinct and Public Domain improvements.

Divided into four Stages of delivery to facilitate:

- **Stage 1: Sydney Trains Bankstown Works** (To enable Sydney Trains 4-Car operation) Separation of the current Sydney Trains line at Bankstown into sections for Sydney Metro and Sydney Trains
- **Stage 2: Sydney Metro Turn back, fencing and rail adjustment** to enable dynamic testing in the Sydney Metro portion
- **Stage 3a: Sydney Trains Bankstown Works** (To enable Sydney Trains 8-Car operation):
    - Bankstown Station Works: extension of the existing platforms further west, a new eastern entrance to Bankstown Station with Gatelines and back of house operational spaces
    - Sydney Trains Corridor: track adjustments, new diamond crossing (or alternative equivalent), OHWS and signalling and rail systems infrastructure to accommodate the modifications to Bankstown Station and continued operations between Bankstown and Yagoona stations
- **Stage 3b: Bankstown Metro Works**
    - Bankstown Metro Station Works
    - Bankstown Metro Corridor Works
- **Stage 4: all remaining Bankstown Station and Precinct Works,** to achieve the final station and precinct configuration

Southwest Station Work

- **Remaining (S2B works from SWMC, BEW, SWM1, SWM2)**
    - Remaining South West Metro Corridor Work
        - Segregation Fencing between;
            - Marrickville and Dulwich Hill
            - Hurlstone Park and Canterbury
            - Canterbury and Campsie

        - Campsie to Belmore
    - Remaining South West Metro Corridor Work Package 2
        - Guard Rail installation various locations along corridor
        - Overhead Wire installation various locations along corridor
        - Station Security Fencing
            - Marrickville
            - Dulwich Hill
            - Canterbury
            - Campsie
            - Belmore
            - Lakemba
            - Wiley Park
            - Punchbowl
        - Segregation Fencing
            - Sydenham
            - Dulwich Hill
            - Campsie
        - Mechanical Gap Filler/Platform Screen Doors- all stations excluding Sydenham and Bankstown
        - Signalling at Sydenham and Bankstown
    - Additional (SWM3)

Southwest Corridor Works

- Corridor access stairs
- Screens fixed to CSR on bridges
- Veg management
- Acoustic treatment
- Boundary fencing
- Track monitoring
- Cable hauling, signalling and comms equipment, radio mast and repeater install

Asset Upgrades

- Infringement and track rectification
- Bridge upgrades renewals
- Civil asset upgrade renewal

Final Conversions

- Sydenham junction final track configuration, fencing, wayfinding & signage (all stations), building management and control systems (BMCS), cable containment systems, cabinet installation and cable haul from Stations to MSBs, cable termination, testing and commissioning, low voltage power supplies, distribution systems and energisation, and lift conversions (Marrickville Station to Punchbowl Station)
- Earthing bonding, alteration works, insulated rail joints, redundant asset works

- Clean up work (final rail grind, final rail tamp, station refresh/deep clean)
- Station meal room alterations at 9 stations (excluding Bankstown)
- Fixed gap filler works
- Commissioning trials of equipment and temporary use of any part of the CSSI by
- Interface Contractor within the definition of Construction (Under separate EPL and low impact activities subject to ER endorsement as per Staging Report Rev 8.1)

ARTC Works

Temporary and permanent adjustments to ARTC operated and maintained infrastructure
Utility works

- Qenos Pipe removal
- Non Sydney Trains (ST) or Sydney Metro (SM) assets (typically non-contestable works)

Local area works

Modification, reinstatement of public space, roads and pedestrian way, required for, or as a consequence of the SWM3 Contractor's Activities

Property works

The Property Works comprises permanent adjustments to existing private properties required for, or as a consequence of the SWM3 Works and Temporary Works

Temporary Works

- Temporary arrangements to divert and control pedestrians, public transport users, cyclists, public transport and traffic and to provide public access, amenity, security and safety during all stages of design and construction of the Works;
- Temporary arrangements for people and vehicles to safely access all property, including publicly accessible space affected by the Contractor's Activities;
- Temporary arrangements for people and vehicles to safely access the Site;
- Temporary access stairs, walkways and platforms within the Site;
- Temporary construction hoardings, fencing, noise walls, access gates, barriers and signage on and around the Site;
- All environmental safeguards and measures necessary to mitigate environmental effects which may arise during the design and construction of the Works;
- Cleaning, maintenance, repair, replacement and reinstatement, as required, of all areas occupied by the Contractor during design and construction of the Works;
- Temporary site facilities/compounds required for design and construction of the Works (i.e. Canterbury Bowls Club), including set-up and operation;
- Temporary infrastructure, safety screens and ground support installed or erected to undertake design and construction of the Works;
- Temporary arrangements for Utility Services including water, electricity, stormwater, sewerage, gas and electronic communications;
- Temporary power for stations
- Temporary works and measures required as a consequence of requirements arising from the stakeholder and community liaison process; and
- All other temporary works and measures required for the construction of the Works.

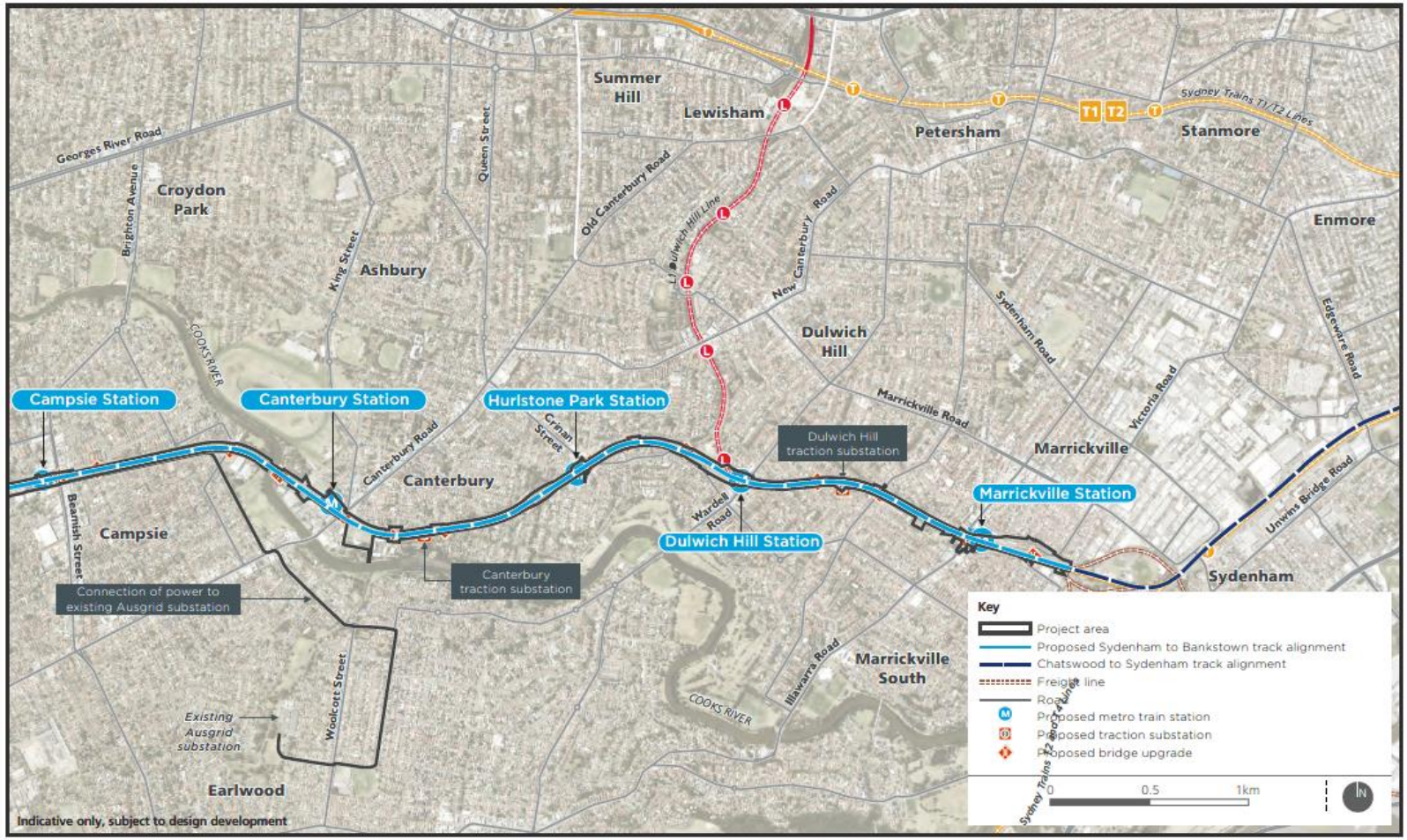
- Investigation works including services searching and geotechnical investigations, insitu waste classification along the full alignment from Sydenham to Bankstown.

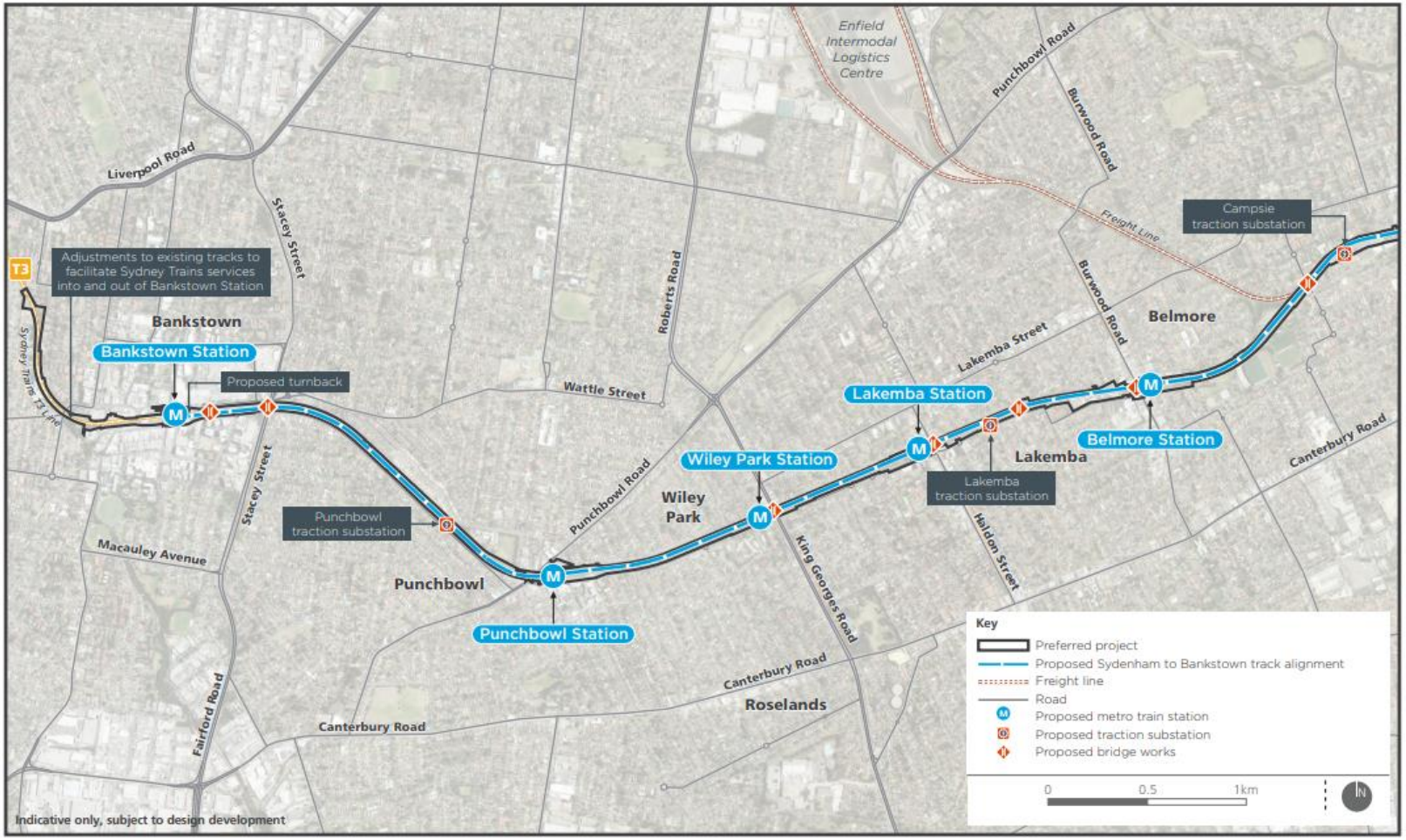
The Southwest Metro Conversion and Station Work Package scope 3 (SWM3) requires the removal or pruning of a number of trees to enable access to a number of temporary construction facilities. This may be required at each station precincts. This Tree Report will be updated as required. The current revision addresses;

- Marrickville Station:
    - Removal of one (1) landscaped trees for secondary egress construction inside project boundary, in southern platform garden bed.
- Reconsolidation of the tree removal numbers.

The SWM2 & 3 site is shown in Figure 1.

Figure 1 Site Layout




Enfield Intermodal Logistics Centre
Punchbowl Road
Burwood Road
Liverpool Road
Stacey Street
Roberts Road
Freight Line
Campsie traction substation
Adjustments to existing tracks to facilitate Sydney Trains services into and out of Bankstown Station
Bankstown
Bankstown Station
Sydney Trains T3 Line
Proposed turnback
Wattle Street
Lakemba Street
Belmore
Lakemba Station
Belmore Station
Lakemba
Lakemba traction substation
Canterbury Road
Wiley Park Station
Wiley Park
Punchbowl traction substation
Punchbowl
Macauley Avenue
Haldon Street
King Georges Road
Punchbowl Station
Roselands
Fairford Road
Canterbury Road
Key
Preferred project
Proposed Sydenham to Bankstown track alignment
Freight line
Road
Proposed metro train station
Proposed traction substation
Proposed bridge works
0
0.5
1km
N
Indicative only, subject to design development

1.3 Background

In accordance with the *Sydney Metro City & Southwest Sydenham to Bankstown Instrument of Approval* a tree is defined as "*Long lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks*".

Condition of Approval E5 states "*The Proponent must commission an independent experienced and suitably qualified arborist, to prepare a comprehensive Tree Report(s) before removing any trees as detailed in the documents listed in Condition A1. The Tree Report may be prepared for the entire CSSI or separate reports may be prepared for individual areas where trees are required to be removed. The report(s) must identify the impacts of the CSSI on trees and vegetation within and adjacent to the Construction footprint. The report(s) must include:*

a) a description of the conditions of the tree(s) and its amenity and visual value;
b) consideration of all options to avoid tree removal, including relocation of services, redesign or relocation of ancillary components (such as substations, fencing etc.) and reduction of standard offsets to underground services; and
c) measures to avoid the removal of trees or minimise damage to existing trees and ensure the health and stability of those trees to be protected. This includes details of any proposed canopy or root pruning, root protection zone, excavation, site controls on waste disposal, vehicular access, storage of materials and protection of public utilities.

A copy of the report(s) must be submitted to the Planning Secretary before the removal or pruning of any trees, including those affected by site establishment Work. All recommendations of the report must be implemented by the Proponent, unless otherwise agreed by the Planning Secretary."

The ecological potential of the project site has been assessed under the Sydney Metro City & Southwest Sydenham to Bankstown Environmental Impact Statement (EIS). Section 22.2 of the EIS states "*The majority of the study area has been heavily modified by past and ongoing disturbances associated with urban development and the active rail corridor. Urban development, clearance, and ongoing maintenance of the rail corridor has resulted in fragmentation, a high level of disturbance, and degradation of vegetation communities.*

The majority of vegetation in the project area and surrounding study area comprises exotic or planted native species on highly modified landforms. There are small isolated patches of remnant or regrowth native vegetation in small portions of the study area associated with rail cuttings with less disturbed soil profiles.

Native vegetation and habitat within the project area is in medium to poor condition, and features impacts from existing maintenance activities, edge effects, weed infestation, and exotic pests."

The EIS also states "*There is relatively low native species richness within the study area, which confirms that the native vegetation has been extensively modified and is in moderate to poor condition.*

A total of 129 flora species from 40 families were recorded within the study area, comprising 63 native and 66 exotic species. Poaceae (grasses, 22 species, 11 native), Myrtaceae (flowering shrubs and trees, 20 species, 13 native), Fabaceae (23 species, 17 native), and Asteraceae (flowering herbs, 11 species, 2 native) were the most diverse families recorded. One threatened flora species (Downy Wattle) was recorded in the study area, outside the project area."

In regards to plant communities Section 22.2 of the EIS states "*two of the native plant communities identified conform to the following threatened ecological communities listed under the TSC Act:*

- *Sydney Turpentine Ironbark Forest in the Sydney Basin Bioregion (Sydney Turpentine Ironbark Forest)*

- *Shale Gravel Transition Forest in the Sydney Basin Bioregion (Shale Gravel Transition Forest).*

No threatened ecological communities listed under the EPBC Act are located in the study area."

It is noted that one threatened plant species was recorded in the vicinity of the EIS study area, however the species does not reside within the Project area. Downy Wattle (*Acacia pubescens*) was recorded near Punchbowl Station. The Downy Wattle will not be removed as part of these works and will be protected. The EIS states "*No listed threatened flora species were recorded in the project area. One threatened plant species Downy Wattle (Acacia pubescens) listed as vulnerable under the EPBC Act and TSC Act, was recorded in the study area. Around 650 stems are located near the project area as shown in Figure 22.1.*

The patches of stems recorded are located mainly in the vicinity of Punchbowl Station, with around two stems recorded in the rail corridor, and one stem in a Council reserve around 100 metres east of the Yagoona substation. The project has been designed to avoid impacting on the recorded locations of this species."

The *Sydney Metro City & Southwest Sydenham to Bankstown Upgrade – Submissions and Preferred Project Report* (SPIR) states "*It is expected that large areas of the planted native vegetation and exotic scrub and forest would not require removal for the corridor works, however this is subject to the detailed design of the proposed works, including fencing and the communications services route.*

The visual / amenity value of trees and vegetation around station precincts has to be taken into consideration when removal is required. This vegetation would potentially include trees that provide screening to the surrounding stations'-built environment. The need to clear vegetation would be reviewed by the construction contractor/s and minimised wherever practicable."

The SPIR also states "*about 16.3 hectares of vegetation (not including vegetation classed as exotic grassland) may need to be removed, including*:

- *up to 7.3 hectares of planted native vegetation*
- *up to 9 hectares of exotic scrub and forest*."

The SPIR does not specify where these areas of clearing are located as this was to be developed as part of detailed design. Furthermore, these areas represent the clearing to occur for both corridor and station precinct works from Sydenham to Bankstown under all work packages (refer to the *Sydney Metro City & Southwest Sydenham to Bankstown Upgrade Staging Report* for more information on the different packages under which the project has been staged). As such, minimisation of impacts is driven through the design and construction methodology. Refer to Section 4 for more information on minimisation of impacts through design and construction methodology. Refer to Section 5 for Mitigation Measures.

For the purpose of producing this report, the Arboricultural reports that form the appendices of this document have been divided on the following basis;

- Appendix A – Station Precincts Construction Impact Arboricultural Report:
    - Marrickville
    - Dulwich Hill
    - Hurlstone Park
    - Canterbury
    - Campsie
    - Belmore
    - Lakemba

  - Wiley Park
  - Punchbowl
- Appendix B – Cumberland Ecology – Station Precinct Pre-clearance Assessment: Southwest Metro Corridor Vegetation Removal (15/04/2024)
- Appendix C – Urban Arbor Curriculum Vitae
- Appendix D – Mark up of trees identified for removal within station precincts and landscaped areas
- Appendix E – Compliance Matrix

It is noted that the Station Precincts Construction Impact Arboricultural Report has also captured potential design as well as construction related impacts as no Arboricultural Report or tree data was provided as part of the *Metron T2M Technical Memorandum: SSR042 Post-Approved for Construction Tree Impact design*. Note: this Station Precincts Report does not have cross over or overlap with trees within the Corridor Design and Construction Arboricultural Report.

2. Site Inspections

Bryce Claassens, Consulting Arborist of Urban Arbor, has attended site on numerous occasions. Please refer to inspection dates within the respective Arboricultural reports for details regarding inspection dates.

Urban Arbor have subsequently produced Arboricultural Reports to satisfy the Planning Approval conditions related to tree and vegetation removal. Copies of the reports are included in Appendix A as described above.

A curriculum vitae for Bryce is attached in Appendix C.

3. Inspection Results

The Station Precincts Construction Impact Arboricultural Report has captured all trees within the Sydney Metro City & Southwest Sydenham to Bankstown Station Precinct areas required for removal as part of the SWM2 fencing scope of works.

As JHLORJV's work package, Southwest Metro Corridor, is located largely within the corridor, however the installation of security fencing will occur also within the station precincts. For this reason, a number of trees that have been selected for removal and can be found in Appendix A. These trees are listed under Section 4.1 of this document.

In accordance with the Arboricultural Reports **67** standalone trees and **8** groups (or approximately **55** trees) which make up to a **total of 122** trees are proposed to be removed as part of this scope of works. In addition, **32** trees and **4** groups (or approximately **37** trees in total) will be trimmed (Group G26 comprises native and exotic weed species). Individual native trees will be pruned as needed and weed species will be removed). Due to unknown location of subsurface tree roots, all trees may be subject to root trimming where the arborist confirms that the trees health will be maintained following trimming. Where root trimming must occur and that trimming will impact the viability of the tree, the tree will be included within this tree report for removal prior to any removal works.

Overall clearance of vegetation has also been assessed. JHLORJV has estimated the area of planted native vegetation and exotic scrub and forest to be removed as part of SWM2 & 3.

Broad mapping within the EIS is likely to overstate impacts of clearing, as the broad mapping accounts for areas that may not be vegetated.

4. Alternatives to Design

Refer *to Metron T2M Technical Memorandum: SSR042 Post-Approved for Construction Tree Impact design* for compliance with CoA E4 and justification for the removal of additional trees.

Section 9 of each station tree assessment in Appendix A provides justification for the removal of trees and vegetation, however does not differentiate between design and construction impacts as the design impacts are not known to the JHLORJV. The tech memo specifies the requirements for a 2 metre exclusion zone around the fence to minimise climbing aids to mitigate the security risk posed by fence scaling. The construction impacts consider limited space within the project boundary, access to existing services, maintain access tracks and integration with other S2B design elements. In some instances, it is not feasible or reasonable to move these design components to accommodate the existing trees and vegetation.

In accordance with the Sydney Metro Sydenham to Bankstown Interim Tree Management Strategy tree and vegetation removal has been limited through construction planning. Refer to Section 9 of each station's Arboricultural Report in Appendix A for removal justifications. Reduction of impacts at the Detailed Design stage remains the responsibility of Sydney Metro.

Avoidance of impacts to trees and vegetation on the project has been undertaken based on the following hierarchy;

1. Avoid impacts to tree, ensuring design and construction falls outside the tree protection zone (Sydney Metro design responsibility)
2. Impacts within the tree protection zone, but no trimming or removal
3. Trimming of trees with visual or amenity value (including privacy screening)
4. Removal of trees with visual or amenity value (including privacy screening)
5. Trimming of trees with ecological value (habitat, threatened vegetation communities, threatened flora species)
6. Removal of trees with ecological value (habitat, threatened vegetation communities, threatened flora species)

It is noted that a number of trees within the station precincts and at access gates will be trimmed to accommodate the design components and construction requirements.

Where trenching may impact trees, tree sensitive service installation methods could be reviewed based on Sydney Metro direction to determine if alternative methods of service installation (such as non-destructive digging trench excavation of underbores) are practicable and feasible to undertake.

4.1 Considerations and Restrictions

It is noted that trees within the Project area may at times be trimmed or removed by Sydney Trains, other authorities or other Contractors. At times this may occur without JHLORJV's knowledge. The tree count included within this report is based on construction impacts calculated for JHLORJV's scope. Currently, the final tree removal number is 122 trees, based on the current design alignment of the fencing package (refer to table below). The final number is for Sydney Metro consideration that may refine the alignment.

Table 4.1 Additional trees identified for removal based on the current SWM2 fencing design alignment and SWM3 landscaped areas.

Additional Trees identified for removal	Native Trees	Exotic Trees	Total Trees
Marrickville	/	1	1
Dulwich Hill	7	1	8
Hurlstone Park	/	1	1
Canterbury	/	/	/
Campsie	/	/	/
Belmore	33	7	40
Lakemba	7	3	10
Wiley Park	6	1	7
Punchbowl	35	20	55
Bankstown	/	/	/
Total trees count	88	34	122

It is noted that if a tree is to be removed outside of the Project Boundary JHLORJV will obtain landowner's consent prior to the removal works.

Table 2.1 of the SPIR *Number of Trees at station with the potential to be impacted* from the EIS S9.2.3 (refer to table below) is the estimated upper limit for tree removal in station precincts at concept design stage. The overall number is 503. Note that the number of trees with the potential to be impacted is not only based on the concept design at the time of the EIS/SPIR, but also the preliminary desktop survey which identifies the number of trees that existed at the time of the EIS/SPIR. Accordingly, the final number of trees required for removal would be confirmed during detail design and construction planning process as specified in in the EIS/SPIR.

Table 4.2 Number of trees at stations that have been or with the potential to be impacted by JHLOR – based on concept design as well as trees to be removed as part of the landscape package (SWM3 work)

Station	Number of trees already removed by JHLOR within the station precinct	Number of trees to be removed by JHLOR within the station precinct (SWM2) – security fencing installation	Number of trees deemed for removal with station precinct that JHLOR managed to retain (SWM2) – to date	Number of trees to be removed as part of landscape works (SWM3) – to date	Native Trees	Exotic Trees	Total Trees
Marrickville	0	0	0	1	0	1	1
Dulwich Hill	1	2	0	6	8	1	9
Hurlstone Park	0	0	0	1	0	1	1
Canterbury	0	0	0	0	0	0	0
Campsie	1	0	0	0	0	0	1
Belmore	0	40	0	0	33	7	40
Lakemba	9	10	2	0	16	3	19
Wiley Park	9	7	0	0	14	2	16
Punchbowl	9	55	0	0	44	20	64
Bankstown	112	0	0	0	60	52	112
Total trees count					175	87	**262**

To date, including the removals carried out or proposed to be carried out as per table 4.2 above by JHLOR is 262, whereas the previous contractors have removed 239, making up to **501** trees removed. A balance of 34 trees for removal remains to achieve the proposed total at concept design across all stations. However, based on the current fencing alignment design provided by the Sydney Metro to JHLORJV, it is noted that 122 additional trees need to be removed to complete the scope of work. It is understood that the EIS S9.3.2 states that final number of trees to be removed would be confirmed during detailed design and final construction planning. It is also noted that JHLORJV SWM2 scope is construct only for station precinct areas, therefore, any design changes or direction / instruction will be provided by Sydney Metro.

Based on the current SWM2 Fencing Design Package, a total of 122 trees need to be removed to complete the scope of work. Refer to Appendix D Markup of the one hundred (122) trees identified for removal.

In accordance with the Sydney Metro City & Southwest Sydenham to Bankstown Tree Management Strategy Revision 14, the construction planning process has taken into consideration the changes between the concept design and the Approved for Construction (AFC) Design. Finalising the tree removal numbers the distinction between established trees and re-growth and new growth has also been made. For instance, among the ninety-nine tree (122) trees that required removal, based on the current alignment**, fifty-seven (57)** trees based on the Safe Useful Life Expectancy (SULE), (Barrel, 2001), have been labelled as '**small/young**' which means they are generally considered re-growth (new growth), as they are less than fifteen (15) years old and below five (5) meters in height.

Additionally, out of the 122 trees identified for removal, **thirty-four (34)** are exotic (**E**) species.

Furthermore, **three (3)** trees have a **high** amenity value, and **one (1)** tree has a **very high** amenity value. All four trees are established, native species and are located within the Punchbowl station precinct. This means that those trees provide for a functional and aesthetic value to the surrounding built landscape. Visual Amenity should be assessed on an individual tree, case by case basis, further assessment may be required to determine the fate of these trees. Based on the Project Visual Amenity Management Plan (rev.9), JHLORJV is bring this to the attention of Sydney Metro to take into consideration visual amenity impacts, retain existing screening vegetation around stations where practicable through design change to the alignment or mitigating through the final Landscape Design.

The above considerations are all capture in the below Table 4.2 that summarises the key findings about the 122 trees.

Note: It is up to the discretion of Sydney Metro to interpret the requirements of Table 2.1 of the SPIR in terms of the upper limit and which trees are counted towards this limit. Regardless of this interpretation, all trees removed should still be offset in accordance with CoA E4 at a 2:1 ratio.

Table 4.3 – 122 trees details

Station	Tree ID	Species	Exotic / Native	SULE*	Amenity / Visual Value
Marrickville	558	*Lagerstroemia indica*	E	Medium	Medium
Dulwich Hill	564	Green-leaved tamaring / *Cupaniopsis anacardioides*	N	Long	Medium
	3562	Chinese celtis / *Cletis sinensis*	**E**	**Small / young**	Low
	1A**	Tea trees / *Leptospermum spp*	N	**Small / young**	Low
	2A**	Tuckeroo / *Cupaniopsis anacardioides*	N	**Small / young**	Low
	3A**	Spider flower / *Grevillea spp*	N	**Small / young**	Low
	4A**	Tuckeroo / *Cupaniopsis anacardioides*	N	**Small / young**	Low
	5A**	Tuckeroo / *Cupaniopsis anarcadioides*	N	**Small / young**	Low
	6A**	Bottlebrush / *Callistemon viminalis*	N	**Small / young**	Low
Hurlstone Park	594a	*Acer negundo*	E	**Small / young**	Medium

Belmore	3569	Parramatta wattle / *Acacia parramttensi*	N	**Small / young**	Low
	656	Flame bottletree / *Brachychiton acerifolius*	N	Medium	Medium
	G1.22 x 4 Trees	*Acacia Sp / wattles*	N	Short	Low
	G1.24 x 20 Trees	*Acacia Sp / wattles*	N	**Small / young**	Low
	G1.25 x 3 Trees	*Acacia longifolia*	N	Short	Low
	658c	*Acacia saligna*	N		
	662	*Robinia pasudoacacia 'Frisia'* / Golden Robinia	**E**	Short	Low
	668	*Lophostemon confertus* / Brush box	N	Long	Medium
	670	Lophostemon confertus / Brush box	N	Medium	Medium
	3563	*Phoenix canariensis*	**E**	**Small / young**	Low
	3564	*Grevillea spp* / Spider flower	N	Low	Low
	3565	*Robinia pasudoacacia* 'Frisia' / Golden Robinia	**E**	Short	Low
	3566	*Robinia pasudoacacia* 'Frisia' / Golden Robinia	**E**	Short	Low

	3567	Robinia pasudoacacia 'Frisia' / Golden Robinia	**E**	**Small / young**	Low
	3618	*Celtis sinensis* / Chinese celtis	**E**	**Small / young**	Low
	3619	*Phoenix canariensis*	**E**	Long	Medium
Lakemba	3610	Mexican fan palm / *Washington reobusta*	**E**	Long	Medium
	3611	*Triadica sebifera*	**E**	**Small / young**	Low
	G1.15 x 4 Trees	Mixed spp	N	**Small / young**	Medium
	3582	Mulberry / *Morus nigra*	**E**	Short	Medium
	3613	Long-leaved wattle / *Acacia longfolia*	N	**Small / young**	Low
	3614	Long-leaved wattle / *Acacia longfolia*	N	**Small / young**	Low
	3615	Long-leaved wattle / *Acacia longfolia*	N	Short	Medium
Wiley Park	1995	Long-leaved wattle / *Acacia longfolia*	N	Medium	Medium
	3585	Chinese elm / *Ulmus parvifolia*	**E**	**Small / young**	Low

	G1073 x 3 Trees	Long-leaved wattle / *Acacia longfolia*	N	**Small / young**	Low
	1073	Long-leaved wattle / *Acacia longfolia*	N	Medium	Medium
	3584	Spider flower / *Grevillea spp*	N	**Small / young**	Low
Punchbowl	722	Spotted gumtree / *Corymbia maculata*	N	Long	**High**
	726	Brush box / *Lophostemon confertus*	N	Long	Medium
	727	Lemon-scented gum / *Corymbia citridora*	N	Short	Medium
	737	Weeping bottlebrush / *Callistemon viminalis*	N	Long	Medium
	738	Weeping bottlebrush / *Callistemon viminalis*	N	Long	Medium
	739	Weeping bottlebrush / *Callistemon viminalis*	N	Long	Medium
	3366	Wiikkybutt / *Eucalysptus botryoides*	N	Long	**Very high**
	3367	Camphor laurel / *Cinnamomum camphora*	**E**	**Small / young**	Low

	3368	Camphor laurel / *Cinnamomum camphora*	**E**	**Small / young**	Low
	3369	Camphor laurel / *Cinnamomum camphora*	**E**	Medium	Low
	3370	Camphor laurel / *Cinnamomum camphora*	**E**	**Small / young**	Low
	3371	Wiikkybutt / Eucalysptus botryoides	N	Long	**High**
	3372	Camphor laurel / Cinnamomum camphora	**E**	**Small / young**	Low
	3373	Lombardy Poplar / Populus nigra 'Italica'	**E**	Short	Low
	3374	Lombardy Poplar / Populus nigra 'Italica'	**E**	Short	Low
	3378	Melaleuca bracteate 'Revolution Gold'	N	**Small / young**	Low
	3379	Melaleuca bracteate 'Revolution Gold'	N	**Small / young**	Low
	3380	Melaleuca bracteate 'Revolution Gold'	N	**Small / young**	Low
	3583	Sydney red gum / Angophora costata	N	Medium	**High**
	G3366 x 10 Trees	Long leaved wattle / Acacia longifolia	N	**Small / young**	Low

	3526	Western Australia golden wattle / Acacia saligna	N	Short	Medium
	3527	Western Australia golden wattle / Acacia saligna	N	Short	Medium
	3528	Mexican alder / Alnus jorullensis	**E**	Medium	Medium
	3529	Mexican alder / Alnus jorullensis	**E**	Medium	Medium
	3530	Mexican alder / Alnus jorullensis	**E**	Medium	Medium
	3531	Dwarf date palm / Phoenix roabelenii	**E**	Medium	Low
	3544	Mexican alder / *Alnus jorullensis*	**E**	Medium	Medium
	3545	Dwarf date palm / *Phoenix roabelenii*	**E**	**Small / young**	Low
	3546	Mexican alder / *Alnus jorullensis*	**E**	Medium	Medium
	3547	Mexican alder / *Alnus jorullensis*	**E**	Medium	Medium
	3548	Mexican alder / *Alnus jorullensis*	**E**	Medium	Medium
	3549	Mexican alder / *Alnus jorullensis*	**E**	Medium	Medium
	3550	Mexican alder / *Alnus jorullensis*	**E**	Medium	Medium
	3551	Mexican alder / *Alnus jorullensis*	**E**	Medium	Medium
	3606	Olea europaea	**E**	**Small / young**	Low

		subsp. uspidata			
	G1.19 x 4 trees	Casuarina glauca	**N**	**Small / young**	Low
	G1.20 x 7 trees	Casuarina glauca	**N**	**Small / young**	Low

Safe Useful Life Expectancy – life expectancy of the tree modified by its age, health, condition, safety, location, economics and sustained amenity.

**These trees are located in council landscaped areas but within the Project boundaries, and will be re-landscaped by JHLOR as part of SWM3 work package.

5. Mitigation Measures

JHLORJV will implement a number of measures to ensure the correct vegetation and trees are removed and to mitigate the risk of damage to trees and vegetation that will remain. These mitigation measures include;

- Undertake all Protection Measures as identified within Appendix A of this Report
- The project will be designed to minimise impacts to trees where possible (Sydney Metro Responsibility). This will include a review of design alignment through as ground truthing exercise to help understand the design and construction impacts on trees.
- Relevant Councils and the DPHI will be consulted in regards to replacement tree planting locations. Relevant Councils will be consulted in regards to appropriate sizes for replacement trees.
- A Vegetation Removal and Trimming Permit will be implemented
- All existing trees to be retained within the site area must be protected in accordance with Australian Standard AS 4970 'Tree protection in development sites' to avoid and minimise impacts
- All trees to be removed or trimmed will be appropriately demarcated
- Qualified and experienced tree loppers will be engaged to removed and trim trees
- Where works will occur in the vicinity of trees that are to remain intact, demarcation or barriers will be put in place around the tree at the extent of the structural root zone
- Access tracks will be clearly delineated and defined within the Environmental Control Maps
- Staff and workers to be educated on vegetation trimming and removal requirements
- A copy of the Tree Report must be submitted to the Secretary for information before the removal, damage and/or pruning of any trees, including those affected by the site establishment works.
- All recommendations of the Tree Report must be implemented by the Proponent, unless otherwise agreed by the Secretary.
- JHLORJV will consult with the relevant Council in regards to the timing of removal of trees on council land (including landscaped areas), as required.
- Detailed design and construction planning would avoid direct impacts to vegetation mapped as threatened ecological communities or native plant community types, specifically Downy Wattle Turpentine - Grey Ironbark open forest on shale, Degraded Turpentine - Grey Ironbark open forest on shale and Broad-leaved Ironbark – Grey Box in accordance with REMM B1.
- Pre-clearing surveys and inspections for endangered and threatened flora and fauna species would be undertaken by qualified ecologists prior to any clearing occurring in accordance with REMM B2.

- Impacts to Downy Wattle Turpentine - Grey Ironbark open forest on shale, Degraded Turpentine - Grey Ironbark open forest on shale and Broad-leaved Ironbark – Grey Box would be avoided. The locations of these species and communities would be marked on plans, fenced on site, and avoided in accordance with REMM B4.
- Equipment storage and stockpiling would be restricted to identified compound sites and already cleared land in accordance with REMM B5.
- A trained ecologist would be present during the clearing of native vegetation or removal of potential fauna habitat to avoid impacts on resident fauna and to salvage habitat resources as far as is practicable in accordance with REMM B6.
- JHLORJV will consult with relevant local stakeholders in regards to visual amenity impacts.
- Advise will be sought from an Arborist prior to substantial root trimming.
- Implement recommendations from the Ecological Report in Appendix C

In addition, JHLORJV will maintain a Tree and Vegetation Removal Register. The register will track which tree have been removed or trimmed (based on the number within the tree report) and the area of vegetation cleared as part of the works. The JHLORJV Vegetation Removal and Trimming Permit will prompt the Environmental Manager (or delegate) to record these factors during the permit authorisation site inspection.

This report will be submitted to the Secretary for information prior to the removal, damage and/or pruning of any trees.

5.1 Tree Trimming Memorandum

The SWM2 scope of works and the interactions with trees across site is complex. Due to the constantly changing nature of construction, construction methodologies must change, leading to unexpected impacts. At times, changes to construction methodology may result in the requirement for the trimming of trees not previously assessed. In these instances trimming would be required to maintain the health of the tree. To ensure all tree trimming is assessed and to mitigate delays to construction JHLORJV will implement a Tree Trimming Memorandum (memo) Process.

The process will work as follows;

- All trees in the project area are to be given a number and the condition, amenity and visual value of the tree is to be included. This is to be included in the Appendix A of the Arboricultural Report.
- Where known at time of the initial submission, each tree to be trimmed should be included within an Arboricultural Report
- As works commence, any additional trees to be trimmed should be assessed by an arborist and should be captured under a memo for that tree. The memo would address if there are any changes to the aspects of the tree as a result of trimming – condition of the tree, amenity, visual value
- If a tree is to be removed it must be included in the Tree report as per CoA E5c)
- If a tree is to be trimmed but does not have a number under the Arboricultural report the Arboricultural report must be updated to include the tree and description of aspects
- The memo would be submitted to SM & ER for information prior to trimming.

Appendix A – Urban Arbor - Arboricultural Report – Design & Construction Impacts

Marrickville

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Arboricultural Report

Site location:
Southwest Metro
Marrickville Station
Marrickville NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens &
Alex Kurath
Urban Arbor Pty Ltd
Date: 11 March 2026
Ref: 260311_SWMMS_AIA_R2
Rev: 2

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1. INTRODUCTION

1.1 Urban Arbor have been instructed by John Holland Laing O'Rourke to provide an Arboricultural Impact Assessment Report for trees located within the site and adjoining sites in relation to a proposed development.

1.2 Below is a list of all documents and information used to assist in preparing this report.

A) Marrickville Station Fencing Design Package No. 113, Metron T2M, Rev 02, 29 November 2022.
B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 201201-SWMMS-AIA, Rev D, 1 December 2020.
C) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 240504-SWMRC-AIA, Rev 6, 3 May 2024.
D) Arboricultural Report – SWMC Tree Report, Urban Arbor Pty Ltd, Ref: 240527-SWMC-AIA, Rev 28, 27 May 2024.

1.3 The trees were initially inspected on 4 December 2019, 27 May 2020 and 5 August 2020 by Bryce Claassens of Urban Arbor. Additional trees were inspected on 25 March 2024, 26 March 2024 and 27 May 2024 by Alex Kurath of Urban Arbor. The most recent site/tree inspection was completed on 12 August 2024 by Bryce Claassens. Access was available to the subject site and the adjoining public areas only. All tree data contained in this report was collected during these site inspections. This report has been written by Bryce Claassens.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment of all significant trees located within the area identified for assessment by John Holland Laing O'Rourke. For the purpose of this report, a significant tree is a ‘Long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or relatively few main stems or trunks’.

2.1.2 Determine the trees estimated contribution years and remaining useful life expectancy and award the trees a retention value.

2.1.3 Determine trees that are to be removed or pruned based on information provided by John Holland Laing O'Rourke.

2.1.4 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

2.1.5 Specify generic tree protection measures for trees to be retained in accordance with AS4970-2009.

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3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspection was visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.6 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.7 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp*.

3.8 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Alteration of this report invalidates the entire report.

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4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

4.1.1 Tree common name
4.1.2 Tree botanical name
4.1.3 Tree age class
4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m) - millimetres.
4.1.5 DAB (Trunk diameter directly above the root buttress) – millimetres.
4.1.6 Estimated height – metres.
4.1.7 Estimated crown spread (diameter of crown) - metres.
4.1.8 Health
4.1.9 Structural condition
4.1.10 Amenity value
4.1.11 Estimated remaining contribution years (SULE)[1]
4.1.12 Retention value (Tree AZ)[2]
4.1.13 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a nylon mallet, compass, camera and a steel probe.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009).[4]

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

[1] Barrell, J. (2001), *'SULE: Its use and status in the new millennium' in Management of Mature Trees proceedings of the 4th NAAA Workshop*, Sydney, 2001. Barrell.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

[4] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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5. SITE LOCATION AND BRIEF DESCRIPTION

5.1 The site is located in the Inner West Local Government Area (LGA). The trees are subject to protection under the Inner West Local Environmental Plan (LEP) 2022[5] and the Inner West Council Tree Management DCP 2023.[6] The site has been identified as a heritage item in the NSW Planning Portal Spatial Viewer.[7]

6. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection. Additional information about the TPZ is included in Appendix 3.

6.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula; (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

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5 *Inner West Local Environmental Plan 2022*, https://www.legislation.nsw.gov.au/#/view/EPI/2011/645/full, accessed 4 June 2024.

6 *Inner West Tree Management Development Control Plan 2023*, https://www.innerwest.nsw.gov.au/live/information-for-residents/trees/trees-on-your-property-pruning-or-removing, accessed 4 June 2024.

7 *NSW Planning Portal Spatial Viewer – Property Report,* https://www.planningportal.nsw.gov.au/propertyreports/92584a10-a3ee-4285-ae99-01dc90e572c7.pdf, accessed 4 June 2024.

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6.3 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

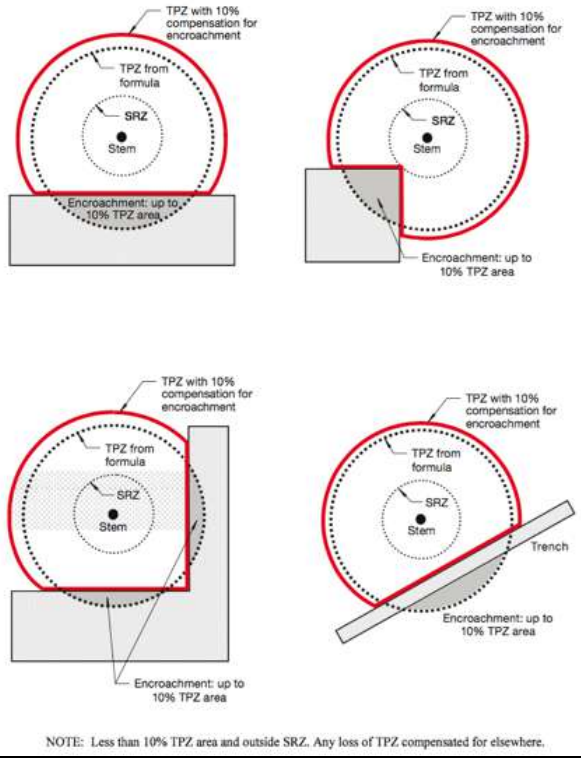


Image 1: Example minor TPZ encroachment from AS4970-2009.

6.4 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment (see Appendix 3 for more information in relation to root investigations).

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7. OBSERVATIONS

7.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in Appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.

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8. ASSESSMENT OF TREE IMPACTS BY AREA

8.1 The trees included in the following sections have been identified by John Holland Laing O'Rourke as being subject to impacts from development works. All trees to be retained should be protected in accordance with AS4970-2009, details of which are included in section 11. If there are any development works that have not been assessed and could potentially impact additional trees, the project arborist must assess the impact of the proposed works to the condition of the trees, determining the trees viability for retention.

8.2 **Marrickville**

8.2.1 **Marrickville Station:** The trees within this area are located adjacent to the proposed security fencing, vehicle access routes, or station platform upgrades. Tree 546a, 546b, 546c, 546d, 546e, 546f, 740, 3620 and G1.26 will require canopy pruning to allow for the works. Tree 558 is located in the footprint of the proposed hard surfacing for the emergency egress and will need to be removed to accommodate the works. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value	Recommendation
546a	*Ulmus parvifolia*	1. Long	A1	3.0	2.0	Exotic	Medium	Prune
546b	*Ulmus parvifolia*	1. Long	A1	2.6	1.9	Exotic	Medium	Prune
546c	*Ulmus parvifolia*	1. Long	A1	2.9	2.0	Exotic	Medium	Prune
546d	*Ulmus parvifolia*	1. Long	A1	3.2	2.1	Exotic	Medium	Prune
546e	*Ulmus parvifolia*	1. Long	A1	3.1	2.0	Exotic	Medium	Prune
546f	*Ulmus parvifolia*	1. Long	A1	3.1	2.1	Exotic	Medium	Prune
558	*Lagerstroemia indica*	2. Medium	A1	6.8	2.8	Exotic	Medium	Remove
740	*Eucalyptus microcorys*	1. Long	A1	10.2	3.2	Native	High	Prune
3620	*Celtis sinensis*	2. Medium	A1	3.7	2.1	Exotic	Medium	Prune
G1.26	*Celtis sinensis*	5. Small/Young	Z1	2.0	1.5	Exotic	Low	Prune

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Image 1: Looking West towards tree 740 showing the required canopy pruning. The lowest 250mm diameter first order branch to the North at 5-6m is to be removed. The pruning will result in the removal of approximately 10% of the live foliage area of the tree.



Image 2: Looking East towards tree 3620 showing the required canopy pruning (hatched yellow). The smaller 50-60mm diameter branches to the Northeast are to be removed. The pruning will result in the removal of approximately 5% of the live foliage area of the tree.

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Image 3: Looking East towards tree G1.26 showing the required canopy pruning (hatched yellow). The South side of the canopy of each tree is to be reduced by approximately 1-2m to allow for the fence installation. The pruning will result in the removal of less than 10% of the live foliage area of each tree. The finished cut diameters must not exceed 100mm.

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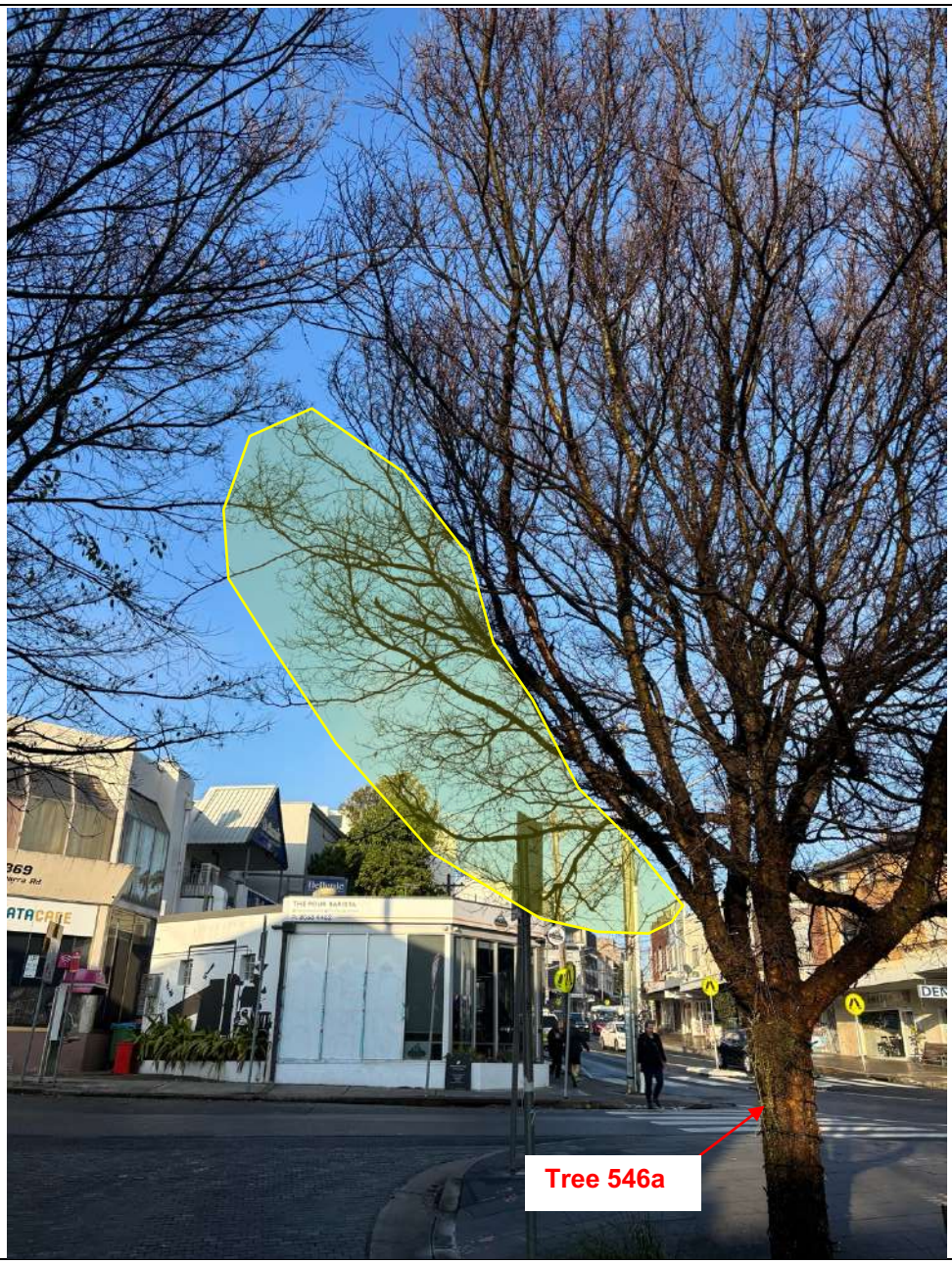


Image 4: Looking South towards tree 546a showing the required canopy pruning (hatched yellow). The smaller second and third order branches to the East are to be pruned to allow for vehicle/site shed installation access. The vehicle access will require a clearance height of 5 metres. The pruning will result in the removal of approximately 10% of the live foliage area of the tree. Finished cut diameters must not exceed 50mm.

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Image 5: Looking South towards tree 546b showing the required canopy pruning (hatched yellow). The smaller second and third order branches to the East are to be pruned to allow for vehicle/site shed installation access. The vehicle access will require a clearance height of 5 metres. The pruning will result in the removal of approximately 10% of the live foliage area of the tree. Finished cut diameters must not exceed 50mm.

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Image 6: Looking South towards tree 546c showing the required canopy pruning (hatched yellow). The smaller second and third order branches to the East are to be pruned to allow for vehicle/site shed installation access. The vehicle access will require a clearance height of 5 metres. The pruning will result in the removal of approximately 5% of the live foliage area of the tree. Finished cut diameters must not exceed 50mm.

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Image 7: Looking South towards tree 546d showing the required canopy pruning. The 120mm diameter 1st order branch to the Southwest at 3m is to be removed. The 30mm diameter 2nd order branch to the West at 4.5m is to be removed. The 50mm diameter 2nd order branch to the Northwest at 4.5m is to be removed. The pruning will result in the removal of approximately 15-20% of the live foliage area of the tree. The yellow lines indicate the branches to be removed. The red lines indicate the approximate location of the final pruning cut.

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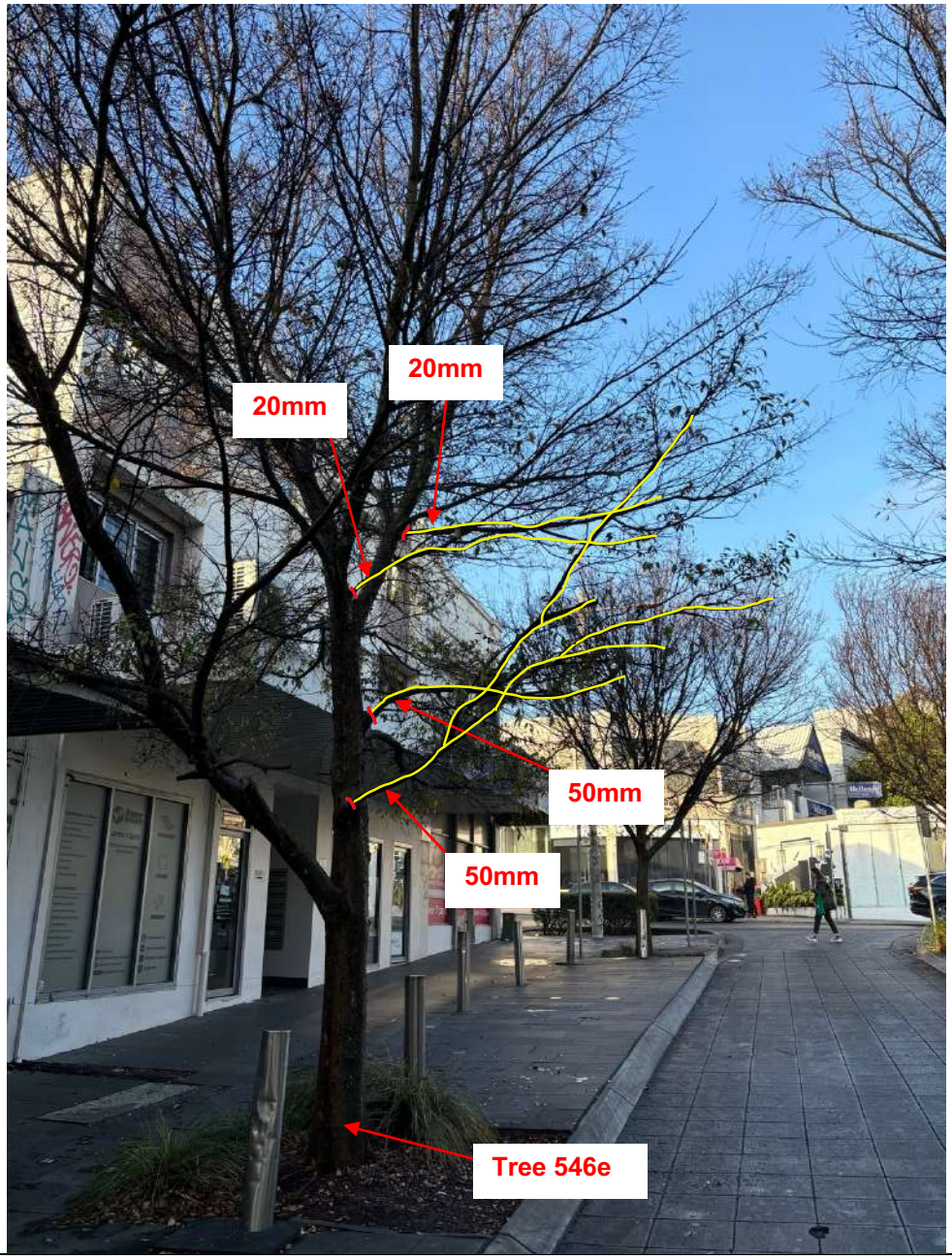


Image 8: Looking South towards tree 546e showing the required canopy pruning. The 50mm diameter 1st order branch to the West at 2m is to be removed. The 50mm diameter 1st order branch to the West at 2.5m is to be removed. The 20mm diameter 2nd order branch to the West at 4m is to be removed. The 20mm diameter 2nd order branch to the West at 4.5m is to be removed. The pruning will result in the removal of approximately 15% of the live foliage area of the tree. The yellow lines indicate the branches to be removed. The red lines indicate the approximate location of the final pruning cut.

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Image 9: Looking South towards tree 546f showing the required canopy pruning. The 60mm diameter 2nd order branch to the West at 3.5m is to be removed. The yellow line indicates the branch to be removed. The red line indicates the approximate location of the final pruning cut. The smaller second and third order branches to the West are to be pruned to allow for vehicle/site shed installation access (hatched yellow). The vehicle access will require a clearance height of 5 metres. Finished cut diameters must not exceed 50mm for the area hatched yellow. The pruning will result in the removal of approximately 10% of the live foliage area of the tree.

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Image 10: Looking Southeast towards tree 558. The trunk of the tree is located in the footprint of the proposed hard surfacing for the emergency egress. The removal of the tree is required to accommodate the works.

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9. CONCLUSIONS

9.1 **Table 2:** Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees recommended to be removed	Installation of hard surfacing, construction works areas, etc.	558	None	**1 tree**
Trees recommended to be retained requiring canopy pruning	Clearance for construction works i.e. vehicle access, security fencing, etc.	546a, 546b, 546c, 546d, 546e, 546f, 740, 3620	G1.26	**8 trees & 1 group of trees**

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10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the subject site to nine (9) trees and one (1) group of trees that are located at selected areas around the development site.

10.2 One (1) tree has been recommended for removal to accommodate the development, tree 558. Tree 558 has been awarded a higher value category A retention value rating.

10.3 Eight (8) trees and one (1) group of trees have been identified for canopy pruning to provide clearance for proposed construction works, including tree 546a, 546b, 546c, 546d, 546e, 546f, 740, 3620 and G1.26. Refer to section 8 for canopy pruning specifications. All pruning works must be completed in accordance with AS4373-2007 Pruning of Amenity Trees.

10.4 All trees to be retained that are located adjacent to the proposed works must be protected in accordance with AS4970-2009. Generic tree protection guidance has been provided in section 11. It is recommended that a detailed tree management plan (TMP) is prepared for the development in accordance with AS4970-2009 and developed in combination with the overall construction management plan for the site. The TMP should be prepared by a consulting Arborist with a minimum AQF level 5 qualification.

10.5 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report must also be made available to any contractor prior to works commencing and during any on site operations.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. Site inspection frequency must be agreed upon by the project arborist and principal contractor prior to the commencement of works.

11.5 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.5.1 Protective fencing: Site specific tree protection requirements are in section 11.5. Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

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11.5.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

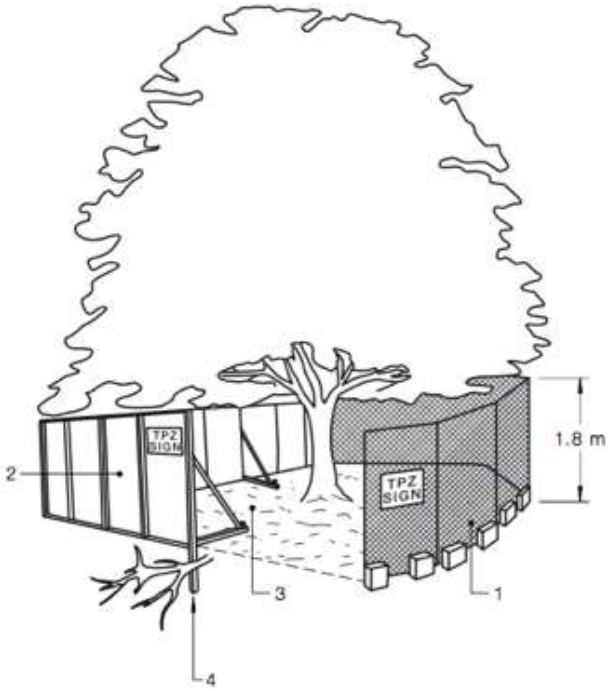
11.5.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.5.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

11.5.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

11.5.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

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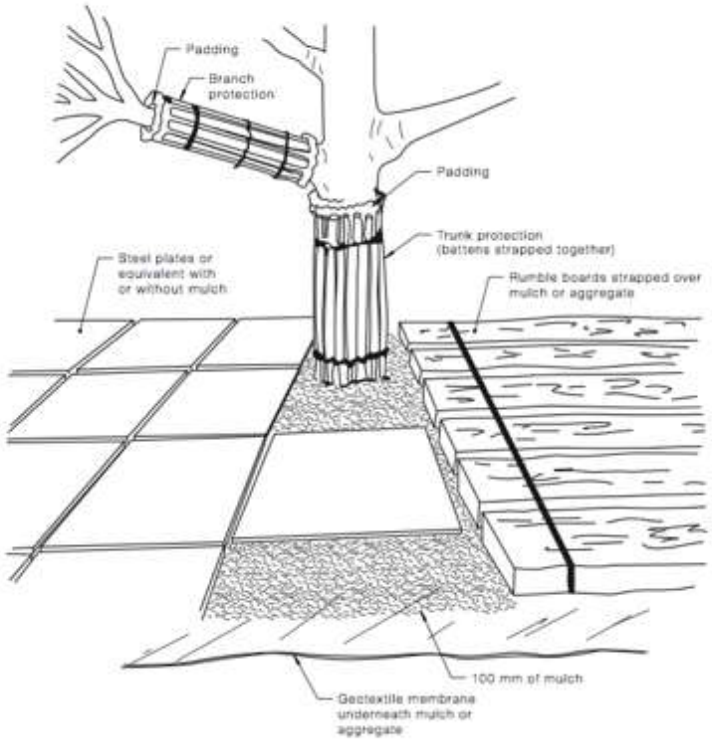


LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[8] with example tree protection.

[8] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.

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NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,[9] with example tree protection.

11.6 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refuelling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

[9] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

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11.7 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.8 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[10] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

11.9 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 100mm or increased by more than 100mm (300mm increase is acceptable if using a coarse free draining material) without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

[10] Council Of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

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- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpaths should be located outside the SRZ where possible.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.10 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 40mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.11 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.12 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.13 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

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12. BIBLIOGRAPHY/REFERENCES

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- *Inner West Tree Management Development Control Plan 2023*, https://www.innerwest.nsw.gov.au/live/information-for-residents/trees/trees-on-your-property-pruning-or-removing
- *NSW Planning Portal Spatial Viewer,* https://www.planningportal.nsw.gov.au/spatialviewerhistoric/#/find-a-property/address

13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 2 - Tree Inspection Schedule
Appendix 3 - Further information of methodology



Bryce Claassens
Diploma of Arboriculture (AQF5)
Cert III Landscape Construction
Member Arboriculture Australia
Quantified Tree Risk Assessment (QTRA)
ISA Tree Risk Assessment Qualification (TRAQ)

Appendix 2 - Tree Inspection Schedule

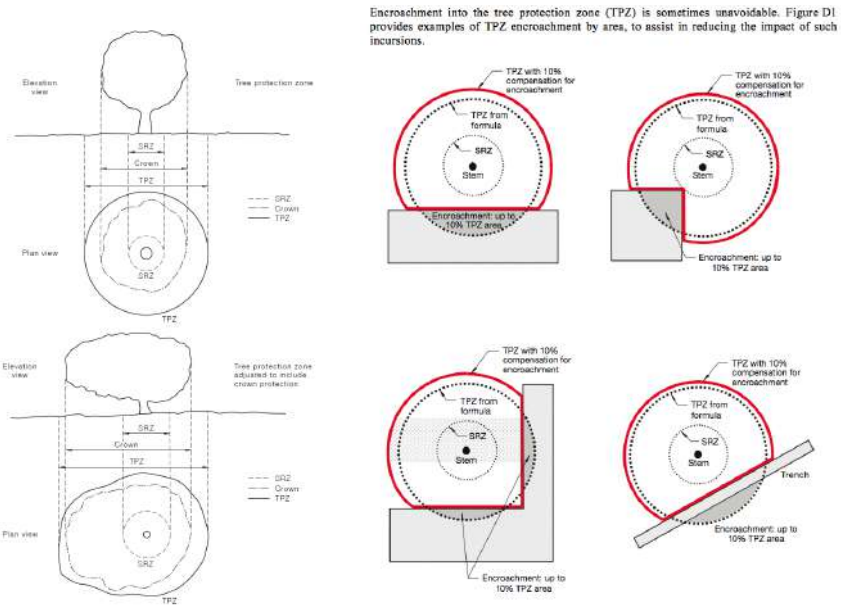
Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
546a	Chinese Elm	*Ulmus parvifolia*	Semi-mature	7	3	250					250	310	Good	Good	Medium	1. Long	A1	3.0	2.0	Street tree. Fairy lights installed on trunk and primary branches.
546b	Chinese Elm	*Ulmus parvifolia*	Semi-mature	7	3	220					220	280	Good	Good	Medium	1. Long	A1	2.6	1.9	Street tree. Fairy lights installed on trunk and primary branches.
546c	Chinese Elm	*Ulmus parvifolia*	Semi-mature	8	3	240					240	290	Good	Good	Medium	1. Long	A1	2.9	2.0	Street tree. Fairy lights installed on trunk and primary branches.
546d	Chinese Elm	*Ulmus parvifolia*	Semi-mature	8	5	270					270	320	Good	Good	Medium	1. Long	A1	3.2	2.1	Street tree.
546e	Chinese Elm	*Ulmus parvifolia*	Semi-mature	8	4	260					260	310	Good	Good	Medium	1. Long	A1	3.1	2.0	Street tree.
546f	Chinese Elm	*Ulmus parvifolia*	Semi-mature	8	5	260					260	350	Good	Good	Medium	1. Long	A1	3.1	2.1	Street tree.
558	Crepe Myrtle	*Lagerstroemia indica*	Mature	9	3	160	300	450			564	650	Good	Fair	Medium	2. Medium	A1	6.8	2.8	Multiple pruning wounds.
740	Tallowood	*Eucalyptus microcorys*	Mature	23	8	850					850	900	Good	Good	High	1. Long	A1	10.2	3.2	Canopy extends into corridor.
3620	Chinese Hackberry	*Celtis sinensis*	Mature	8	4	180	160	140	140		312	350	Good	Good	Medium	2. Medium	A1	3.7	2.1	Located in adjoining property. DBH estimated.
G1.26	Chinese Hackberry	*Celtis sinensis*	Young	6	3	120	100				156	150	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	Group of 4 trees. No access available. DBH estimated.

Explanatory Notes

Tree Species - Common name followed by botanical name. Where species is unknown it is indicated with an '*spp*'.
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level.
Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - $(DAB \times 50)^{0.42} \times 0.64$. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
Retention Value: Tree AZ, see appendix 3 for categories.

Appendix 3 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required).
   It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
   Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
   Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.
   An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.
   SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).

3. **Tree Age Class:** If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below;
   - Young/Newly planted: Young or recently planted tree.
   - Semi Mature: Up to 20% of the usual life expectancy for the species.
   - Early mature/Mature: Between 20%-80% of the usual life expectancy for the species.
   - Over mature: Over 80% of the usual life expectancy for the species.
   - Dead: Tree is dead or almost dead.

4. **Health/Physiological Condition:** Below are examples conditions used when assigning a category for tree health.

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

5. **Structural Condition:** Below are examples conditions used when assigning a category for structural condition.

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

6. **Amenity Value:** To determine the amenity value of a tree we assess a number of different factors, which include but are not limited to the information below.
   - The visibility of the tree to adjacent sites.
   - The relationship between the tree and the site.
   - Whether the tree is protected by any statuary conditions.
   - The habitat value of the tree.
   - Whether the tree is considered a noxious weed species.

   The amenity value is rated using one of the following values.
   - Very High
   - High
   - Moderate
   - Low
   - Very Low

7. **Safe Useful Life Expectancy (SULE), (Barrel, 2001):** A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8. **Root investigations:** The root investigations should identify roots greater than 30mm in diameter that are located along the edge of the structures footprint or in the location of footings. Root investigations must be carried out using non-invasive methods (manual excavations). Any excavations for the root investigations must carried out manually to avoid damaging the roots during excavations. Manual excavation may include the use of a high-pressure air/air knife, or a combination of high-pressure water and a vacuum device. When hand excavating carefully work around roots retaining as many as possible. Take care to not fray, wound, or cause damage to any roots during excavations as this may cause decay or infection from pathogens. It is essential that exposed roots are kept moist and the excavation back filled as soon as possible. The root investigations should be carried out by a qualified Arborist minimum AQF3. Once roots are exposed, a visual assessment can be carried out by a consulting Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree. A root map/report should be prepared identifying the findings of investigations, including photographs as supporting evidence in the report.

9. **Retention Value:** The system I have used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The table below provides a brief description of each category.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

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Glossary of Terms

Abiotic - Pertaining to non-living agents; e.g. environmental factors

Adventitious shoots - Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage - The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Bark - A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Branch:
• **Primary**. A first order branch arising from a stem
• **Lateral**. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
• **Sub-lateral**. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch collar - A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot - A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling - An irreversible deformation of a structure subjected to a bending load

Buttress zone - The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium - Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker - A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Compartmentalisation - The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compressive loading - Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition - An indication of the physiological condition of the tree. Where the term 'condition' is used in a report, it should not be taken as an indication of the stability of the tree

Crown/Canopy - The main foliage bearing section of the tree

Crown lifting - The removal of limbs and small branches to a specified height above ground level

Crown thinning - The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping - A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

DAB (Diameter Above Buttress) - Trunk diameter measured above the root buttress

Defect - In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Dieback - The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease - A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Dominance - In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud - An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction - In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height) - Stem diameter measured at a height of 1.4 metres or the nearest measurable point. Where measurement at a height of 1.4 metres is not possible, another height may be specified

Deadwood - Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Epicormic shoot - A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Flush-cut - A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root - A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Habit - The overall growth characteristics, shape of the tree and branch structure

Hazard beam - An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

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Heartwood/false-heartwood - The dead central wood that has become dysfunctional as part of the aging processes and being distinct from the sapwood

Heave - A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

Included bark (ingrown bark) - Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Lever arm - A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin - The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing - A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end- loading

Loading - A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Mycelium - The body of a fungus, consisting of branched filaments (hyphae)

Occlusion - The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen - A micro-organism which causes disease in another organism

Photosynthesis - The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Probability - A statistical measure of the likelihood that a particular event might occur

Pruning - The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial - In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Ring-barking - The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage

Root-collar - The transitional area between the stem/s and roots

Sapwood - Living xylem tissues

Soft-rot - A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Stem/s - Principle above-ground structural component(s) of a tree that supports its branches

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

SRZ (Structural Root Zone) - The area around the base of the tree required for the trees stability in the ground

Subsidence - In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Taper - In stems and branches, the degree of change in girth along a given length

Targets - In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping - In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Transpiration - The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

TPZ (Tree Protection Zone) - A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development

Understory - This layer consists of younger individuals of the dominant trees, together with smaller trees and shrubs which are adapted to grow under lower light conditions

Veteran tree - Tree that, by recognised criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem

Vigour - The expression of carbohydrate expenditure to growth (in trees)

White-rot - A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure - The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure - The force exerted by a wind on a particular object

Windthrow - The blowing over of a tree at its roots

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Dulwich Hill

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Arboricultural Report

Site location:
Southwest Metro
Dulwich Hill Station
Dulwich Hill NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens &
Alex Kurath
Urban Arbor Pty Ltd
Date: 21 March 2025
Ref: 250321_SWMDHS_AIA
Rev: 1

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1. INTRODUCTION

1.1 Urban Arbor have been instructed by John Holland Laing O'Rourke (JHLOR) to provide an Arboricultural Impact Assessment Report for trees located within the site and adjoining sites in relation to a proposed development.

1.2 Below is a list of all documents and information used to assist in preparing this report.

A) Dulwich Hill Station Fencing Design Package No. 123, Metron T2M, Rev 00, 5 August 2022.
B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 211027-SWMDH-AIA, Rev C, 26 February 2021.
C) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 240504-SWMRC-AIA, Rev 6, 3 May 2024.
D) Arboricultural Report – SWMC Tree Report, Urban Arbor Pty Ltd, Ref: 240527-SWMC-AIA, Rev 28, 27 May 2024.

1.3 The trees were initially inspected on 4 December 2019 by Bryce Claassens of Urban Arbor. Additional trees were inspected on 25 March 2024, 26 March 2024 and 27 May 2024 by Alex Kurath of Urban Arbor. JHLOR provided additional tree details on 19 March 2025 for trees located adjacent to Bedford Crescent. Access was available to the subject site and the adjoining public areas only. All tree data contained in this report was collected during these site inspections. This report has been written by Bryce Claassens.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment of all significant trees located within the area identified for assessment by John Holland Laing O'Rourke. For the purpose of this report, a significant tree is a ‘Long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or relatively few main stems or trunks’.

2.1.2 Determine the trees estimated contribution years and remaining useful life expectancy and award the trees a retention value.

2.1.3 Determine trees that are to be removed or pruned based on information provided by JHLOR. The landscaping activities adjacent to Bedford Crescent will be located within land managed by Inner West Council. JHLOR have advised Urban Arbor that Inner West Council has provided approval to JHLOR to complete the works.

2.1.4 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

2.1.5 Specify generic tree protection measures for trees to be retained in accordance with AS4970-2009.

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3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspection was visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.6 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.7 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp*.

3.8 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Alteration of this report invalidates the entire report.

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4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

- 4.1.1 Tree common name
- 4.1.2 Tree botanical name
- 4.1.3 Tree age class
- 4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m) - millimetres.
- 4.1.5 DAB (Trunk diameter directly above the root buttress) – millimetres.
- 4.1.6 Estimated height – metres.
- 4.1.7 Estimated crown spread (diameter of crown) - metres.
- 4.1.8 Health
- 4.1.9 Structural condition
- 4.1.10 Amenity value
- 4.1.11 Estimated remaining contribution years (SULE)[1]
- 4.1.12 Retention value (Tree AZ)[2]
- 4.1.13 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a nylon mallet, compass, camera and a steel probe.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009).[4]

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

[1] Barrell, J. (2001), *'SULE: Its use and status in the new millennium' in Management of Mature Trees proceedings of the 4th NAAA Workshop*, Sydney, 2001. Barrell.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

[4] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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5. SITE LOCATION AND BRIEF DESCRIPTION

5.1 The site is located in the Inner West Local Government Area (LGA). The trees are subject to protection under the Inner West Local Environmental Plan (LEP) 2022[5] and the Inner West Council Tree Management DCP 2023.[6] The site has been identified as a heritage item in the NSW Planning Portal Spatial Viewer.[7]

6. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection. Additional information about the TPZ is included in Appendix 3.

6.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula; (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

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5 *Inner West Local Environmental Plan 2022*, https://www.legislation.nsw.gov.au/#/view/EPI/2011/645/full, accessed 4 June 2024.

6 *Inner West Tree Management Development Control Plan 2023*, https://www.innerwest.nsw.gov.au/live/information-for-residents/trees/trees-on-your-property-pruning-or-removing, accessed 4 June 2024.

7 *NSW Planning Portal Spatial Viewer – Property Report,* https://www.planningportal.nsw.gov.au/propertyreports/92b4068d-82cb-42d3-abf4-535e367134b1.pdf, accessed 4 June 2024.

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6.3 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

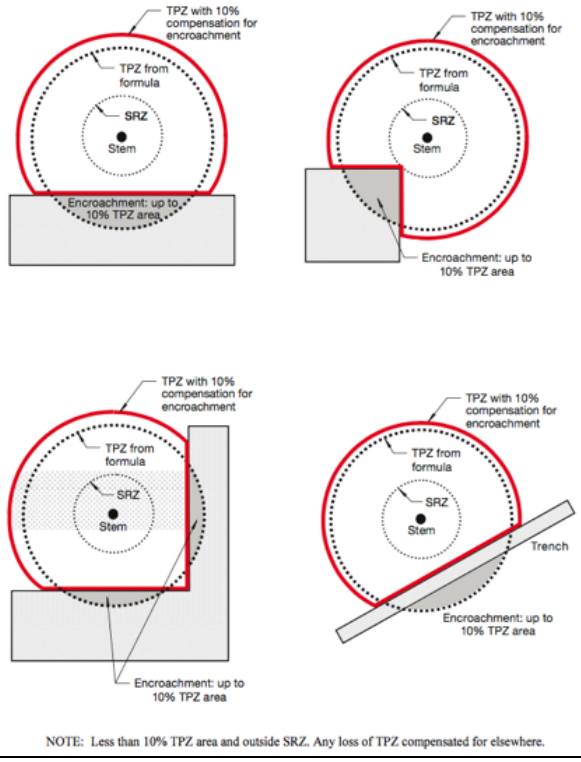


Image 1: Example minor TPZ encroachment from AS4970-2009.

6.4 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment (see Appendix 3 for more information in relation to root investigations).

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7. OBSERVATIONS

7.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in Appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.

8. ASSESSMENT OF TREE IMPACTS BY AREA

8.1 The trees included in the following sections have been identified by John Holland Laing O'Rourke as being subject to impacts from development works. All trees to be retained should be protected in accordance with AS4970-2009, details of which are included in section 11. If there are any development works that have not been assessed and could potentially impact additional trees, the project arborist must assess the impact of the proposed works to the condition of the trees, determining the trees viability for retention.

8.2 **Dulwich Hill**

8.2.1 **Dulwich Hill Station (Railway Parade – North side):** The trees within this area are located adjacent to the proposed security fencing. Tree 95 will require canopy pruning to allow for the works. Tree 564 and 3562 are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
95	*Platanus x hispanica*	2. Medium	A1	14.4	3.6	Exotic	High
564	*Cupaniopsis anacardioides*	1. Long	A1	4.8	2.5	Native	Medium
3562	*Celtis sinensis*	5. Small/Young	Z1	2.0	1.5	Exotix	Low

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Image 1: Looking East towards tree 95 showing the required canopy pruning (hatched yellow). The South side of the canopy is to be raised by 4-5m. The pruning will result in the removal of less than 5% of the live foliage area of the tree. The finished cut diameters must not exceed 50mm.



Image 2: Looking towards tree 564. Excessive canopy pruning will be required to accommodate the proposed fencing and the removal of the tree is recommended to accommodate the proposed works.

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Image 3: Looking towards tree 3562. The tree is recommended for removal due to the proposed security fencing.

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8.2.2 **Dulwich Hill Station (Bedford Crescent Area):** The trees within this area are located adjacent to the proposed landscaping. Tree 1A, 2A, 3A, 4A, 5A and 6A are located within the footprint or directly adjacent to the proposed landscaping construction and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
1A	*Leptospermum spp*	5. Small/Young	Z1	2.0	1.6	Native	Low
2A	*Cupaniopsis anacardioides*	5. Small/Young	Z1	2.0	1.5	Native	Low
3A	*Grevillea spp*	5. Small/Young	Z1	2.0	1.6	Native	Low
4A	*Cupaniopsis anacardioides*	5. Small/Young	Z1	2.0	1.5	Native	Low
5A	*Cupaniopsis anacardioides*	5. Small/Young	Z1	2.0	1.5	Native	Low
6A	*Callistemon viminalis*	5. Small/Young	Z1	2.0	1.5	Native	Low

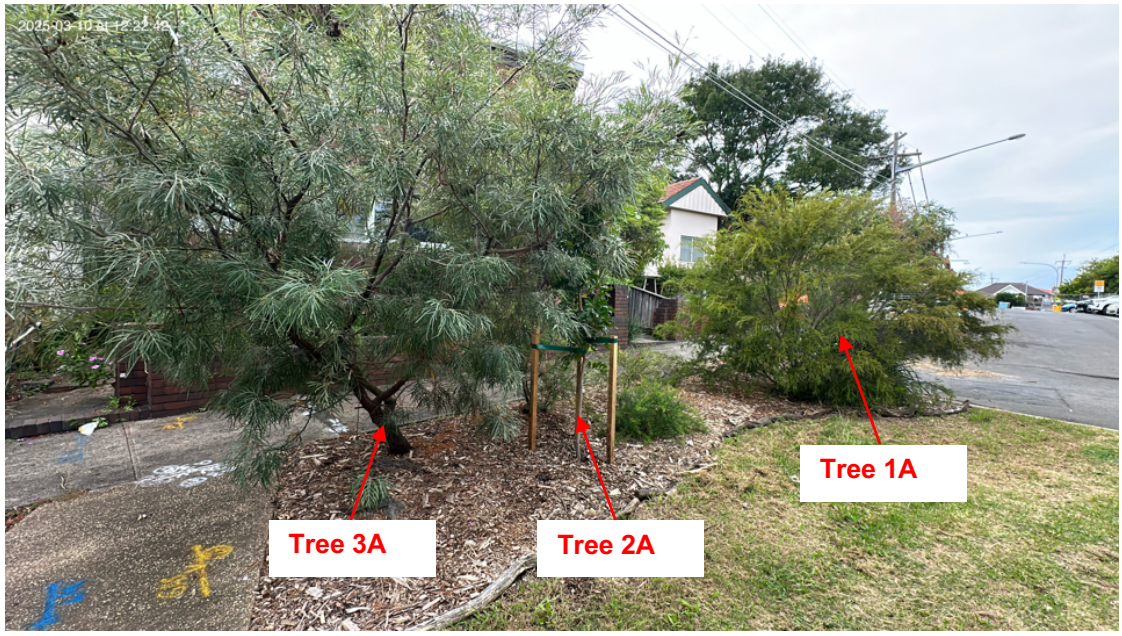


Image 4: Looking towards tree 1A, 2A and 3A. The trees are recommended for removal due to the proposed landscaping.

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Image 5: Looking towards tree 4A. The tree is recommended for removal due to the proposed landscaping.

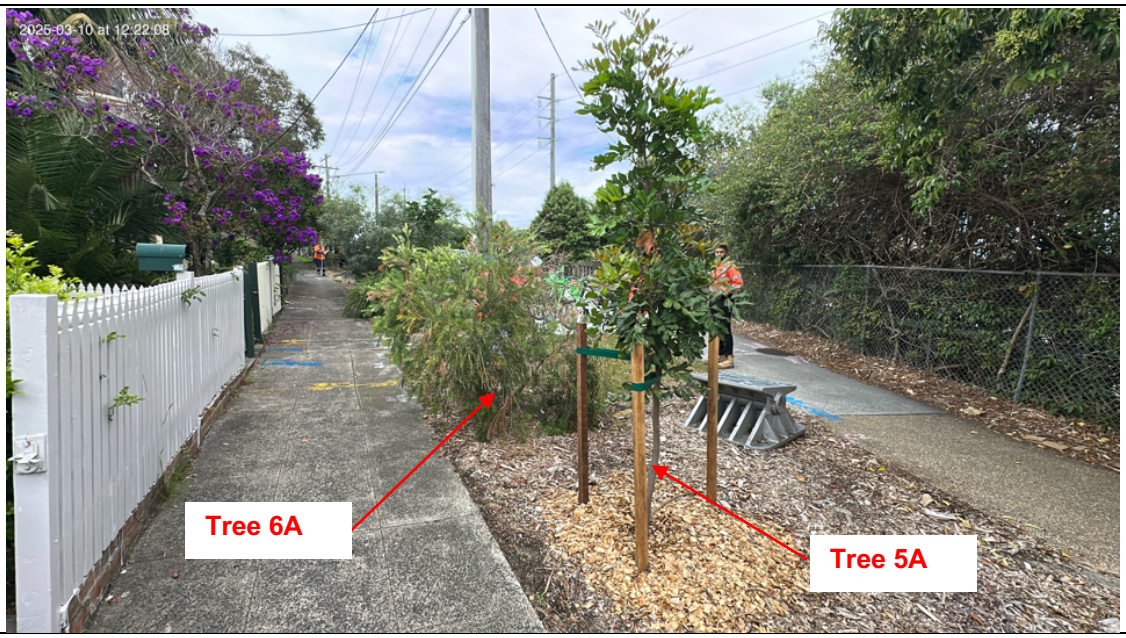


Image 6: Looking towards tree 5A and 6A. The trees are recommended for removal due to the proposed landscaping.

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9. CONCLUSIONS

9.1 **Table 2:** Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees recommended to be removed	Installation of security fencing, construction works areas, vehicle access	564	1A, 2A, 3A, 4A, 5A, 6A, 3562	**8 trees**
Trees recommended to be retained requiring canopy pruning	Clearance for construction works i.e. vehicle access, security fencing, etc.	95	None	**1 tree**

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10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the subject site to Nine (9) trees that are located at selected areas around the development site.

10.2 Eight (8) trees have been recommended for removal within this report, including tree 1A, 2A, 3A, 4A, 5A, 6A, 564 and 3562. See section 9.1 Table 2 for recommended tree removal by retention values.

10.3 One (1) tree has been identified for canopy pruning to provide clearance for proposed construction works, including tree 95. Refer to section 8 for canopy pruning specifications. All pruning works must be completed in accordance with AS4373-2007 Pruning of Amenity Trees.

10.4 All trees to be retained that are located adjacent to the proposed works must be protected in accordance with AS4970-2009. Generic tree protection guidance has been provided in section 11. It is recommended that a detailed tree management plan (TMP) is prepared for the development in accordance with AS4970-2009 and developed in combination with the overall construction management plan for the site. The TMP should be prepared by a consulting Arborist with a minimum AQF level 5 qualification.

10.5 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report must also be made available to any contractor prior to works commencing and during any on site operations.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. Site inspection frequency must be agreed upon by the project arborist and principal contractor prior to the commencement of works.

11.5 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.5.1 Protective fencing: Site specific tree protection requirements are in section 11.5. Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

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11.5.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

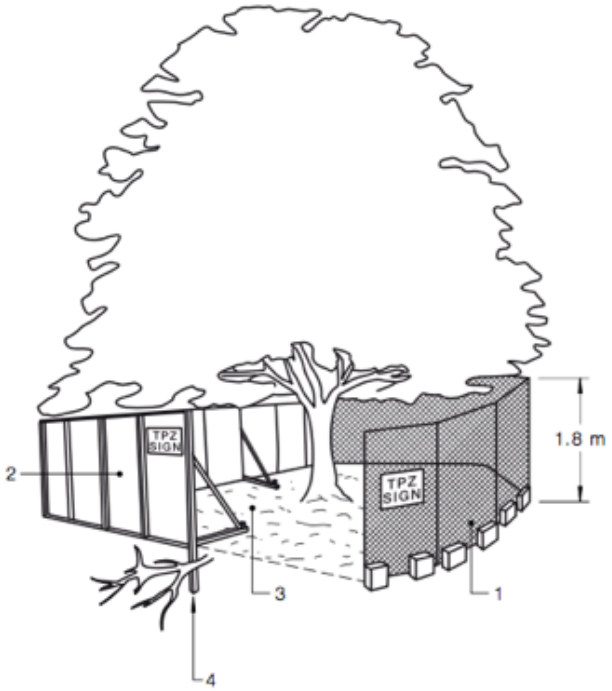
11.5.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.5.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

11.5.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

11.5.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

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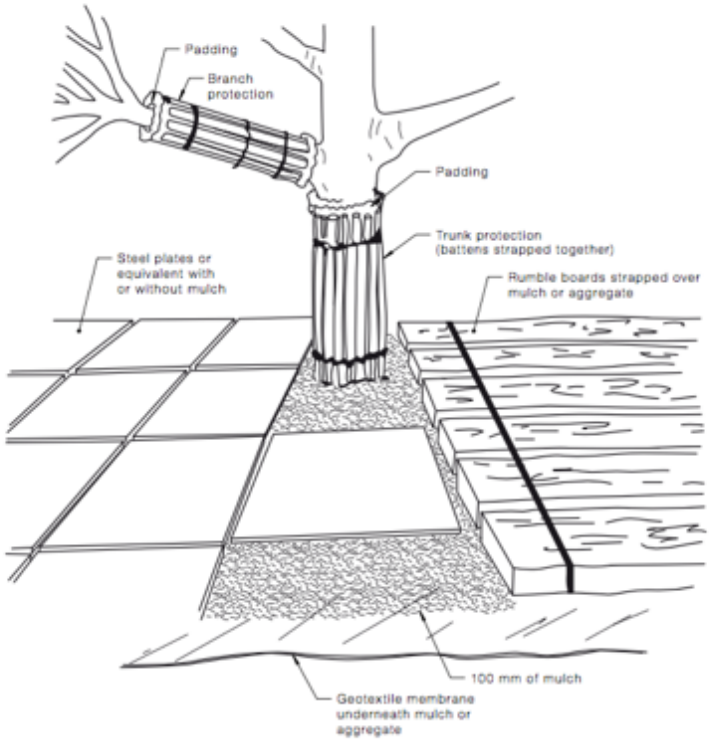


LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[8] with example tree protection.

[8] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.

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NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,[9] with example tree protection.

11.6 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refuelling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

[9] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

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11.7 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.8 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[10] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

11.9 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 100mm or increased by more than 100mm (300mm increase is acceptable if using a coarse free draining material) without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

[10] Council Of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpaths should be located outside the SRZ where possible.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.10 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 40mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.11 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.12 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.13 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

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- *Inner West Tree Management Development Control Plan 2023*, https://www.innerwest.nsw.gov.au/live/information-for-residents/trees/trees-on-your-property-pruning-or-removing
- *NSW Planning Portal Spatial Viewer,* https://www.planningportal.nsw.gov.au/spatialviewerhistoric/#/find-a-property/address

13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 2 - Tree Inspection Schedule
Appendix 3 - Further information of methodology



Bryce Claassens
Diploma of Arboriculture (AQF5)
Cert III Landscape Construction
Member Arboriculture Australia
Quantified Tree Risk Assessment (QTRA)
ISA Tree Risk Assessment Qualification (TRAQ)

Appendix 2 - Tree Inspection Schedule

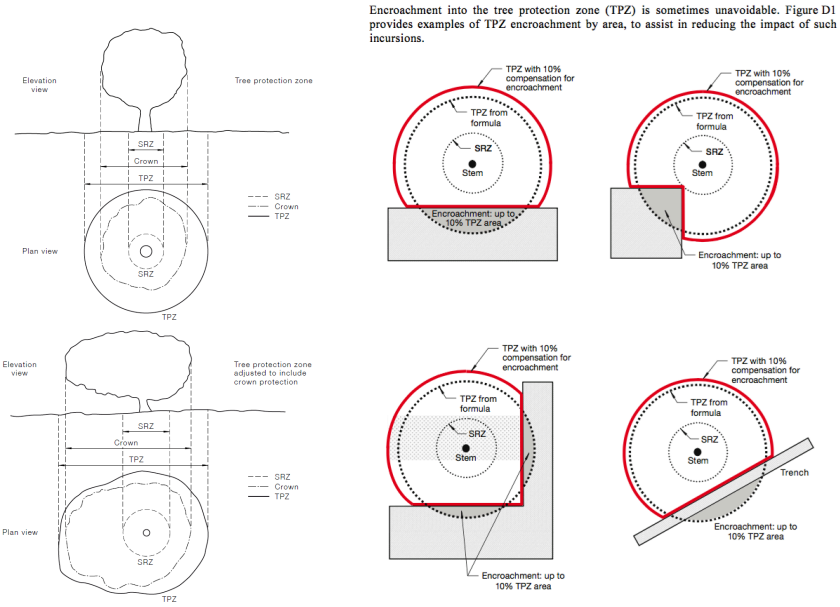
Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
1A	Leptospermum	*Leptospermum spp*	Young	2.9	1.5	170					170	170	Good	Good	Low	5. Small/Young	Z1	2.0	1.6	The tree is located within council land. All tree dimensions have been estimated based on information from JHLOR.
2A	Tuckeroo	*Cupaniopsis anacardioides*	Young	2.8	0.5	30					30	70	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	The tree is located within council land. All tree dimensions have been estimated based on information from JHLOR.
3A	Grevillea	*Grevillea spp*	Semi-mature	3	2	130					130	170	Good	Good	Low	5. Small/Young	Z1	2.0	1.6	The tree is located within council land. All tree dimensions have been estimated based on information from JHLOR.
4A	Tuckeroo	*Cupaniopsis anacardioides*	Young	2.9	0.5	30					30	70	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	The tree is located within council land. All tree dimensions have been estimated based on information from JHLOR.
5A	Tuckeroo	*Cupaniopsis anacardioides*	Young	2.9	0.5	30					30	70	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	The tree is located within council land. All tree dimensions have been estimated based on information from JHLOR.
6A	Weeping Bottlebrush	*Callistemon viminalis*	Young	1,8	1	50					50	80	Good	Fair	Low	5. Small/Young	Z1	2.0	1.5	The tree is located within council land. All tree dimensions have been estimated based on information from JHLOR.
95	London Plane	*Platanus x hispanica*	Mature	21	8	1200					1200	1250	Good	Fair	High	2. Medium	A1	14.4	3.6	Located within corridor. Asymmetric crown shape due to power line clearance.
564	Tuckeroo	*Cupaniopsis anacardioides*	Mature	6	4	280	260	110			398	490	Good	Good	Medium	1. Long	A1	4.8	2.5	Multiple pruning wounds.
3562	Chinese Hackberry	*Celtis sinensis*	Young	4	2	100					100	120	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	None.

Explanatory Notes

Tree Species - Common name followed by botanical name. Where species is unknown it is indicated with an '*spp*'.
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level.
Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - (DAB x 50) $^{0.42}$ x 0.64. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
Retention Value: Tree AZ, see appendix 3 for categories.

Appendix 3 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required).
It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.
An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.
SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).

3. **Tree Age Class:** If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below;
    - Young/Newly planted: Young or recently planted tree.
    - Semi Mature: Up to 20% of the usual life expectancy for the species.
    - Early mature/Mature: Between 20%-80% of the usual life expectancy for the species.
    - Over mature: Over 80% of the usual life expectancy for the species.
    - Dead: Tree is dead or almost dead.

4. **Health/Physiological Condition:** Below are examples conditions used when assigning a category for tree health.

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

5. **Structural Condition:** Below are examples conditions used when assigning a category for structural condition.

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

6. **Amenity Value:** To determine the amenity value of a tree we assess a number of different factors, which include but are not limited to the information below.
   - The visibility of the tree to adjacent sites.
   - The relationship between the tree and the site.
   - Whether the tree is protected by any statuary conditions.
   - The habitat value of the tree.
   - Whether the tree is considered a noxious weed species.

   The amenity value is rated using one of the following values.
   - Very High
   - High
   - Moderate
   - Low
   - Very Low

7. **Safe Useful Life Expectancy (SULE), (Barrel, 2001):** A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8. **Root investigations:** The root investigations should identify roots greater than 30mm in diameter that are located along the edge of the structures footprint or in the location of footings. Root investigations must be carried out using non-invasive methods (manual excavations). Any excavations for the root investigations must carried out manually to avoid damaging the roots during excavations. Manual excavation may include the use of a high-pressure air/air knife, or a combination of high-pressure water and a vacuum device. When hand excavating carefully work around roots retaining as many as possible. Take care to not fray, wound, or cause damage to any roots during excavations as this may cause decay or infection from pathogens. It is essential that exposed roots are kept moist and the excavation back filled as soon as possible. The root investigations should be carried out by a qualified Arborist minimum AQF3. Once roots are exposed, a visual assessment can be carried out by a consulting Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree. A root map/report should be prepared identifying the findings of investigations, including photographs as supporting evidence in the report.

9. **Retention Value:** The system I have used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The table below provides a brief description of each category.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

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Glossary of Terms

Abiotic - Pertaining to non-living agents; e.g. environmental factors

Adventitious shoots - Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage - The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Bark - A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Branch:
• **Primary**. A first order branch arising from a stem
• **Lateral**. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
• **Sub-lateral**. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch collar - A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot - A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling - An irreversible deformation of a structure subjected to a bending load

Buttress zone - The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium - Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker - A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Compartmentalisation - The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compressive loading - Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition - An indication of the physiological condition of the tree. Where the term ‘condition’ is used in a report, it should not be taken as an indication of the stability of the tree

Crown/Canopy - The main foliage bearing section of the tree

Crown lifting - The removal of limbs and small branches to a specified height above ground level

Crown thinning - The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping - A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

DAB (Diameter Above Buttress) - Trunk diameter measured above the root buttress

Defect - In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Dieback - The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease - A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Dominance - In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud - An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction - In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height) - Stem diameter measured at a height of 1.4 metres or the nearest measurable point. Where measurement at a height of 1.4 metres is not possible, another height may be specified

Deadwood - Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Epicormic shoot - A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Flush-cut - A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root - A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Habit - The overall growth characteristics, shape of the tree and branch structure

Hazard beam - An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

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Heartwood/false-heartwood - The dead central wood that has become dysfunctional as part of the aging processes and being distinct from the sapwood

Heave - A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

Included bark (ingrown bark) - Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Lever arm - A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin - The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing - A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end- loading

Loading - A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Mycelium - The body of a fungus, consisting of branched filaments (hyphae)

Occlusion - The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen - A micro-organism which causes disease in another organism

Photosynthesis - The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Probability - A statistical measure of the likelihood that a particular event might occur

Pruning - The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial - In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Ring-barking - The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage

Root-collar - The transitional area between the stem/s and roots

Sapwood - Living xylem tissues

Soft-rot - A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Stem/s - Principle above-ground structural component(s) of a tree that supports its branches

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

SRZ (Structural Root Zone) - The area around the base of the tree required for the trees stability in the ground

Subsidence - In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Taper - In stems and branches, the degree of change in girth along a given length

Targets - In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping - In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Transpiration - The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

TPZ (Tree Protection Zone) - A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development

Understory - This layer consists of younger individuals of the dominant trees, together with smaller trees and shrubs which are adapted to grow under lower light conditions

Veteran tree - Tree that, by recognised criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem

Vigour - The expression of carbohydrate expenditure to growth (in trees)

White-rot - A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure - The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure - The force exerted by a wind on a particular object

Windthrow - The blowing over of a tree at its roots

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Hurlstone Park

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Arboricultural Report

Site location:
Southwest Metro
Hurlstone Park Station
Hurlstone Park NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens &
Alex Kurath
Urban Arbor Pty Ltd
Date: 21 November 2024
Ref: 241121_SWMHPS_AIA
Rev: 1

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1. INTRODUCTION

1.1 Urban Arbor have been instructed by John Holland Laing O'Rourke to provide an Arboricultural Impact Assessment Report for trees located within the site and adjoining sites in relation to a proposed development.

1.2 Below is a list of all documents and information used to assist in preparing this report.

A) Hurlstone Park Station Fencing Design Package No. 133, Metron T2M, Rev 00, 8 July 2022.
B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 210227-SWMHP-AIA, Rev C, 26 February 2021.
C) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 240504-SWMRC-AIA, Rev 6, 3 May 2024.
D) Arboricultural Report – SWMC Tree Report, Urban Arbor Pty Ltd, Ref: 240527-SWMC-AIA, Rev 28, 27 May 2024.

1.3 The trees were initially inspected on 16 December 2019 and 17 December 2020 by Bryce Claassens of Urban Arbor. Additional trees were inspected on 25 March 2024, 26 March 2024 and 27 May 2024 by Alex Kurath of Urban Arbor. Access was available to the subject site and the adjoining public areas only. All tree data contained in this report was collected during these site inspections. This report has been written by Bryce Claassens.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment of all significant trees located within the area identified for assessment by John Holland Laing O'Rourke. For the purpose of this report, a significant tree is a 'Long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or relatively few main stems or trunks'.

2.1.2 Determine the trees estimated contribution years and remaining useful life expectancy and award the trees a retention value.

2.1.3 Determine trees that are to be removed or pruned based on information provided by John Holland Laing O'Rourke.

2.1.4 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

2.1.5 Specify generic tree protection measures for trees to be retained in accordance with AS4970-2009.

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3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspection was visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.6 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.7 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp*.

3.8 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Alteration of this report invalidates the entire report.

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4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

4.1.1 Tree common name
4.1.2 Tree botanical name
4.1.3 Tree age class
4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m) - millimetres.
4.1.5 DAB (Trunk diameter directly above the root buttress) – millimetres.
4.1.6 Estimated height – metres.
4.1.7 Estimated crown spread (diameter of crown) - metres.
4.1.8 Health
4.1.9 Structural condition
4.1.10 Amenity value
4.1.11 Estimated remaining contribution years (SULE)[1]
4.1.12 Retention value (Tree AZ)[2]
4.1.13 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a nylon mallet, compass, camera and a steel probe.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009).[4]

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

[1] Barrell, J. (2001), *'SULE: Its use and status in the new millennium' in Management of Mature Trees proceedings of the 4th NAAA Workshop*, Sydney, 2001. Barrell.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

[4] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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5. SITE LOCATION AND BRIEF DESCRIPTION

5.1 The site is located in the Canterbury Bankstown Local Government Area (LGA). The trees are subject to protection under the Canterbury Bankstown LEP 2023[5] and Canterbury Bankstown DCP 2023.[6] The site has been identified as a heritage item in the NSW Planning Portal Spatial Viewer.[7]

6. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection. Additional information about the TPZ is included in Appendix 3.

6.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula; (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

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5 *Canterbury Bankstown Local Environmental Plan 2023*, https://legislation.nsw.gov.au/view/html/inforce/current/epi-2023-0336, accessed 3 June 2024.

6 *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023, accessed 3 June 2024.

7 *NSW Planning Portal Spatial Viewer – Property Report,* https://www.planningportal.nsw.gov.au/propertyreports/e93d5a34-80d2-4201-a907-1226c313672f.pdf, accessed 3 June 2024.

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6.3 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

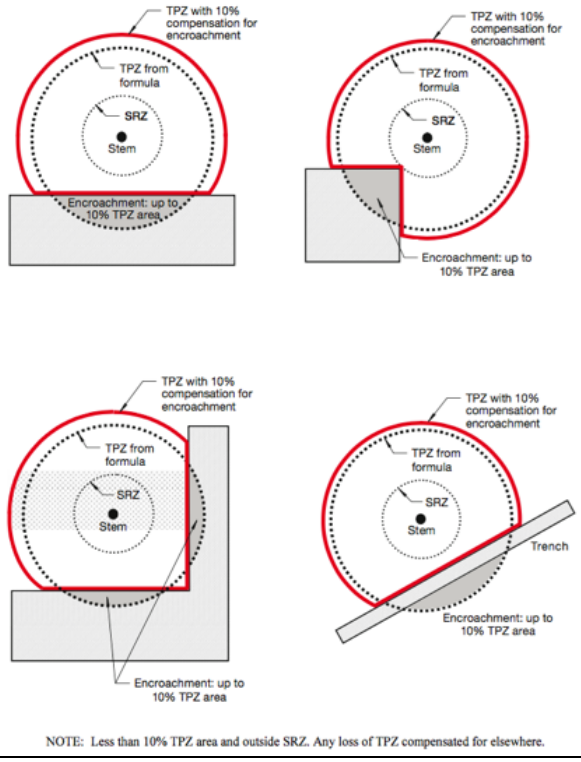


Image 1: Example minor TPZ encroachment from AS4970-2009.

6.4 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment (see Appendix 3 for more information in relation to root investigations).

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7. OBSERVATIONS

7.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in Appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.

8. ASSESSMENT OF TREE IMPACTS BY AREA

8.1 The trees included in the following sections have been identified by John Holland Laing O'Rourke as being subject to impacts from development works. All trees to be retained should be protected in accordance with AS4970-2009, details of which are included in section 11. If there are any development works that have not been assessed and could potentially impact additional trees, the project arborist must assess the impact of the proposed works to the condition of the trees, determining the trees viability for retention.

8.2 **Hurlstone Park**

8.2.1 **Hurlstone Park Station (Duntroon Street):** The trees within this area are located adjacent to the proposed security fencing. Tree 593, 594 and G2 will require canopy pruning to allow for the works. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
593	*Callistemon viminalis*	2. Medium	A1	3.0	2.0	Native	Medium
594	*Callistemon viminalis*	2. Medium	A1	4.2	2.2	Native	Medium
G2	*Cinnamomum camphora*	5. Small/Young	Z3	2.4	1.7	Exotic	Low

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Image 1: Looking West towards tree 593 and 594. Both trees require pruning, see Image 2 and 3 below.



Image 2: Looking towards tree 593 showing the required canopy pruning. The 150mm diameter first order branch to the Southeast is to be removed. The smaller 50mm diameter second and third order branches to the Southeast are to be removed. The pruning will result in the removal of approximately 15% of the live foliage area of the tree.

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Image 3: Looking towards tree 594 showing the required canopy pruning. The 160mm diameter first order branch to the Southeast is to be removed. The smaller 50mm diameter second and third order branches to the Southeast are to be removed. The pruning will result in the removal of approximately 15% of the live foliage area of the tree.



Image 4: Looking towards tree G2 showing the required canopy pruning. The removal of multiple stems to the Southeast at ground level will be required. The pruning will result in the removal of approximately 15-20% of the live foliage area of the trees. Finished pruning cuts must not exceed 160mm in diameter.

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8.2.2 **Hurlstone Park Station (Crinan Street):** The tree within this area is located directly adjacent to the proposed 'anti-throw screen'. Tree 594a is to be removed to accommodate the proposed construction. Smaller weed species to the Southwest of tree 594a are also to be removed. The following tree has been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
594a	*Acer negundo*	5. Small/Young	Z3	2.0	1.6	Exotic	Low



Image 5: Looking North towards tree 594a. The tree is to be removed to accommodate the proposed construction. The smaller weed species to the left of tree 594a are also to be removed (circled red).

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9. CONCLUSIONS

9.1 **Table 2:** Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees recommended to be removed	Installation of security fencing, construction works areas, vehicle access	None	594a	**1 tree**
Trees recommended to be retained requiring canopy pruning	Clearance for construction works i.e. vehicle access, security fencing, etc.	593, 594	G2	**2 trees & 1 group of trees**

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10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the subject site to three (3) trees and one (1) group of trees that are located at selected areas around the development site.

10.2 Tree 594a has been recommended for removal to accommodate the development works. Tree 594a is a lower value category Z retention value tree.

10.3 The remaining two (2) trees and one (1) group of trees have been identified for canopy pruning to provide clearance for proposed construction works, including tree 593, 594 and G2. Refer to section 8 for canopy pruning specifications. All pruning works must be completed in accordance with AS4373-2007 Pruning of Amenity Trees.

10.4 All trees to be retained that are located adjacent to the proposed works must be protected in accordance with AS4970-2009. Generic tree protection guidance has been provided in section 11. It is recommended that a detailed tree management plan (TMP) is prepared for the development in accordance with AS4970-2009 and developed in combination with the overall construction management plan for the site. The TMP should be prepared by a consulting Arborist with a minimum AQF level 5 qualification.

10.5 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report must also be made available to any contractor prior to works commencing and during any on site operations.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. Site inspection frequency must be agreed upon by the project arborist and principal contractor prior to the commencement of works.

11.5 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.5.1 Protective fencing: Site specific tree protection requirements are in section 11.5. Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

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11.5.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

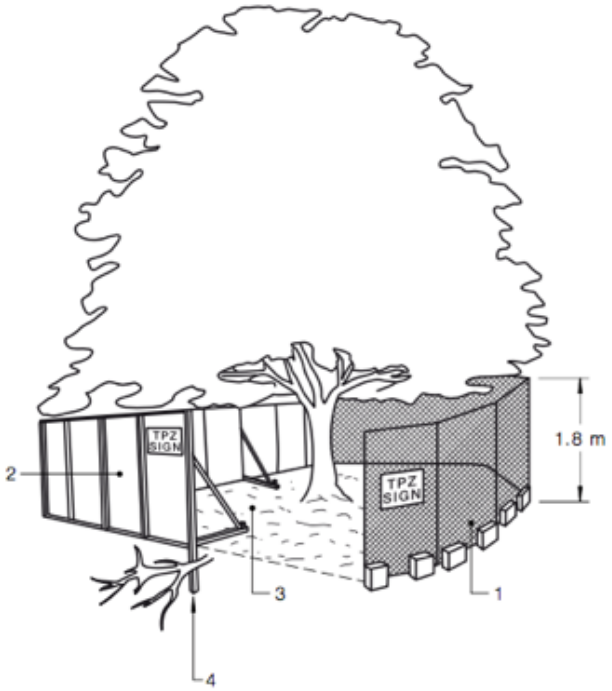
11.5.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.5.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

11.5.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

11.5.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

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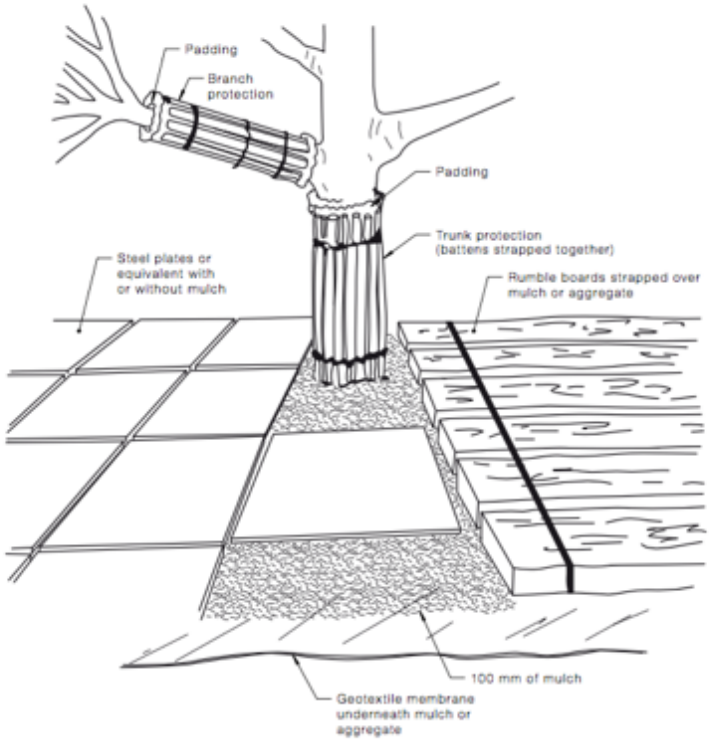


LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[8] with example tree protection.

[8] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.

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NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,[9] with example tree protection.

11.6 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refuelling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

[9] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

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11.7 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.8 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[10] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

11.9 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 100mm or increased by more than 100mm (300mm increase is acceptable if using a coarse free draining material) without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

[10] Council Of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpaths should be located outside the SRZ where possible.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.10 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 40mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.11 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.12 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.13 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

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- *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023
- *NSW Planning Portal Spatial Viewer,* https://www.planningportal.nsw.gov.au/spatialviewerhistoric/#/find-a-property/address

13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 2 - Tree Inspection Schedule
Appendix 3 - Further information of methodology



Bryce Claassens
Diploma of Arboriculture (AQF5)
Cert III Landscape Construction
Member Arboriculture Australia
Quantified Tree Risk Assessment (QTRA)
ISA Tree Risk Assessment Qualification (TRAQ)

Appendix 2 - Tree Inspection Schedule

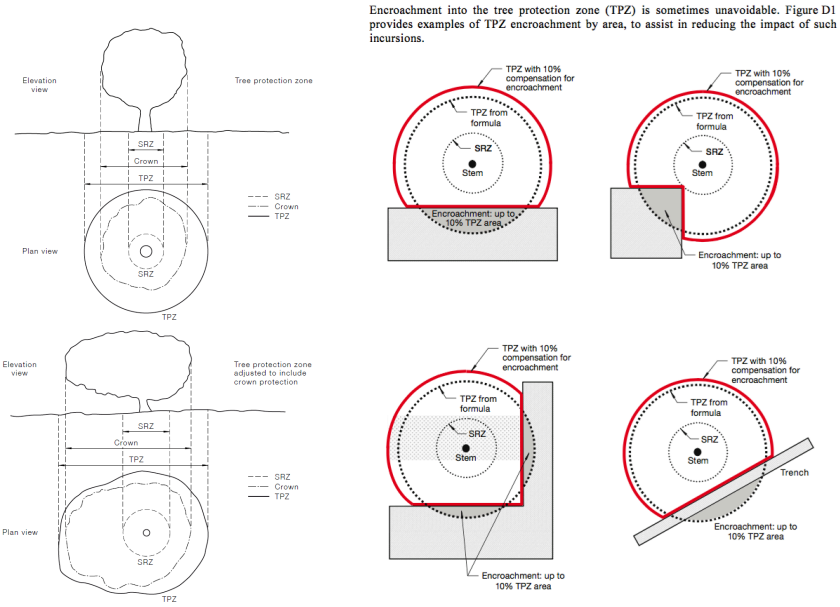
Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
593	Weeping Bottlebrush	*Callistemon viminalis*	Mature	5	2.5	250					250	290	Good	Good	Medium	2. Medium	A1	3.0	2.0	Located on steep embankment.
594	Weeping Bottlebrush	*Callistemon viminalis*	Veteran	5	3	350					350	390	Good	Good	Medium	2. Medium	A1	4.2	2.2	Located on steep embankment.
594a	Box Elder	*Acer negundo*	Semi-mature	4.5	2	170					170	190	Good	Fair	Low	5. Small/Young	Z3	2.0	1.6	Located within corridor. Exempt species. All tree information has been provided by JHLOR.
G2	Camphor Laurel	*Cinnamomum camphora*	Semi-mature	9	2	200					200	200	Good	Fair	Low	5. Small/Young	Z3	2.4	1.7	Located within corridor. Exempt species. Approximately 4 trees.

Explanatory Notes

Tree Species - Common name followed by botanical name. Where species is unknown it is indicated with an '*spp*'.
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level.
Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - (DAB x 50) $^{0.42}$ x 0.64. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
Retention Value: Tree AZ, see appendix 3 for categories.

Appendix 3 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required).
It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.
An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.
SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).

3. **Tree Age Class:** If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below;
    - Young/Newly planted: Young or recently planted tree.
    - Semi Mature: Up to 20% of the usual life expectancy for the species.
    - Early mature/Mature: Between 20%-80% of the usual life expectancy for the species.
    - Over mature: Over 80% of the usual life expectancy for the species.
    - Dead: Tree is dead or almost dead.

4. **Health/Physiological Condition:** Below are examples conditions used when assigning a category for tree health.

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

5. **Structural Condition:** Below are examples conditions used when assigning a category for structural condition.

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

6. **Amenity Value:** To determine the amenity value of a tree we assess a number of different factors, which include but are not limited to the information below.
   - The visibility of the tree to adjacent sites.
   - The relationship between the tree and the site.
   - Whether the tree is protected by any statuary conditions.
   - The habitat value of the tree.
   - Whether the tree is considered a noxious weed species.

   The amenity value is rated using one of the following values.
   - Very High
   - High
   - Moderate
   - Low
   - Very Low

7. **Safe Useful Life Expectancy (SULE), (Barrel, 2001):** A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8. **Root investigations:** The root investigations should identify roots greater than 30mm in diameter that are located along the edge of the structures footprint or in the location of footings. Root investigations must be carried out using non-invasive methods (manual excavations). Any excavations for the root investigations must carried out manually to avoid damaging the roots during excavations. Manual excavation may include the use of a high-pressure air/air knife, or a combination of high-pressure water and a vacuum device. When hand excavating carefully work around roots retaining as many as possible. Take care to not fray, wound, or cause damage to any roots during excavations as this may cause decay or infection from pathogens. It is essential that exposed roots are kept moist and the excavation back filled as soon as possible. The root investigations should be carried out by a qualified Arborist minimum AQF3. Once roots are exposed, a visual assessment can be carried out by a consulting Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree. A root map/report should be prepared identifying the findings of investigations, including photographs as supporting evidence in the report.

9. **Retention Value:** The system I have used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The table below provides a brief description of each category.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

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Glossary of Terms

Abiotic - Pertaining to non-living agents; e.g. environmental factors

Adventitious shoots - Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage - The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Bark - A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Branch:
• **Primary**. A first order branch arising from a stem
• **Lateral**. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
• **Sub-lateral**. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch collar - A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot - A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling - An irreversible deformation of a structure subjected to a bending load

Buttress zone - The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium - Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker - A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Compartmentalisation - The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compressive loading - Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition - An indication of the physiological condition of the tree. Where the term ‘condition’ is used in a report, it should not be taken as an indication of the stability of the tree

Crown/Canopy - The main foliage bearing section of the tree

Crown lifting - The removal of limbs and small branches to a specified height above ground level

Crown thinning - The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping - A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

DAB (Diameter Above Buttress) - Trunk diameter measured above the root buttress

Defect - In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Dieback - The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease - A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Dominance - In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud - An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction - In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height) - Stem diameter measured at a height of 1.4 metres or the nearest measurable point. Where measurement at a height of 1.4 metres is not possible, another height may be specified

Deadwood - Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Epicormic shoot - A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Flush-cut - A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root - A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Habit - The overall growth characteristics, shape of the tree and branch structure

Hazard beam - An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

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Heartwood/false-heartwood - The dead central wood that has become dysfunctional as part of the aging processes and being distinct from the sapwood

Heave - A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

Included bark (ingrown bark) - Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Lever arm - A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin - The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing - A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end- loading

Loading - A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Mycelium - The body of a fungus, consisting of branched filaments (hyphae)

Occlusion - The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen - A micro-organism which causes disease in another organism

Photosynthesis - The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Probability - A statistical measure of the likelihood that a particular event might occur

Pruning - The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial - In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Ring-barking - The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage

Root-collar - The transitional area between the stem/s and roots

Sapwood - Living xylem tissues

Soft-rot - A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Stem/s - Principle above-ground structural component(s) of a tree that supports its branches

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

SRZ (Structural Root Zone) - The area around the base of the tree required for the trees stability in the ground

Subsidence - In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Taper - In stems and branches, the degree of change in girth along a given length

Targets - In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping - In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Transpiration - The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

TPZ (Tree Protection Zone) - A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development

Understory - This layer consists of younger individuals of the dominant trees, together with smaller trees and shrubs which are adapted to grow under lower light conditions

Veteran tree - Tree that, by recognised criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem

Vigour - The expression of carbohydrate expenditure to growth (in trees)

White-rot - A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure - The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure - The force exerted by a wind on a particular object

Windthrow - The blowing over of a tree at its roots

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Canterbury

No trees to be removed / pruned in Canterbury.

Campsie

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Arboricultural Report

Site location:
Southwest Metro
Campsie Station
Campsie NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens &
Alex Kurath
Urban Arbor Pty Ltd
Date: 4 June 2024
Ref: 240604_SWMCS_AIA

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1. INTRODUCTION

1.1 Urban Arbor have been instructed by John Holland Laing O'Rourke to provide an Arboricultural Impact Assessment Report for trees located within the site and adjoining sites in relation to a proposed development.

1.2 Below is a list of all documents and information used to assist in preparing this report.

A) Campsie Station Fencing Design Package No. 153, Metron T2M, Rev 00, 24 May 2022.
B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 210521-SWMCS-AIA, Rev C, 21 May 2021.
C) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 240504-SWMRC-AIA, Rev 6, 3 May 2024.
D) Arboricultural Report – SWMC Tree Report, Urban Arbor Pty Ltd, Ref: 240527-SWMC-AIA, Rev 28, 27 May 2024.

1.3 The trees were initially inspected on 16 December 2019 and 17 December 2020 by Bryce Claassens of Urban Arbor. Additional trees were inspected on 25 March 2024, 26 March 2024 and 27 May 2024 by Alex Kurath of Urban Arbor. Access was available to the subject site and the adjoining public areas only. All tree data contained in this report was collected during these site inspections. This report has been written by Bryce Claassens.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment of all significant trees located within the area identified for assessment by John Holland Laing O'Rourke. For the purpose of this report, a significant tree is a 'Long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or relatively few main stems or trunks'.

2.1.2 Determine the trees estimated contribution years and remaining useful life expectancy and award the trees a retention value.

2.1.3 Determine trees that are to be removed or pruned based on information provided by John Holland Laing O'Rourke.

2.1.4 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

2.1.5 Specify generic tree protection measures for trees to be retained in accordance with AS4970-2009.

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3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspection was visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.6 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.7 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp*.

3.8 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Alteration of this report invalidates the entire report.

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4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

4.1.1 Tree common name
4.1.2 Tree botanical name
4.1.3 Tree age class
4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m) - millimetres.
4.1.5 DAB (Trunk diameter directly above the root buttress) – millimetres.
4.1.6 Estimated height – metres.
4.1.7 Estimated crown spread (diameter of crown) - metres.
4.1.8 Health
4.1.9 Structural condition
4.1.10 Amenity value
4.1.11 Estimated remaining contribution years (SULE)[1]
4.1.12 Retention value (Tree AZ)[2]
4.1.13 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a nylon mallet, compass, camera and a steel probe.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009).[4]

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

[1] Barrell, J. (2001), *'SULE: Its use and status in the new millennium' in Management of Mature Trees proceedings of the 4th NAAA Workshop*, Sydney, 2001. Barrell.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

[4] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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5. SITE LOCATION AND BRIEF DESCRIPTION

5.1 The site is located in the Canterbury Bankstown Local Government Area (LGA). The trees are subject to protection under the Canterbury Bankstown LEP 2023[5] and Canterbury Bankstown DCP 2023.[6] The site has been identified as a heritage item in the NSW Planning Portal Spatial Viewer.[7]

6. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection. Additional information about the TPZ is included in Appendix 3.

6.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula; (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

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5 *Canterbury Bankstown Local Environmental Plan 2023*, https://legislation.nsw.gov.au/view/html/inforce/current/epi-2023-0336, accessed 3 June 2024.

6 *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023, accessed 3 June 2024.

7 *NSW Planning Portal Spatial Viewer – Property Report,* https://www.planningportal.nsw.gov.au/propertyreports/f59479bd-df97-4e13-bc04-ecf54dd4eae4.pdf, accessed 3 June 2024.

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6.3 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

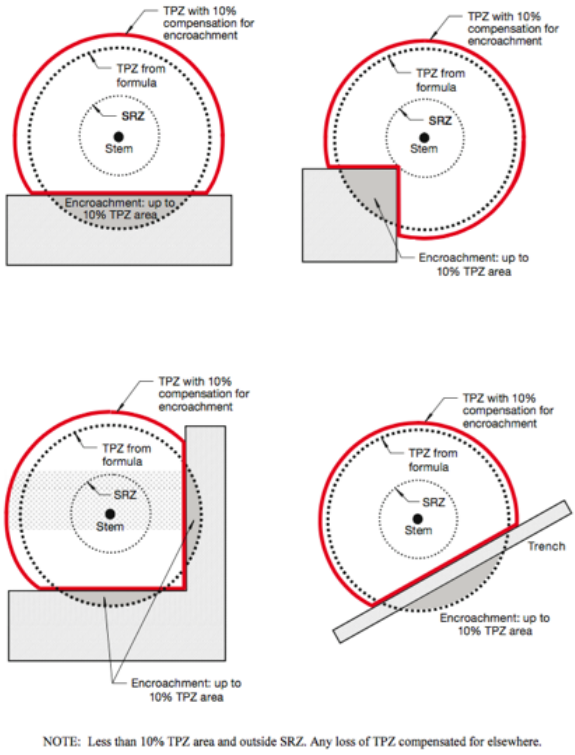


Image 1: Example minor TPZ encroachment from AS4970-2009.

6.4 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment (see Appendix 3 for more information in relation to root investigations).

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7. OBSERVATIONS

7.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in Appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.

8. ASSESSMENT OF TREE IMPACTS BY AREA

8.1 The trees included in the following sections have been identified by John Holland Laing O'Rourke as being subject to impacts from development works. All trees to be retained should be protected in accordance with AS4970-2009, details of which are included in section 11. If there are any development works that have not been assessed and could potentially impact additional trees, the project arborist must assess the impact of the proposed works to the condition of the trees, determining the trees viability for retention.

8.2 **Campsie**

8.2.1 **Campsie Station (S Parade):** The trees within this area are located adjacent to the proposed security fencing. Tree 521 and 522 will require canopy pruning to allow for the works. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
521	*Leptospermum petersonii*	2. Medium	A2	4.1	2.2	Native	Medium
522	*Grevillea robusta*	1. Long	A1	5.4	2.4	Native	Medium

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Image 1: Looking Northeast towards tree 521 showing the required canopy pruning. The second order branch to the West is to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter will be approximately 70mm.



Image 2: Looking West towards tree 522 showing the required canopy pruning. The three lowest first order branches to the North are to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameters will be 70mm or less for each branch.

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9. CONCLUSIONS

9.1 **Table 2:** Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees recommended to be removed	Installation of security fencing, construction works areas, vehicle access	None	None	**0 trees**
Trees recommended to be retained requiring canopy pruning	Clearance for construction works i.e. vehicle access, security fencing, etc.	521, 522	None	**2 trees**

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10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the subject site to two (2) trees that are located at selected areas around the development site.

10.2 No trees have been recommended for removal within this report.

10.3 Two (2) trees have been identified for canopy pruning to provide clearance for proposed construction works, including tree 521 and 522. Refer to section 8 for canopy pruning specifications. All pruning works must be completed in accordance with AS4373-2007 Pruning of Amenity Trees.

10.4 All trees to be retained that are located adjacent to the proposed works must be protected in accordance with AS4970-2009. Generic tree protection guidance has been provided in section 11. It is recommended that a detailed tree management plan (TMP) is prepared for the development in accordance with AS4970-2009 and developed in combination with the overall construction management plan for the site. The TMP should be prepared by a consulting Arborist with a minimum AQF level 5 qualification.

10.5 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report must also be made available to any contractor prior to works commencing and during any on site operations.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. Site inspection frequency must be agreed upon by the project arborist and principal contractor prior to the commencement of works.

11.5 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.5.1 Protective fencing: Site specific tree protection requirements are in section 11.5. Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

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11.5.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

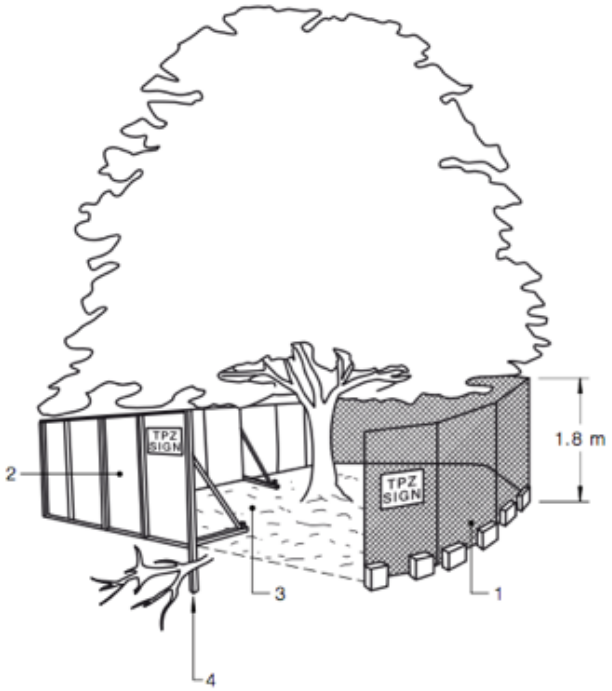
11.5.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.5.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

11.5.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

11.5.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

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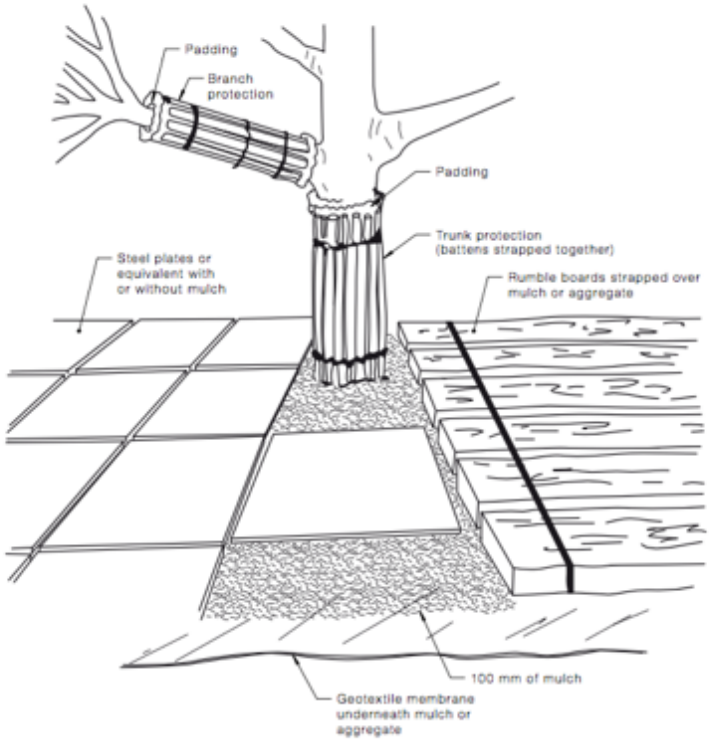


LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[8] with example tree protection.

[8] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.

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NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,[9] with example tree protection.

11.6 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refuelling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

[9] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

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11.7 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.8 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[10] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

11.9 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 100mm or increased by more than 100mm (300mm increase is acceptable if using a coarse free draining material) without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

[10] Council Of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

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- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpaths should be located outside the SRZ where possible.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.10 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 40mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.11 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.12 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.13 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

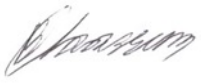
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13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 2 - Tree Inspection Schedule
Appendix 3 - Further information of methodology



Bryce Claassens
Diploma of Arboriculture (AQF5)
Cert III Landscape Construction
Member Arboriculture Australia
Quantified Tree Risk Assessment (QTRA)
ISA Tree Risk Assessment Qualification (TRAQ)

Appendix 2 - Tree Inspection Schedule

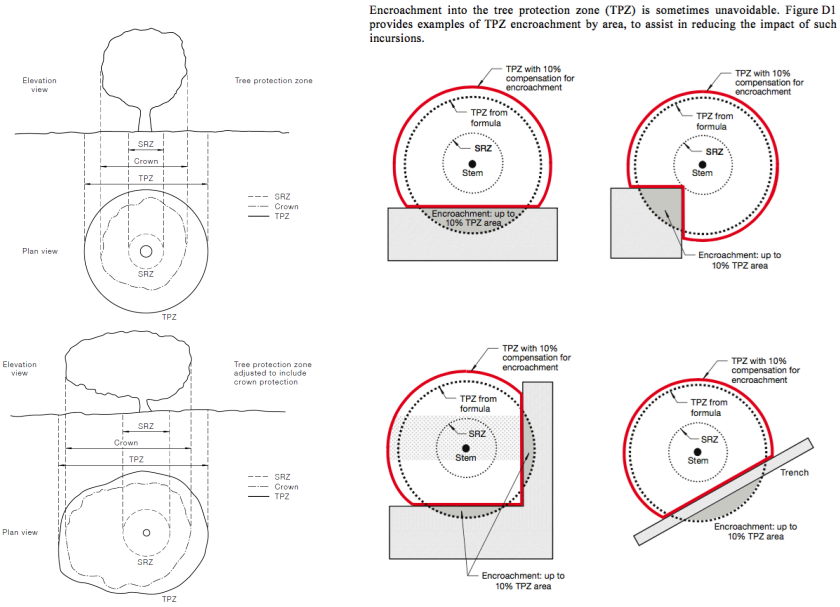
Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
521	Lemon Scented Tea Tree	*Leptospermum petersonii*	Mature	5	2	340					340	360	Good	Fair	Medium	2. Medium	A2	4.1	2.2	Located within nature strip. Trunk lean. Suppressed by adjacent tree.
522	Silky Oak	*Grevillea robusta*	Mature	10	4	450					450	480	Good	Good	Medium	1. Long	A1	5.4	2.4	Located within nature strip. Canopy extends into corridor.

Explanatory Notes

Tree Species - Common name followed by botanical name. Where species is unknown it is indicated with an '*spp*'.
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level.
Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - $(DAB \times 50)^{0.42} \times 0.64$. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
Retention Value: Tree AZ, see appendix 3 for categories.

Appendix 3 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required).
It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.
An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.
SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).

3. **Tree Age Class:** If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below;
    - Young/Newly planted: Young or recently planted tree.
    - Semi Mature: Up to 20% of the usual life expectancy for the species.
    - Early mature/Mature: Between 20%-80% of the usual life expectancy for the species.
    - Over mature: Over 80% of the usual life expectancy for the species.
    - Dead: Tree is dead or almost dead.

4. **Health/Physiological Condition:** Below are examples conditions used when assigning a category for tree health.

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

5. **Structural Condition:** Below are examples conditions used when assigning a category for structural condition.

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

6. **Amenity Value:** To determine the amenity value of a tree we assess a number of different factors, which include but are not limited to the information below.
   - The visibility of the tree to adjacent sites.
   - The relationship between the tree and the site.
   - Whether the tree is protected by any statuary conditions.
   - The habitat value of the tree.
   - Whether the tree is considered a noxious weed species.

   The amenity value is rated using one of the following values.
   - Very High
   - High
   - Moderate
   - Low
   - Very Low

7. **Safe Useful Life Expectancy (SULE), (Barrel, 2001):** A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8. **Root investigations:** The root investigations should identify roots greater than 30mm in diameter that are located along the edge of the structures footprint or in the location of footings. Root investigations must be carried out using non-invasive methods (manual excavations). Any excavations for the root investigations must carried out manually to avoid damaging the roots during excavations. Manual excavation may include the use of a high-pressure air/air knife, or a combination of high-pressure water and a vacuum device. When hand excavating carefully work around roots retaining as many as possible. Take care to not fray, wound, or cause damage to any roots during excavations as this may cause decay or infection from pathogens. It is essential that exposed roots are kept moist and the excavation back filled as soon as possible. The root investigations should be carried out by a qualified Arborist minimum AQF3. Once roots are exposed, a visual assessment can be carried out by a consulting Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree. A root map/report should be prepared identifying the findings of investigations, including photographs as supporting evidence in the report.

9. **Retention Value:** The system I have used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The table below provides a brief description of each category.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

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Glossary of Terms

Abiotic - Pertaining to non-living agents; e.g. environmental factors

Adventitious shoots - Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage - The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Bark - A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Branch:
• **Primary**. A first order branch arising from a stem
• **Lateral**. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
• **Sub-lateral**. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch collar - A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot - A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling - An irreversible deformation of a structure subjected to a bending load

Buttress zone - The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium - Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker - A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Compartmentalisation - The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compressive loading - Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition - An indication of the physiological condition of the tree. Where the term ‘condition’ is used in a report, it should not be taken as an indication of the stability of the tree

Crown/Canopy - The main foliage bearing section of the tree

Crown lifting - The removal of limbs and small branches to a specified height above ground level

Crown thinning - The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping - A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

DAB (Diameter Above Buttress) - Trunk diameter measured above the root buttress

Defect - In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Dieback - The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease - A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Dominance - In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud - An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction - In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height) - Stem diameter measured at a height of 1.4 metres or the nearest measurable point. Where measurement at a height of 1.4 metres is not possible, another height may be specified

Deadwood - Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Epicormic shoot - A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Flush-cut - A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root - A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Habit - The overall growth characteristics, shape of the tree and branch structure

Hazard beam - An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

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Heartwood/false-heartwood - The dead central wood that has become dysfunctional as part of the aging processes and being distinct from the sapwood

Heave - A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

Included bark (ingrown bark) - Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Lever arm - A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin - The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing - A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end- loading

Loading - A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Mycelium - The body of a fungus, consisting of branched filaments (hyphae)

Occlusion - The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen - A micro-organism which causes disease in another organism

Photosynthesis - The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Probability - A statistical measure of the likelihood that a particular event might occur

Pruning - The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial - In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Ring-barking - The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage

Root-collar - The transitional area between the stem/s and roots

Sapwood - Living xylem tissues

Soft-rot - A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Stem/s - Principle above-ground structural component(s) of a tree that supports its branches

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

SRZ (Structural Root Zone) - The area around the base of the tree required for the trees stability in the ground

Subsidence - In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Taper - In stems and branches, the degree of change in girth along a given length

Targets - In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping - In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Transpiration - The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

TPZ (Tree Protection Zone) - A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development

Understory - This layer consists of younger individuals of the dominant trees, together with smaller trees and shrubs which are adapted to grow under lower light conditions

Veteran tree - Tree that, by recognised criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem

Vigour - The expression of carbohydrate expenditure to growth (in trees)

White-rot - A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure - The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure - The force exerted by a wind on a particular object

Windthrow - The blowing over of a tree at its roots

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Belmore

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Arboricultural Report

Site location:
Southwest Metro
Belmore Station
Belmore NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens &
Alex Kurath
Urban Arbor Pty Ltd
Date: 5 August 2024
Ref: 240805_SWMBS_AIA
Rev: 1

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1. INTRODUCTION

1.1 Urban Arbor have been instructed by John Holland Laing O'Rourke to provide an Arboricultural Impact Assessment Report for trees located within the site and adjoining sites in relation to a proposed development.

1.2 Below is a list of all documents and information used to assist in preparing this report.

A) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 211027-SWMPS-AIA, Rev C, 27 October 2021.
B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 240504-SWMRC-AIA, Rev 6, 3 May 2024.
C) Arboricultural Report – SWMC Tree Report, Urban Arbor Pty Ltd, Ref: 240527-SWMC-AIA, Rev 28, 27 May 2024.
D) Belmore Station Pruning for New Tree Identified, PowerPoint Document, John Holland Laing O'Rourke, Received 26 July 2024.

1.3 The trees were initially inspected on 16 December 2019 and 17 December 2020 by Bryce Claassens of Urban Arbor. Additional trees were inspected on 25 March 2024, 26 March 2024 and 27 May 2024 by Alex Kurath of Urban Arbor. Access was available to the subject site and the adjoining public areas only. All tree data contained in this report was collected during these site inspections. This report has been written by Bryce Claassens.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment of all significant trees located within the area identified for assessment by John Holland Laing O'Rourke. For the purpose of this report, a significant tree is a 'Long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or relatively few main stems or trunks'.

2.1.2 Determine the trees estimated contribution years and remaining useful life expectancy and award the trees a retention value.

2.1.3 Determine trees that are to be removed or pruned based on information provided by John Holland Laing O'Rourke.

2.1.4 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

2.1.5 Specify generic tree protection measures for trees to be retained in accordance with AS4970-2009.

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3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspection was visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.6 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.7 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp*.

3.8 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Alteration of this report invalidates the entire report.

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4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

4.1.1 Tree common name
4.1.2 Tree botanical name
4.1.3 Tree age class
4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m) - millimetres.
4.1.5 DAB (Trunk diameter directly above the root buttress) – millimetres.
4.1.6 Estimated height – metres.
4.1.7 Estimated crown spread (diameter of crown) - metres.
4.1.8 Health
4.1.9 Structural condition
4.1.10 Amenity value
4.1.11 Estimated remaining contribution years (SULE)[1]
4.1.12 Retention value (Tree AZ)[2]
4.1.13 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a nylon mallet, compass, camera and a steel probe.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009).[4]

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

[1] Barrell, J. (2001), *'SULE: Its use and status in the new millennium' in Management of Mature Trees proceedings of the 4th NAAA Workshop*, Sydney, 2001. Barrell.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

[4] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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5. SITE LOCATION AND BRIEF DESCRIPTION

5.1 The site is located in the Canterbury Bankstown Local Government Area (LGA). The trees are subject to protection under the Canterbury Bankstown LEP 2023[5] and Canterbury Bankstown DCP 2023.[6] The site has been identified as a heritage item in the NSW Planning Portal Spatial Viewer.[7]

6. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection. Additional information about the TPZ is included in Appendix 3.

6.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula; (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

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5 *Canterbury Bankstown Local Environmental Plan 2023*, https://legislation.nsw.gov.au/view/html/inforce/current/epi-2023-0336, accessed 3 June 2024.

6 *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023, accessed 3 June 2024.

7 *NSW Planning Portal Spatial Viewer – Property Report,* https://www.planningportal.nsw.gov.au/propertyreports/e425caae-7b90-4d53-88cc-b5d30089a975.pdf, accessed 3 June 2024.

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6.3 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

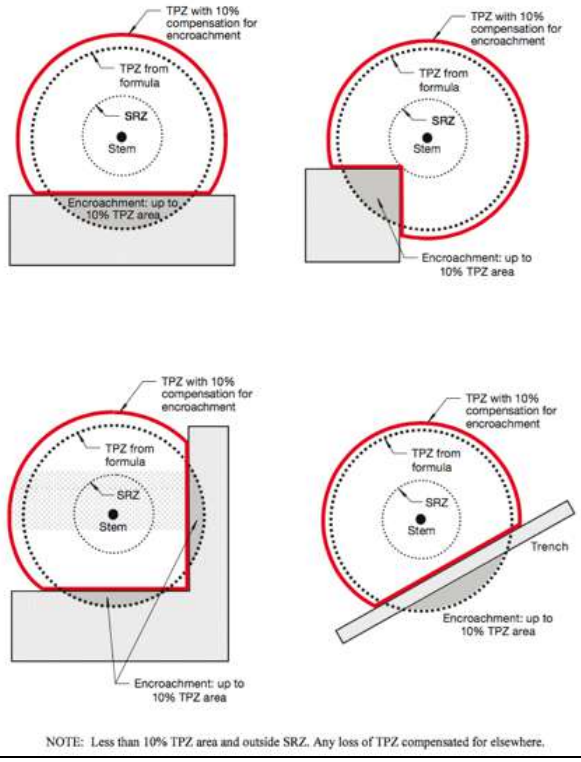


Image 1: Example minor TPZ encroachment from AS4970-2009.

6.4 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment (see Appendix 3 for more information in relation to root investigations).

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7. OBSERVATIONS

7.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in Appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.

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8. ASSESSMENT OF TREE IMPACTS BY AREA

8.1 The trees included in the following sections have been identified by John Holland Laing O'Rourke as being subject to impacts from development works. All trees to be retained should be protected in accordance with AS4970-2009, details of which are included in section 11. If there are any development works that have not been assessed and could potentially impact additional trees, the project arborist must assess the impact of the proposed works to the condition of the trees, determining the trees viability for retention.

8.2 **Belmore**

8.2.1 **Belmore Station (Redman Parade – North side):** The trees within this area are located adjacent to the proposed security fencing. Tree 655, 3568 and 3570 will require canopy pruning to allow for the works. Tree 656 and 3569 are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
655	*Cinnamomum camphora*	2. Medium	A1	6.0	2.6	Exotic	Medium
656	*Brachychiton acerifolius*	2. Medium	A1	3.8	2.1	Native	Medium
3568	*Acacia parramattensis*	3. Short	Z4	5.4	2.5	Native	Medium
3569	*Acacia parramattensis*	5. Small/Young	Z1	2.0	1.5	Native	Low
3570	*Acacia spp*	3. Short	A1	2.2	1.8	Native	Medium

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Image 1: Looking towards tree 655 showing the required canopy pruning. The lowest second order branch to the West is to be removed. The pruning will result in the removal of less than 5% of the live foliage area of the tree. The finished cut diameter will be approximately 120mm. The yellow line indicates the branch to be removed. The red line indicates the approximate location of the final pruning cut.



Image 2: Looking towards tree 655 and 656. Tree 656 is recommended for removal due to the proposed security fencing.

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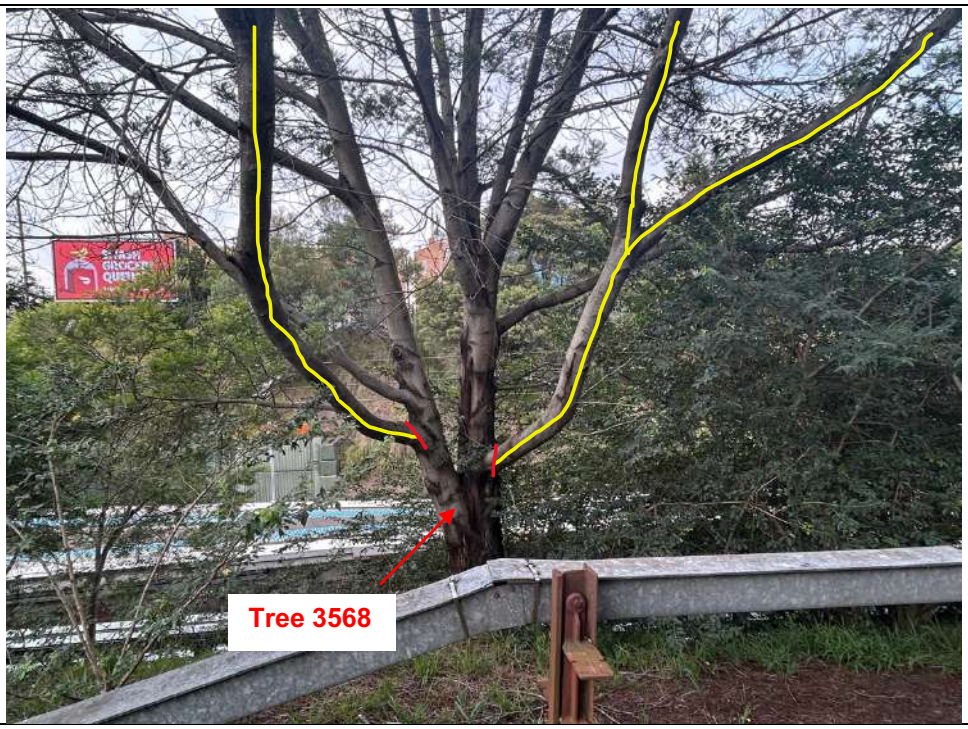


Image 3: Looking towards tree 3568 showing the required canopy pruning. The two lowest first order branches to the North are to be removed. The pruning will result in the removal of approximately 10% of the live foliage area of the tree. The finished cut diameters will be approximately 140mm each. The yellow lines indicate the branches to be removed. The red lines indicate the approximate location of the final pruning cuts.



Image 4: Looking towards tree 3569. The tree is recommended for removal due to the proposed security fencing.

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Image 5: Looking towards tree 3570 showing the required canopy pruning (hatched yellow). The North side of the canopy of is to be raised by 3m. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter must not exceed 50mm.

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8.2.2 **Belmore Station (Torbuk Avenue – South side):** The trees within this area are located adjacent to the proposed security fencing. Tree 3619a and G1.23 will require canopy pruning to allow for the works. Tree 658C, 662, 668, 670, 3563, 3564, 3565, 3566, 3567, 3618, 3619, G1.22, G1,23 and G1.25 are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
658c	*Acacia saligna*	3. Short	Z10	3.2	2.1	Native	Low
662	*Robinia pseudoacacia 'Frisia'*	3. Short	Z3	2.4	1.8	Exotic	Low
668	*Lophostemon confertus*	1. Long	A1	6.2	2.6	Native	Medium
670	*Lophostemon confertus*	2. Medium	A1	3.6	2.3	Native	Medium
3563	*Phoenix canariensis*	5. Small/Young	Z1	2.5	NA	Exotic	Low
3564	*Grevillea spp*	5. Small/Young	Z1	2.2	1.8	Native	Low
3565	*Robinia pseudoacacia*	3. Short	Z3	2.4	1.8	Exotic	Low
3566	*Robinia pseudoacacia*	3. Short	Z3	2.4	1.8	Exotic	Low
3567	*Robinia pseudoacacia*	5. Small/Young	Z3	2.0	1.5	Exotic	Low
3618	*Celtis sinensis*	5. Small/Young	Z3	2.0	1.7	Exotic	Low
3619	*Phoenix canariensis*	1. Long	A1	3.0	NA	Exotic	Medium
3619a	*Melaleuca linariifolia*	1. Long	A1	5.1	2.6	Native	High
G1.22	*Acacia spp*	3. Short	Z1	2.0	1.5	Native	Low
G1.23	*Acacia implexa*	5. Small/Young	Z10	2.4	1.7	Native	Low
G1.24	*Acacia spp*	5. Small/Young	Z1	2.0	1.5	Native	Low
G1.25	*Acacia longifolia*	5. Small/Young	Z1	2.0	1.6	Native	Low

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Image 6: Looking towards tree 662. The tree is recommended for removal due to the proposed security fencing.

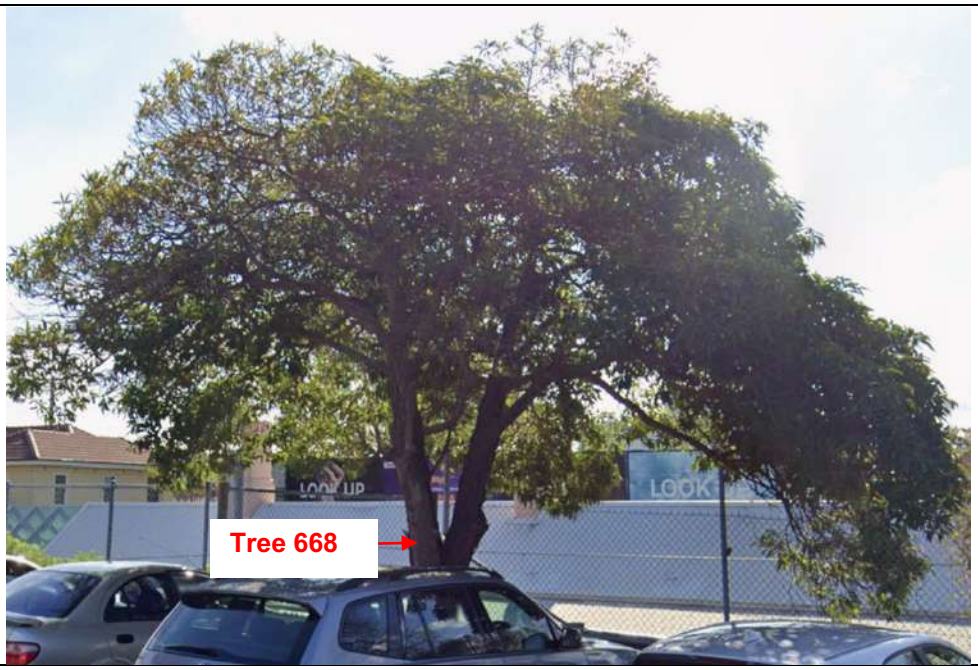


Image 7: Looking towards tree 668. The tree is recommended for removal due to the proposed security fencing.

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Image 8: Looking towards tree 670. The tree is recommended for removal due to the proposed security fencing.



Image 9: Looking towards tree 3563, 3564, 3565, 3566 and 3567. The trees are recommended for removal due to the proposed security fencing.

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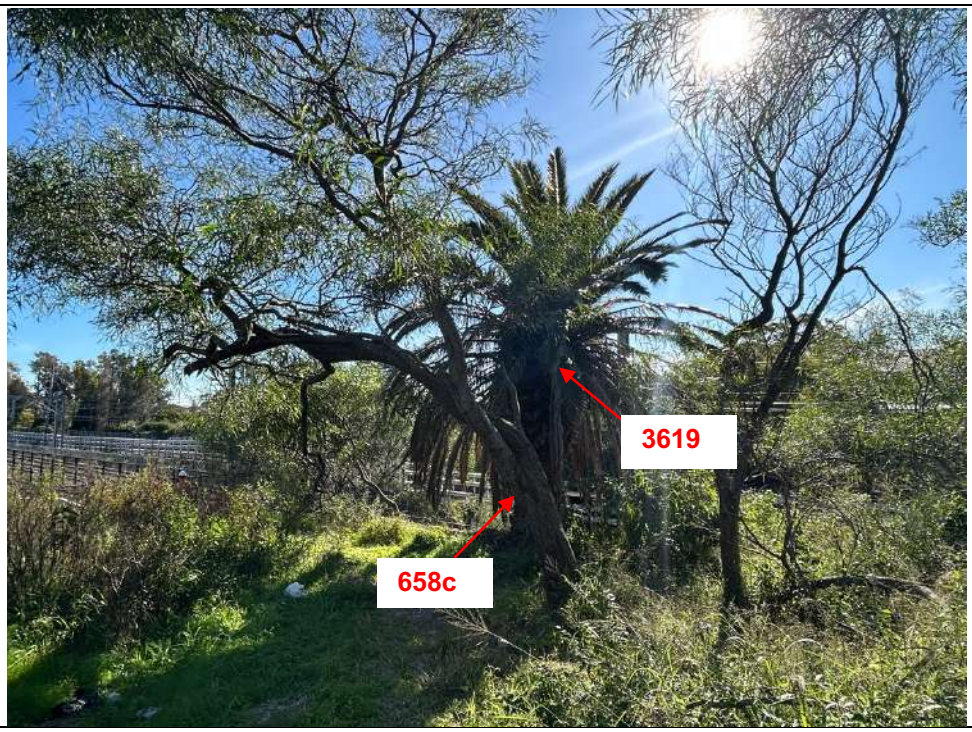


Image 10: Looking towards tree 658C and 3619. The trees are recommended for removal due to the proposed security fencing.



Image 11: Looking towards tree 3618 and G1.22. The trees are recommended for removal due to the proposed security fencing. G1.22 is a group of 4 trees.

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Image 12: Looking towards G1.23 showing the required canopy pruning (hatched yellow). Minor pruning of lower branches for selected trees within the group is required to provide clearance for the proposed fencing. The pruning will result in the removal of less than 10% of the live foliage area of each tree. The finished cut diameter must not exceed 80mm.



Image 13: Looking towards G1.24. The trees are recommended for removal due to the proposed security fencing. G1.24 is a group of approximately 20 trees.

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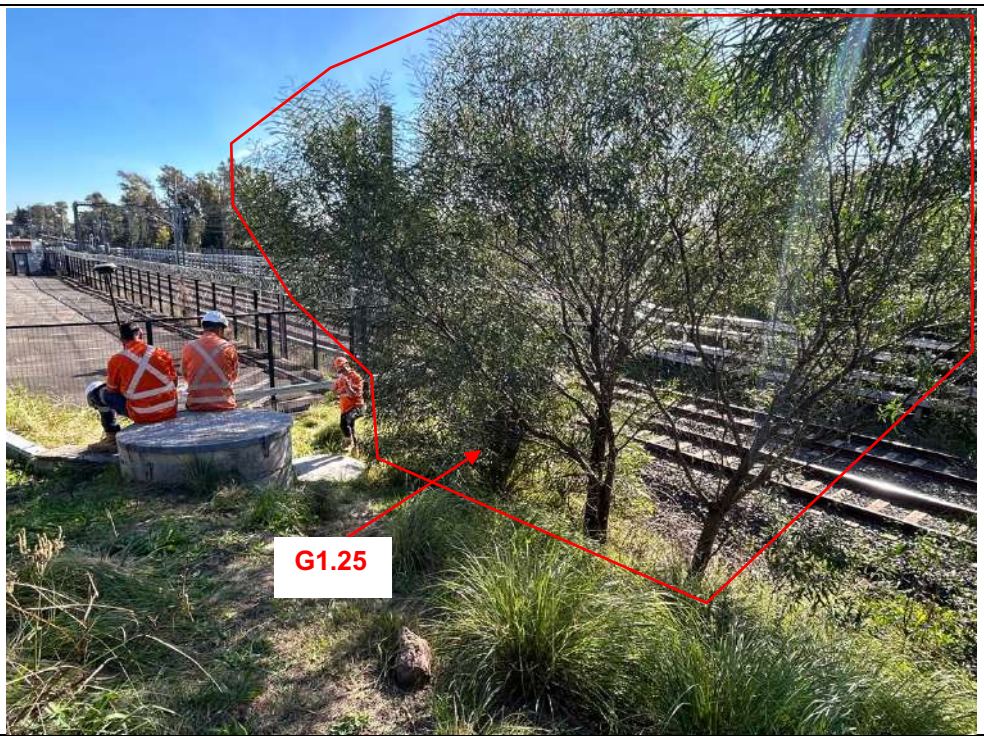


Image 14: Looking towards G1.25. The trees are recommended for removal due to the proposed security fencing. G1.25 is a group of 3 trees.



Image 15: Looking towards 3619a showing the required canopy pruning. The 80mm diameter primary branch to the East is to be removed (red line). The East side of the canopy is to be raised to allow for 5m of clearance (yellow hatched area). The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameters for the yellow hatched area must not exceed 50mm.

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9. CONCLUSIONS

9.1 **Table 2:** Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees recommended to be removed	Installation of security fencing, construction works areas, vehicle access	656, 668, 670, 3619	658c, 662, 3563, 3564, 3565, 3566, 3567, 3569, 3618, G1.22, G1.24, G1.25	**13 trees & 3 groups of trees**
Trees recommended to be retained requiring canopy pruning	Clearance for construction works i.e. vehicle access, security fencing, etc.	655, 3570, 3619a	3568, G1.23	**4 trees & 1 group of trees**

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10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the subject site to seventeen (17) trees and four (4) groups of trees that are located at selected areas around the development site.

10.2 Thirteen (13) trees and three (3) groups of trees have been recommended for removal within this report, including tree 656, 658c, 662, 668, 670, 3563, 3564, 3565, 3566, 3567, 3569, 3618, 3619, G1.22, G1.24 and G1.25. See section 9.1 Table 2 for recommended tree removal by retention values.

10.3 Four (4) trees and one (1) group of trees have been identified for canopy pruning to provide clearance for proposed construction works, including tree 655, 3568, 3570, 3619a and G1.23. Refer to section 8 for canopy pruning specifications. All pruning works must be completed in accordance with AS4373-2007 Pruning of Amenity Trees.

10.4 All trees to be retained that are located adjacent to the proposed works must be protected in accordance with AS4970-2009. Generic tree protection guidance has been provided in section 11. It is recommended that a detailed tree management plan (TMP) is prepared for the development in accordance with AS4970-2009 and developed in combination with the overall construction management plan for the site. The TMP should be prepared by a consulting Arborist with a minimum AQF level 5 qualification.

10.5 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report must also be made available to any contractor prior to works commencing and during any on site operations.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. Site inspection frequency must be agreed upon by the project arborist and principal contractor prior to the commencement of works.

11.5 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.5.1 Protective fencing: Site specific tree protection requirements are in section 11.5. Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

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11.5.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

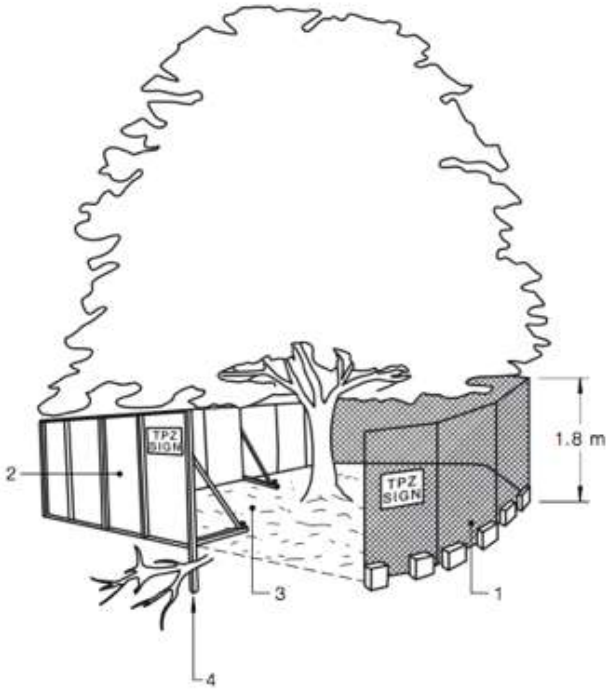
11.5.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.5.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

11.5.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

11.5.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

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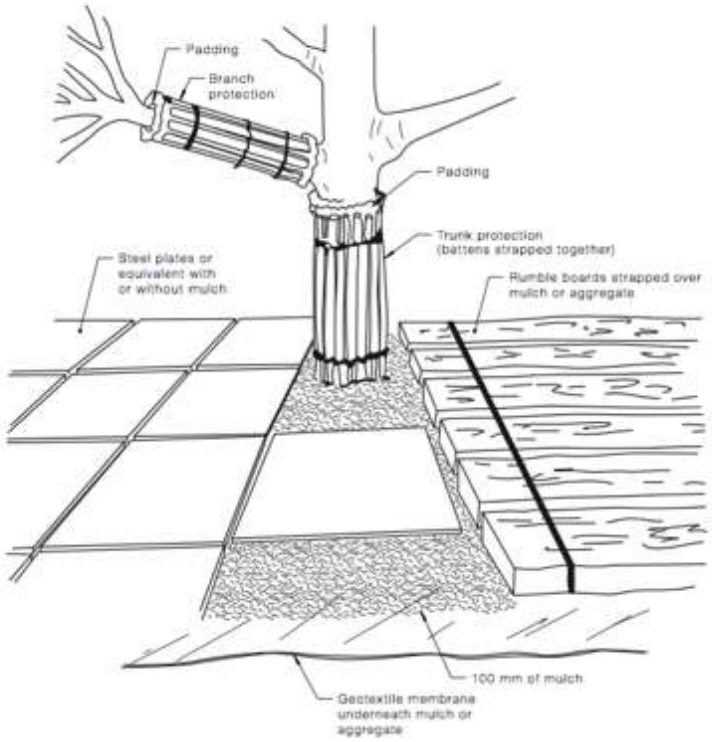


LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[8] with example tree protection.

[8] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.

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NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,[9] with example tree protection.

11.6 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refuelling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

[9] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

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11.7 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.8 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[10] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

11.9 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 100mm or increased by more than 100mm (300mm increase is acceptable if using a coarse free draining material) without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

[10] Council Of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

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- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpaths should be located outside the SRZ where possible.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.10 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 40mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.11 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.12 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.13 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

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- *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023
- *NSW Planning Portal Spatial Viewer,* https://www.planningportal.nsw.gov.au/spatialviewerhistoric/#/find-a-property/address

13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 2 - Tree Inspection Schedule
Appendix 3 - Further information of methodology



Bryce Claassens
Diploma of Arboriculture (AQF5)
Cert III Landscape Construction
Member Arboriculture Australia
Quantified Tree Risk Assessment (QTRA)
ISA Tree Risk Assessment Qualification (TRAQ)

Appendix 2 - Tree Inspection Schedule

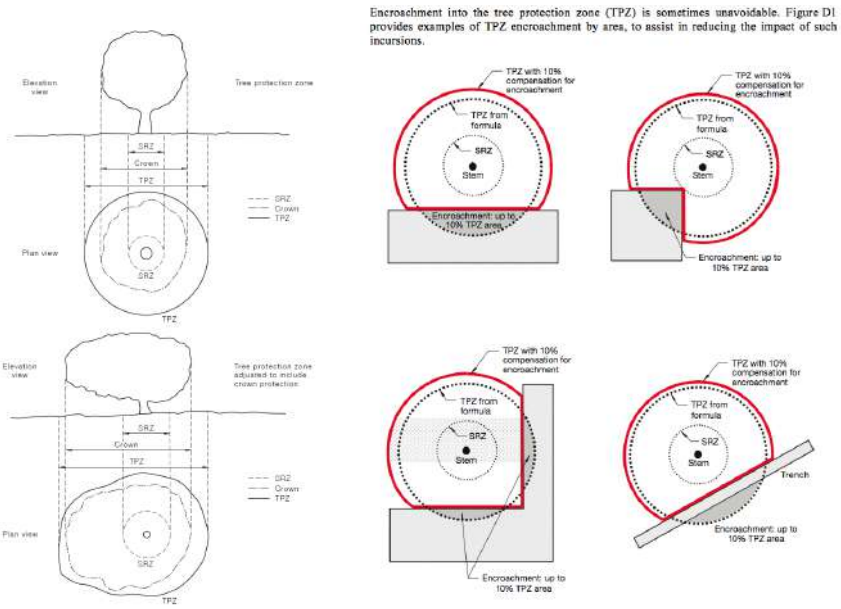
Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
655	Camphor Laurel	*Cinnamomum camphora*	Mature	11	5	500					500	580	Good	Fair	Medium	2. Medium	A1	6.0	2.6	Located within corridor. DBH estimated.
656	Illawara Flame	*Brachychiton acerifolius*	Mature	8	2	320					320	340	Good	Good	Medium	2. Medium	A1	3.8	2.1	Located within corridor. DBH estimated.
658c	Golden Wreath Wattle	*Acacia saligna*	Mature	7	3	270					270	320	Fair	Fair	Low	3. Short	Z10	3.2	2.1	Asymmetric to the SW with trunk lean and included stem union at 1.4m.
662	Golden Robinia	*Robinia pseudoacacia 'Frisia'*	Semi-mature	5	2	200					200	230	Fair	Fair	Low	3. Short	Z3	2.4	1.8	Exempt species. Dieback of S stem.
668	Queensland Brushbox	*Lophostemon confertus*	Mature	6	4	520					520	580	Good	Good	Medium	1. Long	A1	6.2	2.6	None.
670	Queensland Brushbox	*Lophostemon confertus*	Mature	4.5	3	300					300	400	Good	Fair	Medium	2. Medium	A1	3.6	2.3	None.
3563	Canary Palm	*Phoenix canariensis*	Semi-mature	4	1.5	300					300	NA	Good	Good	Low	5. Small/Young	Z1	2.5	NA	None.
3564	Grevillea 'Moonlight'	*Grevillea sp*	Semi-mature	4	2.5	180					180	220	Good	Good	Low	5. Small/Young	Z1	2.2	1.8	None.
3565	Robinia	*Robinia pseudoacacia*	Semi-mature	5	2	200					200	230	Fair	Fair	Low	3. Short	Z3	2.4	1.8	None.
3566	Robinia	*Robinia pseudoacacia*	Semi-mature	5	2	200					200	230	Fair	Fair	Low	3. Short	Z3	2.4	1.8	None.
3567	Robinia	*Robinia pseudoacacia*	Young	4	1.5	80					80	100	Good	Good	Low	5. Small/Young	Z3	2.0	1.5	None.
3568	Parramatta Wattle	*Acacia parramattensis*	Mature	9	5	350	250	140			452	530	Fair	Fair	Medium	3. Short	Z4	5.4	2.5	Low foliage density for species.
3569	Parramatta Wattle	*Acacia parramattensis*	Young	4	2	60	50				78	100	Good	Fair	Low	5. Small/Young	Z1	2.0	1.5	Asymmetric canopy to the East.
3570	Wattle	*Acacia spp*	Mature	8	3	180					180	230	Good	Good	Medium	3. Short	A1	2.2	1.8	None.
3618	Chinese Hackberry	*Celtis sinensis*	Semi-mature	5	2	40	50	50	50	40	103	200	Good	Fair	Low	5. Small/Young	Z3	2.0	1.7	Regrowth from stump. Exempt species.
3619	Canary Palm	*Phoenix canariensis*	Semi-mature	7	2	500					500	NA	Good	Good	Medium	1. Long	A1	3.0	NA	None.
3619a	Snow in Summer	*Melaleuca linariifolia*	Mature	8	4	250	340				422	550	Good	Good	High	1. Long	A1	5.1	2.6	Tree data estimated based on information from JHLOR.
G1.22	Wattle	*Acacia spp*	Young	4	2	80	60				100	120	Good	Fair	Low	3. Short	Z1	2.0	1.5	Group of 4 trees of varying condition
G1.23	Hickory Wattle	*Acacia implexa*	Semi-mature	7	2	200					200	200	Good	Fair	Low	5. Small/Young	Z10	2.4	1.7	Row of 20 trees up to 200mm in diameter. Asymmetric canopy due to overhead power lines. Set back from fence by approximately 2-2.5m.
G1.24	Wattle	*Acacia spp*	Semi-mature	3	1.5	80					80	100	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	Group of 15-20 small Acacias within 2m of proposed fence alignment. Ranging in height from 3-4m.
G1.25	Sydney Golden Wattle	*Acacia longifolia*	Semi-mature	6	2.5	150					150	180	Good	Good	Low	5. Small/Young	Z1	2.0	1.6	Group of 3 Acacia's longifolia. DBH estimated.

Explanatory Notes

Tree Species - Common name followed by botanical name. Where species is unknown it is indicated with an *'spp'*.
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level.
Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - (DAB x 50) $^{0.42}$ x 0.64. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
Retention Value: Tree AZ, see appendix 3 for categories.

Appendix 3 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required).
   It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
   Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
   Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.
   An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.
   SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).

3. **Tree Age Class:** If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below;
   - Young/Newly planted: Young or recently planted tree.
   - Semi Mature: Up to 20% of the usual life expectancy for the species.
   - Early mature/Mature: Between 20%-80% of the usual life expectancy for the species.
   - Over mature: Over 80% of the usual life expectancy for the species.
   - Dead: Tree is dead or almost dead.

4. **Health/Physiological Condition:** Below are examples conditions used when assigning a category for tree health.

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

5. **Structural Condition:** Below are examples conditions used when assigning a category for structural condition.

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

6. **Amenity Value:** To determine the amenity value of a tree we assess a number of different factors, which include but are not limited to the information below.
   - The visibility of the tree to adjacent sites.
   - The relationship between the tree and the site.
   - Whether the tree is protected by any statuary conditions.
   - The habitat value of the tree.
   - Whether the tree is considered a noxious weed species.

   The amenity value is rated using one of the following values.
   - Very High
   - High
   - Moderate
   - Low
   - Very Low

7. **Safe Useful Life Expectancy (SULE), (Barrel, 2001):** A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8. **Root investigations:** The root investigations should identify roots greater than 30mm in diameter that are located along the edge of the structures footprint or in the location of footings. Root investigations must be carried out using non-invasive methods (manual excavations). Any excavations for the root investigations must carried out manually to avoid damaging the roots during excavations. Manual excavation may include the use of a high-pressure air/air knife, or a combination of high-pressure water and a vacuum device. When hand excavating carefully work around roots retaining as many as possible. Take care to not fray, wound, or cause damage to any roots during excavations as this may cause decay or infection from pathogens. It is essential that exposed roots are kept moist and the excavation back filled as soon as possible. The root investigations should be carried out by a qualified Arborist minimum AQF3. Once roots are exposed, a visual assessment can be carried out by a consulting Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree. A root map/report should be prepared identifying the findings of investigations, including photographs as supporting evidence in the report.

9. **Retention Value:** The system I have used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The table below provides a brief description of each category.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

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Glossary of Terms

Abiotic - Pertaining to non-living agents; e.g. environmental factors

Adventitious shoots - Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage - The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Bark - A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Branch:
• **Primary**. A first order branch arising from a stem
• **Lateral**. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
• **Sub-lateral**. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch collar - A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot - A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling - An irreversible deformation of a structure subjected to a bending load

Buttress zone - The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium - Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker - A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Compartmentalisation - The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compressive loading - Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition - An indication of the physiological condition of the tree. Where the term 'condition' is used in a report, it should not be taken as an indication of the stability of the tree

Crown/Canopy - The main foliage bearing section of the tree

Crown lifting - The removal of limbs and small branches to a specified height above ground level

Crown thinning - The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping - A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

DAB (Diameter Above Buttress) - Trunk diameter measured above the root buttress

Defect - In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Dieback - The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease - A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Dominance - In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud - An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction - In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height) - Stem diameter measured at a height of 1.4 metres or the nearest measurable point. Where measurement at a height of 1.4 metres is not possible, another height may be specified

Deadwood - Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Epicormic shoot - A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Flush-cut - A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root - A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Habit - The overall growth characteristics, shape of the tree and branch structure

Hazard beam - An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

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Heartwood/false-heartwood - The dead central wood that has become dysfunctional as part of the aging processes and being distinct from the sapwood

Heave - A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

Included bark (ingrown bark) - Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Lever arm - A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin - The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing - A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end- loading

Loading - A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Mycelium - The body of a fungus, consisting of branched filaments (hyphae)

Occlusion - The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen - A micro-organism which causes disease in another organism

Photosynthesis - The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Probability - A statistical measure of the likelihood that a particular event might occur

Pruning - The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial - In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Ring-barking - The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage

Root-collar - The transitional area between the stem/s and roots

Sapwood - Living xylem tissues

Soft-rot - A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Stem/s - Principle above-ground structural component(s) of a tree that supports its branches

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

SRZ (Structural Root Zone) - The area around the base of the tree required for the trees stability in the ground

Subsidence - In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Taper - In stems and branches, the degree of change in girth along a given length

Targets - In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping - In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Transpiration - The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

TPZ (Tree Protection Zone) - A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development

Understory - This layer consists of younger individuals of the dominant trees, together with smaller trees and shrubs which are adapted to grow under lower light conditions

Veteran tree - Tree that, by recognised criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem

Vigour - The expression of carbohydrate expenditure to growth (in trees)

White-rot - A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure - The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure - The force exerted by a wind on a particular object

Windthrow - The blowing over of a tree at its roots

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Lakemba

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Arboricultural Report

Site location:
Southwest Metro
Lakemba Station
Lakemba NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens &
Alex Kurath
Urban Arbor Pty Ltd
Date: 4 June 2024
Ref: 240604_SWMLS_AIA

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1. INTRODUCTION

1.1 Urban Arbor have been instructed by John Holland Laing O'Rourke to provide an Arboricultural Impact Assessment Report for trees located within the site and adjoining sites in relation to a proposed development.

1.2 Below is a list of all documents and information used to assist in preparing this report.

A) Lakemba Station Fencing Design Package No. 223, Metron T2M, Rev 00, 11 July 2022.
B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 211027-SWMPS-AIA, Rev C, 26 February 2021.
C) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 240504-SWMRC-AIA, Rev 6, 3 May 2024.
D) Arboricultural Report – SWMC Tree Report, Urban Arbor Pty Ltd, Ref: 240527-SWMC-AIA, Rev 28, 27 May 2024.

1.3 The trees were initially inspected on 16 December 2019 and 17 December 2020 by Bryce Claassens of Urban Arbor. Additional trees were inspected on 25 March 2024, 26 March 2024 and 27 May 2024 by Alex Kurath of Urban Arbor. Access was available to the subject site and the adjoining public areas only. All tree data contained in this report was collected during these site inspections. This report has been written by Bryce Claassens.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment of all significant trees located within the area identified for assessment by John Holland Laing O'Rourke. For the purpose of this report, a significant tree is a ‘Long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or relatively few main stems or trunks’.

2.1.2 Determine the trees estimated contribution years and remaining useful life expectancy and award the trees a retention value.

2.1.3 Determine trees that are to be removed or pruned based on information provided by John Holland Laing O'Rourke.

2.1.4 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

2.1.5 Specify generic tree protection measures for trees to be retained in accordance with AS4970-2009.

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3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspection was visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.6 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.7 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp*.

3.8 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Alteration of this report invalidates the entire report.

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4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

4.1.1 Tree common name
4.1.2 Tree botanical name
4.1.3 Tree age class
4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m) - millimetres.
4.1.5 DAB (Trunk diameter directly above the root buttress) – millimetres.
4.1.6 Estimated height – metres.
4.1.7 Estimated crown spread (diameter of crown) - metres.
4.1.8 Health
4.1.9 Structural condition
4.1.10 Amenity value
4.1.11 Estimated remaining contribution years (SULE)[1]
4.1.12 Retention value (Tree AZ)[2]
4.1.13 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a nylon mallet, compass, camera and a steel probe.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009).[4]

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

[1] Barrell, J. (2001), *'SULE: Its use and status in the new millennium' in Management of Mature Trees proceedings of the 4th NAAA Workshop*, Sydney, 2001. Barrell.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

[4] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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5. SITE LOCATION AND BRIEF DESCRIPTION

5.1 The site is located in the Canterbury Bankstown Local Government Area (LGA). The trees are subject to protection under the Canterbury Bankstown LEP 2023[5] and Canterbury Bankstown DCP 2023.[6] The site has been identified as a heritage item in the NSW Planning Portal Spatial Viewer.[7]

6. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection. Additional information about the TPZ is included in Appendix 3.

6.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula; (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

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5 *Canterbury Bankstown Local Environmental Plan 2023*, https://legislation.nsw.gov.au/view/html/inforce/current/epi-2023-0336, accessed 3 June 2024.

6 *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023, accessed 3 June 2024.

7 *NSW Planning Portal Spatial Viewer – Property Report,* https://www.planningportal.nsw.gov.au/propertyreports/f59479bd-df97-4e13-bc04-ecf54dd4eae4.pdf, accessed 3 June 2024.

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6.3 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

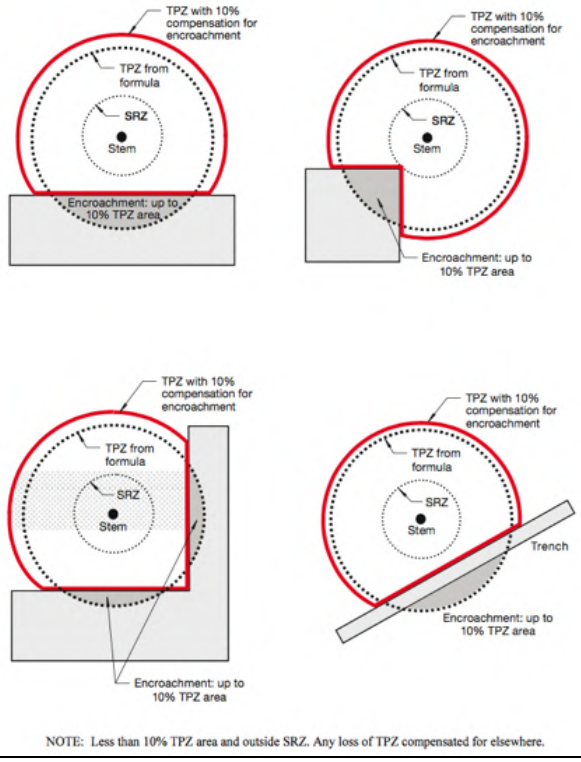


Image 1: Example minor TPZ encroachment from AS4970-2009.

6.4 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment (see Appendix 3 for more information in relation to root investigations).

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7. OBSERVATIONS

7.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in Appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.

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8. ASSESSMENT OF TREE IMPACTS BY AREA

8.1 The trees included in the following sections have been identified by John Holland Laing O'Rourke as being subject to impacts from development works. All trees to be retained should be protected in accordance with AS4970-2009, details of which are included in section 11. If there are any development works that have not been assessed and could potentially impact additional trees, the project arborist must assess the impact of the proposed works to the condition of the trees, determining the trees viability for retention.

8.2 **Lakemba**

8.2.1 **Lakemba Station (Railway Parade – North side):** The trees within this area are located adjacent to the proposed security fencing. Tree 2099, 2100 and 2101 will require canopy pruning to allow for the works. Tree 3582, 3610 and G1.15 are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
2099	*Lophostemon confertus*	5. Small/Young	Z1	2.4	1.8	Native	Low
2100	*Lophostemon confertus*	5. Small/Young	Z1	2.0	1.7	Native	Low
2101	*Lophostemon confertus*	1. Long	A1	2.4	1.8	Native	Medium
3582	*Morus nigra*	5. Small/Young	Z10	2.0	1.5	Exotic	Low
3610	*Washingtonia robusta*	1. Long	A1	2.5	NA	Exotic	Medium
G1.15	*Mixed spp*	5. Small/Young	Z1	2.0	1.7	Native	Medium

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Image 1: Looking East towards tree 2099, 2100 and 2101 showing the required canopy pruning (hatched yellow). The South side of the canopy of each tree is to be raised by 3-4m. The pruning will result in the removal of 10-15% of the live foliage area of each tree. The finished cut diameters must not exceed 100mm.



Image 2: Looking towards tree 3582. The tree is recommended for removal due to the proposed security fencing.

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Image 3: Looking towards tree 3610. The tree is recommended for removal due to the proposed security fencing.



Image 4: Looking towards G1.15. G1.15 is recommended for removal due to the proposed security fencing. G1.15 is a group of 4 trees.

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8.2.2 **Lakemba Station (The Boulevarde – South side):** The trees within this area are located adjacent to the proposed security fencing. Tree 3573, 3574, 3575, 3576, 3577, 3579, 3580, 3581, 3612, 3616 and 3617 will require canopy pruning to allow for the works. Tree 3611, 3613, 3614 and 3615 are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
3573	*Casuarina glauca*	1. Long	A1	5.4	2.5	Native	High
3574	*Casuarina glauca*	1. Long	A1	4.2	2.3	Native	Medium
3575	*Casuarina glauca*	1. Long	A1	4.8	2.4	Native	High
3576	*Eucalyptus scoparia*	2. Medium	Z10	4.4	2.3	Native	Medium
3577	*Casuarina glauca*	1. Long	A1	6.7	2.7	Native	High
3579	*Casuarina glauca*	5. Small/Young	Z10	2.4	1.8	Native	Low
3580	*Casuarina glauca*	1. Long	A1	4.7	2.4	Native	High
3581	*Lophostemon confertus*	1. Long	A1	12.6	3.6	Native	High
3611	*Triadica sebifera*	5. Small/Young	Z1	2.0	1.5	Exotic	Low
3612	*Triadica sebifera*	1. Long	A1	6.0	2.5	Exotic	Medium
3613	*Acacia longifolia*	5. Small/Young	Z1	2.0	1.6	Native	Low
3614	*Acacia longifolia*	5. Small/Young	Z1	2.0	1.5	Native	Low
3615	*Acacia longifolia*	3. Short	Z4	4.0	2.4	Native	Medium
3616	*Pyrus calleryana*	2. Medium	A1	3.6	2.1	Exotic	Medium
3617	*Lophostemon confertus*	2. Medium	A2	7.2	2.8	Native	High

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Image 5: Looking towards tree 3573 showing the required canopy pruning. The first order branch to the North is to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter will be approximately 150mm.



Image 6: Looking towards tree 3574 showing the required canopy pruning. The two second order branches to the North are to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter will be approximately 50mm for each branch.

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Image 7: Looking towards tree 3575 showing the required canopy pruning. The second order branch to the North is to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter will be approximately 50mm.



Image 8: Looking towards tree 3576 showing the required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4-5m. The pruning will result in the removal of approximately 10-15% of the live foliage area of the tree. The finished cut diameters must not exceed 100mm.

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Image 9: Looking towards tree 3577 showing the required canopy pruning. The first order branch to the North is to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter will be approximately 120mm.

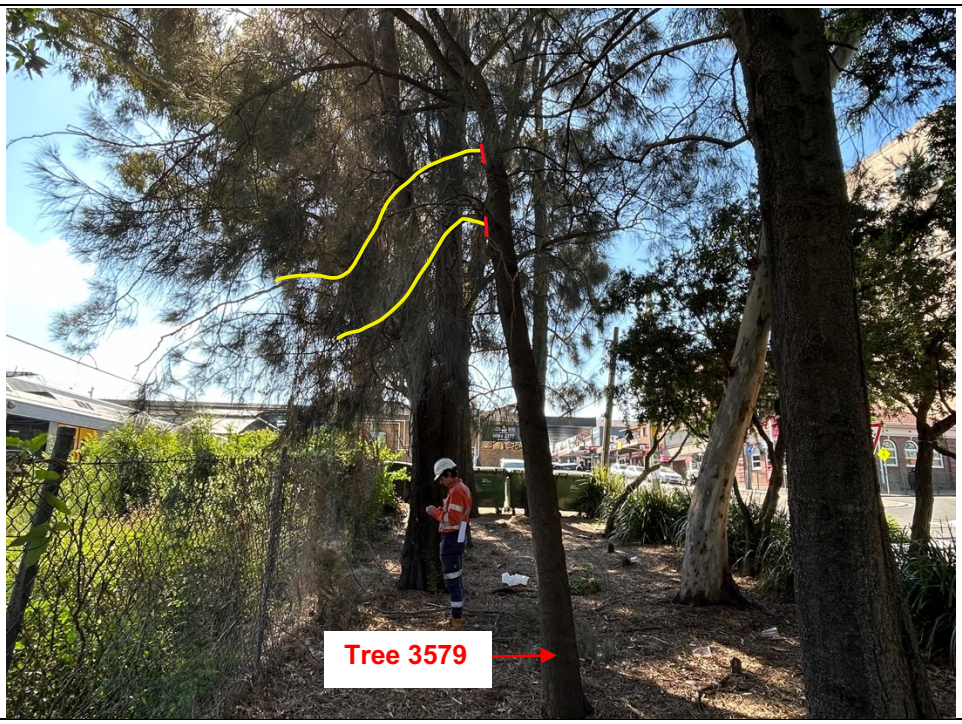


Image 10: Looking towards tree 3579 showing the required canopy pruning. The two second order branches to the North are to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter will be approximately 50mm for each branch.

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Image 11: Looking towards tree 3580 and 3581 showing the required canopy pruning (hatched yellow). The North side of the crown of each tree is to be raised by 4-5m. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameters must not exceed 120mm.



Image 12: Looking towards tree 3611 and 3612. Tree 3611 is recommended for removal due to the proposed security fencing. Canopy pruning will be required for tree 3612 to accommodate the fencing which will equate to the removal of 10-15% of the live foliage area. It was not possible to clearly identify branches to be pruned due to restricted access. Finished cut diameter should not exceed 150mm.

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Image 13: Looking towards tree 3613, 3614 and 3615. The trees are recommended for removal due to the proposed security fencing.



Image 14: Looking towards tree 3616 showing the required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m. The pruning will result in the removal of 10-15% of the live foliage area of the tree. The finished cut diameters must not exceed 150mm.

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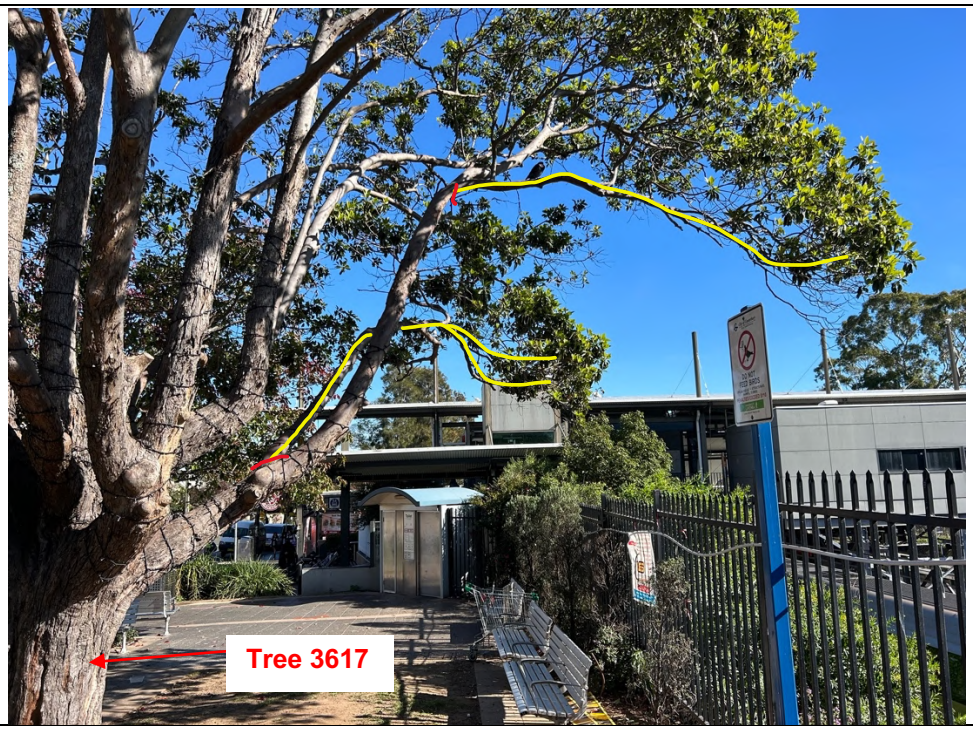


Image 15: Looking towards tree 3617 showing the required canopy pruning. The two second order branches to the North are to be removed. The pruning will result in the removal of less than 5% of the live foliage area of the tree. The finished cut diameters will be approximately 100mm for each branch.

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9. CONCLUSIONS

9.1 **Table 2:** Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees recommended to be removed	Installation of security fencing, construction works areas, vehicle access	3610	3582, 3611, 3613, 3614, 3615, G1.15	**6 trees & 1 group of trees**
Trees recommended to be retained requiring canopy pruning	Clearance for construction works i.e. vehicle access, security fencing, etc.	2101, 3573, 3574, 3575, 3577, 3580, 3581, 3612, 3616, 3617	2099, 2100, 3576, 3579	**14 trees**

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10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the subject site to twenty (20) trees and one (1) groups of trees that are located at selected areas around the development site.

10.2 Six (6) trees and one (1) group of trees have been recommended for removal within this report, including tree 3582, 3610, 3611, 3613, 3614, 3615 and G1.15. See section 9.1 Table 2 for recommended tree removal by retention values.

10.3 Fourteen (14) trees have been identified for canopy pruning to provide clearance for proposed construction works, including tree 2099, 2100, 2101, 3573, 3574, 3575, 3576, 3577, 3579, 3580, 3581, 3612, 3616 and 3617. Refer to section 8 for canopy pruning specifications. All pruning works must be completed in accordance with AS4373-2007 Pruning of Amenity Trees.

10.4 All trees to be retained that are located adjacent to the proposed works must be protected in accordance with AS4970-2009. Generic tree protection guidance has been provided in section 11. It is recommended that a detailed tree management plan (TMP) is prepared for the development in accordance with AS4970-2009 and developed in combination with the overall construction management plan for the site. The TMP should be prepared by a consulting Arborist with a minimum AQF level 5 qualification.

10.5 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report must also be made available to any contractor prior to works commencing and during any on site operations.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. Site inspection frequency must be agreed upon by the project arborist and principal contractor prior to the commencement of works.

11.5 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.5.1 Protective fencing: Site specific tree protection requirements are in section 11.5. Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

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11.5.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

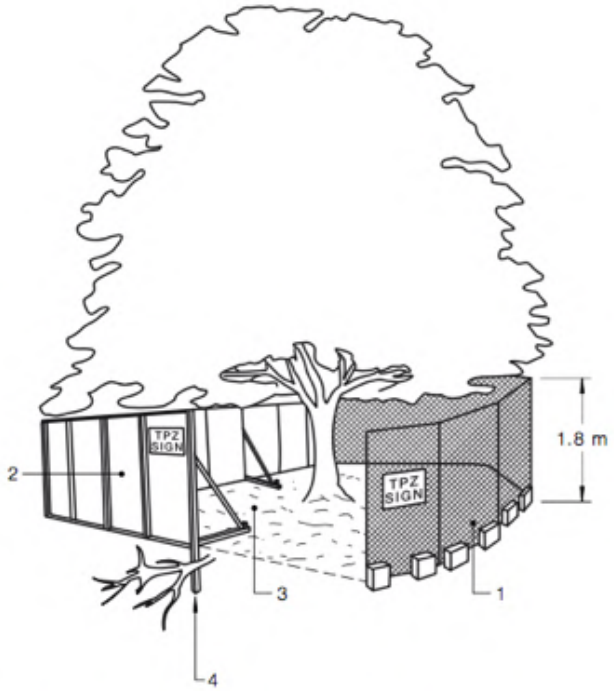
11.5.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.5.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

11.5.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

11.5.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

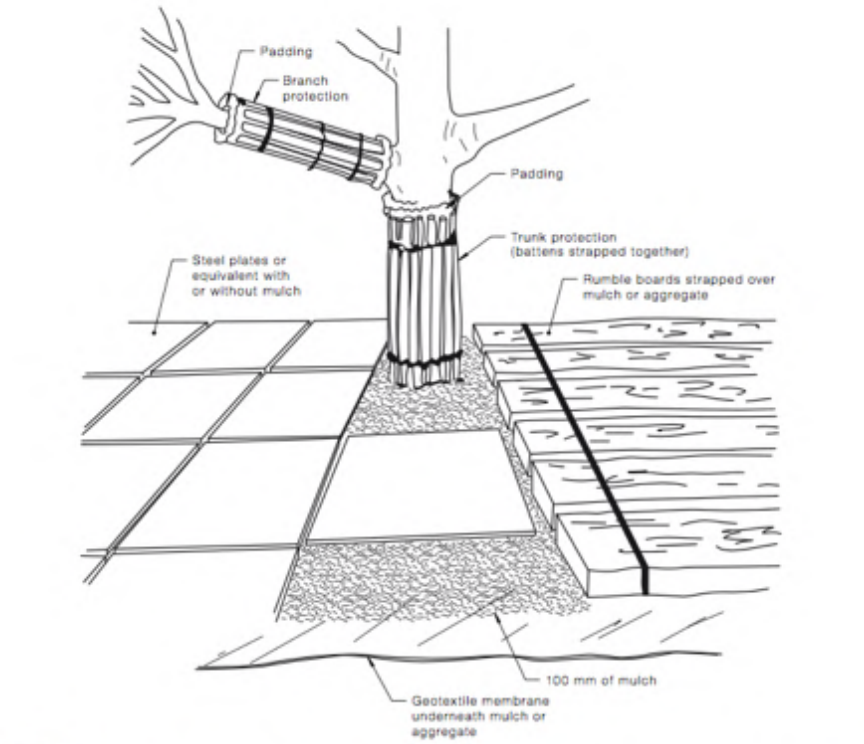
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LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[8] with example tree protection.

[8] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.



NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,[9] with example tree protection.

11.6 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refuelling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

[9] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

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11.7 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.8 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[10] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

11.9 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 100mm or increased by more than 100mm (300mm increase is acceptable if using a coarse free draining material) without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

[10] Council Of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpaths should be located outside the SRZ where possible.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.10 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 40mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.11 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.12 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.13 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

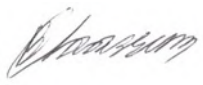
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- *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023
- *NSW Planning Portal Spatial Viewer,* https://www.planningportal.nsw.gov.au/spatialviewerhistoric/#/find-a-property/address

13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 2 - Tree Inspection Schedule
Appendix 3 - Further information of methodology



Bryce Claassens
Diploma of Arboriculture (AQF5)
Cert III Landscape Construction
Member Arboriculture Australia
Quantified Tree Risk Assessment (QTRA)
ISA Tree Risk Assessment Qualification (TRAQ)

Appendix 2 - Tree Inspection Schedule

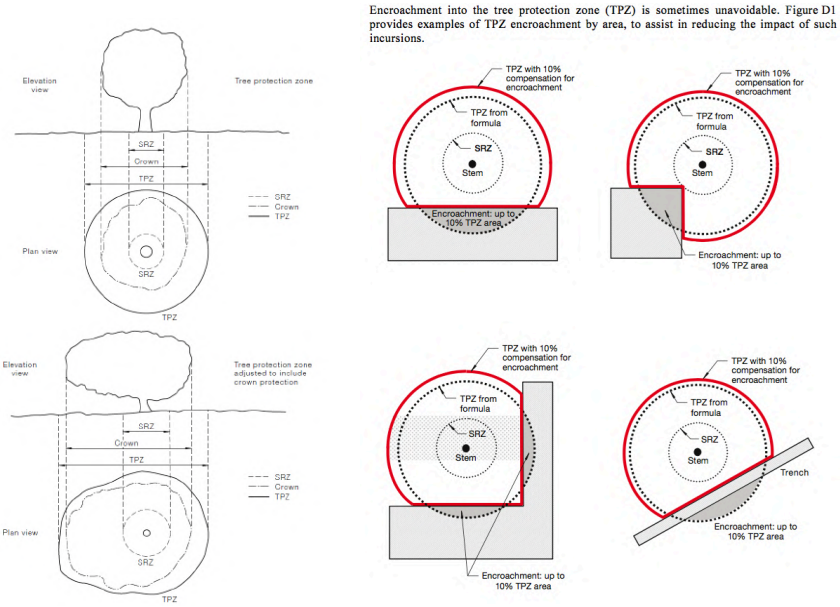
Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
2099	Brushbox	*Lophostemon confertus*	Semi-mature	5	2	200					200	230	Good	Good	Low	5. Small/Young	Z1	2.4	1.8	None.
2100	Brushbox	*Lophostemon confertus*	Semi-mature	5	2	170					170	200	Good	Good	Low	5. Small/Young	Z1	2.0	1.7	None.
2101	Brushbox	*Lophostemon confertus*	Semi-mature	6	2	200					200	220	Good	Good	Medium	1. Long	A1	2.4	1.8	None.
3573	Swamp Oak	*Casuarina glauca*	Mature	19	5	450					450	500	Good	Good	High	1. Long	A1	5.4	2.5	None.
3574	Swamp Oak	*Casuarina glauca*	Mature	16	4	350					350	420	Good	Good	Medium	1. Long	A1	4.2	2.3	None.
3575	Swamp Oak	*Casuarina glauca*	Mature	19	5	400					400	470	Good	Fair	High	1. Long	A1	4.8	2.4	Co-dominant stems.
3576	Wallangarra White Gum	*Eucalyptus scoparia*	Semi-mature	13	3	370					370	420	Fair	Fair	Medium	2. Medium	Z10	4.4	2.3	Asymmetric canopy to the North. Suppressed by adjacent trees.
3577	Swamp Oak	*Casuarina glauca*	Mature	21	6	560					560	640	Good	Fair	High	1. Long	A1	6.7	2.7	Co-dominant included stems at 2.5m.
3579	Swamp Oak	*Casuarina glauca*	Semi-mature	7	3	200					200	250	Fair	Fair	Low	5. Small/Young	Z10	2.4	1.8	Suppressed by adjacent trees.
3580	Swamp Oak	*Casuarina glauca*	Mature	20	5	390					390	450	Good	Fair	High	1. Long	A1	4.7	2.4	Co-dominant stems.
3581	Brushbox	*Lophostemon confertus*	Mature	17	8	1050					1050	1200	Good	Good	High	1. Long	A1	12.6	3.6	DBH measured at 1m
3582	Common or Black Mulberry	*Morus nigra*	Semi-mature	5	3.5	60	50	60			98	120	Good	Fair	Low	5. Small/Young	Z10	2.0	1.5	Suckers off old stump.
3610	Mexican Fan Palm	*Washingtonia robusta*	Semi-mature	8	1.5	350					350	NA	Good	Good	Medium	1. Long	A1	2.5	NA	None.
3611	Chinese Tallow	*Triadica sebifera*	Semi-mature	8	2	140					140	160	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	DBH estimated.
3612	Chinese Tallow	*Triadica sebifera*	Mature	11	6	400	300				500	500	Good	Good	Medium	1. Long	A1	6.0	2.5	DBH estimated.
3613	Sydney Golden Wattle	*Acacia longifolia*	Semi-mature	6	2	100	120				156	180	Good	Fair	Low	5. Small/Young	Z1	2.0	1.6	DBH estimated.
3614	Sydney Golden Wattle	*Acacia longifolia*	Semi-mature	6	2	140					140	160	Fair	Good	Low	5. Small/Young	Z1	2.0	1.5	DBH estimated.
3615	Sydney Golden Wattle	*Acacia longifolia*	Mature	6	4	160	180	140	140	120	334	450	Fair	Fair	Medium	3. Short	Z4	4.0	2.4	Multi stemmed at base with included unions. Early stages of decline.
3616	Callery Pear	*Pyrus calleryana*	Mature	6	4	300					300	350	Good	Fair	Medium	2. Medium	A1	3.6	2.1	Included branch unions.
3617	Brushbox	*Lophostemon confertus*	Mature	11	5	600					600	670	Good	Fair	High	2. Medium	A2	7.2	2.8	Large limbs removed in past with several areas of decay and cambium dieback.
G1.15	Mixed species	*Mixed species*	Semi-mature	8	3	150					150	200	Good	Good	Medium	5. Small/Young	Z1	2.0	1.7	Group of four trees along top edge of rail embankment. Trees consist of a 8m tall Syzygium australe, 8m tall Cinnamomum camphora, small Leptospermum spp and small Acacia spp.

Explanatory Notes

Tree Species - Common name followed by botanical name. Where species is unknown it is indicated with an '*spp*'.
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level.
Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - (DAB x 50) $^{0.42}$ x 0.64. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
Retention Value: Tree AZ, see appendix 3 for categories.

Appendix 3 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required).
   It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
   Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
   Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.
   An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.
   SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).

3. **Tree Age Class:** If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below;
   - Young/Newly planted: Young or recently planted tree.
   - Semi Mature: Up to 20% of the usual life expectancy for the species.
   - Early mature/Mature: Between 20%-80% of the usual life expectancy for the species.
   - Over mature: Over 80% of the usual life expectancy for the species.
   - Dead: Tree is dead or almost dead.

4. **Health/Physiological Condition:** Below are examples conditions used when assigning a category for tree health.

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

5. **Structural Condition:** Below are examples conditions used when assigning a category for structural condition.

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

6. **Amenity Value:** To determine the amenity value of a tree we assess a number of different factors, which include but are not limited to the information below.
   - The visibility of the tree to adjacent sites.
   - The relationship between the tree and the site.
   - Whether the tree is protected by any statuary conditions.
   - The habitat value of the tree.
   - Whether the tree is considered a noxious weed species.

   The amenity value is rated using one of the following values.
   - Very High
   - High
   - Moderate
   - Low
   - Very Low

7. **Safe Useful Life Expectancy (SULE), (Barrel, 2001):** A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8. **Root investigations:** The root investigations should identify roots greater than 30mm in diameter that are located along the edge of the structures footprint or in the location of footings. Root investigations must be carried out using non-invasive methods (manual excavations). Any excavations for the root investigations must carried out manually to avoid damaging the roots during excavations. Manual excavation may include the use of a high-pressure air/air knife, or a combination of high-pressure water and a vacuum device. When hand excavating carefully work around roots retaining as many as possible. Take care to not fray, wound, or cause damage to any roots during excavations as this may cause decay or infection from pathogens. It is essential that exposed roots are kept moist and the excavation back filled as soon as possible. The root investigations should be carried out by a qualified Arborist minimum AQF3. Once roots are exposed, a visual assessment can be carried out by a consulting Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree. A root map/report should be prepared identifying the findings of investigations, including photographs as supporting evidence in the report.

9. **Retention Value:** The system I have used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The table below provides a brief description of each category.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

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Glossary of Terms

Abiotic - Pertaining to non-living agents; e.g. environmental factors

Adventitious shoots - Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage - The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Bark - A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Branch:
• **Primary**. A first order branch arising from a stem
• **Lateral**. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
• **Sub-lateral**. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch collar - A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot - A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling - An irreversible deformation of a structure subjected to a bending load

Buttress zone - The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium - Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker - A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Compartmentalisation - The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compressive loading - Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition - An indication of the physiological condition of the tree. Where the term ‘condition’ is used in a report, it should not be taken as an indication of the stability of the tree

Crown/Canopy - The main foliage bearing section of the tree

Crown lifting - The removal of limbs and small branches to a specified height above ground level

Crown thinning - The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping - A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

DAB (Diameter Above Buttress) - Trunk diameter measured above the root buttress

Defect - In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Dieback - The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease - A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Dominance - In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud - An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction - In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height) - Stem diameter measured at a height of 1.4 metres or the nearest measurable point. Where measurement at a height of 1.4 metres is not possible, another height may be specified

Deadwood - Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Epicormic shoot - A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Flush-cut - A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root - A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Habit - The overall growth characteristics, shape of the tree and branch structure

Hazard beam - An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

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Heartwood/false-heartwood - The dead central wood that has become dysfunctional as part of the aging processes and being distinct from the sapwood

Heave - A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

Included bark (ingrown bark) - Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Lever arm - A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin - The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing - A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end- loading

Loading - A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Mycelium - The body of a fungus, consisting of branched filaments (hyphae)

Occlusion - The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen - A micro-organism which causes disease in another organism

Photosynthesis - The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Probability - A statistical measure of the likelihood that a particular event might occur

Pruning - The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial - In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Ring-barking - The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage

Root-collar - The transitional area between the stem/s and roots

Sapwood - Living xylem tissues

Soft-rot - A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Stem/s - Principle above-ground structural component(s) of a tree that supports its branches

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

SRZ (Structural Root Zone) - The area around the base of the tree required for the trees stability in the ground

Subsidence - In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Taper - In stems and branches, the degree of change in girth along a given length

Targets - In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping - In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Transpiration - The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

TPZ (Tree Protection Zone) - A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development

Understory - This layer consists of younger individuals of the dominant trees, together with smaller trees and shrubs which are adapted to grow under lower light conditions

Veteran tree - Tree that, by recognised criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem

Vigour - The expression of carbohydrate expenditure to growth (in trees)

White-rot - A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure - The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure - The force exerted by a wind on a particular object

Windthrow - The blowing over of a tree at its roots

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Wiley Park

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Arboricultural Report

Site location:
Southwest Metro
Wiley Park Station
Wiley Park NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens &
Alex Kurath
Urban Arbor Pty Ltd
Date: 4 June 2024
Ref: 240604_SWMWPS_AIA

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1. INTRODUCTION

1.1 Urban Arbor have been instructed by John Holland Laing O'Rourke to provide an Arboricultural Impact Assessment Report for trees located within the site and adjoining sites in relation to a proposed development.

1.2 Below is a list of all documents and information used to assist in preparing this report.

A) Wiley Park Station Fencing Design Package No. 233, Metron T2M, Rev 00.02, 23 November 2022.
B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 201223-SWMWP-AIA, Rev B, 23 December 2020.
C) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 240504-SWMRC-AIA, Rev 6, 3 May 2024.
D) Arboricultural Report – SWMC Tree Report, Urban Arbor Pty Ltd, Ref: 240527-SWMC-AIA, Rev 28, 27 May 2024.

1.3 The trees were initially inspected on 16 December 2019 and 17 December 2020 by Bryce Claassens of Urban Arbor. Additional trees were inspected on 25 March 2024, 26 March 2024 and 27 May 2024 by Alex Kurath of Urban Arbor. Access was available to the subject site and the adjoining public areas only. All tree data contained in this report was collected during these site inspections. This report has been written by Bryce Claassens.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment of all significant trees located within the area identified for assessment by John Holland Laing O'Rourke. For the purpose of this report, a significant tree is a ‘Long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or relatively few main stems or trunks’.

2.1.2 Determine the trees estimated contribution years and remaining useful life expectancy and award the trees a retention value.

2.1.3 Determine trees that are to be removed or pruned based on information provided by John Holland Laing O'Rourke.

2.1.4 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

2.1.5 Specify generic tree protection measures for trees to be retained in accordance with AS4970-2009.

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3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspection was visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.6 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.7 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp*.

3.8 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Alteration of this report invalidates the entire report.

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4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

4.1.1 Tree common name
4.1.2 Tree botanical name
4.1.3 Tree age class
4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m) - millimetres.
4.1.5 DAB (Trunk diameter directly above the root buttress) – millimetres.
4.1.6 Estimated height – metres.
4.1.7 Estimated crown spread (diameter of crown) - metres.
4.1.8 Health
4.1.9 Structural condition
4.1.10 Amenity value
4.1.11 Estimated remaining contribution years (SULE)[1]
4.1.12 Retention value (Tree AZ)[2]
4.1.13 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a nylon mallet, compass, camera and a steel probe.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009).[4]

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

[1] Barrell, J. (2001), *'SULE: Its use and status in the new millennium' in Management of Mature Trees proceedings of the 4th NAAA Workshop*, Sydney, 2001. Barrell.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

[4] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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5. SITE LOCATION AND BRIEF DESCRIPTION

5.1 The site is located in the Canterbury Bankstown Local Government Area (LGA). The trees are subject to protection under the Canterbury Bankstown LEP 2023[5] and Canterbury Bankstown DCP 2023.[6] The site has been identified as a heritage item in the NSW Planning Portal Spatial Viewer.[7]

6. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection. Additional information about the TPZ is included in Appendix 3.

6.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula; (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

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5 *Canterbury Bankstown Local Environmental Plan 2023*, https://legislation.nsw.gov.au/view/html/inforce/current/epi-2023-0336, accessed 4 June 2024.

6 *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023, accessed 4 June 2024.

7 *NSW Planning Portal Spatial Viewer – Property Report,* https://www.planningportal.nsw.gov.au/propertyreports/e87b78dc-34d6-40a2-acb0-32fcde2195c3.pdf, accessed 4 June 2024.

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6.3 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

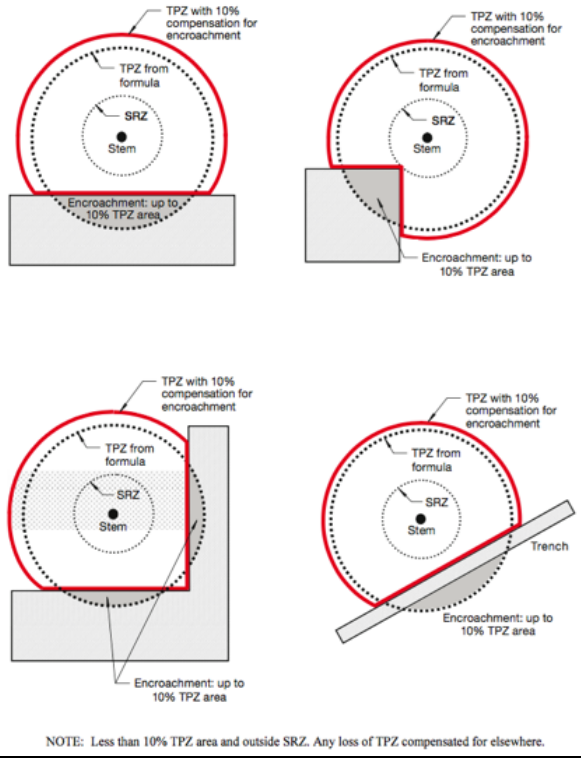


Image 1: Example minor TPZ encroachment from AS4970-2009.

6.4 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment (see Appendix 3 for more information in relation to root investigations).

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7. OBSERVATIONS

7.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in Appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.

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8. ASSESSMENT OF TREE IMPACTS BY AREA

8.1 The trees included in the following sections have been identified by John Holland Laing O'Rourke as being subject to impacts from development works. All trees to be retained should be protected in accordance with AS4970-2009, details of which are included in section 11. If there are any development works that have not been assessed and could potentially impact additional trees, the project arborist must assess the impact of the proposed works to the condition of the trees, determining the trees viability for retention.

8.2 **Wiley Park**

8.2.1 **Wiley Park Station (King Georges Road):** The trees within this area are located adjacent to the proposed security fencing. Tree 1073, 1995, 3584, 3585 and G1073 are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
1073	*Acacia longifolia*	2. Medium	A1	3.6	2.0	Native	Medium
1995	*Acacia longifolia*	4. Remove	Z4	4.9	2.4	Native	Medium
3584	*Grevillea spp*	5. Small/Young	Z1	2.0	1.5	Native	Low
3585	*Ulmus parvifolia*	5. Small/Young	Z1	2.0	1.5	Exotic	Low
G1073	*Acacia longifolia*	5. Small/Young	Z1	2.0	1.6	Native	Low

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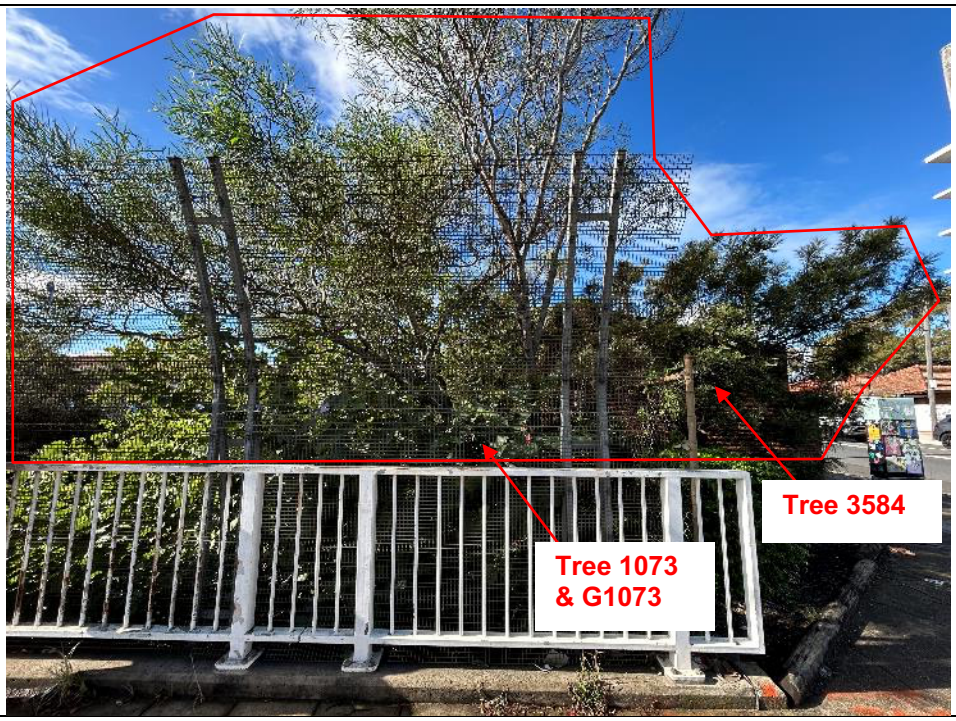


Image 1: Looking towards tree 1073 and G1073. The trees are recommended for removal due to the proposed security fencing. G1073 is a group of three trees.

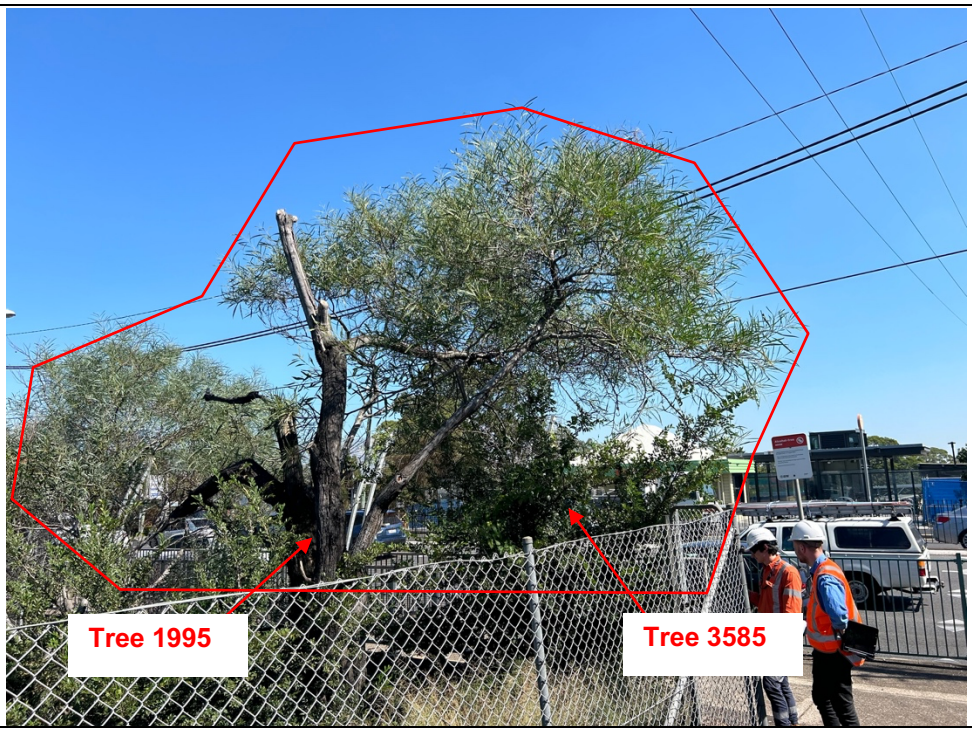


Image 2: Looking towards tree 1995 and 3585. The trees are recommended for removal due to the proposed security fencing.

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9. CONCLUSIONS

9.1 **Table 2:** Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees recommended to be removed	Installation of security fencing, construction works areas, vehicle access	1073	1995, 3584, 3585, G1073	**4 trees & 1 group of trees**

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10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the subject site to four (4) trees and one (1) groups of trees that are located at selected areas around the development site.

10.2 All four (4) trees and one (1) group of trees have been recommended for removal within this report, including tree 1073, 1995, 3584, 3585 and G1073. See section 9.1 Table 2 for recommended tree removal by retention values.

10.3 All trees to be retained that are located adjacent to the proposed works must be protected in accordance with AS4970-2009. Generic tree protection guidance has been provided in section 11. It is recommended that a detailed tree management plan (TMP) is prepared for the development in accordance with AS4970-2009 and developed in combination with the overall construction management plan for the site. The TMP should be prepared by a consulting Arborist with a minimum AQF level 5 qualification.

10.4 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report must also be made available to any contractor prior to works commencing and during any on site operations.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. Site inspection frequency must be agreed upon by the project arborist and principal contractor prior to the commencement of works.

11.5 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.5.1 Protective fencing: Site specific tree protection requirements are in section 11.5. Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

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11.5.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

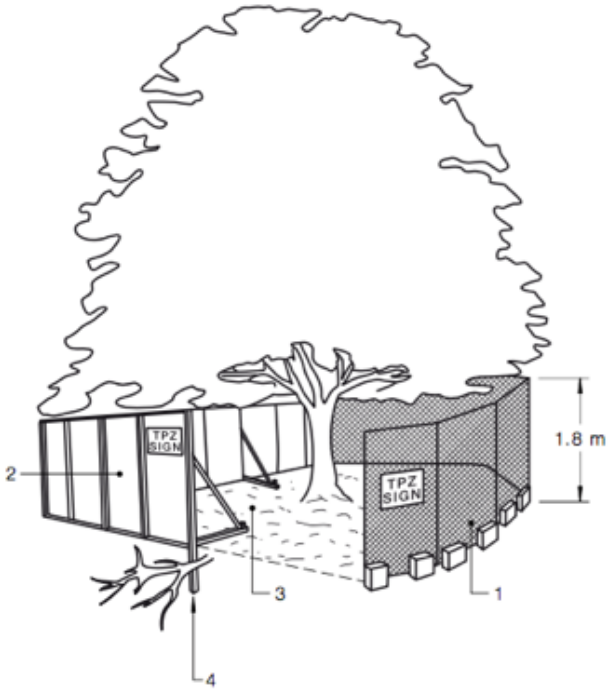
11.5.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.5.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

11.5.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

11.5.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

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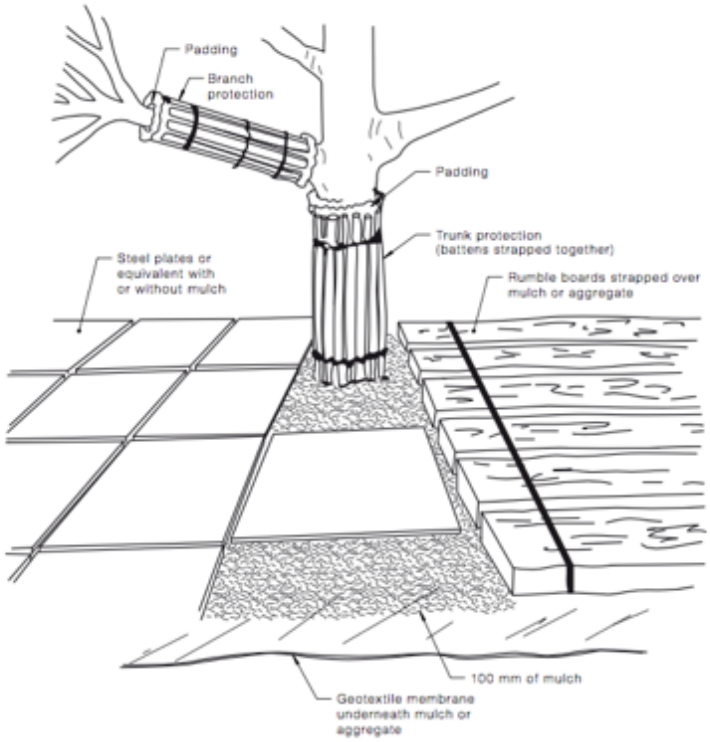


LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[8] with example tree protection.

[8] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.

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NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.

2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

An image from AS4970-2009,[9] with example tree protection.

11.6 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refuelling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

[9] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

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11.7 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.8 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[10] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

11.9 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 100mm or increased by more than 100mm (300mm increase is acceptable if using a coarse free draining material) without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

[10] Council Of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

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- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpaths should be located outside the SRZ where possible.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.10 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 40mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.11 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.12 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.13 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

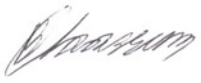
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- *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023
- *NSW Planning Portal Spatial Viewer,* https://www.planningportal.nsw.gov.au/spatialviewerhistoric/#/find-a-property/address

13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 2 - Tree Inspection Schedule
Appendix 3 - Further information of methodology



Bryce Claassens
Diploma of Arboriculture (AQF5)
Cert III Landscape Construction
Member Arboriculture Australia
Quantified Tree Risk Assessment (QTRA)
ISA Tree Risk Assessment Qualification (TRAQ)

Appendix 2 - Tree Inspection Schedule

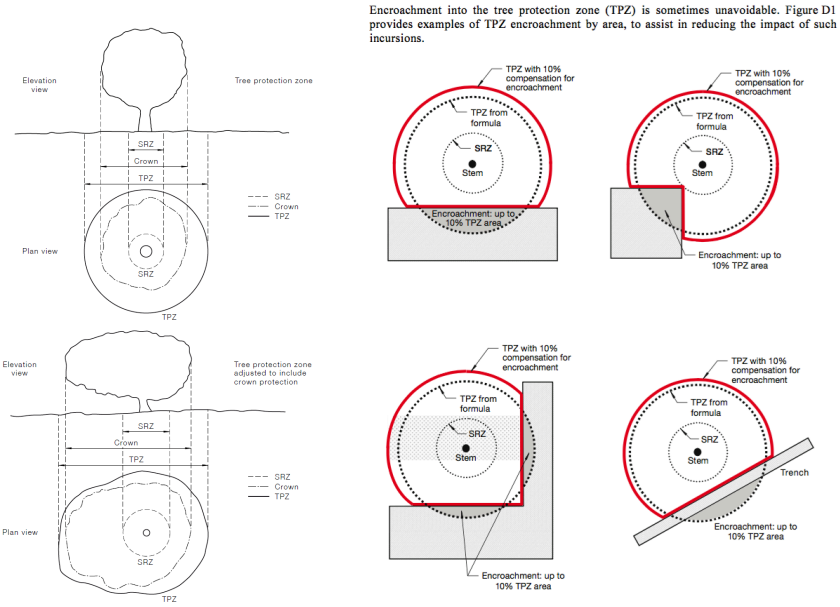
Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
1073	Sydney Golden Wattle	*Acacia longifolia*	Mature	8	3	300					300	300	Good	Fair	Medium	2. Medium	A1	3.6	2.0	Located within corridor. Directly adjacent to toilet block.
1995	Sydney Golden Wattle	*Acacia longifolia*	Mature	5	2	250	320				406	450	Poor	Fair	Medium	4. Remove	Z4	4.9	2.4	In advanced stages of decline.
3584	Grevillea 'Moonlight'	*Grevillea spp*	Semi-mature	4	2.5	130	70				148	150	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	None.
3585	Chinese Elm	*Ulmus parvifolia*	Young	4	2	60	50	60			98	100	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	DBH estimated.
G1073	Sydney Golden Wattle	*Acacia longifolia*	Semi-mature	6	2	150					150	180	Fair	Good	Low	5. Small/Young	Z1	2.0	1.6	Group of three trees.

Explanatory Notes

Tree Species - Common name followed by botanical name. Where species is unknown it is indicated with an '*spp*'.
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level.
Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - $(DAB \times 50)^{0.42} \times 0.64$. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
Retention Value: Tree AZ, see appendix 3 for categories.

Appendix 3 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required).
It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.
An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.
SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).

3. **Tree Age Class:** If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below;
    - Young/Newly planted: Young or recently planted tree.
    - Semi Mature: Up to 20% of the usual life expectancy for the species.
    - Early mature/Mature: Between 20%-80% of the usual life expectancy for the species.
    - Over mature: Over 80% of the usual life expectancy for the species.
    - Dead: Tree is dead or almost dead.

4. **Health/Physiological Condition:** Below are examples conditions used when assigning a category for tree health.

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

5. **Structural Condition:** Below are examples conditions used when assigning a category for structural condition.

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

6. **Amenity Value:** To determine the amenity value of a tree we assess a number of different factors, which include but are not limited to the information below.
   - The visibility of the tree to adjacent sites.
   - The relationship between the tree and the site.
   - Whether the tree is protected by any statuary conditions.
   - The habitat value of the tree.
   - Whether the tree is considered a noxious weed species.

   The amenity value is rated using one of the following values.
   - Very High
   - High
   - Moderate
   - Low
   - Very Low

7. **Safe Useful Life Expectancy (SULE), (Barrel, 2001):** A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8. **Root investigations:** The root investigations should identify roots greater than 30mm in diameter that are located along the edge of the structures footprint or in the location of footings. Root investigations must be carried out using non-invasive methods (manual excavations). Any excavations for the root investigations must carried out manually to avoid damaging the roots during excavations. Manual excavation may include the use of a high-pressure air/air knife, or a combination of high-pressure water and a vacuum device. When hand excavating carefully work around roots retaining as many as possible. Take care to not fray, wound, or cause damage to any roots during excavations as this may cause decay or infection from pathogens. It is essential that exposed roots are kept moist and the excavation back filled as soon as possible. The root investigations should be carried out by a qualified Arborist minimum AQF3. Once roots are exposed, a visual assessment can be carried out by a consulting Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree. A root map/report should be prepared identifying the findings of investigations, including photographs as supporting evidence in the report.

9. **Retention Value:** The system I have used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The table below provides a brief description of each category.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission

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Glossary of Terms

Abiotic - Pertaining to non-living agents; e.g. environmental factors

Adventitious shoots - Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage - The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Bark - A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Branch:
• **Primary**. A first order branch arising from a stem
• **Lateral**. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
• **Sub-lateral**. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch collar - A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot - A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling - An irreversible deformation of a structure subjected to a bending load

Buttress zone - The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium - Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker - A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Compartmentalisation - The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compressive loading - Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition - An indication of the physiological condition of the tree. Where the term ‘condition’ is used in a report, it should not be taken as an indication of the stability of the tree

Crown/Canopy - The main foliage bearing section of the tree

Crown lifting - The removal of limbs and small branches to a specified height above ground level

Crown thinning - The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping - A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

DAB (Diameter Above Buttress) - Trunk diameter measured above the root buttress

Defect - In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Dieback - The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease - A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Dominance - In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud - An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction - In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height) - Stem diameter measured at a height of 1.4 metres or the nearest measurable point. Where measurement at a height of 1.4 metres is not possible, another height may be specified

Deadwood - Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Epicormic shoot - A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Flush-cut - A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root - A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Habit - The overall growth characteristics, shape of the tree and branch structure

Hazard beam - An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

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Heartwood/false-heartwood - The dead central wood that has become dysfunctional as part of the aging processes and being distinct from the sapwood

Heave - A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

Included bark (ingrown bark) - Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Lever arm - A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin - The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing - A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end- loading

Loading - A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Mycelium - The body of a fungus, consisting of branched filaments (hyphae)

Occlusion - The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen - A micro-organism which causes disease in another organism

Photosynthesis - The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Probability - A statistical measure of the likelihood that a particular event might occur

Pruning - The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial - In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Ring-barking - The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage

Root-collar - The transitional area between the stem/s and roots

Sapwood - Living xylem tissues

Soft-rot - A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Stem/s - Principle above-ground structural component(s) of a tree that supports its branches

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

SRZ (Structural Root Zone) - The area around the base of the tree required for the trees stability in the ground

Subsidence - In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Taper - In stems and branches, the degree of change in girth along a given length

Targets - In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping - In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Transpiration - The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

TPZ (Tree Protection Zone) - A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development

Understory - This layer consists of younger individuals of the dominant trees, together with smaller trees and shrubs which are adapted to grow under lower light conditions

Veteran tree - Tree that, by recognised criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem

Vigour - The expression of carbohydrate expenditure to growth (in trees)

White-rot - A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure - The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure - The force exerted by a wind on a particular object

Windthrow - The blowing over of a tree at its roots

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Punchbowl

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Arboricultural Report

Site location:
Southwest Metro
Punchbowl Station
Punchbowl NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens &
Alex Kurath
Urban Arbor Pty Ltd
Date: 5 June 2024
Ref: 240605_SWMPS_AIA
Rev: 1

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1. INTRODUCTION

1.1 Urban Arbor have been instructed by John Holland Laing O'Rourke to provide an Arboricultural Impact Assessment Report for trees located within the site and adjoining sites in relation to a proposed development.

1.2 Below is a list of all documents and information provided to Urban Arbor to assist in preparing this report.

A) Punchbowl Station Fencing Design Package No. 243, Metron T2M, Rev 00, 5 August 2022.
B) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 211027-SWMPS-AIA, Rev C, 27 October 2021.
C) Arboricultural Impact Assessment Report, Urban Arbor Pty Ltd, Ref: 240504-SWMRC-AIA, Rev 6, 3 May 2024.
D) Arboricultural Report – SWMC Tree Report, Urban Arbor Pty Ltd, Ref: 240527-SWMC-AIA, Rev 28, 27 May 2024.

1.3 The trees were initially inspected on 16 December 2019 and 17 December 2020 by Bryce Claassens of Urban Arbor. Additional trees were inspected on 25 March 2024, 26 March 2024 and 27 May 2024 by Alex Kurath of Urban Arbor. Access was available to the subject site and the adjoining public areas only. All tree data contained in this report was collected during these site inspections. This report has been written by Bryce Claassens.

2. SCOPE OF THE REPORT

2.1 This report has been undertaken to meet the following objectives.

2.1.1 Conduct a visual assessment of all significant trees located within the area identified for assessment by John Holland Laing O'Rourke. For the purpose of this report, a significant tree is a ‘Long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or relatively few main stems or trunks’.

2.1.2 Determine the trees estimated contribution years and remaining useful life expectancy and award the trees a retention value.

2.1.3 Determine trees that are to be removed or pruned based on information provided by John Holland Laing O'Rourke.

2.1.4 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

2.1.5 Specify generic tree protection measures for trees to be retained in accordance with AS4970-2009.

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3. LIMITATIONS

3.1 The observations and recommendations are based on the site inspections identified in section 1 only. The findings of this report are based on the observations and site conditions at the time of inspection.

3.2 All of the observations were carried out from ground level. The accuracy of the assessment of the subject trees structural condition and health is limited to the visibility of the tree at the time of inspection.

3.3 The tree inspection was visual from ground level only. No soil or tissue testing was carried out as part of the tree inspection. None of the surrounding surfaces adjacent to trees were lifted or removed during the tree inspections.

3.4 Root decay can sometimes be present with no visual indication above ground. It is also impossible to know the extent of any root damage caused by mechanical damage such as underground root cutting during the installation of services without undertaking detailed root investigation. Any form of tree failure due to these activities is beyond the scope of this assessment.

3.5 While an assessment of the subject trees estimated useful life expectancy is included in this report, no specific tree risk assessment has been undertaken for any of trees at the site.

3.6 The report reflects the subject tree(s) as found on the day of inspection. Any changes to the growing environment of the subject tree, or tree management works beyond those recommended in this report may alter the findings of the report. There is no warranty, expressed or implied, that problems or deficiencies relating to the subject tree, or subject site may not arise in the future.

3.7 Tree identification is based on accessible visual characteristics at the time of inspection. As key identifying features are not always available the accuracy of identification is not guaranteed. Where tree species is unknown, it is indicated with an *spp*.

3.8 Urban Arbor neither guarantees, nor is it responsible for, the accuracy of information provided by others that is contained within this report.

3.9 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.

3.10 Alteration of this report invalidates the entire report.

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4. METHODOLOGY

4.1 The following information was collected during the assessment of the subject tree(s).

4.1.1 Tree common name
4.1.2 Tree botanical name
4.1.3 Tree age class
4.1.4 DBH (Trunk/Stem diameter at breast height/1.4m) - millimetres.
4.1.5 DAB (Trunk diameter directly above the root buttress) – millimetres.
4.1.6 Estimated height – metres.
4.1.7 Estimated crown spread (diameter of crown) - metres.
4.1.8 Health
4.1.9 Structural condition
4.1.10 Amenity value
4.1.11 Estimated remaining contribution years (SULE)[1]
4.1.12 Retention value (Tree AZ)[2]
4.1.13 Notes/comments

4.2 An assessment of the trees condition was made using the visual tree assessment (VTA) model (Mattheck & Breloer, 1994).[3]

4.3 Tree diameter was measured using a DBH tape or in some cases estimated. Tree height and tree canopy spread was measured with a clinometer or in some cases estimated. All other measurements were estimations unless otherwise stated. The other tools used during the assessment were a nylon mallet, compass, camera and a steel probe.

4.4 All DBH measurements, tree protection zones, and structural root zones were calculated in accordance with methods set out in AS4970 Protection of trees on development sites (2009).[4]

4.5 Details of how the observations in this report have been assessed are listed in the appendices.

[1] Barrell, J. (2001), *'SULE: Its use and status in the new millennium' in Management of Mature Trees proceedings of the 4th NAAA Workshop*, Sydney, 2001. Barrell.

[2] Barrell Tree Consultancy, *Tree AZ version 10.10-ANZ*, http://www.treeaz.com/.

[3] Mattheck, C. & Breloer, H., *The body language of trees - A handbook for failure analysis*, The Stationary Office, London, England (1994).

[4] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009).

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5. SITE LOCATION AND BRIEF DESCRIPTION

5.1 The site is located in the Canterbury Bankstown Local Government Area (LGA). The trees are subject to protection under the Canterbury Bankstown LEP 2023[5] and Canterbury Bankstown DCP 2023.[6] The site has been identified as a heritage item in the NSW Planning Portal Spatial Viewer.[7]

6. GENERAL INFORMATION IN RELATION TO PROTECTING TREES ON DEVELOPMENT SITES

6.1 **Tree protection zone (TPZ):** The TPZ is the principle means of protecting trees on development sites and is an area required to maintain the viability of trees during development. It is commonly observed that tree roots will extend significantly further than the indicative TPZ, however the TPZ is an area identified in AS4970-2009 to be the area where root loss or disturbance will generally impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The TPZ also incorporates the SRZ (see below for more information about the SRZ). The TPZ is calculated by multiplying the DBH by twelve, with the exception of palms, other monocots, cycads and tree ferns, the TPZ of which have been calculated at one metre outside the crown projection. Additional information about the TPZ is included in Appendix 3.

6.2 **Structural Root Zone (SRZ):** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always needs to be maintained to preserve a viable tree. The SRZ is calculated using the following formula; (DAB x 50) $^{0.42}$ x 0.64. There are several factors that can vary the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally, work within the SRZ should be avoided. Soil level changes should also generally be avoided inside the SRZ of trees to be retained. Palms, other monocots, cycads and tree ferns do not have an SRZ. See the appendices for more information about the SRZ.

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5 *Canterbury Bankstown Local Environmental Plan 2023*, https://legislation.nsw.gov.au/view/html/inforce/current/epi-2023-0336, accessed 31 May 2024.

6 *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023, accessed 31 May 2024.

7 *NSW Planning Portal Spatial Viewer – Property Report,* https://www.planningportal.nsw.gov.au/propertyreports/1472544f-6476-4aed-980a-714a56d30312.pdf, accessed 31 May 2024.

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6.3 **Minor encroachment into TPZ:** Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.

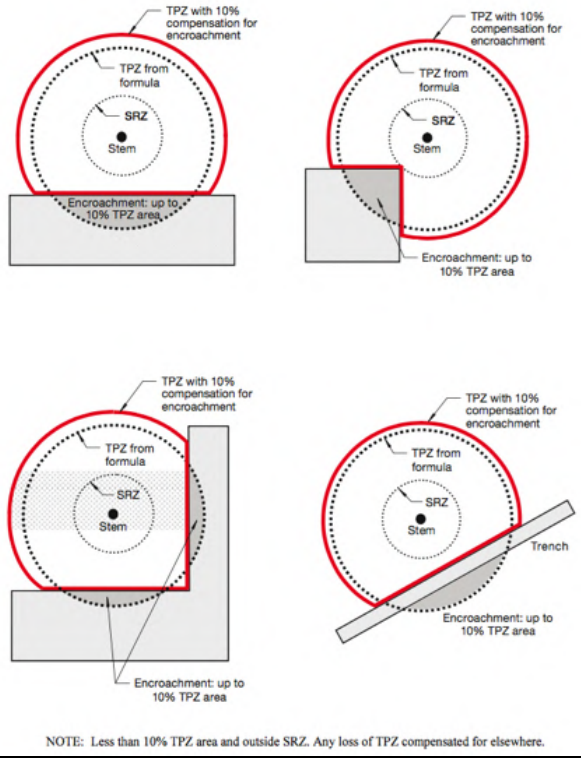


Image 1: Example minor TPZ encroachment from AS4970-2009.

6.4 **Major encroachment into TPZ:** Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted. Root investigations may be required to identify roots that will be impacted during major TPZ encroachment (see Appendix 3 for more information in relation to root investigations).

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7. OBSERVATIONS

7.1 **Tree information:** Details of each individual tree assessed, including the observations taken during the site inspection can be found in the tree inspection schedule in Appendix 2, where the indicative tree protection zone (TPZ) for the subject trees has been calculated. The TPZ and SRZ should be measured in radius from the centre of the trunk. The subject trees have been awarded a retention value based on the observations during the site inspection. The system used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The Tree AZ categories sheet (Barrell Tree Consultancy) has been included in the appendices to assist with understanding the retention values. The retention value that has been allocated to the subject trees in this report is not definitive and should only be used as a guideline. This information has been summarised below.

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8. ASSESSMENT OF TREE IMPACTS BY AREA

8.1 The trees included in the following sections have been identified by John Holland Laing O'Rourke as being subject to impacts from development works. All trees to be retained should be protected in accordance with AS4970-2009, details of which are included in section 11. If there are any development works that have not been assessed and could potentially impact additional trees, the project arborist must assess the impact of the proposed works to the condition of the trees, determining the trees viability for retention.

8.2 **Punchbowl**

8.2.1 **Punchbowl Carpark (city side down track):** The trees within this area are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
3526	*Acacia saligna*	3. Short	Z1	2.4	1.8	Native	Medium
3527	*Acacia saligna*	3. Short	Z1	2.4	1.8	Native	Medium
3528	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3529	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3530	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3531	*Phoenix roebelenii*	5. Small/Young	Z1	2.0	NA	Exotic	Low
3544	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3545	*Phoenix roebelenii*	5. Small/Young	Z1	2.0	NA	Exotic	Low
3546	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3547	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3548	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3549	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3550	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium
3551	*Alnus jorullensis*	2. Medium	A1	2.4	1.8	Exotic	Medium

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Image 1: Looking towards tree 3526, 3527 and 3528. The trees are recommended for removal due to the proposed security fencing.



Image 2: Looking towards tree 3529 and 3530. The trees are recommended for removal due to the proposed security fencing.

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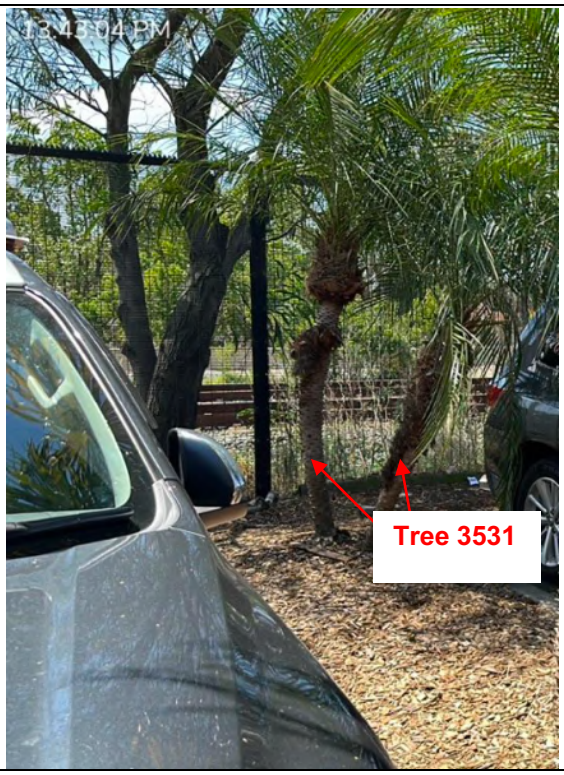


Image 3: Looking towards tree 3531. The tree is recommended for removal due to the proposed security fencing.



Image 4: Looking towards tree 3544 and 3545. The trees are recommended for removal due to the proposed security fencing.

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Image 5: Looking towards tree 3546, 3547, 3548 and 3549. The trees are recommended for removal due to the proposed security fencing.

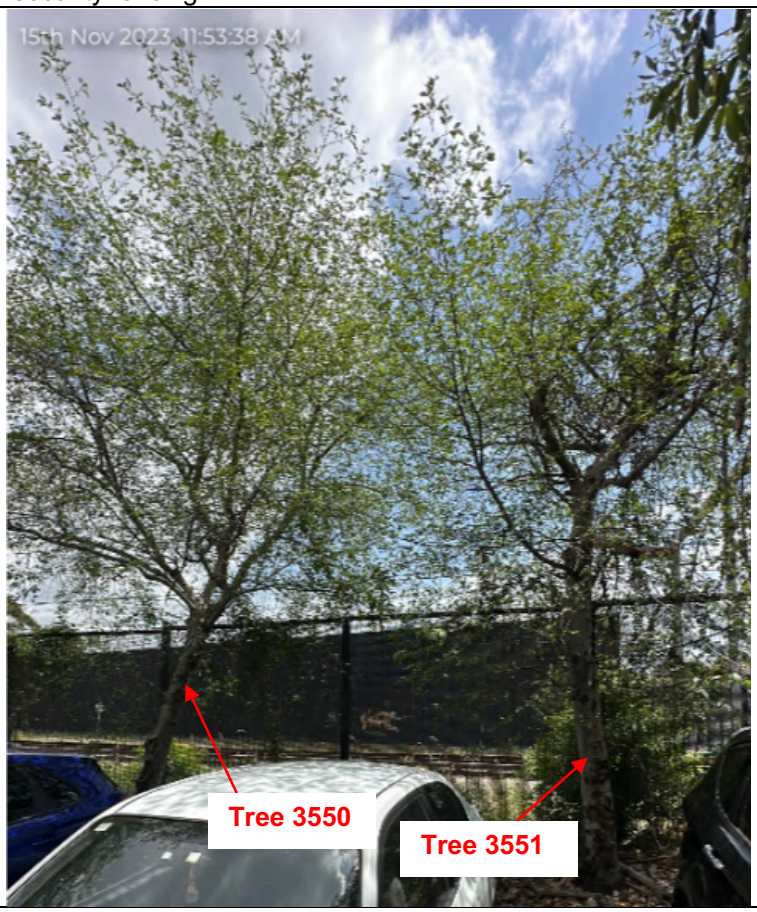


Image 6: Looking towards tree 3550 and 3551. The trees are recommended for removal due to the proposed security fencing.

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8.2.2 **Punchbowl Station (North Side):** The trees within this area are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
722	*Corymbia maculata*	1. Long	A1	4.8	2.4	Native	High
726	*Lophostemon confertus*	1. Long	A1	5.4	2.5	Native	Medium
727	*Corymbia citriodora*	3. Short	Z10	3.9	2.4	Native	Medium
737	*Callistemon viminalis*	1. Long	A1	3.6	2.1	Native	Medium
738	*Callistemon viminalis*	1. Long	A1	3.6	2.1	Native	Medium
739	*Callistemon viminalis*	1. Long	A1	4.2	2.3	Native	Medium



Image 7: Looking North towards tree 722 from the station platform. The tree is recommended for removal due to the proposed security fencing.

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Image 8: Looking towards tree 726 The tree is recommended for removal due to the proposed security fencing.



Image 9: Looking towards tree 727 The tree is recommended for removal due to the proposed security fencing.

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Image 10: Looking towards tree 737, 738 and 739. The trees are recommended for removal due to the proposed security fencing.

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8.2.3 **Breust Place Punchbowl Station:** The trees within this area are located adjacent to the proposed security fencing. Tree 3377, 3605, 3609 and G1.21 will require canopy pruning to allow for the works. Tree 3378, 3379, 3380, 3606, G1.19 and G1.20 are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
3377	*Melaleuca bracteata 'Revolution Gold'*	2. Medium	A1	4.9	2.4	Native	Medium
3378	*Melaleuca bracteata 'Revolution Gold'*	5. Small/Young	Z1	2.4	1.8	Native	Low
3379	*Melaleuca bracteata 'Revolution Gold'*	5. Small/Young	Z1	2.0	1.5	Native	Low
3380	*Melaleuca bracteata 'Revolution Gold'*	5. Small/Young	Z1	2.2	1.8	Native	Low
3605	*Casuarina glauca*	1. Long	A1	4.1	2.1	Native	Medium
3606	*Olea europaea subsp. cuspidata*	5. Small/Young	Z3	2.0	1.6	Exotic	Low
3609	*Eucalyptus microcorys*	1. Long	A1	6.0	2.6	Native	High
G1.19	*Casuarina glauca*	5. Small/Young	Z1	2.0	1.5	Native	Low
G1.20	*Casuarina glauca*	5. Small/Young	Z1	2.0	1.5	Native	Low
G1.21	*Casuarina glauca*	1. Long	A1	2.2	1.8	Native	Medium

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Image 11: Showing the general location of tree 3377, 3378, 3379 and 3380.



Image 12: Looking East towards tree 3377 showing the required canopy pruning (hatched yellow). The South side of the canopy of is to be reduced. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter must not exceed 50mm.

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Image 13: Looking towards tree 3378, 3379 and 3380. The trees are recommended for removal due to the proposed security fencing.

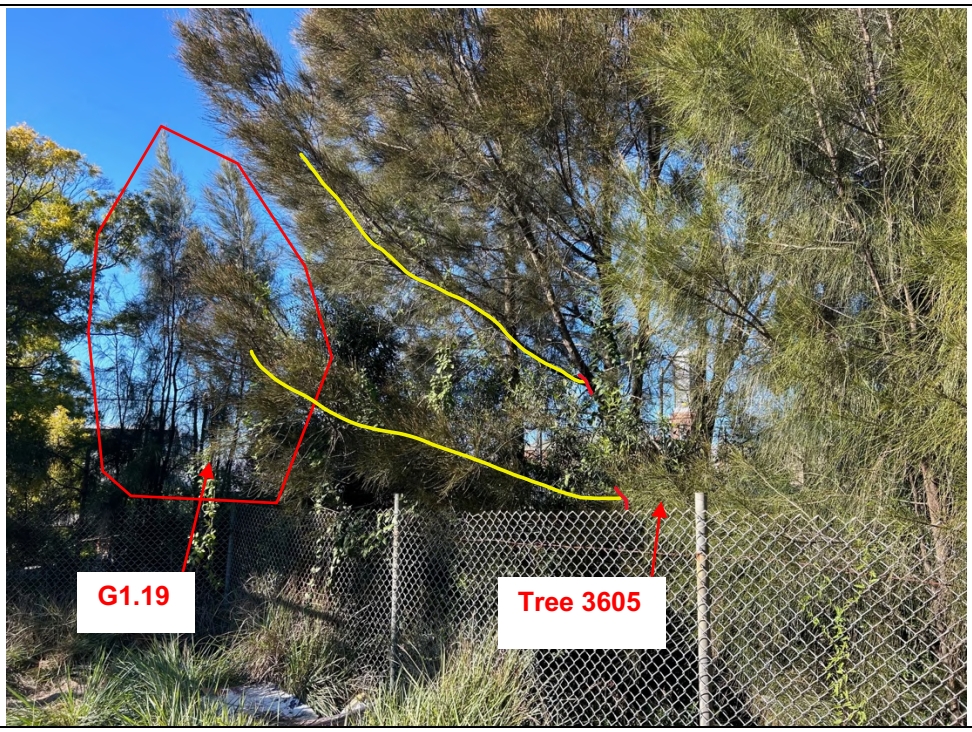


Image 14: Looking towards tree 3605 showing the required canopy pruning. The two second order branches to the North are to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter will be approximately 80mm for each branch. Also showing G1.19, which is a group of 4 trees recommended for removal due to the proposed security fencing.

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Image 15: Looking towards G1.20, which is a group of 7 trees recommended for removal due to the proposed security fencing.



Image 16: Looking towards 3606, which is recommended for removal due to the proposed security fencing. Tree 3606 is a weed species.

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Image 17: Looking towards G1.21 showing the required canopy pruning (hatched yellow). The North side of the canopy of each tree is to be reduced to provide 2m clearance. The pruning will result in the removal of up to 15% of the live foliage area of each tree. The finished cut diameter must not exceed 60mm.



Image 18: Looking towards tree 3609 showing the required canopy pruning. The two first order branches to the North are to be removed. The pruning will result in the removal of less than 10% of the live foliage area of the tree. The finished cut diameter will be approximately 140mm for each branch.

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8.2.4 **Punchbowl Station Urunga Parade:** The trees within this area are located within the footprint or directly adjacent to the proposed security fencing and the removal of the trees is required. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
3366	*Eucalyptus botryoides*	1. Long	A1	10.0	3.3	Native	Very High
3367	*Cinnamomum camphora*	5. Small/Young	Z3	2.3	2.4	Exotic	Low
3368	*Cinnamomum camphora*	5. Small/Young	Z3	2.8	2.2	Exotic	Low
3369	*Cinnamomum camphora*	2. Medium	Z3	3.0	2.0	Exotic	Low
3370	*Cinnamomum camphora*	5. Small/Young	Z3	2.0	1.6	Exotic	Low
3371	*Eucalyptus botryoides*	1. Long	A1	5.3	2.5	Native	High
3372	*Cinnamomum camphora*	5. Small/Young	Z3	4.8	2.3	Exotic	Low
3373	*Populus nigra 'Italica'*	3. Short	Z3	5.9	2.6	Exotic	Low
3374	*Populus nigra 'Italica'*	3. Short	Z3	4.0	2.3	Exotic	Low
3583	*Angophora costata*	2. Medium	A2	5.0	2.5	Native	High
G3366	*Acacia longifolia*	5. Small/Young	Z1	2.0	1.5	Native	Low

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Image 19: Looking towards tree 3366, 3367, 3368, 3369, 3370, 3371, 3372, 3372 and 3374. The trees are recommended for removal due to the proposed security fencing.

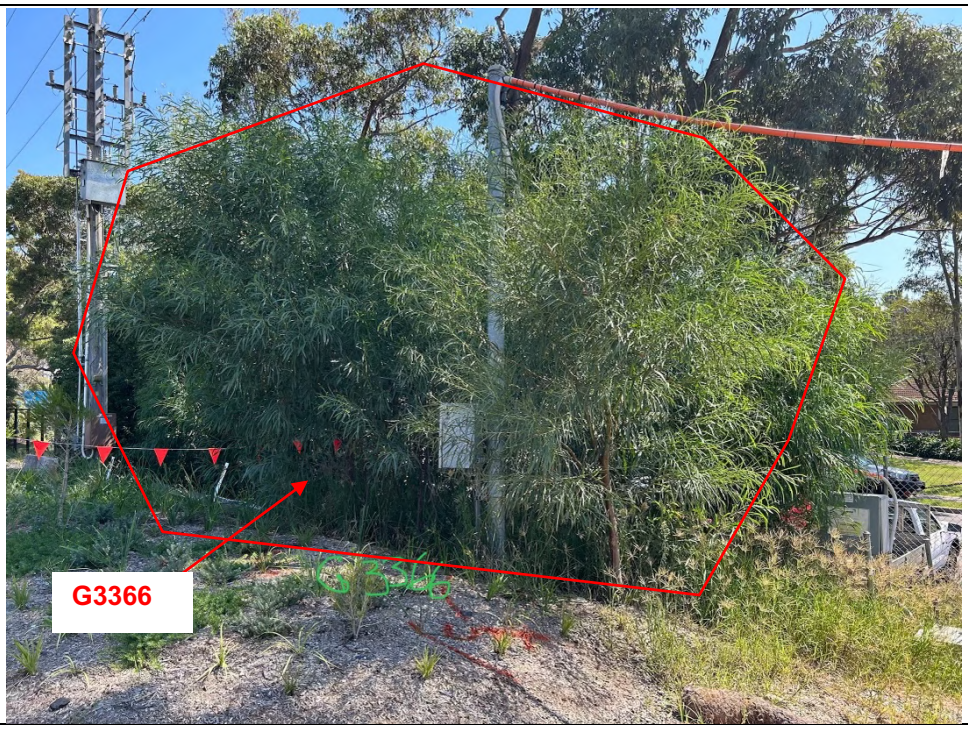


Image 20: Looking towards G3366, which is a group of 10 small trees recommended for removal due to the proposed security fencing.

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Image 21: Looking towards tree 3583, which is recommended for removal due to the proposed security fencing.

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9. CONCLUSIONS

9.1 **Table 2:** Summary of the impact to trees during the development;

Impact	Reason	Category A	Category Z	Total
		A	Z	
Trees recommended to be removed	Installation of security fencing, construction works areas, vehicle access	722, 726, 737, 738, 739, 3366, 3371, 3528, 3529, 3530, 3544, 3546, 3547, 3548, 3549, 3550, 3551, 3583	727, 3367, 3368, 3369, 3370, 3372, 3373, 3374, 3378, 3379, 3380, 3526, 3527, 3531, 3545, 3606, G1.19, G1.20, G3366	**34 trees & 3 groups of trees**
Trees recommended to be retained requiring canopy pruning	Clearance for construction works i.e. vehicle access, security fencing, etc.	3377, 3605, 3609, G1.21	None	**3 trees & 1 group of trees**

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10. RECOMMENDATIONS

10.1 This report assesses the impact of a proposed development at the subject site to thirty-seven (37) trees and four (4) groups of trees that are located at selected areas around the development site.

10.2 Thirty-four (34) trees and three (3) groups of trees have been recommended for removal within this report, including tree 722, 726, 727, 737, 738, 739, 3366, 3367, 3368, 3369, 3370, 3371, 3372, 3373, 3374, 3378, 3379, 3380, 3526, 3527, 3528, 3529, 3530, 3531, 3544, 3545, 3546, 3547, 3548, 3549, 3550, 3551, 3583, 3606, G1.19, G1.20 and G3366. See section 9.1 Table 2 for recommended tree removal by retention values.

10.3 Three (3) trees and one (1) group of trees have been identified for canopy pruning to provide clearance for proposed construction works, including tree 3377, 3605, 3609 and G1.21. Refer to section 8 for canopy pruning specifications. All pruning works must be completed in accordance with AS4373-2007 Pruning of Amenity Trees.

10.4 All trees to be retained that are located adjacent to the proposed works must be protected in accordance with AS4970-2009. Generic tree protection guidance has been provided in section 11. It is recommended that a detailed tree management plan (TMP) is prepared for the development in accordance with AS4970-2009 and developed in combination with the overall construction management plan for the site. The TMP should be prepared by a consulting Arborist with a minimum AQF level 5 qualification.

10.5 This report does not provide approval for tree removal or pruning works. All recommendations in this report are subject to approval by the relevant authorities and/or tree owners. This report should be submitted as supporting evidence with any tree removal/pruning or development application.

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11. TREE PROTECTION REQUIREMENTS

11.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report must also be made available to any contractor prior to works commencing and during any on site operations.

11.2 **Project Arborist:** Prior to any works commencing at the site a project Arborist should be appointed. The project Arborist should be qualified to a minimum AQF level 5 and/or equivalent qualifications and experience, and should assist with any development issues relating to trees that may arise. If at any time it is not feasible to carryout works in accordance with this, an alternative must be agreed in writing with the project Arborist.

11.3 **Tree work:** All tree work must be carried out by a qualified and experienced Arborist with a minimum of AQF level 2 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).

11.4 **Initial site meeting/on-going regular inspections:** The project Arborist is to hold a pre-construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to tree protection that may arise. In accordance with AS4970-2009, the project Arborist should carryout regular site inspections to ensure works are carried out in accordance with this document throughout the development process. Site inspection frequency must be agreed upon by the project arborist and principal contractor prior to the commencement of works.

11.5 **Tree protection Specifications:** It is the responsibility of the principal contractor to install tree protection prior to works commencing at the site (prior to demolition works) and to ensure that the tree protection remains in adequate condition for the duration of the development. The tree protection must not be moved without prior agreement of the project Arborist. The project Arborist must inspect that the tree protection has been installed in accordance with this document and AS4970-2009 prior to works commencing.

11.5.1 Protective fencing: Site specific tree protection requirements are in section 11.5. Where it is not feasible to install fencing at the specified location due to factors such restricting access to areas of the site or for constructing new structures, an alternative location and protection specification must be agreed with the project Arborist. Where the installation of fencing in unfeasible due to restrictions on space, trunk and branch protection will be required (see below). The protective fencing must be constructed of 1.8 metre ‘cyclone chainmesh fence’. The fencing must only be removed for the landscaping phase and must be authorised by the project Arborist. Any modifications to the fencing locations must be approved by the project Arborist.

11.5.2 TPZ signage: Tree protection signage is to be attached to the protective fencing, displayed in a prominent position and the sign repeated at 10 metres intervals or closer where the fence changes direction. Each sign shall contain in a clearly legible form, the following information:

- Tree protection zone/No access.
- This fence has been installed to prevent damage to the tree/s and their growing environment both above and below ground. Do not move fencing or enter TPZ without the agreement of the project Arborist.
- The name, address, and telephone number of the developer/builder and project Arborist

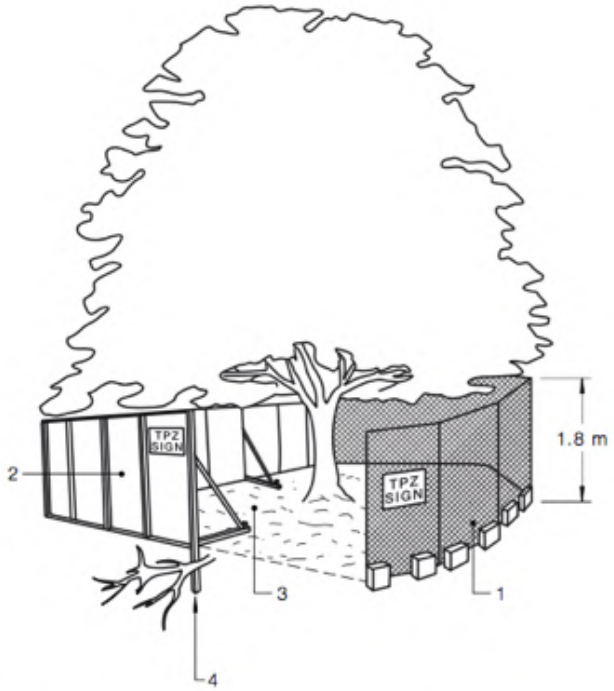
11.5.3 Trunk and Branch Protection: The trunk must be protected by wrapped hessian or similar material to limit damage. Timber planks (50mm x 100mm or similar) should then be placed around tree trunk. The timber planks should be spaced at 100mm intervals, and must be fixed against the trunk with tie wire, or strapping and connections finished or covered to protect pedestrians from injury. The hessian and timber planks must not be fixed to the tree in any instance. The trunk and branch protection shall be installed prior to any work commencing on site and shall be maintained in good condition for the entire development period.

11.5.4 Mulch: Any areas of the TPZ located inside the subject site (only trees to be retained directly adjacent to site works must be mulched to a depth of 75mm with good quality composted wood chip/leaf mulch.

11.5.5 Ground Protection: Ground protection is required to protect the underlying soil structure and root system in areas where it is not practical to restrict access to whole TPZ, while allowing space for construction. Ground protection must consist of good quality composted wood chip/leaf mulch to a depth of between 150-300mm, laid on top of geo textile fabric. If vehicles are to be using the area, additional protection will be required such as rumble boards or track mats to spread the weight of the vehicle and avoid load points. Ground protection is to be specified by the project Arborist as required.

11.5.6 Temporary irrigation: Temporary irrigation should be set up in the TPZ of all trees to be retained, and should distribute water evenly throughout the area of the TPZ. The irrigation should be used for at minimum one hour daily throughout all stages of the development.

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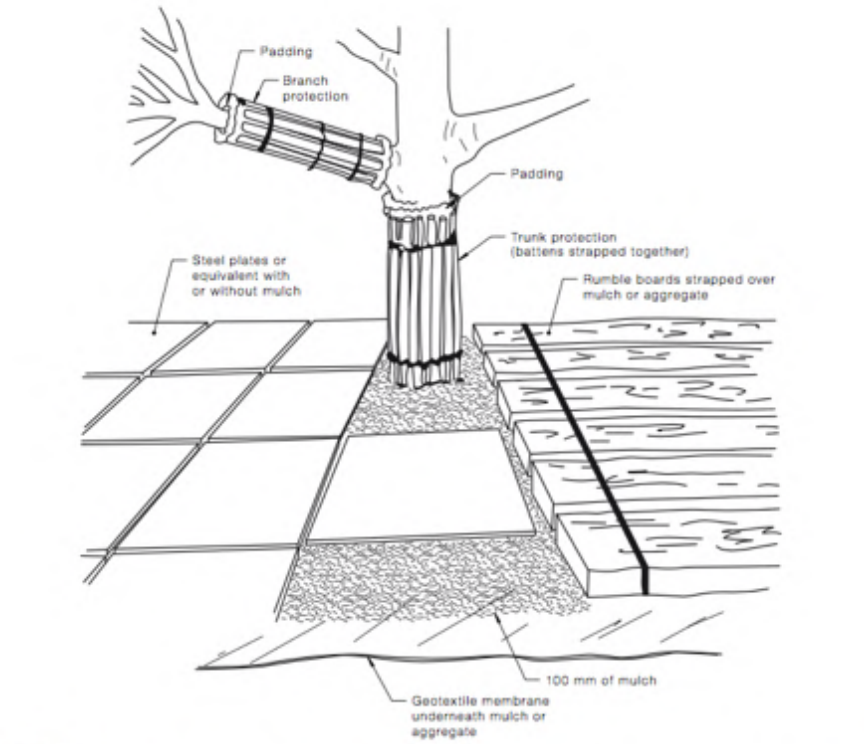


LEGEND:
1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

An image from AS4970-2009,[8] with example tree protection.

[8] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.

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An image from AS4970-2009,[9] with example tree protection.

11.6 **Restricted activities inside TPZ:** The following activities must be avoided inside the TPZ of all trees to be retained unless approved by the project Arborist. If at any time these activities cannot be avoided an alternative must be agreed in writing with the project Arborist to minimise the impact to the tree.

A) Machine excavation.
B) Ripping or cultivation of soil.
C) Storage of spoil, soil or any such materials
D) Preparation of chemicals, including preparation of cement products.
E) Refuelling.
F) Dumping of waste.
G) Wash down and cleaning of equipment.
H) Placement of fill.
I) Lighting of fires.
J) Soil level changes.
K) Any physical damage to the crown, trunk, or root system.
L) Parking of vehicles.

[9] Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

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11.7 **Demolition:** The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project Arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, reaching in to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top down, pull back' method.

11.8 **Excavations:** The project Arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. For continuous strip footings, first manual excavation is required along the edge of the structures closest to the subject trees. Manual excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bed rock or heavy clay, if agreed by project Arborist). Next roots must be pruned back in accordance with AS4373-2007. After all root pruning is completed, machine excavation is permitted within the footprint of the structure. For tree sensitive footings, such as pier and beam, all excavations inside the TPZ must be manual. Manual excavation may include the use of pneumatic and hydraulic tools, high-pressure air or a combination of high-pressure water and a vacuum device. No pruning of roots greater 30mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 30mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3. Root pruning is to be a clean cut with a sharp tool in accordance with AS4373 Pruning of amenity trees (2007).[10] The tree root is to be pruned back to a branch root if possible. Make a clean cut and leave as small a wound as possible.

11.9 **Landscaping:** All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with a consulting Arborist to minimize the impact to trees. General guidance is provided below to minimise the impact of new landscaping to trees to be retained.

- Level changes should be minimised. The existing ground levels within the landscape areas should not be lowered by more than 100mm or increased by more than 100mm (300mm increase is acceptable if using a coarse free draining material) without assessment by a consulting Arborist.
- New retaining walls should be avoided. Where new retaining walls are proposed inside the TPZ of trees to be retained, they should be constructed from tree sensitive material, such as timber sleepers, that require minimal footings/excavations. If brick retaining walls are proposed inside the TPZ, considerer pier and beam type footings to bridge significant roots that are critical to the trees condition. Retaining walls must be located outside the SRZ and sleepers/beams located above existing soil grades.

[10] Council Of Standards Australia, *AS 4373 Pruning of amenity trees* (2007) page 18

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- New footpaths and hard surfaces should be minimised, as they can limit the availability of water, nutrients and air to the trees root system. Where they are proposed, they should be constructed on or above existing soil grades to minimise root disturbance and consider using a permeable surface. Footpaths should be located outside the SRZ where possible.
- Where fill/sub base is used inside the TPZ, fill material should be a coarse granular material that does not restrict the flow of water and air to the root system below. This type of material will also reduce the impact of soil compaction during construction.
- The location of new plantings inside the TPZ of trees to be retained should be flexible to avoid unnecessary damage to tree roots greater than 30mm in diameter.

11.10 **Underground Services:** Where possible underground services should be located outside the TPZ of trees to be retained. All underground services located inside the TPZ of any tree to be retained must be installed via tree sensitive techniques. This should include either directional drilling methods or manual excavations to minimise the impact to trees identified for retention. No roots greater than 40mm in diameter should be severed during the installation of service pipes unless approved in writing by the project Arborist.

11.11 **Sediment and Contamination:** All contamination run off from the development such as but not limited to concrete, sediment and toxic wastes must be prevented from entering the TPZ at all times.

11.12 **Tree Wounding/Injury:** Any wounding or injury that occurs to a tree during the construction process will require the project Arborist to be contacted for an assessment of the injury and provide mitigation/remediation advice. It is generally accepted that trees may take many years to decline and eventually die from root damage. All repair work is to be carried out by the project Arborist, at the contractor's expense.

11.13 **Completion of Development Works:** After all construction works are complete the project Arborist should assess that the subject trees have been retained in the same condition and vigour. If changes to condition are identified the project Arborist should provide recommendations for remediation.

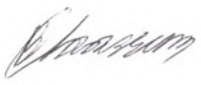
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- *Canterbury Bankstown Development Control Plan 2023*, https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-bankstown-development-control-plan-2023
- *NSW Planning Portal Spatial Viewer,* https://www.planningportal.nsw.gov.au/spatialviewerhistoric/#/find-a-property/address

13. LIST OF APPENDICES

The following are included in the appendices:
Appendix 2 - Tree Inspection Schedule
Appendix 3 - Further information of methodology



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Appendix 2 - Tree Inspection Schedule

Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
722	Spotted Gum	*Corymbia maculata*	Mature	22	5	400					400	460	Good	Good	High	1. Long	A1	4.8	2.4	Located within corridor. DBH estimated.
726	Queensland Brushbox	*Lophostemon confertus*	Mature	7	4	450					450	490	Good	Good	Medium	1. Long	A1	5.4	2.5	Located within corridor. DBH estimated.
727	Lemon Scented Gum	*Corymbia citriodora*	Semi-mature	9	5	190	260				322	450	Good	Fair	Medium	3. Short	Z10	3.9	2.4	Co-dominant stems with lopped East stem.
737	Weeping Bottlebrush	*Callistemon viminalis*	Mature	8	3	300					300	350	Good	Good	Medium	1. Long	A1	3.6	2.1	Located within corridor. DBH estimated.
738	Weeping Bottlebrush	*Callistemon viminalis*	Mature	8	3	300					300	350	Good	Good	Medium	1. Long	A1	3.6	2.1	Located within corridor. DBH estimated.
739	Weeping Bottlebrush	*Callistemon viminalis*	Mature	8	4	350					350	400	Good	Good	Medium	1. Long	A1	4.2	2.3	Located within corridor. DBH estimated.
3366	Bangalay	*Eucalyptus botryoides*	Mature	16	10	330	600	400	260		835	990	Good	Good	Very High	1. Long	A1	10.0	3.3	Located within nature strip.
3367	Camphor Laurel	*Cinnamomum camphora*	Semi-mature	7	2	120	110	100			191	450	Good	Fair	Low	5. Small/Young	Z3	2.3	2.4	Under 10m - exempt species.
3368	Camphor Laurel	*Cinnamomum camphora*	Semi-mature	7	2	140	110	100	70	80	230	360	Good	Fair	Low	5. Small/Young	Z3	2.8	2.2	Under 10m - exempt species. Growing through fence.
3369	Camphor Laurel	*Cinnamomum camphora*	Semi-mature	9	3	250					250	290	Good	Fair	Low	2. Medium	Z3	3.0	2.0	Under 10m - exempt species.
3370	Camphor Laurel	*Cinnamomum camphora*	Semi-mature	6	2	140					140	180	Good	Fair	Low	5. Small/Young	Z3	2.0	1.6	Under 10m - exempt species. Growing through fence.
3371	Bangalay	*Eucalyptus botryoides*	Mature	14	6	440					440	490	Good	Good	High	1. Long	A1	5.3	2.5	Located within nature strip.
3372	Camphor Laurel	*Cinnamomum camphora*	Semi-mature	6	2	400					400	400	Good	Fair	Low	5. Small/Young	Z3	4.8	2.3	Under 10m - exempt species. DBH measured at base.
3373	Lombardy Poplar	*Populus nigra 'Italica'*	Mature	16	2	490					490	580	Fair	Fair	Low	3. Short	Z3	5.9	2.6	Located within nature strip. Exempt species. In decline.
3374	Lombardy Poplar	*Populus nigra 'Italica'*	Mature	15	1	330					330	400	Fair	Fair	Low	3. Short	Z3	4.0	2.3	Located within nature strip. Exempt species. In decline.
3377	Honey Myrtle	*Melaleuca bracteata 'Revolution Gold'*	Mature	7	3	300	280				410	450	Good	Fair	Medium	2. Medium	A1	4.9	2.4	Co-dominant stems.
3378	Honey Myrtle	*Melaleuca bracteata 'Revolution Gold'*	Semi-mature	6	2	200					200	220	Good	Good	Low	5. Small/Young	Z1	2.4	1.8	Crown raise to 2m.
3379	Honey Myrtle	*Melaleuca bracteata 'Revolution Gold'*	Semi-mature	6	1	140					140	150	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	No pruning required.
3380	Honey Myrtle	*Melaleuca bracteata 'Revolution Gold'*	Semi-mature	6	2	110	150				186	250	Good	Fair	Low	5. Small/Young	Z1	2.2	1.8	No pruning required.
3526	Golden Wreath Wattle	*Acacia saligna*	Mature	7	2	200					200	250	Good	Fair	Medium	3. Short	Z1	2.4	1.8	All measurements estimates based on information from JHLOR.
3527	Golden Wreath Wattle	*Acacia saligna*	Mature	7	2	200					200	250	Good	Fair	Medium	3. Short	Z1	2.4	1.8	All measurements estimates based on information from JHLOR.
3528	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3529	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3530	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3531	Pygmy Date Palm	*Phoenix roebelenii*	Semi-mature	3	1	100	100				141	NA	Good	Fair	Low	5. Small/Young	Z1	2.0	NA	All measurements estimates based on information from JHLOR.
3544	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3545	Pygmy Date Palm	*Phoenix roebelenii*	Semi-mature	3	1	100	100				141	NA	Good	Fair	Low	5. Small/Young	Z1	2.0	NA	All measurements estimates based on information from JHLOR.
3546	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3547	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3548	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3549	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.

Appendix 2 - Tree Inspection Schedule

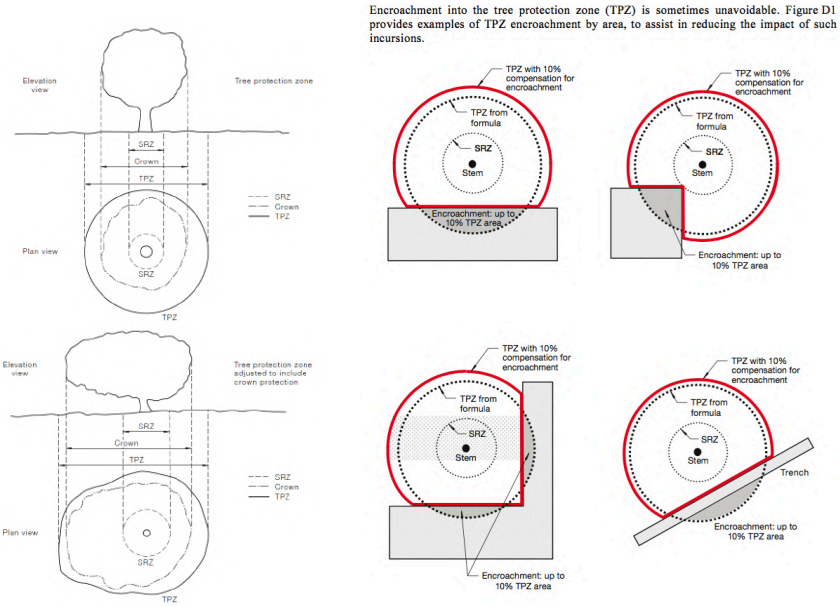
Tree ID	Common Name	Botanical Name	Age Class	Height (m)	Canopy Spread Radius (m)	Stem 1	Stem 2	Stem 3	Stem 4	Stem 5	DBH (mm)	DAB (mm)	Health	Structure	Amenity Value	SULE	Retention Value	TPZ Radius (m)	SRZ Radius (m)	Notes
3550	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3551	Evergreen Alder	*Alnus jorullensis*	Semi-mature	7	2	200					200	250	Good	Fair	Medium	2. Medium	A1	2.4	1.8	All measurements estimates based on information from JHLOR.
3583	Smooth Barked Apple	*Angophora costata*	Mature	15	5	420					420	460	Fair	Fair	High	2. Medium	A2	5.0	2.4	Reduced foliage density with apical dieback.
3605	Swamp Oak	*Casuarina glauca*	Semi-mature	10	4	180	180	160	160		341	350	Good	Fair	Medium	1. Long	A1	4.1	2.1	Multi stemmed st base. DBH estimated.
3606	African Olive	*Olea europaea subsp. cuspidata*	Semi-mature	4	2	80	60	60	50	40	133	170	Good	Good	Low	5. Small/Young	Z3	2.0	1.6	Weed species.
3609	Tallowood	*Eucalyptus microcorys*	Mature	17	5	500					500	580	Good	Fair	High	1. Long	A1	6.0	2.6	Asymmetric canopy to the North with trunk lean.
G1.19	Swamp Oak	*Casuarina glauca*	Young	5	1	70	60				92	100	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	Group of 4 trees.
G1.20	Swamp Oak	*Casuarina glauca*	Young	6	1	60	70	50			105	120	Good	Fair	Low	5. Small/Young	Z1	2.0	1.5	Group of 7 trees
G1.21	Swamp Oak	*Casuarina glauca*	Semi-mature	9	3	180					180	230	Good	Good	Medium	1. Long	A1	2.2	1.8	Group of 3 trees.
G3366	Sydney Golden Wattle	*Acacia longifolia*	Young	4	1.5	80					80	100	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	Group of 5-10 trees.

Explanatory Notes

Tree Species - Common name followed by botanical name. Where species is unknown it is indicated with an *'spp'.*
Age Class - Over mature (OM), Mature (M), Early mature (EM), Semi mature (SM), Young (Y).
Diameter at Breast Height (DBH) - Measured with a DBH tape or estimated at approximately 1.4m above ground level.
Diameter Above root Buttresses (DAB): Measured with a DBH tape or estimated above root buttresses (DAB) for calculating the SRZ.
Height - Height from ground level to top of crown. All heights are estimated unless otherwise indicated.
Spread - Radius of crown at widest section. All tree spreads are estimated unless otherwise indicated.
Tree Protection Zone (TPZ) - DBH x 12. Measured in radius from the centre of the trunk. Rounded to nearest 0.1m. For monocots, the TPZ is set at 1 metre outside the crown projection.
Structural Root Zone (SRZ) - $(DAB \times 50)^{0.42} \times 0.64$. Measured in radius from the centre of the trunk. Rounded up to nearest 0.1m.
Health - Good/Fair/Poor/Dead
Structure - Good/Fair/Poor
Safe Useful Life Expectancy (SULE) - 1. Long (40+years), 2. Medium (15 - 40 years), 3. Short (5 - 15 years), 4. Remove (under 5 years), 5. Small/young.
Amenity Value - Very High/High/Medium/Low/Very Low.
Retention Value: Tree AZ, see appendix 3 for categories.

Appendix 3 - Further Information of Methodology

1. **Tree Protection Zone:** The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The radius of the TPZ is calculated for each tree by multiplying its DBH x 12. The derived value is measured in radius from the centre of the stem/trunk at ground level. A TPZ should not be less than 2.0 metres nor greater than 15 metres (except where crown protection is required).
   It is commonly observed that tree roots will extend significant further than the indicative TPZ, however the TPZ is an area identified AS4970-2009 to be extent where root loss or disturbance will generally not impact the viability of the tree. The TPZ is identified as a restricted area to prevent damage to trees either above or below ground during a development. Where trees are intended to be retained proposed developments must provide an adequate TPZ around trees. The TPZ is set aside for the tree's root zone, trunk and crown and it is essential for the stability and longevity of the tree. The tree protection also incorporates the SRZ (see below for more information about the SRZ). I have calculated the TPZ of palms, other monocots, cycads and tree ferns at one metre outside the crown projection. See appendices for additional information about the TPZ including information about calculating the TPZ and examples of TPZ encroachment.
   Minor encroachment into TPZ: Sometimes encroachment into the TPZ is unavoidable. Encroachment includes but is not limited to activities such as excavation, compacted fill and machine trenching. Minor encroachment of up to 10% of the overall TPZ area is normally considered acceptable, providing there is space adjacent to the TPZ for the tree to compensate and the tree is displaying adequate vigour/health to tolerate changes to its growing environment.
   Major encroachment into TPZ: Where encroachment of more than 10% of the overall TPZ area is proposed the project Arborist must investigate and demonstrate that the tree will remain in a viable condition. In some cases, tree sensitive construction methods such as pier and beam footings, suspended slabs, or cantilevered sections, can be utilised to allow additional encroachment into the TPZ by bridging over roots and minimising root disturbance. Major encroachment is only possible if it can be undertaken without severing significant size roots, or if it can be demonstrated that significant roots will not be impacted.



2. **Structural Root Zone:** This is the area around the base of a tree required for the trees stability in the ground. An area larger than the SRZ always need to be maintained to preserve a viable tree as it will only have a minor effect on the trees vigour and health. There are several factors that determine the SRZ which include height, crown area, soil type and soil moisture. It can also be influenced by other factors such as natural or built structures. Generally work within the SRZ should be avoided.
   An indicative SRZ radius can be determined from the diameter of the trunk measured immediately above the root buttresses. Root investigation could provide more information about the extent of the SRZ. The following formula should be used to calculate the SRZ.
   SRZ radius = $(D \times 50)^{0.42} \times 0.64$ (D = Diameter above root buttress).

3. **Tree Age Class:** If can be difficult to determine the age of a tree without carrying out invasive tests that may damage the tree, so we have categorised there likely age class which is defined below;
   - Young/Newly planted: Young or recently planted tree.
   - Semi Mature: Up to 20% of the usual life expectancy for the species.
   - Early mature/Mature: Between 20%-80% of the usual life expectancy for the species.
   - Over mature: Over 80% of the usual life expectancy for the species.
   - Dead: Tree is dead or almost dead.

4. **Health/Physiological Condition:** Below are examples conditions used when assigning a category for tree health.

Category	Example condition	Summary
Good	• Crown has good foliage density for species. • Tree shows no or minimal signs of pathogens that are unlikely to have an effect on the health of the tree. • Tree is displaying good vigour and reactive growth development.	• The tree is in above average health and condition and no remedial works are required.
Fair	• The tree may be starting to dieback or have over 25% deadwood. • Tree may have slightly reduced crown density or thinning. • There may be some discolouration of foliage. • Average reactive growth development. • There may be early signs of pathogens which may further deteriorate the health of the tree. • There may be epicormic growth indicating increased levels of stress within the tree.	• The tree is in below average health and condition and may require remedial works to improve the trees health.
Poor	• The may be in decline, have extensive dieback or have over 30% deadwood. • The canopy may be sparse or the leaves may be unusually small for species. • Pathogens or pests are having a significant detrimental effect on the tree health.	• The tree is displaying low levels of health and removal or remedial works may be required.
Dead	• The tree is dead or almost dead.	• The tree should generally be removed.

5. **Structural Condition:** Below are examples conditions used when assigning a category for structural condition.

Category	Example condition	Summary
Good	• Branch unions appear to be strong with no sign of defects. • There are no significant cavities. • The tree is unlikely to fail in usual conditions. • The tree has a balanced crown shape and form.	• The tree is considered structurally good with well developed form.
Fair	• The tree may have minor structural defects within the structure of the crown that could potentially develop into more significant defects. • The tree may a cavity that is currently unlikely to fail but may deteriorate in the future. • The tree is an unbalanced shape or leans significantly. • The tree may have minor damage to its roots. • The root plate may have moved in the past but the tree has now compensated for this. • Branches may be rubbing or crossing.	• The identified defects are unlikely cause major failure. • Some branch failure may occur in usual conditions. • Remedial works can be undertaken to alleviate potential defects.
Poor	• The tree has significant structural defects. • Branch unions may be poor or weak. • The tree may have a cavity or cavities with excessive levels of decay that could cause catastrophic failure. • The tree may have root damage or is displaying signs of recent movement. • The tree crown may have poor weight distribution which could cause failure.	• The identified defects are likely to cause either partial or whole failure of the tree.

6. **Amenity Value:** To determine the amenity value of a tree we assess a number of different factors, which include but are not limited to the information below.
   - The visibility of the tree to adjacent sites.
   - The relationship between the tree and the site.
   - Whether the tree is protected by any statuary conditions.
   - The habitat value of the tree.
   - Whether the tree is considered a noxious weed species.

   The amenity value is rated using one of the following values.
   - Very High
   - High
   - Moderate
   - Low
   - Very Low

7. **Safe Useful Life Expectancy (SULE), (Barrel, 2001):** A trees safe useful life expectancy is determined by assessing a number of different factors including the health and vitality, estimated age in relation to expected life expectancy for the species, structural defects, and remedial works that could allow retention in the existing situation.

Category	Description
1. Long - Over 40 years	(a) Structurally sound trees located in positions that can accommodate future growth. (b) Trees that could be made suitable for retention in the long term by remedial tree care. (c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.
2. Medium - 15 to 40 years	(a) Trees that may only live between 15 and 40 more years. (b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that could be made suitable for retention in the medium term by remedial tree care.
3. Short - 5 to 15 years	(a) Trees that may only live between 5 and 15 more years. (b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons. (c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.
4. Remove - Under 5 years	(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions. (b) Dangerous trees because of instability or recent loss of adjacent trees. (c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form. (d) Damaged trees that are clearly not safe to retain. (e) Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. (f) Trees that are damaging or may cause damage to existing structures within 5 years. (g) Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f). (h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.
5. Small/Young	(a) Small trees less than 5m in height. (b) Young trees less than 15 years old but over 5m in height. (c) Formal hedges and trees intended for regular pruning to artificially control growth.

8. **Root investigations:** The root investigations should identify roots greater than 30mm in diameter that are located along the edge of the structures footprint or in the location of footings. Root investigations must be carried out using non-invasive methods (manual excavations). Any excavations for the root investigations must carried out manually to avoid damaging the roots during excavations. Manual excavation may include the use of a high-pressure air/air knife, or a combination of high-pressure water and a vacuum device. When hand excavating carefully work around roots retaining as many as possible. Take care to not fray, wound, or cause damage to any roots during excavations as this may cause decay or infection from pathogens. It is essential that exposed roots are kept moist and the excavation back filled as soon as possible. The root investigations should be carried out by a qualified Arborist minimum AQF3. Once roots are exposed, a visual assessment can be carried out by a consulting Arborist to evaluate the potential impact of the proposed root loss on the health and stability of the tree. A root map/report should be prepared identifying the findings of investigations, including photographs as supporting evidence in the report.

9. **Retention Value:** The system I have used to award the retention value is Tree AZ. Tree AZ is used to identify higher value trees worthy of being a constraint to development and lower value trees that should generally not be a constraint to the development. The table below provides a brief description of each category.

TreeAZ Categories (Version 10.04-ANZ)

CAUTION: TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at www.TreeAZ.com.

Category Z: Unimportant trees not worthy of being a material constraint

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

NOTE: Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

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URBAN ARBOR
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Glossary of Terms

Abiotic - Pertaining to non-living agents; e.g. environmental factors

Adventitious shoots - Shoots that develop other than from apical, axillary or dormant buds; see also 'epicormic'

Anchorage - The system whereby a tree is fixed within the soil, involving cohesion between roots and soil and the development of a branched system of roots which withstands wind and gravitational forces transmitted from the aerial parts of the tree

Bark - A term usually applied to all the tissues of a woody plant lying outside the vascular cambium, thus including the phloem, cortex and periderm; occasionally applied only to the periderm or the phellem

Branch:
• **Primary**. A first order branch arising from a stem
• **Lateral**. A second order branch, subordinate to a primary branch or stem and bearing sub-lateral branches
• **Sub-lateral**. A third order branch, subordinate to a lateral or primary branch, or stem and usually bearing only twigs

Branch collar - A visible swelling formed at the base of a branch whose diameter growth has been disproportionately slow compared to that of the parent stem; a term sometimes applied also to the pattern of growth of the cells of the parent stem around the branch base

Brown-rot - A type of wood decay in which cellulose is degraded, while lignin is only modified

Buckling - An irreversible deformation of a structure subjected to a bending load

Buttress zone - The region at the base of a tree where the major lateral roots join the stem, with buttress-like formations on the upper side of the junctions

Cambium - Layer of dividing cells producing xylem (woody) tissue internally and phloem (bark) tissue externally

Canker - A persistent lesion formed by the death of bark and cambium due to colonisation by fungi or bacteria

Compartmentalisation - The confinement of disease, decay or other dysfunction within an anatomically discrete region of plant tissue, due to passive and/or active defences operating at the boundaries of the affected region

Compressive loading - Mechanical loading which exerts a positive pressure; the opposite to tensile loading

Condition - An indication of the physiological condition of the tree. Where the term ‘condition’ is used in a report, it should not be taken as an indication of the stability of the tree

Crown/Canopy - The main foliage bearing section of the tree

Crown lifting - The removal of limbs and small branches to a specified height above ground level

Crown thinning - The removal of a proportion of secondary branch growth throughout the crown to produce an even density of foliage around a well-balanced branch structure

Crown reduction/shaping - A specified reduction in crown size whilst preserving, as far as possible, the natural tree shape

DAB (Diameter Above Buttress) - Trunk diameter measured above the root buttress

Defect - In relation to tree hazards, any feature of a tree which detracts from the uniform distribution of mechanical stress, or which makes the tree mechanically unsuited to its environment

Dieback - The death of parts of a woody plant, starting at shoot-tips or root-tips

Disease - A malfunction in or destruction of tissues within a living organism, usually excluding mechanical damage; in trees, usually caused by pathogenic micro-organisms

Dominance - In trees, the tendency for a leading shoot to grow faster or more vigorously than the lateral shoots; also the tendency of a tree to maintain a taller crown than its neighbours

Dormant bud - An axial bud which does not develop into a shoot until after the formation of two or more annual wood increments; many such buds persist through the life of a tree and develop only if stimulated to do so

Dysfunction - In woody tissues, the loss of physiological function, especially water conduction, in sapwood

DBH (Diameter at Breast Height) - Stem diameter measured at a height of 1.4 metres or the nearest measurable point. Where measurement at a height of 1.4 metres is not possible, another height may be specified

Deadwood - Branch or stem wood bearing no live tissues. Retention of deadwood provides valuable habitat for a wide range of species and seldom represents a threat to the health of the tree. Removal of deadwood can result in the ingress of decay to otherwise sound tissues and climbing operations to access deadwood can cause significant damage to a tree. Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard

Epicormic shoot - A shoot having developed from a dormant or adventitious bud and not having developed from a first year shoot

Flush-cut - A pruning cut which removes part of the branch bark ridge and or branch-collar

Girdling root - A root which circles and constricts the stem or roots possibly causing death of phloem and/or cambial tissue

Habit - The overall growth characteristics, shape of the tree and branch structure

Hazard beam - An upwardly curved part of a tree in which strong internal stresses may occur without being reduced by adaptive growth; prone to longitudinal splitting

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

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Heartwood/false-heartwood - The dead central wood that has become dysfunctional as part of the aging processes and being distinct from the sapwood

Heave - A term mainly applicable to a shrinkable clay soil which expands due to re-wetting after the felling of a tree which was previously extracting moisture from the deeper layers; also the lifting of pavements and other structures by root diameter expansion; also the lifting of one side of a wind-rocked root-plate

Included bark (ingrown bark) - Bark of adjacent parts of a tree (usually forks, acutely joined branches or basal flutes) which is in face-to-face contact

Lever arm - A mechanical term denoting the length of the lever represented by a structure that is free to move at one end, such as a tree or an individual branch

Lignin - The hard, cement-like constituent of wood cells; deposition of lignin within the matrix of cellulose microfibrils in the cell wall is termed Lignification

Lions tailing - A term applied to a branch of a tree that has few if any side-branches except at its end, and is thus liable to snap due to end- loading

Loading - A mechanical term describing the force acting on a structure from a particular source; e.g. the weight of the structure itself or wind pressure

Mycelium - The body of a fungus, consisting of branched filaments (hyphae)

Occlusion - The process whereby a wound is progressively closed by the formation of new wood and bark around it

Pathogen - A micro-organism which causes disease in another organism

Photosynthesis - The process whereby plants use light energy to split hydrogen from water molecules, and combine it with carbon dioxide to form the molecular building blocks for synthesizing carbohydrates and other biochemical products

Probability - A statistical measure of the likelihood that a particular event might occur

Pruning - The removal or cutting back of twigs or branches, sometimes applied to twigs or small branches only, but often used to describe most activities involving the cutting of trees or shrubs

Radial - In the plane or direction of the radius of a circular object such as a tree stem

Reactive Growth/Reaction Wood - Production of woody tissue in response to altered mechanical loading; often in response to internal defect or decay and associated strength loss (cf. adaptive growth)

Ring-barking - The removal of a ring of bark and phloem around the circumference of a stem or branch, normally resulting in an inability to transport photosynthetic assimilates below the area of damage. Almost inevitably results in the eventual death of the affected stem or branch above the damage

Root-collar - The transitional area between the stem/s and roots

Sapwood - Living xylem tissues

Soft-rot - A kind of wood decay in which a fungus degrades cellulose within the cell walls, without any general degradation of the wall as a whole

Stem/s - Principle above-ground structural component(s) of a tree that supports its branches

Stress - In plant physiology, a condition under which one or more physiological functions are not operating within their optimum range, for example due to lack of water, inadequate nutrition or extremes of temperature

SRZ (Structural Root Zone) - The area around the base of the tree required for the trees stability in the ground

Subsidence - In relation to soil or structures resting in or on soil, a sinking due to shrinkage when certain types of clay soil dry out, sometimes due to extraction of moisture by tree roots

Taper - In stems and branches, the degree of change in girth along a given length

Targets - In tree risk assessment (with slight misuse of normal meaning) persons or property or other things of value which might be harmed by mechanical failure of the tree or by objects falling from it

Topping - In arboriculture, the removal of the crown of a tree, or of a major proportion of it

Transpiration - The evaporation of moisture from the surface of a plant, especially via the stomata of leaves; it exerts a suction which draws water up from the roots and through the intervening xylem cells

TPZ (Tree Protection Zone) - A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development

Understory - This layer consists of younger individuals of the dominant trees, together with smaller trees and shrubs which are adapted to grow under lower light conditions

Veteran tree - Tree that, by recognised criteria, shows features of biological, cultural or aesthetic value that are characteristic of, but not exclusive to, individuals surviving beyond the typical age range for the species concerned. These characteristics might typically include a large girth, signs of crown retrenchment and hollowing of the stem

Vigour - The expression of carbohydrate expenditure to growth (in trees)

White-rot - A range of kinds of wood decay in which lignin, usually together with cellulose and other wood constituents, is degraded

Wind exposure - The degree to which a tree or other object is exposed to wind, both in terms of duration and velocity

Wind pressure - The force exerted by a wind on a particular object

Windthrow - The blowing over of a tree at its roots

Incorporating extracts from Lonsdale, D. 1999. Principles of Tree Hazard Assessment. Her Majesty's Stationary Office, London

Appendix B – Cumberland Ecology – Ecological Report

15 April 2024

Andre Kruize
Environmental Coordinator
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Station Precinct Pre-clearance Assessment: Southwest Metro Corridor Vegetation Removal

Dear Andre,

Cumberland Ecology was commissioned by John Holland and Laing O'Rourke Joint Venture on behalf of Sydney Metro to undertake a pre-clearance assessment to facilitate services for the Sydney Metro – City and Southwest – Sydenham to Bankstown Project (the 'project').

The pre-clearance assessment included a desktop assessment and site inspections by Cumberland Ecology to assess all vegetation potentially impacted by the project for potential fauna habitat (e.g. tree hollows, nests, human-made structures) as well as occurrences of threatened species listed under the NSW *Biodiversity Conservation Act 2016* and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

The results of the pre-clearance assessment are provided in **Appendix A** and supporting photographs in **Appendix B**. Should you have any queries, please do not hesitate to contact me in our office on (02) 9868 1933.

Yours sincerely,



Mikael Peck
Principal Ecologist
Mikael.peck@cumberlandecology.com.au

APPENDIX A :

Pre-clearance Assessment

A.1. Introduction

Cumberland Ecology was commissioned by John Holland and Laing O'Rourke Joint Venture (the 'client') on behalf of Sydney Metro to undertake a pre-clearance assessment to facilitate services for the Sydney Metro – City and Southwest – Sydenham to Bankstown Project (the 'project). The pre-clearance assessment was undertaken at the following station precincts:

- Marrickville Station;
- Dulwich Hill Station;
- Hurlstone Park Station;
- Canterbury Station;
- Campsie Station*;
- Belmore Station;
- Lakemba Station;
- Wiley Park Station*; and
- Punchbowl Station.

Stations listed above with an asterisk (*) were not visually inspected by Cumberland Ecology, and the pre-clearance assessment for these stations was done via a desktop assessment which included a detailed review of photographs provided by the client. Further details are provided in ***Section A.3***.

A.2. Purpose

The purpose of the pre-clearance assessment was to meet project approval REMM B2 which states the following:

Pre-clearing surveys and inspections for endangered and threatened flora and fauna species would be undertaken by qualified ecologist prior to any clearing occurring. The surveys and inspections, and any subsequent relocation of species, would be undertaken in accordance with the measures provide in the biodiversity assessment report.

In order to satisfy project approval REMM B2, a pre-clearance assessment for each of the stations was undertaken to identify the occurrences of:

- Habitat features suitable for native fauna (including threatened species) that will require supervision during clearance/removal works; and
- Presence of threatened flora and fauna listed under the NSW *Biodiversity Conservation Act 2016* (BC Act) and/or the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

A.3. Methodology

A site inspection was undertaken by an ecologist on 22 February 2024 at the stations listed in ***Section A.1***, except for Campsie Station and Wiley Park Stations. The attending ecologist was accompanied by the John Holland Laing O'Rourke Environmental Coordinator and Engineers, to identify the vegetation subject to removal and ensure all areas were assessed. The inspection involved traversing each station precinct on foot and visually inspecting the areas where vegetation disturbance may occur.

Field notes regarding the general condition and composition of the vegetation within each station precinct were made. This included documenting the species and location of all vegetation to be disturbed with particular attention to native shrubs and trees, threatened species, and any habitat features that could be utilised by native fauna. Photographs were taken at various locations of proposed disturbance to document the general condition and composition of the vegetation within each station precinct.

A discussion was carried out with John Holland Laing O'Rourke Environmental Coordinator as required to ascertain the level of clearing (overstorey, understorey, groundcover), the nature of clearing (trimming, removal, etc.) and the extent of clearing within the subject site where disturbance works are to be located.

A site inspection was not undertaken at Campsie Station or Wiley Park Station, and therefore, the pre-clearance assessment for this station was undertaken via a desktop assessment that utilised a description of the proposed works, as well as photographs taken by the client during an inspection of all vegetation potentially impacted by the project.

Although a qualified ecologist did not undertake the pre-clearance surveys that informed this pre-clearance assessment for Campsie Station and Wiley Park Station, the information provided by the client is considered to be sufficient to support the results and recommendations made in this pre-clearance assessment due to the minor nature of the proposed works as well as their location within heavily disturbed areas. It is further noted that ***Section A.5*** recommends that an ecologist conduct a 'follow-up' pre-clearance assessment of all areas to be impacted prior to any vegetation being removed on the actual day of clearing. Therefore, if the recommendations made in ***Section A.5*** are completed, then REMM B2 of the project's approval will be met

A.4. Key Findings

The key findings of the pre-clearance assessment for each station precinct are provided in the following sections.

A.4.1. Marrickville Station

A.4.1.1. Fauna Habitat

Within the station precinct, the majority of the vegetation surveyed was limited to foraging habitat for fauna in the form of flowering plants such as Crepe Myrtle (*Lagerstroemia* sp.), Swamp Mahogany (*Eucalyptus robusta*) and Magnolia (*Magnolia* sp.) (see **Photographs 1** and **2**). No habitat features in the form of nests or hollow bearing trees were identified.

A.4.1.2. Threatened Species

No threatened flora or fauna species were recorded within the station precinct. Although threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct.

A.4.1.3. Impacts on Vegetation

The station precinct has been subject to previous clearing and consists of landscaped areas with planted vegetation, with the exception of two remnant Swamp Mahogany (*Eucalyptus robusta*) on the western side of Illawarra Road as shown in **Photographs 1** and **2** respectively). It is understood that the planted vegetation within landscaped areas will be subject to removal/trimming, while remnant native trees are likely to be avoided, however if required, may be subject to minor trimming. The vegetation identified for removal is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. Details of the vegetation to be impacted is provided in **Table 1** below and areas surveyed within the Marrickville Station precinct are provided in **Figure 1**.

Table 1 Vegetation and habitat recorded within the Marrickville Station precinct

Species	Number of Individuals	Native/Exotic	Habitat Type	Impact
Group of Crepe Myrtle (*Lagerstroemia* sp.)	~3	Exotic	Foraging habitat	Removal/ Trimming
Eucalyptus robusta	1	Native	Foraging habitat	Trimming
Eucalyptus robusta	1	Native	Foraging habitat	Trimming
Magnolia sp.	1	Exotic	Foraging habitat	Trimming

Figure 1 Areas surveyed within the Marrickville Station precinct (outlined in red)



A.4.1.4. Impacts on Fauna Habitat

Fauna habitat within the station precinct is limited to potential foraging habitat by native birds and mammals. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal.

A.4.2. Dulwich Hill Station

A.4.2.1. Fauna Habitat

Within the station precinct, the majority of the vegetation surveyed was limited to foraging habitat for fauna in the form exotic groundcovers and shrubs such as Lantana (*Lantana camara*) (see **Photographs 3** and **4**). No habitat features in the form of nests or hollow bearing trees were identified.

A.4.2.2. Threatened Species

No threatened flora or fauna species were recorded within the station precinct. Although threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct.

A.4.2.3. Impacts on Vegetation

The station precinct has been subject to previous clearing and comprises predominantly exotic groundcovers and shrubs which will be subject to removal. One planted *Cupaniopsis anacardioides* is located along the northern side of the rail line behind the existing bus shelter which will be subject to trimming. Furthermore, two London Plane trees (*Platanus* × *Acerifolia*) are located at the western end of the station precinct which may be subject to minor trimming (**Photograph 5**). The vegetation identified for removal is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. Details of the vegetation to be impacted is provided in **Table 2** below and areas surveyed within the Dulwich Hill Station precinct are provided in **Figure 2.**

Table 2 Vegetation and habitat recorded within the Dulwich Hill station precinct

Species	Number of Individuals	Native/Exotic	Habitat Type	Impact
Exotic vegetation	N/A	Exotic	Foraging habitat	Removal
Cupaniopsis anacardioides	1	Native	Foraging habitat	Trimming
Platanus × *Acerifolia*	2	Exotic	Foraging habitat	Trimming

Figure 2 Areas surveyed within the Dulwich Station precinct (outlined in red)



A.4.2.4. Impacts on Fauna Habitat

Fauna habitat within the station precinct is limited to potential foraging habitat by native birds and mammals. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal.

A.4.3. Hurlstone Park Station

A.4.3.1. Fauna Habitat

Within the station precinct, the majority of the vegetation surveyed was limited to foraging habitat in the form of native and exotic trees and shrubs including Weeping Bottlebrush (*Callistemon viminalis*) and Camphor Laurel (*Cinnamomum camphora*) (see **Photographs 6** and **7**). No habitat features in the form of nests or hollow bearing trees were identified.

A.4.3.2. Threatened Species

No threatened flora or fauna species were recorded within the station precinct. Although threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct.

A.4.3.3. Impacts on Vegetation

The station precinct has been subject to previous clearing and comprises predominantly exotic understorey vegetation. There are two Camphor Laurel (*Cinnamomum camphora*) that will be removed on the eastern side of Floss Street as well as exotic understorey vegetation including Lantana (*Lantana camara*). Furthermore, two Weeping Bottlebrush (*Callistemon viminalis*) planted within landscaped garden beds, will be subject to trimming on the western side of Floss Street. Some additional exotic understorey vegetation comprised predominantly of exotic grasses will be subject to removal at the western most extent of the station precinct. The vegetation identified for removal is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. Details of the vegetation to be impacted is provided in **Table 3** below and areas surveyed within the Hurlstonoe Park Station precinct are provided in **Figure 3.**

Table 3 Vegetation and habitat recorded within the Hurlstone Park station precinct

Species	Number of Individuals	Native/Exotic	Habitat Type	Impact
Exotic vegetation	N/A	Exotic	Foraging habitat	Removal
Cinnamomum camphora	2	Exotic	Foraging habitat	Removal/ Trimming
Callistemon viminalis	2	Native	Foraging habitat	Trimming

Figure 3 Areas surveyed within the Hurlstone Park Station precinct (outlined in red)



A.4.3.4. Impacts on Fauna Habitat

Fauna habitat within the station precinct is limited to potential foraging habitat by native birds and mammals. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal.

A.4.4. Canterbury Station

A.4.4.1. Fauna Habitat

Within the station precinct, the majority of the vegetation surveyed was limited to foraging habitat in the form of exotic shrubs and groundcovers (see **Photographs 8** and **9**). No habitat features in the form of nests or hollow bearing trees were identified.

A.4.4.2. Threatened Species

No threatened flora or fauna species were recorded within the station precinct. Although threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct.

A.4.4.3. Impacts on Vegetation

The station precinct has been subject to previous clearing and comprises exotic understorey vegetation, including exotic grasses as well as the shrubs Prickly Pear (*Opuntia stricta*) and White Cedar (*Melia azedarach*). All exotic vegetation within the station precinct will be subject to removal. There are some planted native trees along the pedestrian walkway on the southern-eastern side of station precinct that may require trimming. This includes Sweet Pittosporum (*Pittosporum undulatum*) and Cypress species. The vegetation identified for removal is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. Details of the vegetation to be impacted is provided in **Table 4** below and areas surveyed within the Canterbury Station precinct are provided in **Figure 4.**

Table 4 Vegetation and habitat recorded within the Canterbury Station precinct

Species	Number of Individuals	Native/Exotic	Habitat Type	Impact
Exotic vegetation	N/A	Exotic	Foraging habitat	Removal
Opuntia stricta	5+	Exotic	Foraging habitat	Removal
Melia azedarach	1	Exotic	Foraging habitat	Removal
Cypress sp.	5	Exotic	Foraging habitat	Trimming
Pittosporum undulatum	1	Native	Foraging habitat	Trimming

Figure 4 Areas surveyed within the Canterbury Station precinct (outlined in red)



A.4.4.4. Impacts on Fauna Habitat

Fauna habitat within the station precinct is limited to potential foraging habitat by native birds and mammals. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal.

A.4.5. Campsie Station

A.4.5.1. Fauna Habitat

Within the station precinct, the vegetation present is limited to foraging habitat for fauna in the form of flowering plants such as Silky Oak (*Grevillea robusta*) and Bottlebrushes (*Callistemon* sp.) (see **Photographs 10** and **11**). No habitat features in the form of nests or hollow bearing trees appear to be present.

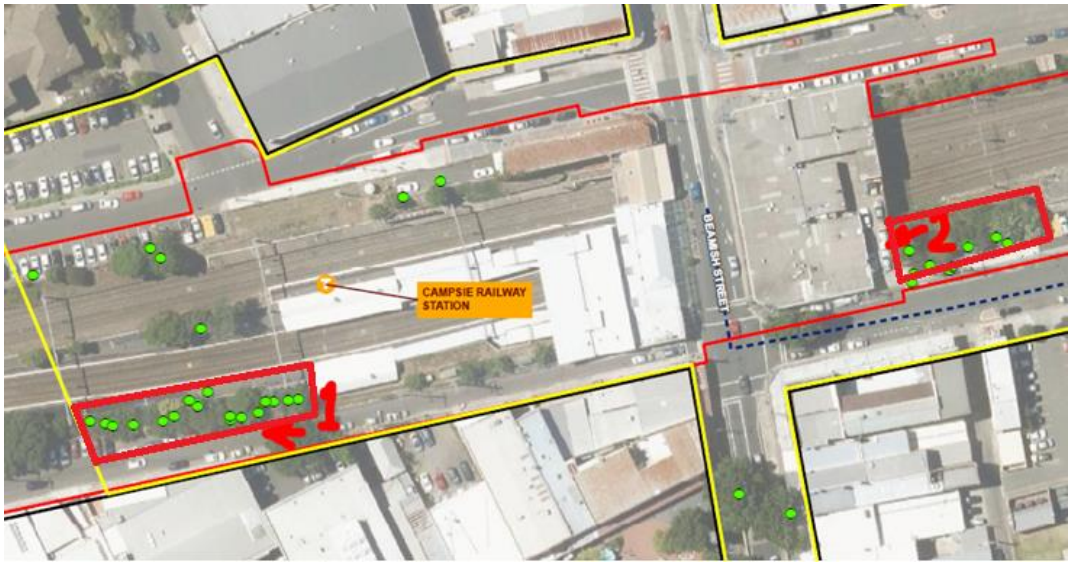
A.4.5.2. Threatened Species

Threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging; however, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct. No threatened flora species are considered likely to occur as the precinct is highly modified and comprised of planted vegetation as part of landscaped areas. Any threatened species present would comprise planted individuals with limited conservation value.

A.4.5.3. Impacts on Vegetation

The station precinct has been subject to previous clearing and consists of landscaped areas with planted vegetation. It is understood that the planted vegetation within landscaped areas will be subject to removal/trimming. The vegetation that may be removed is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. At this stage, the exact extent of impacts is unknown; however, it is understood that it will be restricted to 'Areas 1 and 2' as identified in **Figure 5** below.

Figure 5 Extent of vegetation disturbance proposed at Campsie Station precinct (see Areas 1 and 2 in red)



A.4.5.4. Impacts on Fauna Habitat

Fauna habitat within the station precinct is limited to potential foraging habitat by native birds and mammals. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal.

A.4.6. Belmore Station

A.4.6.1. Fauna Habitat

The vegetation within the station precinct provides foraging and nesting habitat for native birds and mammals. The eastern side of the station precinct contained planted exotic vegetation as well as regrowth native vegetation that provides suitable foraging habitat (see **Photographs 12** and **13**), while the vegetation on the south-western side of the station precinct regrowth and planted native/exotic vegetation that provides foraging and nesting habitat. Approximately 11 active Australian White Ibis (*Threskiornis moluccus*) nests were identified across three trees within the south-western side of the station precinct (see **Photograph 14** and **Figure 5**).

A.4.6.2. Threatened Species

No threatened flora or fauna species were recorded within the station precinct. Although threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct.

A.4.6.3. Impacts on Vegetation

The southern-eastern side of the station precinct comprises a strip of planted exotic vegetation within landscaped areas which connects up with a larger strip of regrowth native vegetation, comprised predominantly of Acacia species (**Photographs 12** and **13**. This area will be subject to removal and trimming of native and exotic vegetation.

The southern-eastern side of the station precinct comprises native and exotic vegetation. Native trees include Flax-leaved Paperbark (*Melaleuca linariifolia*) and Acacia species. The native shrub Blackthorn (*Bursaria spinosa*). Exotic trees including the Canary Island Date Palm (*Phoenix canariensis*) is also present. The vegetation identified for removal is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. Details of the vegetation to be impacted is provided in **Table 5** below and areas surveyed within the Belmore Station precinct are provided in **Figure 6.**

Table 5 Vegetation and habitat recorded within the Belmore station precinct

Species	Number of Individuals	Native/Exotic	Habitat Type	Impact
Exotic vegetation	N/A	Exotic	Foraging habitat	Removal
Phoenix canariensis	5	Exotic	Foraging and nesting habitat (Ibis nests)	Removal

Species	Number of Individuals	Native/Exotic	Habitat Type	Impact
Acacia sp.	50+*	Native	Foraging habitat	Removal/ Trimming
Bursaria spinosa	N/A	Native	Foraging habitat	Removal/ Trimming
Cinnamomum camphora	1	Exotic	Foraging	Trimming
Lophostemon confertus	1	Native	Foraging	Remove
Melaleuca linariifolia	1	Native	Foraging and nesting habitat (Ibis nests)	Trimming
Photinia sp.	(hedge)	Exotic	Foraging	Removal

**estimate only.*

Figure 6 Areas surveyed within the Belmore Station precinct (outlined in red) and location of active Australian White Ibis nests (hatched in blue)



A.4.6.4. Impacts on Fauna Habitat

In addition to potential foraging habitat, approximately eleven Australian White Ibis nests will be impacted by the project as shown in **Figure 6**. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal.

A.4.7. Lakemba Station

A.4.7.1. Fauna Habitat

The vegetation within the station precinct provides foraging and nesting habitat for native birds and mammals. The northern side of the station precinct contained exotic landscape plantings that provide suitable foraging habitat (see **Photograph 15**). The vegetation on the southern side of the station precinct comprises foraging and nesting habitat, including areas of planted native and exotic vegetation that is maintained in landscaped areas to the east (**Photograph 16**), and unmanaged native, exotic vegetation to the west. Within the most westerly section of the station precinct, approximately 10 active Australian White Ibis (*Threskiornis moluccus*) nests were recorded (see **Photograph 17**).

A.4.7.2. Threatened Species

One threatened species, Magenta Lily Pilly (*Syzygium paniculatum*) was identified within the station precinct. The individual tree is considered to be planted given its location within a landscaped garden bed. This species is commonly planted throughout NSW. No other threatened flora or fauna species were recorded within the station precinct. Although threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct.

A.4.7.3. Impacts on Vegetation

On the northern side of the station precinct, maintained landscaped areas comprised of predominantly exotic vegetation will be removed. On the southern-side of the station precinct there are some planted native trees and shrubs which will be removed within the easterly portion of the site, and remnant native vegetation with an exotic shrubby understory in areas to the west of the site. These areas will be subject to removal and trimming of native and exotic vegetation.

The vegetation identified for removal is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. Details of the vegetation to be impacted is provided in **Table 6** below and areas surveyed within the Lakemba Station precinct are provided in **Figure 7.**

Table 6 Vegetation and habitat recorded within the Lakemba Station precinct

Species	Number of Individuals*	Native/Exotic	Habitat Type	Impact
Exotic vegetation	N/A	Exotic	Foraging habitat	Removal
Syagrus romanzoffiana	1	Exotic	Foraging and nesting habitat	Removal
Cinnamomum camphora	2	Exotic	Foraging and nesting habitat (Ibis nests)	Removal/ Trimming
Syzygium paniculatum	1	Native	Foraging habitat	Trimming
Phoenix canariensis	5	Exotic	Foraging and nesting habitat (Ibis nests)	Removal
Pyrus sp.	1	Exotic	Foraging habitat	Trimming

Species	Number of Individuals*	Native/Exotic	Habitat Type	Impact
Cypress sp.	12	Exotic	Foraging habitat	Removal
Acacia sp.	10+	Native	Foraging habitat	Removal
Lophostemon confertus	2	Native	Foraging habitat	Removal/ Trimming
Casuarina sp.	8	Native	Foraging habitat	Removal
Eucalyptus camaldulensis	1	Native	Foraging habitat	Removal
Schinus molle	3	Exotic	Foraging and nesting habitat	Removal
Pittosporum undulatum	10+	Native	Foraging and nesting habitat (Ibis nests)	Removal

**estimates only.*

Figure 7 Areas surveyed within the Lakemba Station precinct (outlined in red) and location of active Australian White Ibis nests (hatched in blue)



A.4.7.4. Impacts on Fauna Habitat

In addition to potential foraging habitat, approximately ten Australian White Ibis nests will be impacted by the project as shown in **Figure 7**. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal.

A.4.8. Wiley Park Station

A.4.8.1. Fauna Habitat

Within the station precinct, the vegetation present is limited to foraging habitat for fauna in the form of flowering plants such as *Acacia* spp. and *Grevillea* sp. (see **Photographs 18** and **19**). No habitat features in the form of nests or hollow bearing trees appear to be present.

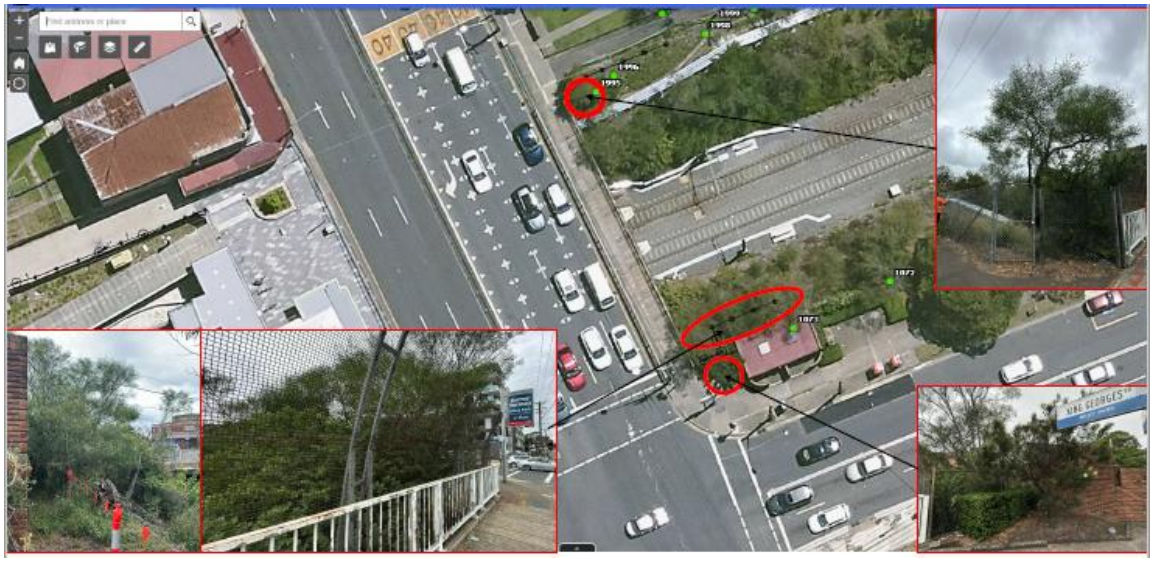
A.4.8.2. Threatened Species

Threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging; however, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct. No threatened flora species are considered likely to occur as the precinct is highly modified and comprised of planted vegetation as part of landscaped areas. Any threatened species present would comprise planted individuals with limited conservation value.

A.4.8.3. Impacts on Vegetation

The station precinct has been subject to previous clearing and consists of regrowth vegetation and landscaped areas with planted vegetation. It is understood that the regrowth and planted vegetation within the subject site will be subject to removal/trimming. The vegetation that may be removed is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. At this stage, the exact extent of impacts is unknown; however, it is understood that it will be restricted to three separate areas identified in **Figure 8** below.

Figure 8 Extent of vegetation disturbance proposed at Wiley Park Station precinct (circled in red)



A.4.8.4. Impacts on Fauna Habitat

Fauna habitat within the station precinct is limited to potential foraging habitat by native birds and mammals. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal

A.4.9. Punchbowl Station

A.4.9.1. Fauna Habitat

Within the station precinct, the majority of the vegetation surveyed was limited to foraging habitat in the form of remnant trees and regrowth vegetation (see **Photographs 20** and **21**). Two hollow-bearing trees each containing one small hollow in their trunk were identified (see **Figure 9** and **Photograph 22**).

A.4.9.2. Threatened Species

No threatened flora or fauna species were recorded within the station precinct. Although threatened fauna species such as birds and microchiropteran bats (microbats) have the potential to utilise the station precinct for foraging, they are highly mobile species and unlikely to be solely reliant on the small area of potential foraging habitat within the station precinct.

A.4.9.3. Impacts on Vegetation

The vegetation to be impacted on the north-eastern side of the station precinct includes exotic and native trees over a predominantly cleared understorey. This includes two Swamp Mahogany (*Eucalyptus robusta*), and several Camphor Laurel (*Cinnamomum camphora*). There are also two isolated *Corymbia* sp. and a Brush Box (*Lophostemon confertus*) within the rail corridor that are likely to be removed. On the north-western side of the station precinct, there is a mixture of native and exotic regrowth vegetation to be removed, including Casuarinas, Acacias, Melaleucas and African Olive (*Olea europaea* subsp. *europaea*).

On the southern side of the station precinct there are some planted Callistemons to be removed adjacent to the station entrance, as well as planted exotic trees within the adjoining carpark to the east.

The vegetation identified for removal is not considered likely to comprise important habitat to any threatened flora or fauna species likely to occur within the station precinct. Details of the vegetation to be impacted is provided in **Table 7** below and areas surveyed within the Punchbowl Station precinct are provided in **Figure 9.**

Table 7 Vegetation and habitat recorded within the Punchbowl Station precinct

Species	Number of Individuals	Native/ Exotic	Habitat Type	Impact
Exotic vegetation	N/A	Exotic	Foraging habitat	Removal
Cinnamomum camphora	20	Exotic	Foraging and nesting habitat (hollow)	Removal/ Trimming
Eucalyptus robusta	2	Native	Foraging habitat	Removal
Corymbia sp.	2	Native	Foraging habitat and nesting habitat (hollow)	Removal
Lophostemon confertus	1	Native	Foraging habitat	Removal
Corymbia citriodora	1	Native	Foraging habitat	Removal
Acacia sp.	1	Native	Foraging habitat	Trimming
Melaleuca sp.	1	Native	Foraging habitat	Trimming

Species	Number of Individuals	Native/ Exotic	Habitat Type	Impact
Olea europaea subsp. *europaea*	N/A	Exotic	Foraging habitat	Removal
Casuarina sp.	~10	Native	Foraging	Removal

Figure 9 Areas surveyed within the Punchbowl Station precinct (outlined in red) and location of hollow-bearing trees (marked in blue)



A.4.9.4. Impacts on Fauna Habitat

Fauna habitat within the station precinct is comprised of two hollow-bearing trees and potential foraging habitat for native birds and mammals. The hollows identified for removal are located within the trunk of the trees approximately 1m from the ground. Recommendations to minimise impacts on native fauna associated with the removal of this habitat is provided in ***Section A.5***. If all mitigation measures recommended are implemented, impacts on native fauna (including threatened species) are anticipated to be minimal.

A.5. Recommendations

Recommendations based on the findings of the pre-clearance assessment are outlined below. It is expected that any clearance works undertaken within the station precincts are done in accordance with any relevant approvals and protocols.

A.5.1. Fauna Habitat

As required by the project's conditions of approval, an ecologist is recommended to supervise the removal of all native vegetation. Due to the time elapsed between the pre-clearance assessment and proposed clearing, it is recommended that the attending ecologist undertaken a 'pre-clearance survey' of station precinct on the day of clearing prior to clearing works commencing. During the pre-clearance survey the attending ecologist will confirm that the results of this pre-clearance assessment are current. If any nests, tree hollows or possum dreys are recorded during the survey, they will be demarcated with pink flagging tape and subsequently removed under the direction of the attending ecologist. Where possible, any dreys/nests observed will be relocated into adjacent vegetation proposed to be retained. Where Ibis nests or tree hollows are identified for removal, the ecologist, with the assistance of an arborist, will capture any fauna (including eggs) and either relocate to adjacent habitat to be retained, hand off to a WIRES carer for future care or taken to a local veterinarian hospital.

An ecologist is not recommended to supervise the removal of the dense exotic vegetation once it has been inspected and the attending ecologist confirms it is okay to be removed (i.e. confirmed no fauna to be impacted).

A.5.2. Weeds

Due to the presence of weeds (including species listed under the NSW *Biosecurity Act 2015*), it is recommended that exotic vegetation removed not be reused within or adjacent to the station precincts as mulch. All cleared exotic vegetation and topsoil within these areas are to be disposed of at an approved green waste facility and in accordance with guidelines identified in the *Greater Sydney Regional Strategic Weed Management Plan 2023-2027* (LLS: Greater Sydney 2022).

A.6. Conclusion

The project requires the removal of native and exotic vegetation that does not provide important habitat for any threatened species known to occur in the region as it is comprised of foraging habitat that would only be utilised on occasion as part of a much broader foraging range. The Australian White Ibis nests identified at Belmore and Lakemba Stations are currently active and will require ecological supervision during vegetation clearing. Further to this, two hollow-bearing trees located at Punchbowl Station will require ecological supervision.

One threatened flora species, Magenta Lily Pilly (*Syzygium paniculatum*) was identified at Belmore Station. This species is listed as a threatened species under the BC Act and EPBC Act, however the species in commonly planted in NSW and the individual identified within the station precinct is considered to be a planted individual. Due to the highly modified nature of the station precincts, no naturally occurring threatened species are likely to be impacted by the project.

If all mitigation measures recommended in ***Section A.5*** are implemented, the project is unlikely to have a significant impact on any of the biodiversity values of the station precincts or surrounding areas.

A.7. References

LLS: Greater Sydney, Ed. (2022). Greater Sydney Regional Strategic Weed Management Plan 2023-2027, Local Land Services NSW.

APPENDIX B :
Photographs

Photograph 1 Marrickville (east)



Photograph 2 Marrickville (west)



Photograph 3 Dulwich Hill (east)



Photograph 4 Dulwich Hill (west)



Photograph 5 Dulwich Hill (west)



Photograph 6 Hurlstone Park (west)



Photograph 7 Hurlstone Park (east)



Photograph 8 Canterbury (east)



Photograph 9 Canterbury (west)



Photograph 10 Campsie (Area 1)



Photograph 11 Campsie (Area 2)



Photograph 12 Belmore (east)



Photograph 13 Belmore (east)



Photograph 14 Belmore (west) - Ibis nest



Photograph 15 Lakemba (north)



Photograph 16 Lakemba (south-west)



Photograph 17 Lakemba (south-west)



Photograph 18 Wiley Park (south-east)



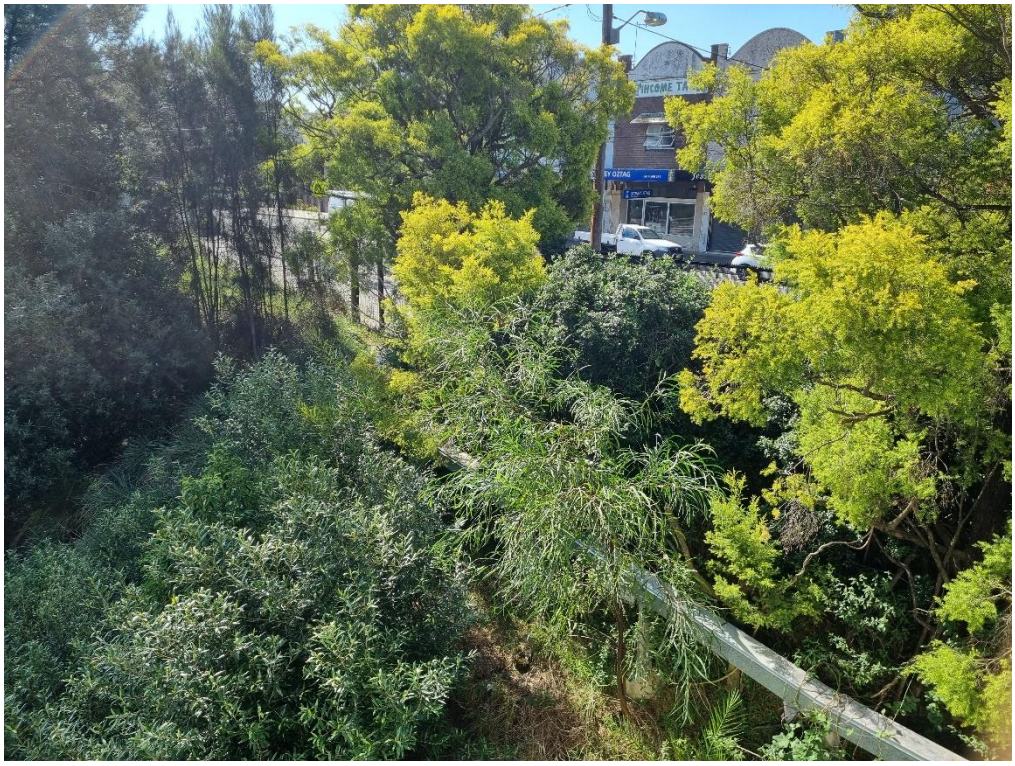
Photograph 19 Wiley Park (south-east)



Photograph 20 Punchbowl (north-east)



Photograph 21 Punchbowl (north-west)



Photograph 22 Punchbowl (small hollow circled in red)



Appendix C – Urban Arbor Curriculum Vitae

Curriculum Vitae - Bryce Claassens - Consulting Arborist
Urban Arbor Pty Ltd

Address: Urban Arbor Pty Ltd, Unit 12/36 Leighton Place, Hornsby, NSW
Contact: [redacted]

Arboricultural and Horticultural Qualifications

- Diploma of Arboriculture (AQF5)
- Cert III Horticulture - Landscape (AQF3)
- Registered Quantified Tree Risk Assessment assessor (QTRA)

Professional Memberships

- General Membership of Arboriculture Australia (AA)

Experience

Bryce brings ten (10) years of experience in Arboriculture and Horticulture. His career has varied experience in both landscape construction/horticulture and arboricultural consulting.

Bryce is a Consulting Arborist for Urban Arbor Pty Ltd. Urban Arbor is a consultancy company that specifically deals with tree management with no practical tree work being offered. Bryce has managed sites and provided expert reports on various projects, from single trees through to large sites with over 600 trees.
Bryce has experience delivering arboricultural management and recommendations throughout the Sydney region.

Bryce's current role includes the following;
- Report writing including preliminary reports, development impact assessments, risk assessment and tree protection during development.
- Developing and implementing tree management programs
- Risk assessments using the QTRA method
- Project Arborist work
- Diagnostic procedures for determination of various tree related issues
- Consultancy work both verbal and written format

Arboricultural and Horticultural Employment History

- 2017 to Present: Consulting Arborist at Urban Arbor Pty Ltd, Sydney, NSW
- 2015 to 2017: Landscape Construction Tradesman/Stonemason at Collaroy Stoneworks, Sydney, NSW
- 2008 to 2015: Landscape Construction Apprentice-Tradesman at All Landscape Services, Sydney, NSW

Recent Project Works Undertaken

Preparing Arboricultural Impact Assessment reports for large projects, such as the new private hospital in Terrey Hills and various public schools for the Department of Education and Training school beautification project, including providing significant tree sensitive solutions of developments within public schools across Sydney.

Project Arborist on large developments including Royal Far West in Manly and Macquarie University. Bryce has worked as a project Arborist for many first tier construction companies, such as Richard Crookes, Liang O'Rourke, PDS Group and FDC Construction.

Delivering Arboricultural Impact Assessments and Project Arborist works for private developers within Councils including Ku Ring Gai Council, Hornsby Council, The Hills Shire, Holroyd Council, Inner West Council, Manly Council, Warringah Council, Pittwater Council, North Sydney Council, Mosman Council, Hunters Hill Council, Lane Cove Council, Parramatta Council, Ryde Council, Blacktown Council, Woollahra Council, Waverley Council, Sutherland Council, and Hawkesbury Council.

Appendix D – Mark up of trees identified for removal within station precincts



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Metres

Map Projection: Transverse Mercator
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N

LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Stand alone trees deemed for removal based on current design alignment
- Group of trees deemed for removal
- Trees deemed for removal that the Project managed to retain

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Marrickville
Trees within station precincts

Figure 1.1

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N

LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Stand alone trees deemed for removal based on current design alignment
- Trees that have been removed
- Stand alone council trees to be removed based on landscape package
- Trees deemed for removal that the Project managed to retain

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Revision	A
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Dulwich Hill
Trees within station precincts

Figure 1.2

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LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Stand alone trees deemed for removal based on current design alignment
- Group of trees deemed for removal
- Trees deemed for removal that the Project managed to retain

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Hurlstone Park
Trees within station precincts

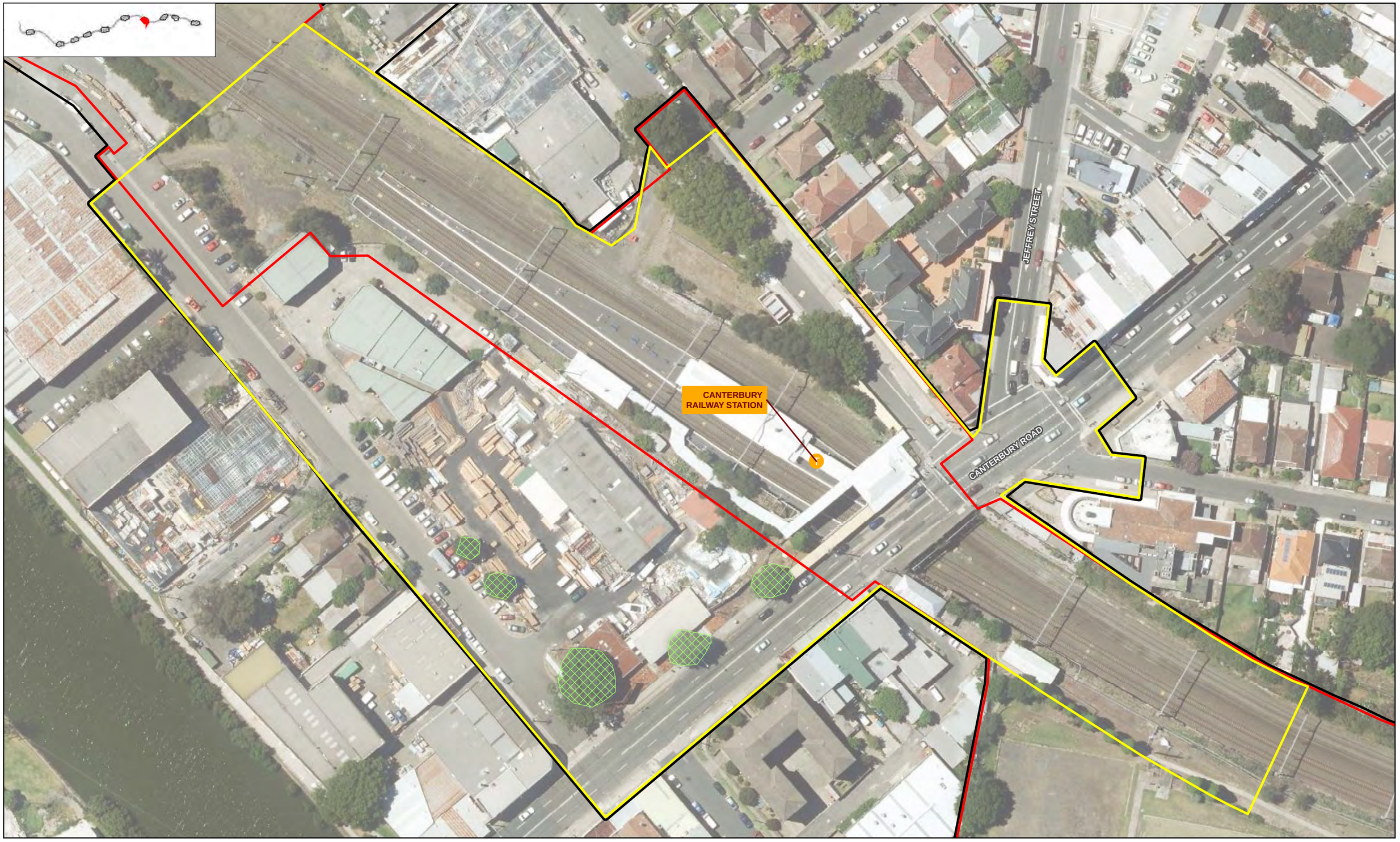
Figure 1.3

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Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Stand alone trees deemed for removal based on current design alignment
- Trees that have been removed
- Group of trees deemed for removal
- Trees deemed for removal that the Project managed to retain

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Canterbury
Trees within station precincts

Figure 1.4

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N

LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Canterbury feeder
- Stand alone trees deemed for removal based on current design alignment
- Group of trees deemed for removal
- Trees deemed for removal that the Project managed to retain

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Campsie
Trees within station precincts

Figure 1.5

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LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Stand alone trees deemed for removal based on current design alignment
- Group of trees deemed for removal
- Trees deemed for removal that the Project managed to retain

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Belmore
Trees within station precincts

Figure 1.6

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LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Stand alone trees deemed for removal based on current design alignment
- Group of trees deemed for removal
- Trees deemed for removal that the Project managed to retain

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Lakemba
Trees within station precincts

Figure 1.7

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LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Stand alone trees deemed for removal based on current design alignment
- Group of trees deemed for removal
- Trees deemed for removal that the Project managed to retain

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Wiley Park
Trees within station precincts

Figure 1.8

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LEGEND

- Project area
- Study area
- Station precincts
- T Train station
- Stand alone trees deemed for removal based on current design alignment
- Group of trees deemed for removal
- Trees deemed for removal that the Project managed to retain

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Biodiversity Assessment

Job Number 21-25273
Revision A
Date 21 Aug 2017

Punchbowl
Trees within station precincts

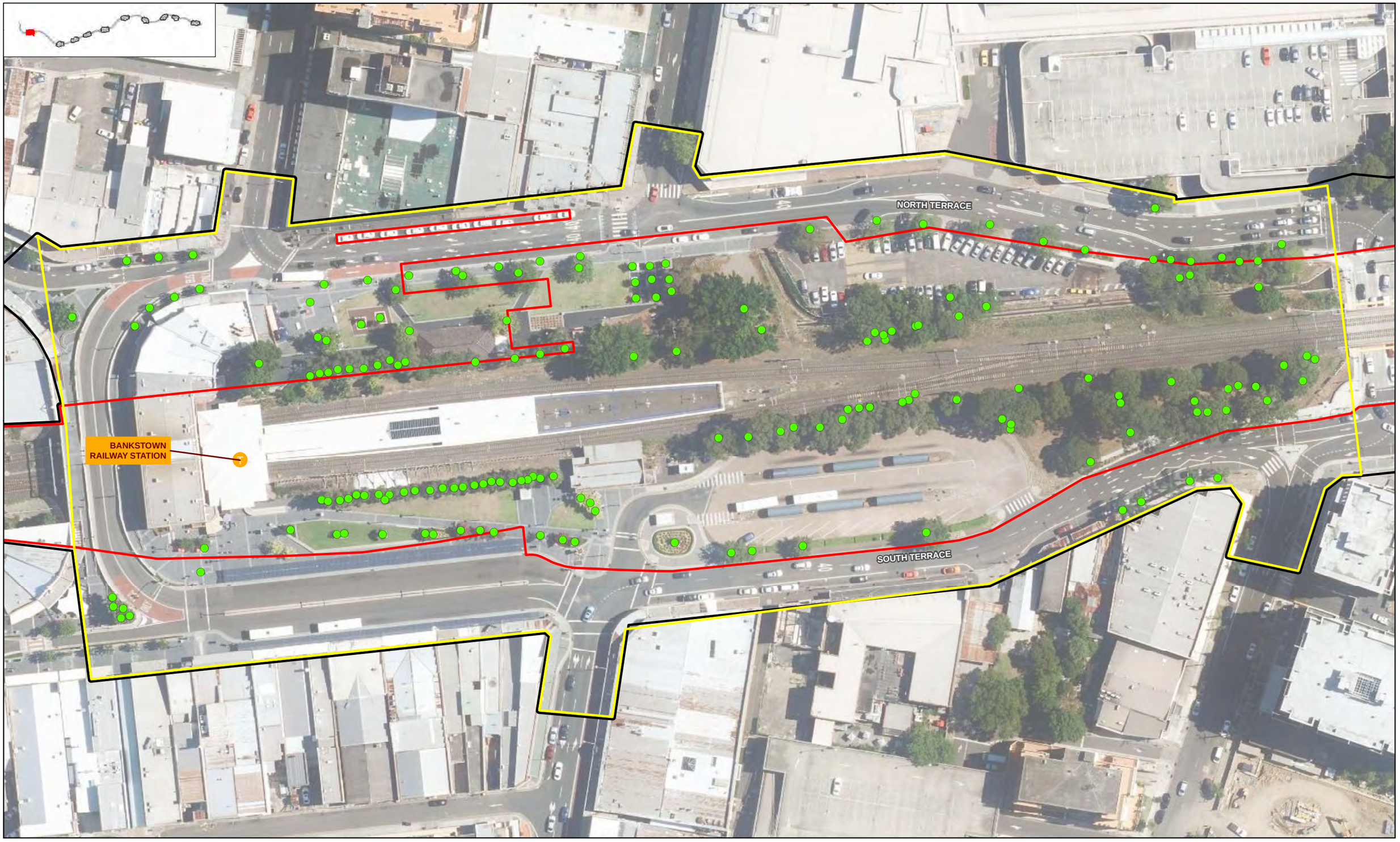
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Metres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Project area
- Study area
- Station precincts
- Train station
- Trees within station precinct

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Revision	A
Date	21 Aug 2017

Bankstown
Trees within station precincts

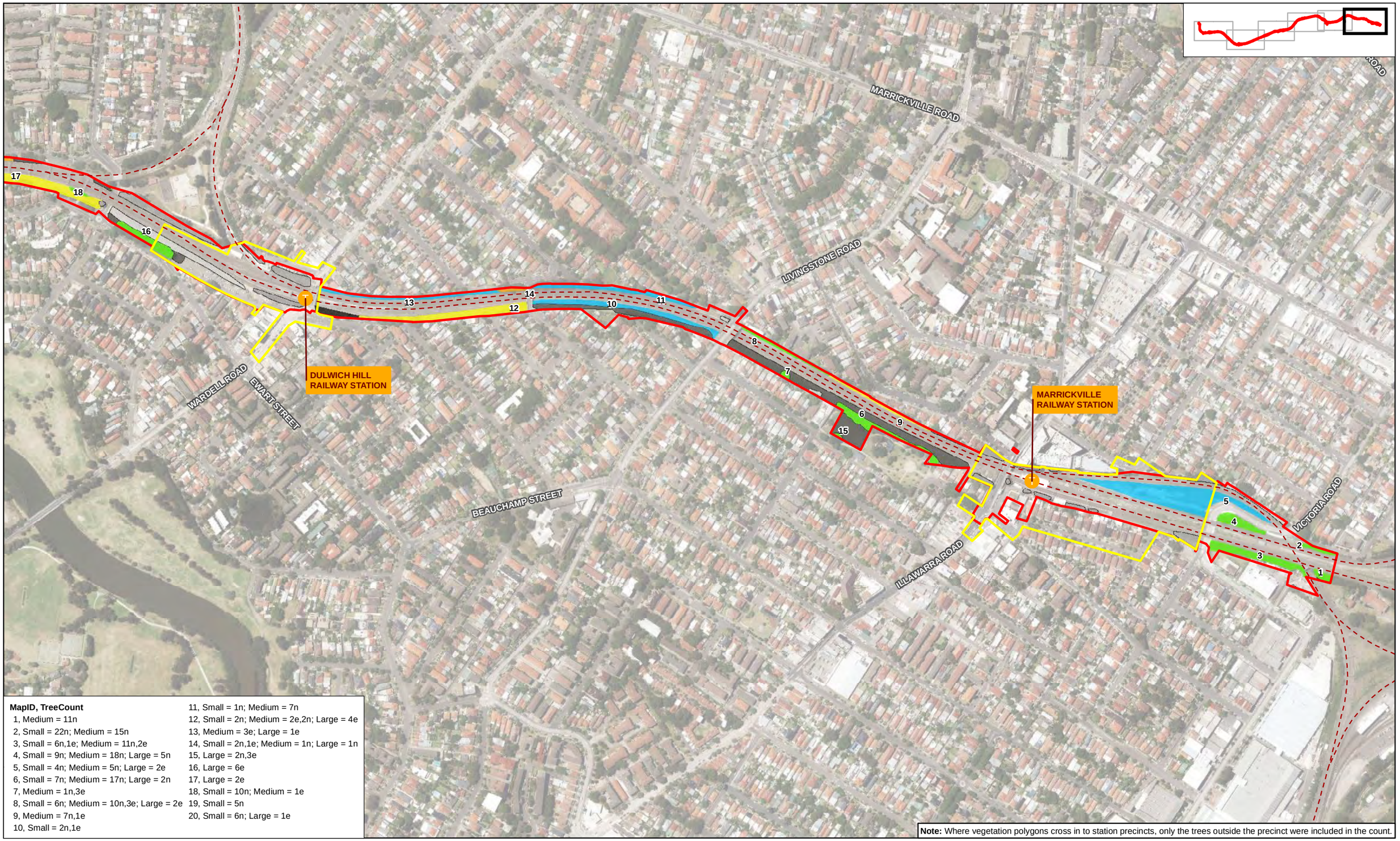
Figure 1.10

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MapID, TreeCount

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2, Small = 22n; Medium = 15n
3, Small = 6n,1e; Medium = 11n,2e
4, Small = 9n; Medium = 18n; Large = 5n
5, Small = 4n; Medium = 5n; Large = 2e
6, Small = 7n; Medium = 17n; Large = 2n
7, Medium = 1n,3e
8, Small = 6n; Medium = 10n,3e; Large = 2e
9, Medium = 7n,1e
10, Small = 2n,1e
11, Small = 1n; Medium = 7n
12, Small = 2n; Medium = 2e,2n; Large = 4e
13, Medium = 3e; Large = 1e
14, Small = 2n,1e; Medium = 1n; Large = 1n
15, Large = 2n,3e
16, Large = 6e
17, Large = 2e
18, Small = 10n; Medium = 1e
19, Small = 5n
20, Small = 6n; Large = 1e

Note: Where vegetation polygons cross in to station precincts, only the trees outside the precinct were included in the count.

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Paper Size A3

0 50 100 200

Metres

Map Projection: Transverse Mercator
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Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Project area
- Station precincts
- Train station
- Railway
- Exotic grassland
- Exotic scrub or forest
- Planted native vegetation
- Degraded Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-poor)
- Exotic grassland (no trees recorded)
- Exotic scrub or forest (no trees recorded)
- Planted native vegetation (no trees recorded)
- Degraded Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-poor) (no trees recorded)

Revised by JHLORJV July 2024

Transport for NSW
Sydney Metro - Sydenham to Bankstown upgrade
Biodiversity Assessment

Job Number	21-25273
Revision	A
Date	21 Aug 2017

Trees between station precincts

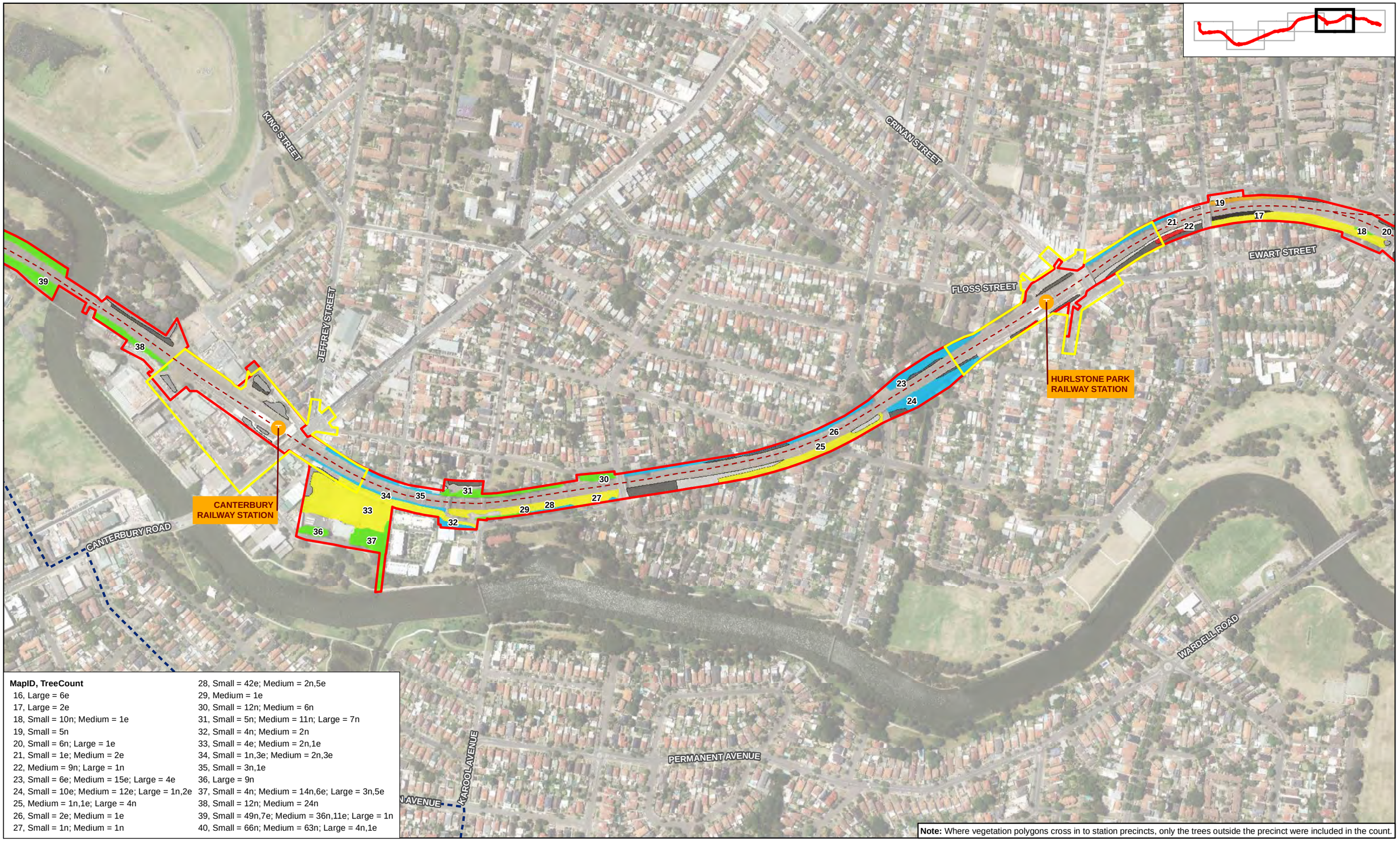
Figure 2a

N:\AU\Sydney\Projects\21\25273\GIS\Maps\Deliverables\Biodiversity\21_25273_Z021_TreesBetweenStationPrecincts.mxd

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MapID, TreeCount

16, Large = 6e
17, Large = 2e
18, Small = 10n; Medium = 1e
19, Small = 5n
20, Small = 6n; Large = 1e
21, Small = 1e; Medium = 2e
22, Medium = 9n; Large = 1n
23, Small = 6e; Medium = 15e; Large = 4e
24, Small = 10e; Medium = 12e; Large = 1n,2e
25, Medium = 1n,1e; Large = 4n
26, Small = 2e; Medium = 1e
27, Small = 1n; Medium = 1n
28, Small = 42e; Medium = 2n,5e
29, Medium = 1e
30, Small = 12n; Medium = 6n
31, Small = 5n; Medium = 11n; Large = 7n
32, Small = 4n; Medium = 2n
33, Small = 4e; Medium = 2n,1e
34, Small = 1n,3e; Medium = 2n,3e
35, Small = 3n,1e
36, Large = 9n
37, Small = 4n; Medium = 14n,6e; Large = 3n,5e
38, Small = 12n; Medium = 24n
39, Small = 49n,7e; Medium = 36n,11e; Large = 1n
40, Small = 66n; Medium = 63n; Large = 4n,1e

Note: Where vegetation polygons cross in to station precincts, only the trees outside the precinct were included in the count.

Service Layer Credits: © Land and Property Information 2015

Paper Size A3

0 50 100 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Project area
- Station precincts
- Train station
- Railway
- Canterbury feeder
- Exotic grassland
- Exotic scrub or forest
- Planted native vegetation
- Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-medium)
- Degraded Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-poor)
- Exotic grassland (no trees recorded)
- Exotic scrub or forest (no trees recorded)
- Planted native vegetation (no trees recorded)
- Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-medium) (no trees recorded)
- Degraded Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-poor) (no trees recorded)

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Transport for NSW
Sydney Metro - Sydenham to Bankstown upgrade
Biodiversity Assessment

Job Number	21-25273
Revision	A
Date	21 Aug 2017

Trees between station precincts

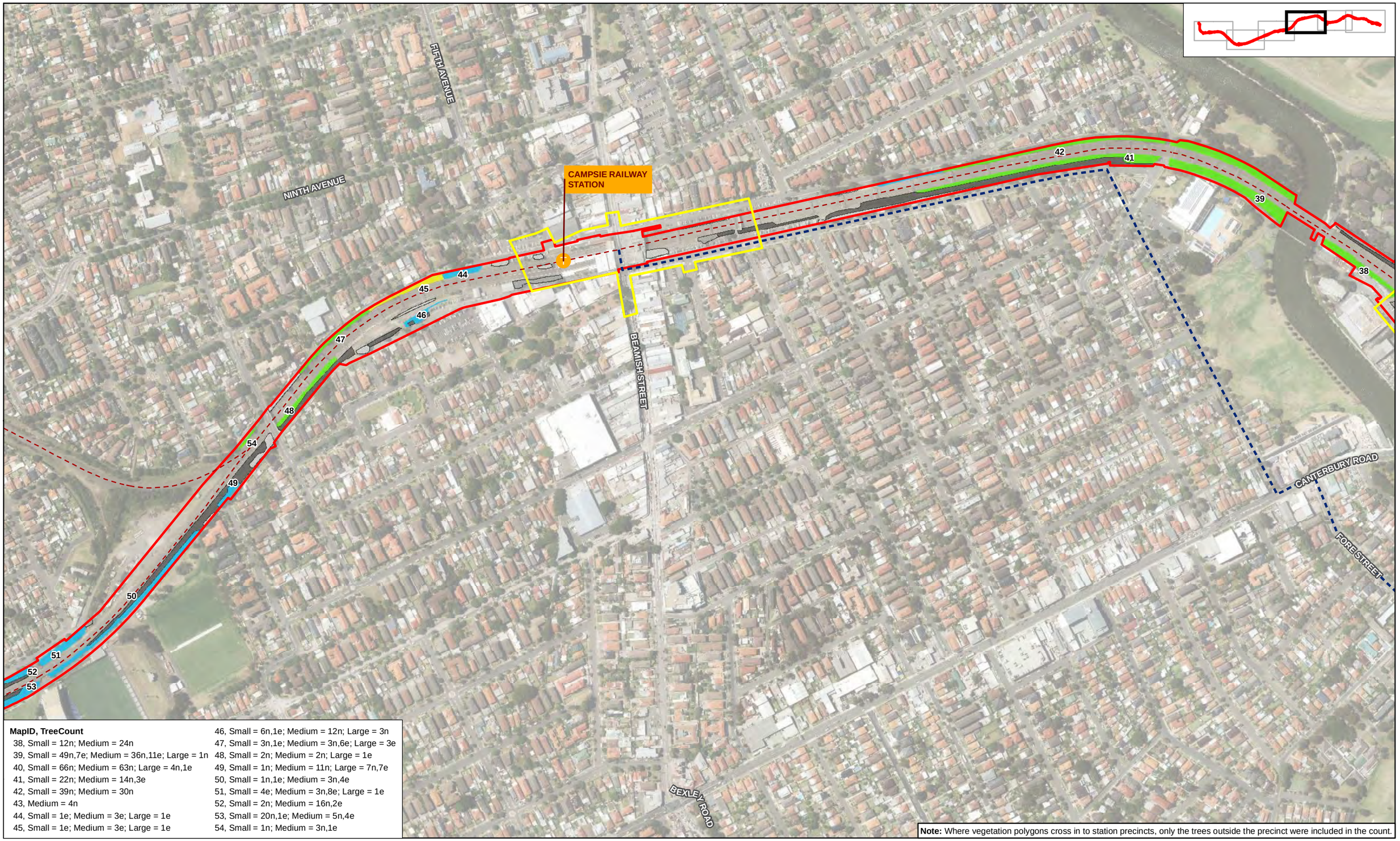
Figure 2b

N:\AU\Sydney\Projects\21\25273\GIS\Maps\Deliverables\Biodiversity\21_25273_Z021_TreesBetweenStationPrecincts.mxd

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MapID, TreeCount

38, Small = 12n; Medium = 24n
39, Small = 49n,7e; Medium = 36n,11e; Large = 1n
40, Small = 66n; Medium = 63n; Large = 4n,1e
41, Small = 22n; Medium = 14n,3e
42, Small = 39n; Medium = 30n
43, Medium = 4n
44, Small = 1e; Medium = 3e; Large = 1e
45, Small = 1e; Medium = 3e; Large = 1e
46, Small = 6n,1e; Medium = 12n; Large = 3n
47, Small = 3n,1e; Medium = 3n,6e; Large = 3e
48, Small = 2n; Medium = 2n; Large = 1e
49, Small = 1n; Medium = 11n; Large = 7n,7e
50, Small = 1n,1e; Medium = 3n,4e
51, Small = 4e; Medium = 3n,8e; Large = 1e
52, Small = 2n; Medium = 16n,2e
53, Small = 20n,1e; Medium = 5n,4e
54, Small = 1n; Medium = 3n,1e

Note: Where vegetation polygons cross in to station precincts, only the trees outside the precinct were included in the count.

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Paper Size A3

0 50 100 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Project area
- Station precincts
- Train station
- Railway
- Canterbury feeder
- Exotic grassland
- Exotic scrub or forest
- Planted native vegetation
- Exotic grassland (no trees recorded)
- Exotic scrub or forest (no trees recorded)
- Planted native vegetation (no trees recorded)

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Transport for NSW
Sydney Metro - Sydenham to Bankstown upgrade
Biodiversity Assessment

Job Number 21-25273
Revision A
Date 21 Aug 2017

Trees between station precincts

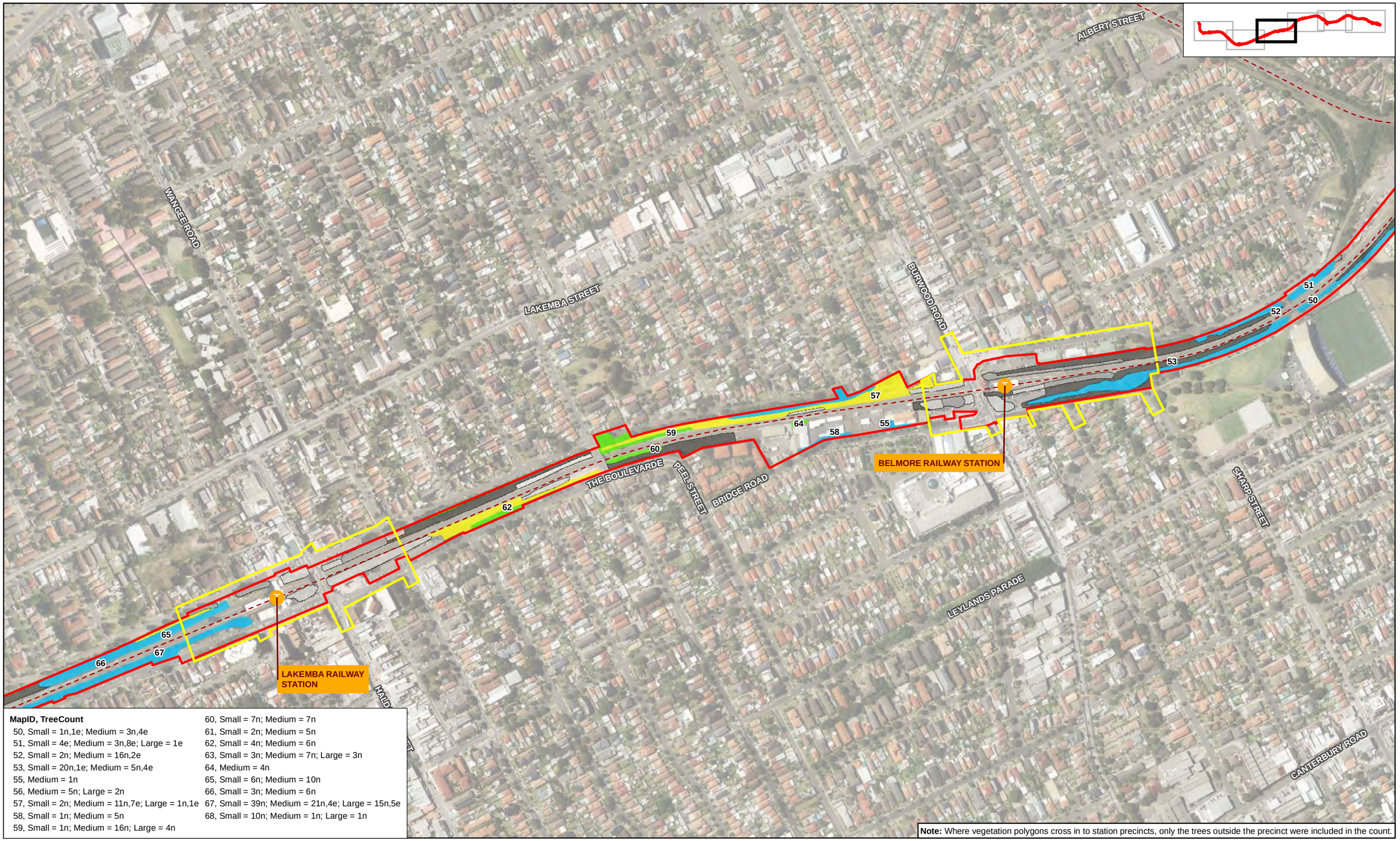
Figure 2c

N:\AU\Sydney\Projects\21\25273\GIS\Maps\Deliverables\Biodiversity\21_25273_Z021_TreesBetweenStationPrecincts.mxd

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Data source: Aerial imagery - sixmaps 2016, General topo - NSW LPI DTDB 2012. Created by:jrprice

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MapID, TreeCount

50, Small = 1n,1e; Medium = 3n,4e
51, Small = 4e; Medium = 3n,8e; Large = 1e
52, Small = 2n; Medium = 16n,2e
53, Small = 20n,1e; Medium = 5n,4e
55, Medium = 1n
56, Medium = 5n; Large = 2n
57, Small = 2n; Medium = 11n,7e; Large = 1n,1e
58, Small = 1n; Medium = 5n
59, Small = 1n; Medium = 16n; Large = 4n
60, Small = 7n; Medium = 7n
61, Small = 2n; Medium = 5n
62, Small = 4n; Medium = 6n
63, Small = 3n; Medium = 7n; Large = 3n
64, Medium = 4n
65, Small = 6n; Medium = 10n
66, Small = 3n; Medium = 6n
67, Small = 39n; Medium = 21n,4e; Large = 15n,5e
68, Small = 10n; Medium = 1n; Large = 1n

Note: Where vegetation polygons cross in to station precincts, only the trees outside the precinct were included in the count.

Service Layer Credits: © Land and Property Information 2015

Paper Size A3

0 50 100 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Project area
- Station precincts
- Train station
- Railway
- Exotic grassland
- Exotic scrub or forest
- Planted native vegetation
- Exotic grassland (no trees recorded)
- Exotic scrub or forest (no trees recorded)
- Planted native vegetation (no trees recorded)
- Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-medium) (no trees recorded)

Revised by JHLORJV July 2024

Transport for NSW
Sydney Metro - Sydenham to Bankstown upgrade
Biodiversity Assessment

Job Number 21-25273
Revision A
Date 21 Aug 2017

Trees between station precincts

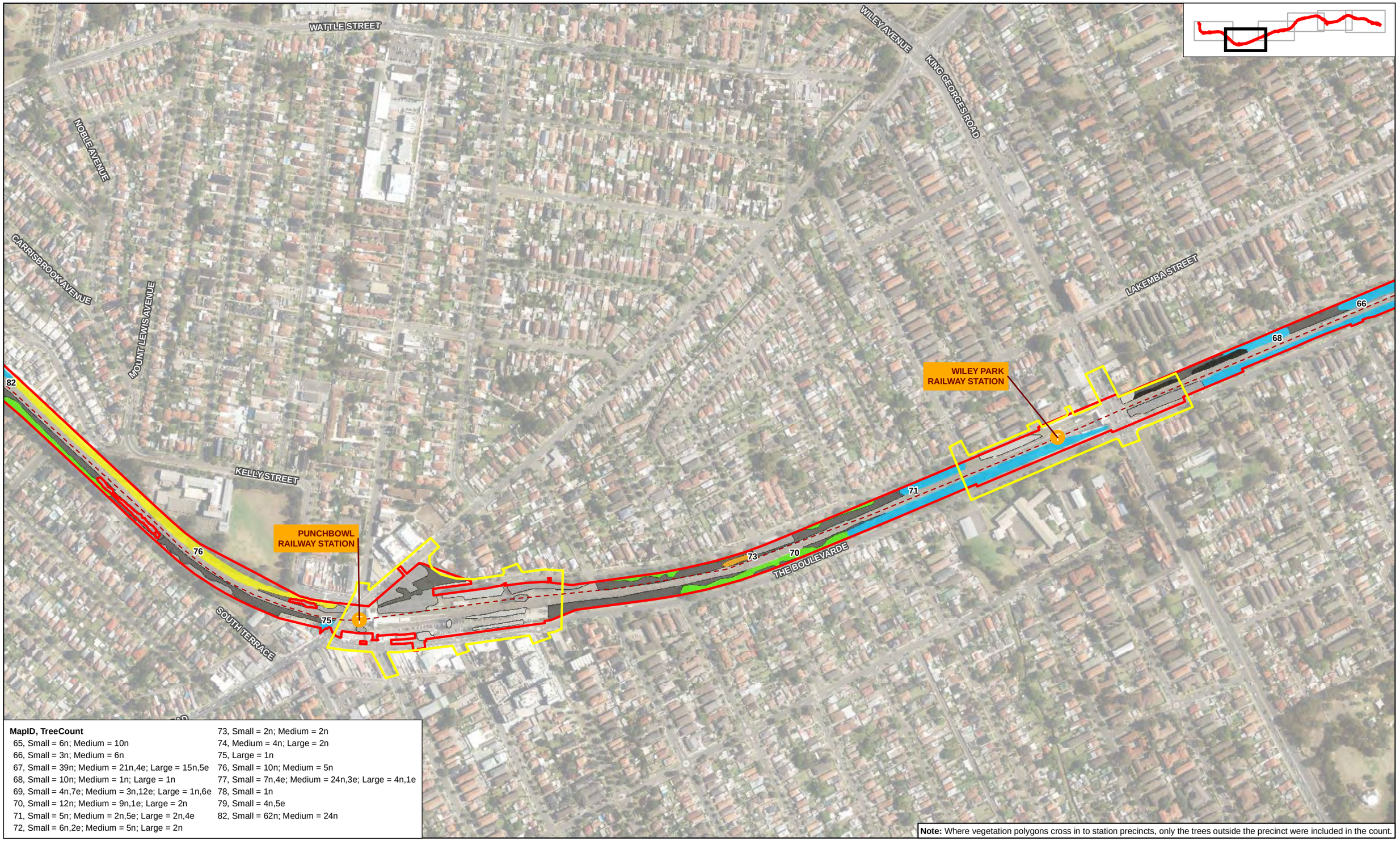
Figure 2d

N:\AU\Sydney\Projects\21\25273\GIS\Maps\Deliverables\Biodiversity\21_25273_Z021_TreesBetweenStationPrecincts.mxd

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MapID, TreeCount

65, Small = 6n; Medium = 10n
66, Small = 3n; Medium = 6n
67, Small = 39n; Medium = 21n,4e; Large = 15n,5e
68, Small = 10n; Medium = 1n; Large = 1n
69, Small = 4n,7e; Medium = 3n,12e; Large = 1n,6e
70, Small = 12n; Medium = 9n,1e; Large = 2n
71, Small = 5n; Medium = 2n,5e; Large = 2n,4e
72, Small = 6n,2e; Medium = 5n; Large = 2n
73, Small = 2n; Medium = 2n
74, Medium = 4n; Large = 2n
75, Large = 1n
76, Small = 10n; Medium = 5n
77, Small = 7n,4e; Medium = 24n,3e; Large = 4n,1e
78, Small = 1n
79, Small = 4n,5e
82, Small = 62n; Medium = 24n

Note: Where vegetation polygons cross in to station precincts, only the trees outside the precinct were included in the count.

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Paper Size A3

0 50 100 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Project area
- Station precincts
- Train station
- Railway
- Exotic grassland
- Exotic scrub or forest
- Planted native vegetation
- Degraded Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-poor)
- Exotic grassland (no trees recorded)
- Exotic scrub or forest (no trees recorded)
- Planted native vegetation (no trees recorded)
- Broad-leaved Ironbark - Grey Box - *Melaleuca decora* grassy open forest (ME004, Moderate/good) (no trees recorded)
- Degraded Turpentine - Grey Ironbark open forest on shale (ME041, Moderate/good-poor) (no trees recorded)

Revised by JHLORJV July 2024

Transport for NSW
Sydney Metro - Sydenham to Bankstown upgrade
Biodiversity Assessment

Job Number 21-25273
Revision A
Date 21 Aug 2017

Trees between station precincts

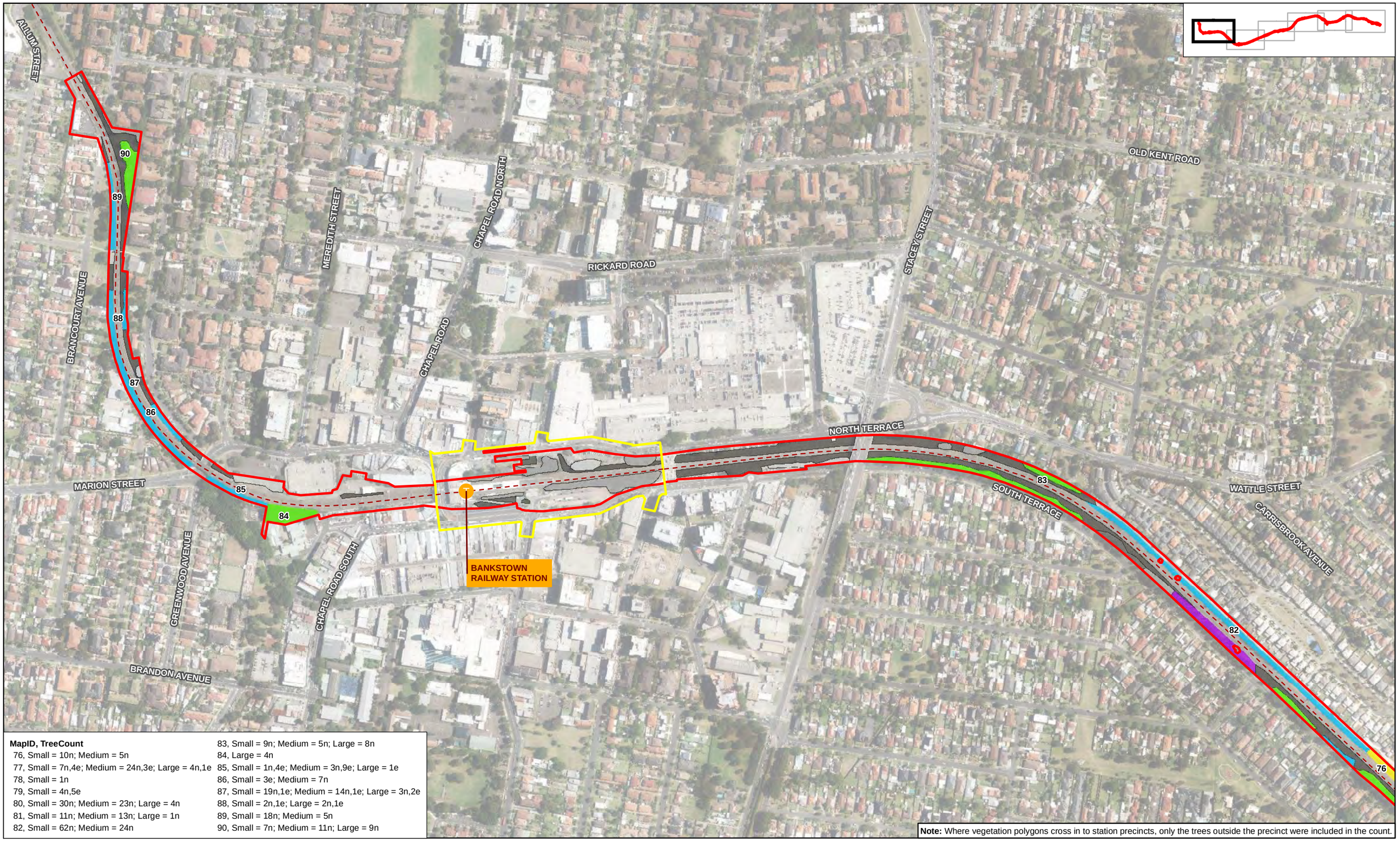
Figure 2e

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MapID, TreeCount

76, Small = 10n; Medium = 5n
77, Small = 7n,4e; Medium = 24n,3e; Large = 4n,1e
78, Small = 1n
79, Small = 4n,5e
80, Small = 30n; Medium = 23n; Large = 4n
81, Small = 11n; Medium = 13n; Large = 1n
82, Small = 62n; Medium = 24n
83, Small = 9n; Medium = 5n; Large = 8n
84, Large = 4n
85, Small = 1n,4e; Medium = 3n,9e; Large = 1e
86, Small = 3e; Medium = 7n
87, Small = 19n,1e; Medium = 14n,1e; Large = 3n,2e
88, Small = 2n,1e; Large = 2n,1e
89, Small = 18n; Medium = 5n
90, Small = 7n; Medium = 11n; Large = 9n

Note: Where vegetation polygons cross in to station precincts, only the trees outside the precinct were included in the count.

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Paper Size A3

0 50 100 200

Metres

Map Projection: Transverse Mercator
Horizontal Datum: GDA 1994
Grid: GDA 1994 MGA Zone 56

N

LEGEND

- Project area
- Station precincts
- Train station
- Railway
- Exotic grassland
- Exotic scrub or forest
- Planted native vegetation
- Broad-leaved Ironbark - Grey Box - *Melaleuca decora* grassy open forest (ME004, Moderate/good)
- Exotic grassland (no trees recorded)
- Exotic scrub or forest (no trees recorded)
- Planted native vegetation (no trees recorded)
- Broad-leaved Ironbark - Grey Box - *Melaleuca decora* grassy open forest (ME004, Moderate/good) (no trees recorded)

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July 2024

Transport for NSW
Sydney Metro - Sydenham to Bankstown upgrade
Biodiversity Assessment

Job Number 21-25273
Revision A
Date 21 Aug 2017

Trees between station precincts

Figure 2f

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Data source: Aerial imagery - sixmaps 2016, General topo - NSW LPI DTDB 2012. Created by:jrprice

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Appendix E – Compliance Matrix

Table 1 lists the Section of this report that demonstrate compliance with CoA – E5.

Details	Compliance
The Proponent must commission an independent experienced and suitably qualified arborist, to prepare a comprehensive Tree Report(s) before removing any trees as detailed in the documents listed in Condition A1. The Tree Report may be prepared for the entire CSSI or separate reports may be prepared for individual areas where trees are required to be removed. The report(s) must identify the impacts of the CSSI on trees and vegetation within and adjacent to the Construction footprint.	Section 2 of Appendix A and Appendix C. Bryce Claassens, consulting arborist from Urban Arbor was engaged to assess trees.
The report(s) must include:	
(a) a description of the conditions of the tree(s) and its amenity and visual value;	Appendix A
(b) consideration of all options to avoid tree removal, including relocation of services, redesign or relocation of ancillary components (such as substations, fencing etc.) and reduction of standard offsets to underground services; and	Section 8 of each station tree assessment, Appendix A
(c) measures to avoid the removal of trees or minimise damage to existing trees and ensure the health and stability of those trees to be protected. This includes details of any proposed canopy or root pruning, root protection zone, excavation, site controls on waste disposal, vehicular access, storage of materials and protection of public utilities.	Section 11 of each station tree assessment, Appendix A
A copy of the report(s) must be submitted to the Planning Secretary before the removal or pruning of any trees, including those affected by site establishment Work. All recommendations of the report must be implemented by the Proponent, unless otherwise agreed by the Planning Secretary.	Section 10 of each station tree assessment, Appendix A