



Arboricultural Report: BAC Tree Report

Site Location: Southwest Metro -
Marrickville, Belmore, Wiley Park,
Punchbowl and Bankstown, NSW

Prepared for:
John Holland Laing O'Rourke

Prepared by: Bryce Claassens
Urban Arbor Pty Ltd
Date prepared: 23 September 2022
Ref: 220923-BAC-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 Report for trees located at the site and adjoining sites in relation to the proposed Bankstown & Additional Corridor (BAC) construction works. The report is to address trees to be removed or pruned within specific areas at the site and to specify tree protection requirements for trees to be retained.
- 1.2 Documents and information provided to assist in preparing the report;
- A) BAC Proposed Laydown Areas & Compounds, John Holland Liang O'Rourke, Final TCDP Version V4.
 - B) BAC Arborist Assessment Document, John Holland Liang O'Rourke, 10 June 2022.
- 1.3 The site and tree inspections were completed on 6 November 2020, 9 December 2020, 12 February 2021, 17 February 2021, 10 June 2021, 16 July 2021, 19 November 2021, 17 December 2021 and 10 June 2022. Some trees included within this report were previously inspected between the dates of 6 January 2020 to 3 April 2020 during the Southwest Metro Rail Corridor (Marrickville to Bankstown) works. Access was available to the subject site and adjoining public areas only.

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 retained within each area.
 - 2.1.4 Specify tree protection measures for trees to be retained in accordance with AS4970-2009.
 - 2.1.5 Provide pruning specifications for trees where required, in accordance with AS4373-2007.

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 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.
- 3.6 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.*
- 3.7 Some trees included within this report have been located using a Trimble TDC100 hand held GNSS device by Urban Arbor Pty Ltd. Tree locations are only accurate within 1m - 3m. If an accurate location of the trees is required, a registered surveyor should locate the trees.
- 3.8 All diagrams, plans and photographs included in this report are visual aids only and are not to scale unless otherwise indicated.
- 3.9 Alteration of this report invalidates the entire report.

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 information was imported into our computerised geographical information system (GIS) PT-mapper pro. This software was used to measure/calculate all encroachment estimates included in this report.
- 4.5 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
- 4.6 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).

5. SITE LOCATION AND BRIEF DESCRIPTION

- 5.1 The area covered in the site inspections is located within two Local Government Areas (LGA), including Inner West LGA and Canterbury Bankstown LGA. All trees within the Inner West LGA are subject to protection under the corresponding Local Environmental Plans (LEP)⁵, Development Control Plans (DCP)⁶ and Tree Management DCP 2020.⁷ All trees within the Canterbury Bankstown LGA are subject to protection under the Canterbury LEP 2012⁸, Canterbury DCP 2012⁹, Bankstown LEP 2015¹⁰ and Bankstown DCP 2015.¹¹

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.

⁵ Inner West Local Environmental Plans, <https://www.innerwest.nsw.gov.au/develop/planning-controls/local-environment-plans-lep>, accessed 4 March 2021.

⁶ Inner West Development Control Plans, <https://www.innerwest.nsw.gov.au/develop/planning-controls/current-development-control-plans-dcp>, accessed 4 March 2021.

⁷ Inner West Tree Management Development Control Plan 2020, <https://www.innerwest.nsw.gov.au/live/information-for-residents/trees/trees-on-your-property-pruning-or-removing>, accessed 4 March 2021.

⁸ Canterbury Local Environmental Plan 2012, <https://www.legislation.nsw.gov.au/#/view/EPI/2012/673>, accessed 4 March 2021.

⁹ Canterbury Development Control Plan 2012, <https://www.cbcity.nsw.gov.au/development/planning-control-policies/canterbury-development-control-plan-2012>, accessed 4 March 2021.

¹⁰ Bankstown Local Environmental Plan 2015, <https://www.legislation.nsw.gov.au/#/view/EPI/2015/140/full>, accessed 4 March 2021.

¹¹ Bankstown Development Control Plan 2015, <https://www.cbcity.nsw.gov.au/resident/trees-garden-home/pruning-removing-trees/tree-preservation-order>, accessed 4 March 2021.

- 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; $(DAB \times 50)^{0.42} \times 0.64$. 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.
- 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.

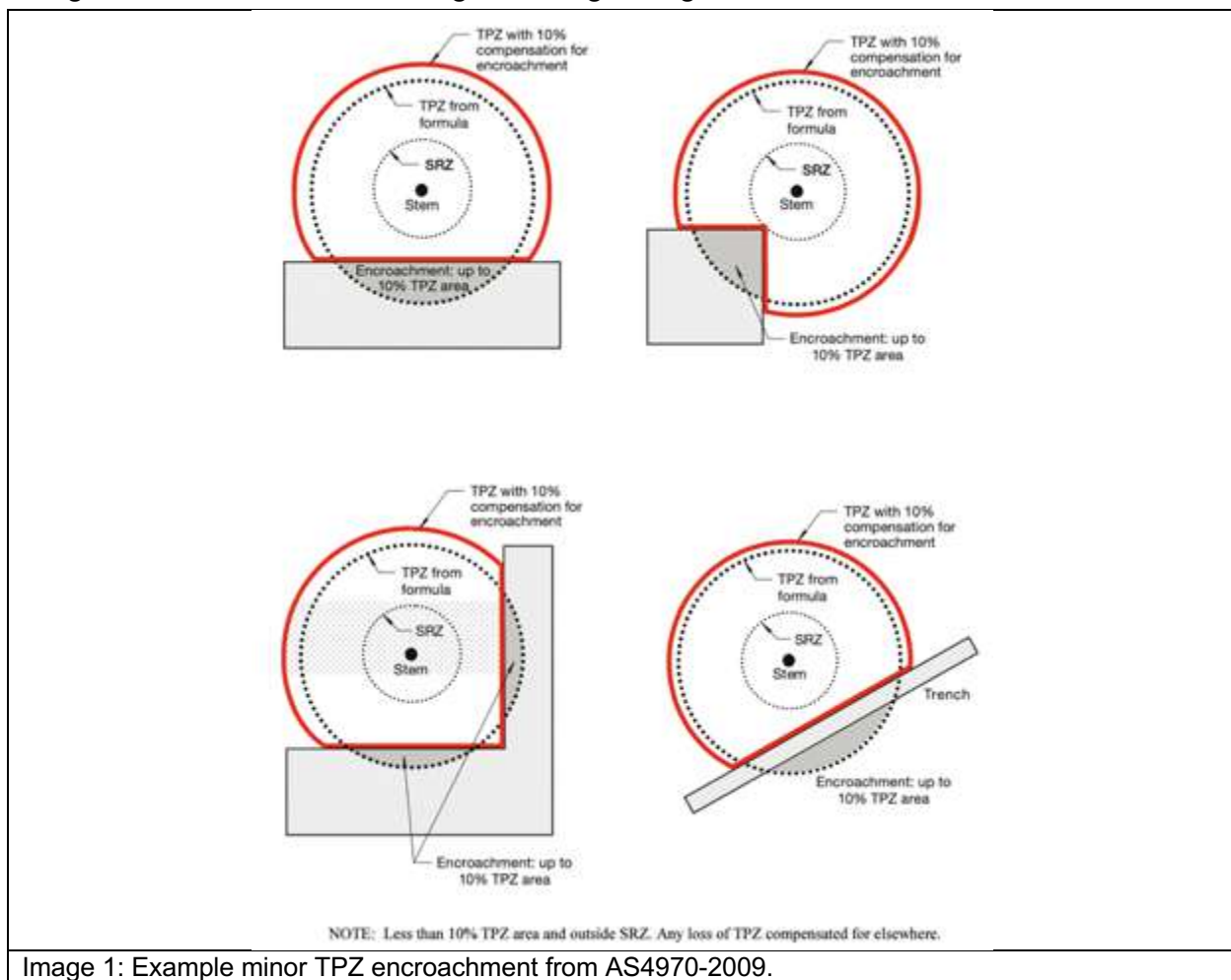


Image 1: Example minor TPZ encroachment from AS4970-2009.

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).

7. SITE LOCATION

7.1 The areas assessed in this report have been identified by John Holland Laing O'Rourke and have been listed below. Urban Arbor carried out a site inspection to identify significant trees within each area. The following areas were assessed for significant trees that could potentially be impacted by the proposed development;

- **9.3** Marrickville
- **9.4** Belmore
- **9.5** Wiley Park
- **9.6** Punchbowl
- **9.7** Bankstown

8. TREE OBSERVATIONS

- 8.1 **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) and Structural Root Zone (SRZ) has been calculated for each of the subject trees. The TPZ and SRZ should be measured in radius from the centre of the trunk. Each of the subject trees have been awarded a retention value based on the observations using the Tree AZ method. 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 appendix 3 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.

9. ASSESSMENT OF TREE IMPACTS BY AREA

- 9.1 The below tables include trees and other *vegetation* - refer to the notes column in Appendix 2 for classification. *Vegetation* has been identified at the discretion of Urban Arbor to meet the requirements of Condition of Approval E5 and includes shrubs and some exotic species but does not include small insignificant regrowth, weed species and grasses. Totals derived for replacement planting include trees only, as defined by the *NSW Government Planning & Environment, 12 December 2018, Condition of Approval – E5, SSI 8256*.
- 9.2 The trees and *vegetation* 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 12. 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.

9.3.1 Victoria Road/Riverdale: No *vegetation*/tree removal or pruning is required within this area. Removal of insignificant weed species only.



Image 1: Victoria Road/Riverdale works area from JHLOR.

9.4.1 Elata Street: No *vegetation*/tree removal or pruning is required within this area. Removal of insignificant weed species only.



Image 2: Elata Street works area from JHLOR.

9.4.2 Bridge Road: The trees within this area are located adjacent to proposed laydown areas and canopy pruning will be required to allow for the works. The following trees have been identified within this area:

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	TPZ Area (m ²)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
924	<i>Eucalyptus spp</i>	1. Long	A1	6.6	136.8	2.7	Native	High
927	<i>Lophostemon confertus</i>	2. Medium	A1	4.4	60.8	2.4	Native	Medium
929	<i>Eucalyptus scoparia</i>	2. Medium	Z3	3.2	32.2	2.2	Native	Medium
930	<i>Lophostemon confertus</i>	2. Medium	A1	5.9	109.4	2.6	Native	Medium
931	<i>Lophostemon confertus</i>	2. Medium	A1	5.0	78.5	2.4	Native	Medium



Image 3: Bridge Road works area from JHLOR (circled pink).



Image 4: Looking towards tree 924, showing required canopy pruning. The 150mm primary branch to the North at 3.5m above ground is to be removed. The branch has been marked yellow and the final pruning cut has been marked red. The pruning will result in the removal of less than 10% of the overall live canopy.



Image 5: Looking towards tree 927, showing required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m to allow for the works. Final pruning cuts should not exceed 50mm in diameter. The pruning will result in the removal of less than 10% of the overall live canopy.

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Image 6: Looking towards tree 929, showing required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m to allow for the works. Final pruning cuts should not exceed 50mm in diameter. The pruning will result in the removal of less than 10% of the overall live canopy.



Image 7: Looking towards tree 930, showing required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m to allow for the works. Final pruning cuts should not exceed 50mm in diameter. The pruning will result in the removal of less than 10% of the overall live canopy.

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Image 8: Looking towards tree 931, showing required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m to allow for the works. Final pruning cuts should not exceed 50mm in diameter. The pruning will result in the removal of less than 10% of the overall live canopy.

9.4.3 Belmore Carpark: No *vegetation/tree* removal or pruning is required within this area. Removal of insignificant weed species only.



Image 9: Belmore carpark works area from JHLOR (circled pink).

9.5 **Wiley Park**

9.5.1 **The Boulevard:** The trees within this area are located adjacent to proposed laydown areas and canopy pruning will be required to allow for the works. The following trees have been identified within this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	TPZ Area (m ²)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
1025	<i>Lophostemon confertus</i>	1. Long	A1	6.6	136.8	2.7	Native	High
1026	<i>Cinnamomum camphora</i>	1. Long	Z3	3.4	36.3	2.2	Exotic	Low



Image 10: The Boulevard works area from JHLOR



Image 11: Looking towards tree 1025, showing required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m to allow for the works. Final pruning cuts should not exceed 70mm in diameter. The pruning will result in the removal of less than 10% of the overall live canopy.

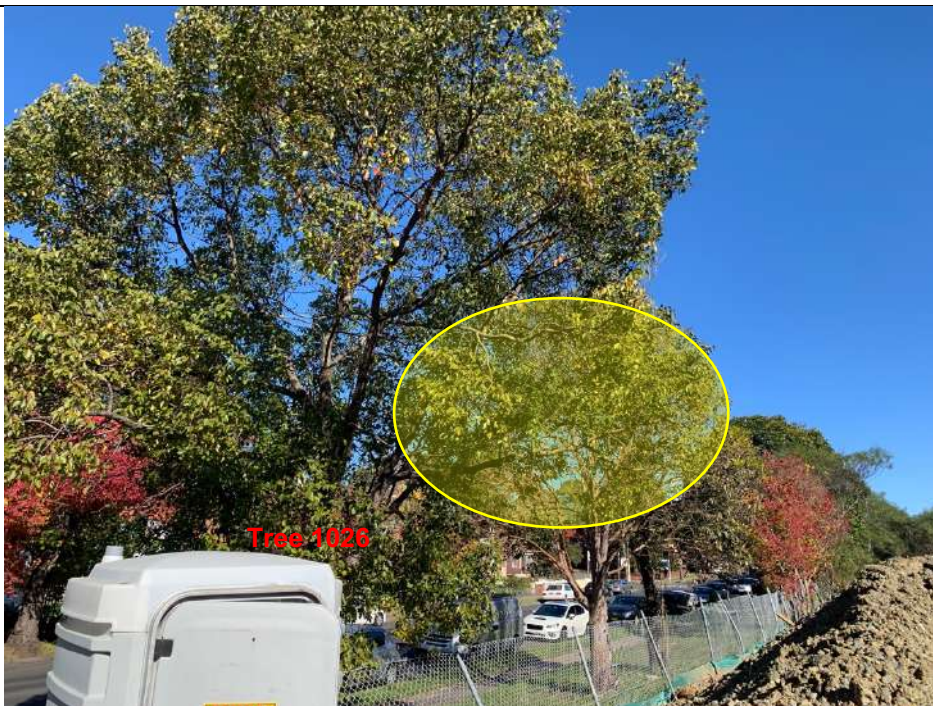


Image 12: Looking towards tree 1026, showing required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m to allow for the works. Final pruning cuts should not exceed 50mm in diameter. The pruning will result in the removal of less than 10% of the overall live canopy.

9.6 **Punchbowl**

9.6.1 **The Boulevard:** The trees within this area are located adjacent to proposed laydown areas and canopy pruning will be required to allow for the works. The following trees have been identified within this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	TPZ Area (m ²)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
1112	<i>Eucalyptus saligna</i>	1. Long	A1	6.2	120.8	2.9	Native	High
1116	<i>Lophostemon confertus</i>	1. Long	A1	4.4	60.8	2.6	Native	Medium



Image 13: The Boulevard works area from JHLOR



Image 14: Looking towards tree 1112, showing required canopy pruning. The 120mm second order branch to the West at 3m above ground is to be removed. The branch has been marked yellow and the final pruning cut has been marked red. The pruning will result in the removal of less than 5% of the overall live canopy.



Image 15: Looking towards tree 1016, showing required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m to allow for the works. Final pruning cuts should not exceed 50mm in diameter. The pruning will result in the removal of less than 10% of the overall live canopy.

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9.6.2 Urunga Parade: No *vegetation*/tree removal or pruning is required within this area. Removal of insignificant weed species only.



Image 16: Urunga Parade works area from JHLOR.

9.7 **Bankstown**

9.7.1 South Terrace, Bankstown: A combination of tree removal and canopy pruning will be required to accommodate the proposed construction. Tree 1493, 1494, 1496, 1497, 1498, 1499, 1500, 1504, 1506, 1513, 1514, 1516, 3524 and 3525 will be in conflict with the works area and are required to be removed. Tree 1525, 1526, 1527, 1528, 1529 and 1531 will require canopy pruning to allow for access to the works area. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	TPZ Area (m ²)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
1493	<i>Eucalyptus microcorys</i>	5. Small/Young	Z1	2.0	12.6	1.7	Native	Low
1494	<i>Eucalyptus microcorys</i>	1. Long	A1	3.8	45.4	2.3	Native	Medium
1496	<i>Eucalyptus microcorys</i>	5. Small/Young	Z1	2.0	12.6	1.6	Native	Low
1497	<i>Eucalyptus microcorys</i>	1. Long	A1	3.6	40.7	2.5	Native	Medium
1498	<i>Eucalyptus moluccana</i>	5. Small/Young	Z1	2.0	12.6	1.5	Native	Low
1499	<i>Eucalyptus moluccana</i>	1. Long	A1	2.5	19.6	1.9	Native	Medium
1500	<i>Eucalyptus microcorys</i>	5. Small/Young	Z1	2.0	12.6	1.7	Native	Low
1504	<i>Eucalyptus punctata</i>	1. Long	A1	3.6	40.7	2.1	Native	Medium
1506	<i>Eucalyptus punctata</i>	5. Small/Young	Z1	2.0	12.6	1.5	Native	Low

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Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	TPZ Area (m ²)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
1513	<i>Cinnamomum camphora</i>	4. Remove	Z4	7.2	162.9	2.8	Exotic	Low
1514	<i>Cinnamomum camphora</i>	5. Small/Young	Z4	6.6	136.8	2.6	Exotic	Low
1516	<i>Cinnamomum camphora</i>	4. Remove	Z4	6.0	113.1	2.6	Exotic	Low
1525	<i>Cinnamomum camphora</i>	3. Short	Z3	3.6	40.7	2.0	Exotic	Low
1526	<i>Cinnamomum camphora</i>	2. Medium	Z3	3.8	45.4	2.3	Exotic	Low
1527	<i>Cinnamomum camphora</i>	2. Medium	Z3	6.0	113.1	2.5	Exotic	Low
1528	<i>Cinnamomum camphora</i>	5. Small/Young	Z3	5.7	102.1	2.6	Exotic	Low
1529	<i>Cinnamomum camphora</i>	5. Small/Young	Z3	2.6	21.2	2.1	Exotic	Low
1531	<i>Melaleuca quinquenervia</i>	1. Long	A1	12.0	452.4	3.3	Native	High
3524	<i>Eucalyptus tereticornis</i>	5. Small/Young	Z1	2.0	12.6	1.7	Native	Low
3525	<i>Eucalyptus punctata</i>	5. Small/Young	Z1	2.0	12.6	1.8	Native	Low



Image 17: South Terrace works area from JHLOR.

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Image 18: Showing tree 1493 and 1494, recommended for removal due to development impacts from the proposed works area.



Image 19: Showing tree 1496, 1497, 1498, 1499 and 1500, recommended for removal due to development impacts from the proposed works area.



Image 20: Showing tree 3524, recommended for removal due to development impacts from the proposed works area.



Image 21: Showing tree 1504, recommended for removal due to development impacts from the proposed works area.



Image 22: Showing tree 1506 and 3525, recommended for removal due to development impacts from the proposed works area.



Image 23: Showing tree 1513, 1514 and 1516, recommended for removal due to development impacts from the proposed works area.



Image 24: Looking towards tree 1525, 1526, 1527, 1528 and 1529, showing required canopy pruning (hatched yellow). The North side of the crown of each tree is to be reduced by 1m to allow for the works. Final pruning cuts should not exceed 100mm in diameter. The pruning will result in the removal of less than 10% of the overall live canopy.



Image 25: Looking towards tree 1531, showing required canopy pruning (hatched yellow). The North side of the crown is to be raised by 4m to allow for the works. Final pruning cuts should not exceed 100mm in diameter. The pruning will result in the removal of 15% of the overall live canopy.

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9.7.2 North Terrace: No *vegetation*/tree removal or pruning is required within this area. Removal of insignificant weed species only.



Image 26: North Terrace works area from JHLOR.

9.7.3 Bankstown Station: A combination of tree removal and canopy pruning will be required to accommodate the proposed construction. Tree 1647, 1656, 1671, 1675, 1677, 1678, 1679, 1682, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1694, 1696, 1697, 1699, 1700, 1701, 1704, 1705, 1706 and G31 will be in conflict with the works area and are required to be removed. Multiple insignificant weed species will also require removal within this area. Tree 1643 and 1676 will require canopy pruning to allow for access to the works area. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	TPZ Area (m ²)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
1643	<i>Platanus x hispanica</i>	1. Long	A1	3.6	40.7	2.2	Exotic	High
1647	<i>Platanus x hispanica</i>	1. Long	A1	3.1	30.2	2.1	Exotic	Medium
1656	<i>Pyrus ussuriensis</i>	5. Small/Young	Z1	2.0	12.6	1.5	Exotic	Low
1671	<i>Platanus x hispanica</i>	1. Long	A1	4.1	52.8	2.3	Exotic	Medium
1675	<i>Cinnamomum camphora</i>	5. Small/Young	Z3	3.6	40.7	2.0	Exotic	Low
1676	<i>Lophostemon confertus</i>	1. Long	A1	4.8	72.4	2.4	Exotic	High
1677	<i>Grevillea robusta</i>	4. Remove	Z5	2.9	26.4	1.9	Native	Medium
1678	<i>Celtis sinensis</i>	2. Medium	Z3	3.0	28.3	2.3	Exotic	Low
1679	<i>Celtis sinensis</i>	2. Medium	Z3	5.4	91.6	2.4	Exotic	Low
1682	<i>Lophostemon confertus</i>	2. Medium	A2	6.0	113.1	2.6	Native	High
1683	<i>Lophostemon confertus</i>	1. Long	A1	6.0	113.1	2.6	Native	High
1684	<i>Lophostemon confertus</i>	1. Long	A1	2.6	21.2	1.9	Native	Medium

Site Address: Southwest Metro, Marrickville to Bankstown, NSW.

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Date of prepared: 23 September 2022. Rev: 1.

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	TPZ Area (m ²)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
1685	<i>Cinnamomum camphora</i>	2. Medium	Z3	6.0	113.1	2.6	Exotic	Low
1686	<i>Grevillea robusta</i>	3. Short	Z9	5.6	98.5	2.6	Native	Medium
1687	<i>Celtis sinensis</i>	3. Short	Z3	2.4	18.1	1.8	Exotic	Low
1688	<i>Celtis sinensis</i>	3. Short	Z3	3.6	40.7	2.1	Exotic	Low
1689	<i>Melaleuca quinquenervia</i>	2. Medium	A1	9.6	289.5	3.1	Native	High
1690	<i>Cinnamomum camphora</i>	4. Remove	Z5	4.2	55.4	2.5	Exotic	Low
1691	<i>Celtis sinensis</i>	3. Short	Z3	4.2	55.4	2.1	Exotic	Low
1692	<i>Celtis sinensis</i>	2. Medium	Z3	2.4	18.1	1.7	Exotic	Low
1693	<i>Celtis sinensis</i>	2. Medium	Z3	3.0	28.3	1.8	Exotic	Low
1694	<i>Pyrus spp</i>	2. Medium	Z1	4.9	75.4	2.5	Exotic	Low
1696	<i>Corymbia maculata</i>	5. Small/Young	Z1	2.5	19.6	2.1	Native	Low
1697	<i>Unknown spp</i>	2. Medium	A1	14.4	651.4	3.6	Exotic	Medium
1699	<i>Lophostemon confertus</i>	1. Long	A1	5.4	91.6	2.5	Native	High
1700	<i>Melaleuca linariifolia</i>	2. Medium	A2	4.0	50.3	2.2	Native	Medium
1701	<i>Lophostemon confertus</i>	1. Long	A1	4.3	58.1	2.3	Native	High
1704	<i>Ligustrum lucidum</i>	5. Small/Young	Z3	4.2	55.4	2.1	Native	Very Low
1705	<i>Lophostemon confertus</i>	1. Long	A1	4.4	60.8	2.4	Native	High
1706	<i>Angophora costata</i>	2. Medium	A1	4.3	58.1	2.3	Native	Medium
G31	<i>Mixed species</i>	5. Small/Young	Z1	2.0	12.6	1.7	Exotic	Low

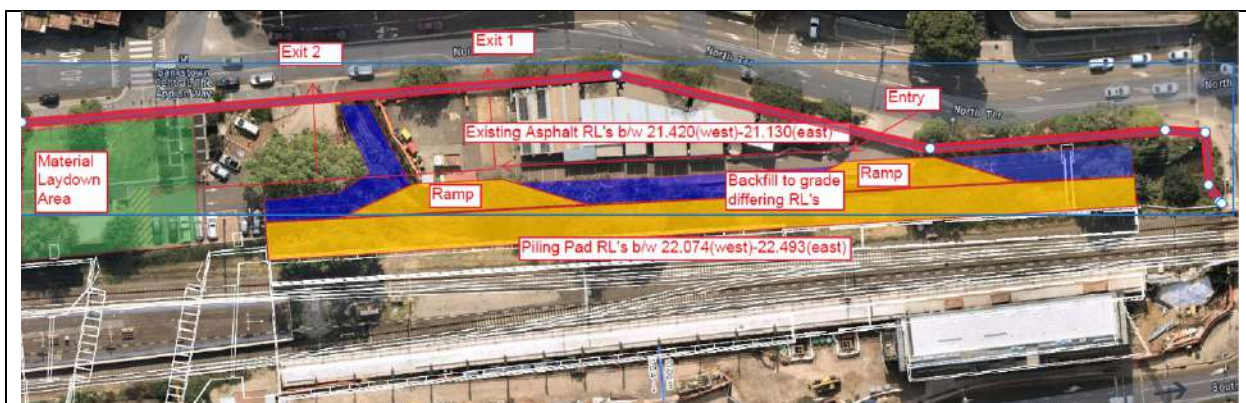


Image 27: Bankstown Station works area from JHLOR.

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Date of prepared: 23 September 2022. Rev: 1.



Image 28: Looking towards tree 1643, showing required canopy pruning (hatched yellow). The North side of the crown is to be reduced by 2m to allow for the works. Final pruning cuts should not exceed 50mm in diameter. The pruning will result in the removal of 15% of the overall live canopy.



Image 29: Showing tree 1647, recommended for removal due to development impacts from the proposed works area.

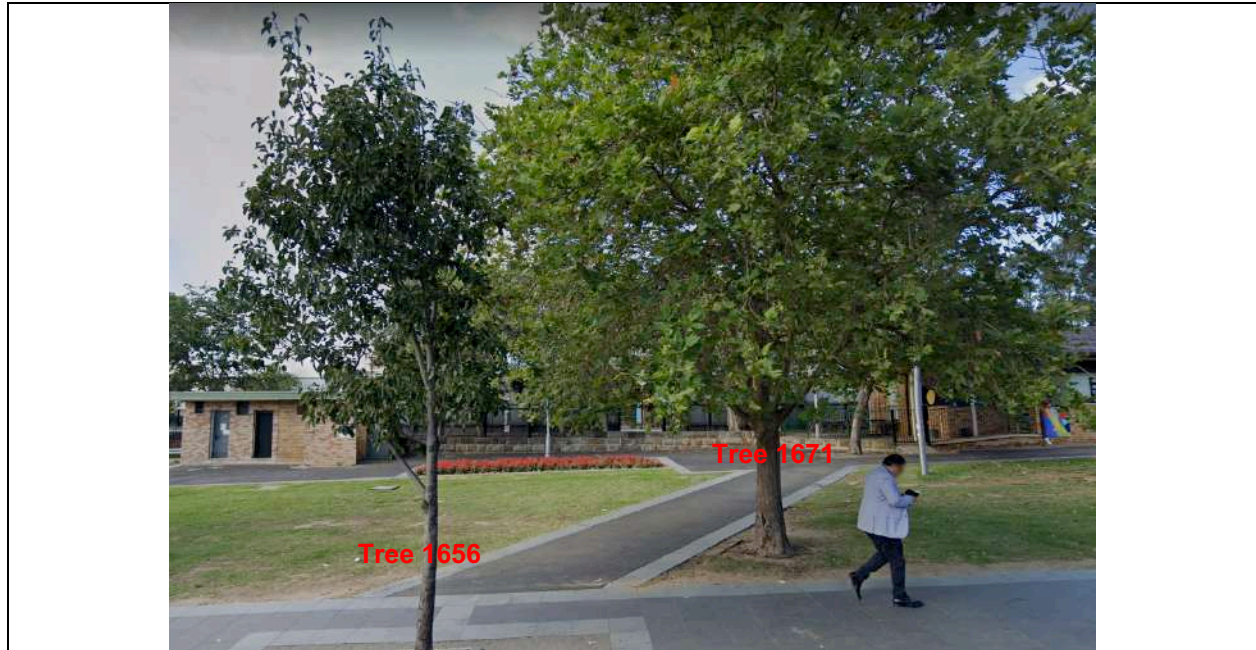


Image 30: Showing tree 1656 and 1671, recommended for removal due to development impacts from the proposed works area.

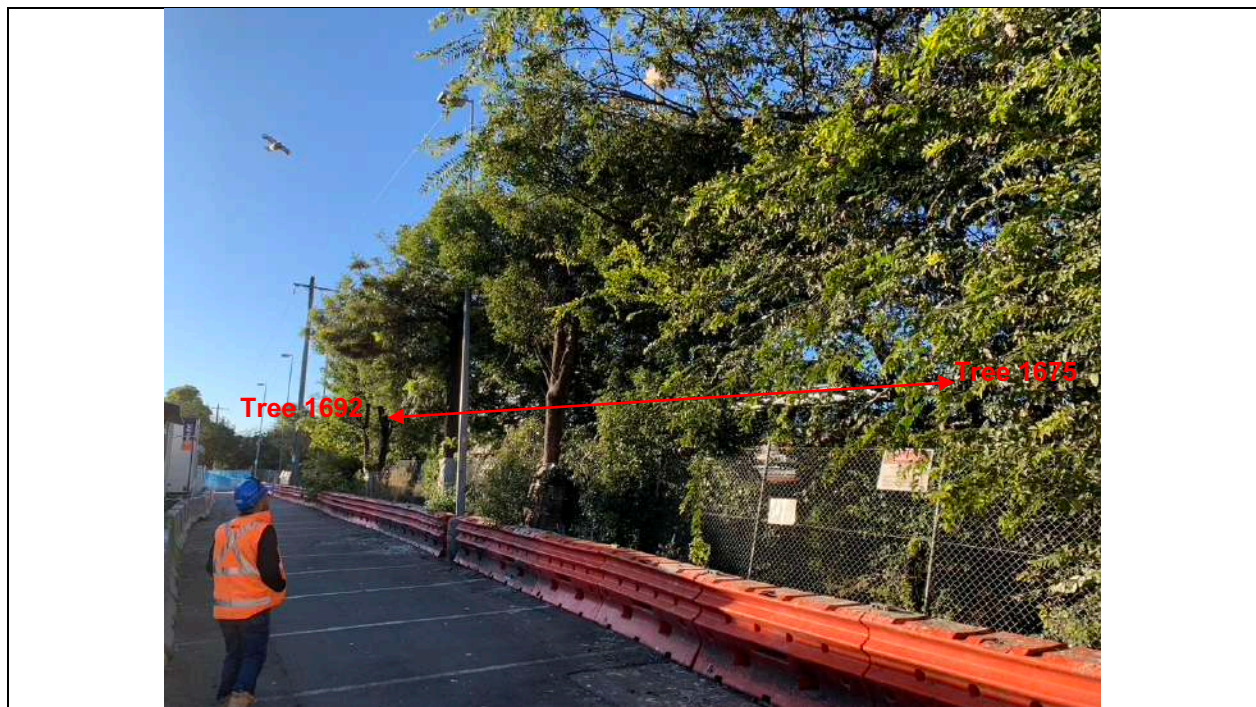


Image 31: Showing tree 1675, 1677, 1678, 1679, 1685, 1686, 1687, 1688, 1689, 1690, 1691 and 1692, recommended for removal due to development impacts from the proposed works area.



Image 32: Looking towards tree 1676, showing required canopy pruning. The first order 200mm branch to the West at 2m is to be removed. The second order 30mm branch to the East at 4m is to be removed. The pruning will result in the removal of 15% of the overall live canopy.



Image 33: Showing tree 1682, recommended for removal due to development impacts from the proposed works area.



Image 34: Showing tree 1683, recommended for removal due to development impacts from the proposed works area.



Image 35: Showing tree 1684, recommended for removal due to development impacts from the proposed works area.



Image 36: Showing tree 1696, recommended for removal due to development impacts from the proposed works area.



Image 37: Showing tree 1693, recommended for removal due to development impacts from the proposed works area.



Image 38: Showing tree G31, recommended for removal due to development impacts from the proposed works area. G31 consists of 4 x *Celtis sinensis* and 1 x *Acacia saligna*.



Image 39: Showing tree 1694, recommended for removal due to development impacts from the proposed works area.

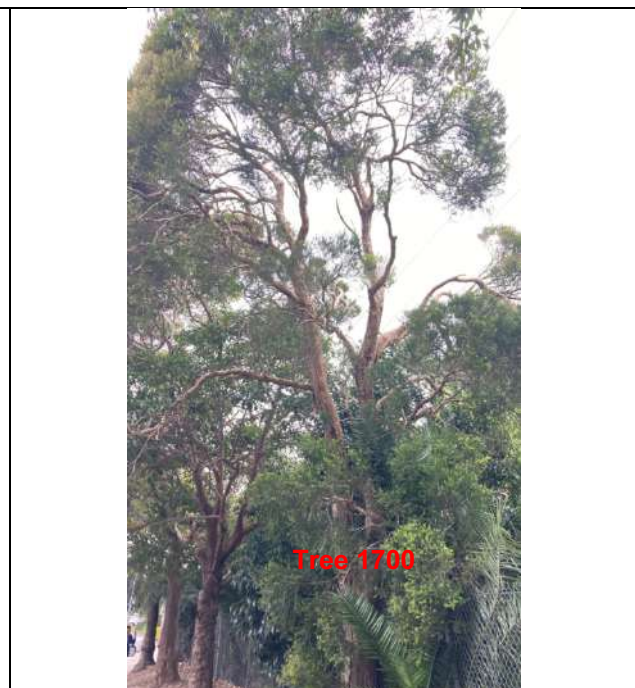




Image 43: Showing tree 1701, recommended for removal due to development impacts from the proposed works area.



Image 44: Showing tree 1704, recommended for removal due to development impacts from the proposed works area.

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Image 45: Showing tree 1705, recommended for removal due to development impacts from the proposed works area.



Image 46: Showing tree 1706, recommended for removal due to development impacts from the proposed works area.

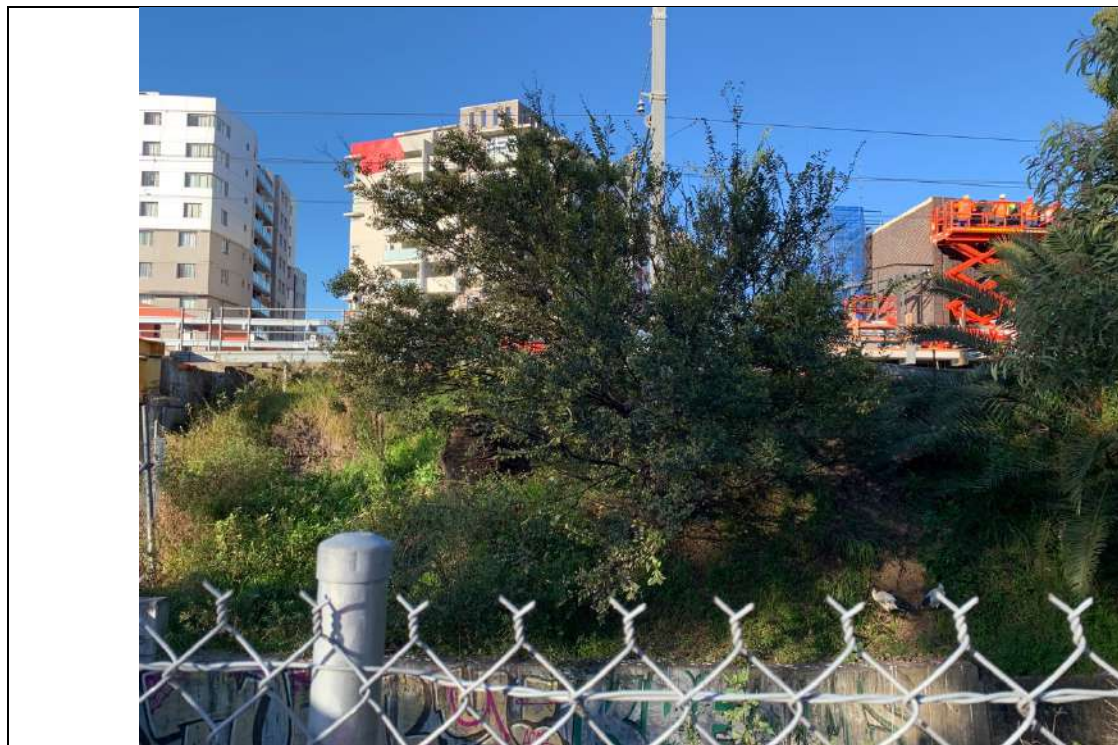


Image 47: Showing small weed species to be removed for the proposed works area.

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9.7.4 Depot Place: The trees located within this area will require canopy pruning to allow for vehicle access, including tree 3520, 3521, 3522, 3523. The following trees have been identified in this area;

Tree ID	Species	SULE	Retention Value	TPZ Radius (M)	TPZ Area (m ²)	SRZ Radius (m)	Native or Exotic Species	Amenity/ Visual Value
3520	<i>Cinnamomum camphora</i>	3. Short	Z10	3.4	36.3	2.0	Exotic	Medium
3521	<i>Cinnamomum camphora</i>	3. Short	Z10	4.7	69.4	2.5	Exotic	Medium
3522	<i>Cinnamomum camphora</i>	2. Medium	Z3	3.1	30.2	1.9	Exotic	Low
3523	<i>Melaleuca quinquenervia</i>	2. Medium	A2	6.0	113.1	2.6	Native	Medium



Image 48: Depot Place works area from JHLOR.



Image 49: Looking towards tree 3520 and 3521, showing required pruning (hatched yellow). The South side of the canopy of each tree is to be raised to 4m. The finished cut diameters must not exceed 50mm. The pruning will result in the removal of less than 5% of the overall live canopy of each tree.



Image 50: Looking towards tree 3522, showing required pruning (hatched yellow). The South side of the canopy of each tree is to be raised to 4m. The finished cut diameters must not exceed 30mm. The pruning will result in the removal of less than 5% of the overall live canopy of each tree.

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Image 51: Looking towards tree 3523, showing required pruning (hatched yellow). The South side of the canopy of each tree is to be raised to 4m. The finished cut diameters must not exceed 30mm. The pruning will result in the removal of less than 5% of the overall live canopy of each tree.

10. CONCLUSIONS

10.1 **Table 2:** Summary of the impact to trees by the development;

Impact	Reason	Category A	Category Z	TOTAL
		A	Z	
Trees recommended to be removed	Installation of services, construction works areas, vehicle access	1494, 1497, 1499, 1504, 1647, 1671, 1682, 1683, 1684, 1689, 1697, 1699, 1700, 1701, 1705, 1706 (16 trees)	1493, 1496, 1498, 1500, 1506, 1513, 1514, 1516, 1656, 1677, 1678, 1679, 1685, 1686, 1687, 1688, 1690, 1691, 1692, 1693, 1694, 1696, 1704, 3524, 3525, G31 (25 trees and 1 group)	41 trees and one group of trees
Trees recommended to be retained requiring canopy pruning	Clearance for construction works i.e. vehicle access, laydown areas etc.	924, 927, 930, 931, 1112, 1116, 1025, 1531, 1643, 1676, 3523 (11 trees)	929, 1026, 1525, 1526, 1527, 1528, 1529, 1675, 3520, 3521, 3522 (11 trees)	22 trees

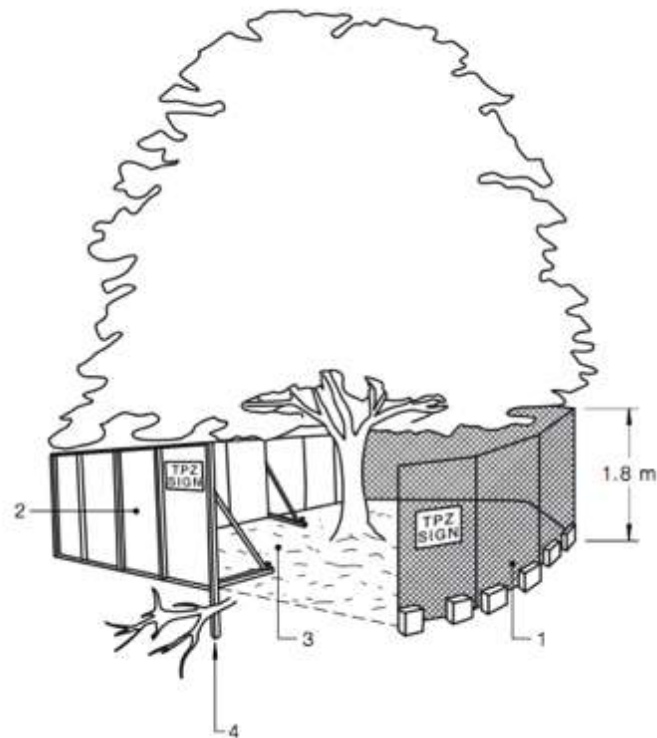
11. RECOMMENDATIONS

- 11.1 This report assesses the impact of a proposed development to sixty-three (63) trees and one (1) group of trees that are located at selected areas around the development site.
- 11.2 Forty-one (41) trees and one (1) group of trees have been recommended for removal to accommodate the development, including tree 1493, 1494, 1496, 1497, 1498, 1499, 1500, 1504, 1506, 1513, 1514, 1516, 1647, 1656, 1671, 1677, 1678, 1679, 1682, 1683, 1684, 1685, 1686, 1687, 1688, 1689, 1690, 1691, 1692, 1693, 1694, 1696, 1697, 1699, 1700, 1701, 1704, 1705, 1706, 3524, 3525 and G31. See Table 2 for recommended tree removal by retention values.
- 11.3 Twenty-two (22) trees have been identified for canopy pruning to provide clearance for proposed construction works, including tree 924, 927, 929, 930, 931, 1112, 1116, 1025, 1026, 1525, 1526, 1527, 1528, 1529, 1531, 1643, 1675, 1676, 3520, 3521, 3522 and 3523. Refer to section 9 for canopy pruning specifications. All pruning works must be completed in accordance with AS4373-2007 Pruning of Amenity Trees.
- 11.4 All trees that require canopy pruning can be retained in a viable condition. All trees to be retained must be protected in accordance with AS4970-2009, details of which are included in section 12 of this report.
- 11.5 Site plans with the construction locations marked are listed in section 1.2 of this report.

12. TREE PROTECTION REQUIREMENTS

- 12.1 **Use of this report:** All contractors must be made aware of the tree protection requirements prior to commencing works at the site. This report and a copy of the site plans (Appendix 1) drawing must also be made available to any contractor prior to works commencing and during any on site operations.
- 12.2 **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.
- 12.3 **Tree work:** All tree work should be carried out by a qualified and experienced Arborist with a minimum of AQF level 3 in arboriculture, in accordance with NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and AS4373 Pruning of amenity trees (2007).
- 12.4 **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 inspections are recommended on a monthly frequency throughout the development.
- 12.5 **Site Specific Tree Protection Recommendations:** Site specific tree protection measures should be specified by the project Arborist during the initial site meeting, prior to development works. All development works that are within the TPZ of the trees to be retained should be discussed during this meeting and required tree protection measures agreed in writing.
- 12.6 **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.
- 12.6.1 **Protective fencing:** The protective fencing must be constructed from materials that complies with all other relevant standards for fencing and temporary structures within the rail corridor, i.e. bollards, flagging etc. The fencing should only be removed for the landscaping/soft works phase. Where it is not feasible to install fencing at the specified location due to factors such as restricting access to areas of the site or for constructing new structures, an alternative location should be specified and must be installed in accordance with AS4970-2009.

- 12.6.2 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
- 12.6.3 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.
- 12.6.4 Mulch: Any areas of the TPZ located inside the subject site must be mulched to a depth of 75mm with good quality mulch. Mulch must not be built-up around the trunk the trees as it can cause collar rot.
- 12.6.5 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.
- 12.6.6 Temporary irrigation: Temporary irrigation 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.

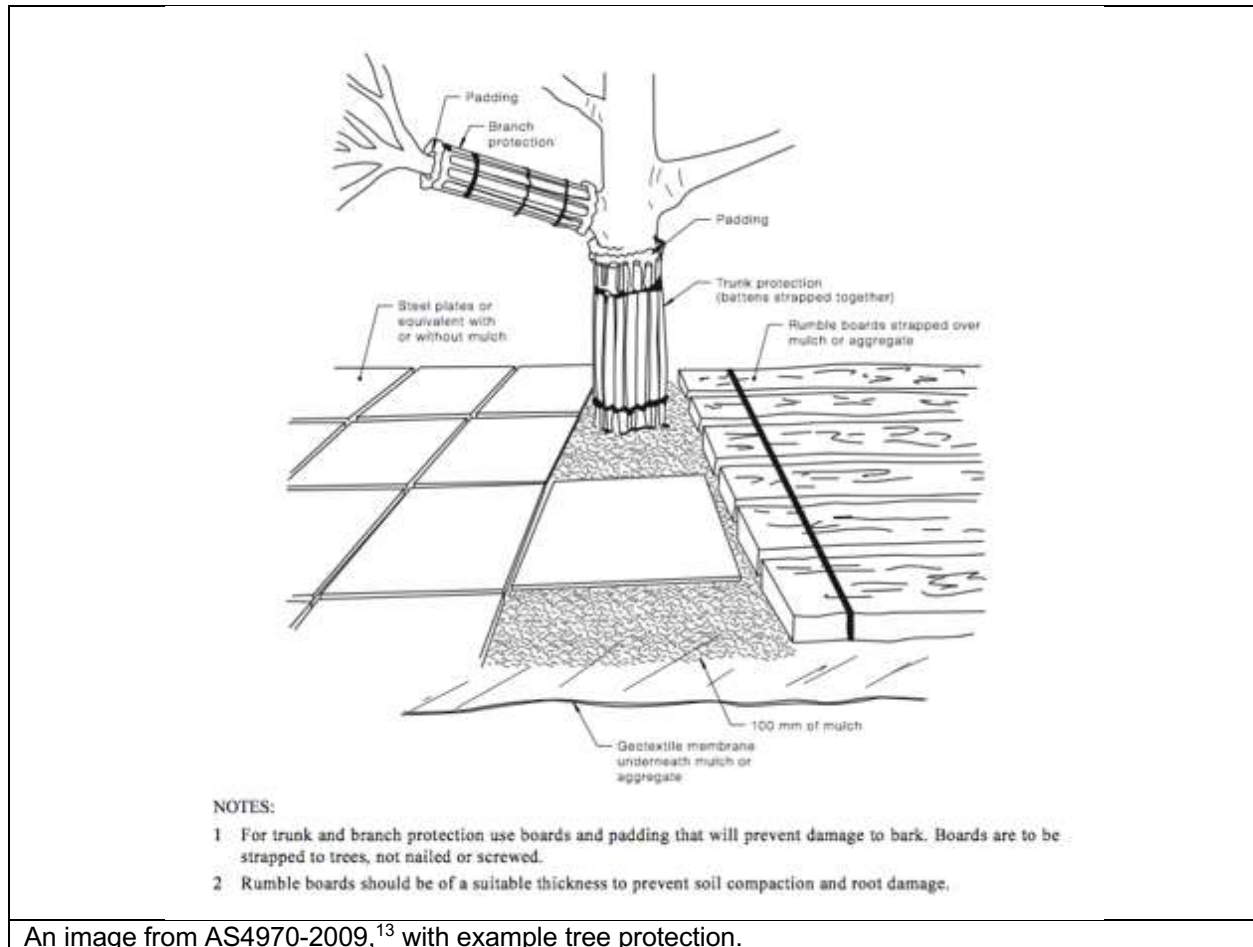


LEGEND:

- 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 AS4970-2009,¹² with example tree protection.

¹² Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 16.



An image from AS4970-2009,¹³ with example tree protection.

12.7 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.

¹³ Council Of Standards Australia, *AS4970 Protection of trees on development sites* (2009), page 17.

- 12.8 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.
- 12.9 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 40mm in diameter is to be carried out without approval of the project arborist. All pruning of roots greater than 40mm 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).¹⁴ 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.
- 12.10 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.
- 12.11 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.
- 12.12 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.

¹⁴ Council Of Standards Australia, AS 4373 *Pruning of amenity trees* (2007) page 18

13. CONSTRUCTION HOLD POINTS FOR TREE PROTECTION

13.1 Hold Points: Below is a sequence of hold points requiring project Arborist certification throughout the development process. It provides a list of hold points that must be checked and certified. All certification must be provided in written format upon completion of the development. The final certification must include details of any instructions for remediation undertaken during the development. The principal contractor should be responsible for implementing all tree protection requirements.

Hold Point	Stage	Date Completed and Signature of Project Arborist Responsible
Project Arborist to hold pre construction site meeting with principal contractor to discuss methods and importance of tree protection measures and resolve any issues in relation to feasibility of tree protection requirements that may arise. Project Arborist to mark all trees approved for removal.	Prior to development work commencing	
Project Arborist to assess and certify that tree protection has been installed in accordance with AS4970-2009 prior to works commencing at site.	Prior to development work commencing.	
In accordance with AS4970-2009 the project arborist should carryout regular site inspections to ensure works are carried out in accordance with the recommendations. Site inspection are recommended on a monthly frequency.	On-going throughout the development	
The removal of existing structures inside the TPZ of any tree to be retained, such as the existing buildings and hard surfaces, must be completed in consultation with the Project Arborist.	Demolition	
The Project Arborist must be consulted with for all manual excavations and root pruning inside the TPZ of any tree to be retained. Project Arborist to approve all pruning of roots greater than 40mm inside TPZ. All root pruning of roots greater than 40mm in diameter must be carried out by a qualified Arborist/Horticulturalist with a minimum AQF level 3.	Construction	
Project Arborist to certify that all underground services including storm water inside TPZ of any tree to be retained have been installed in accordance with AS4970-2009.	Construction	
Project Arborist to approve relocation of tree protection for landscaping. All landscaping works within the TPZ of trees to be retained are to be undertaken in consultation with the project Arborist to minimise the impact to trees.	Construction/ Landscape	
After all demolition, construction and landscaping 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.	Upon completion of development	

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Date of prepared: 23 September 2022. Rev: 1.

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15. LIST OF APPENDICES

The following are included in the appendices:

- Appendix 2 - Tree inspection schedule
- Appendix 3 - Definition of Methodology



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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	Recommendations
924	Eucalypt	<i>Eucalyptus spp</i>	Mature	15	6	550					550	620	Good	Good	High	1. Long	A1	6.6	2.7	Located within nature strip. Pruned for power line clearance.	Prune
927	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	6	4	180	320				367	460	Good	Fair	Medium	2. Medium	A1	4.4	2.4	Located within nature strip. Pruned for power line clearance.	Prune
929	Wallangarra White Gum	<i>Eucalyptus scoparia</i>	Mature	9	3	270					270	360	Good	Good	Medium	2. Medium	Z3	3.2	2.2	Located within nature strip. Pruned for power line clearance. Exempt species.	Prune
930	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	6	4	490					490	560	Good	Fair	Medium	2. Medium	A1	5.9	2.6	Located within nature strip. Pruned for power line clearance.	Prune
931	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	6	4	420					420	480	Good	Good	Medium	2. Medium	A1	5.0	2.4	Located within nature strip. Pruned for power line clearance.	Prune
1112	Sydney Blue Gum	<i>Eucalyptus saligna</i>	Mature	16	6	520					520	730	Good	Good	High	1. Long	A1	6.2	2.9	Located within nature strip.	Prune
1116	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	8	4	200	220	150	150		365	580	Good	Good	Medium	1. Long	A1	4.4	2.6	Located within corridor.	Prune
1025	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	10	4	550					550	640	Good	Good	High	1. Long	A1	6.6	2.7	Located within nature strip.	Prune
1026	Camphor Laurel	<i>Cinnamomum camphora</i>	Semi-mature	6	3	200	200				283	380	Good	Good	Low	1. Long	Z3	3.4	2.2	Located within nature strip. Exempt species.	Prune
1493	Tallowood	<i>Eucalyptus microcorys</i>	Semi-mature	5	2	150					150	200	Good	Good	Low	5. Small/Young	Z1	2.0	1.7	Located adjacent to fence.	Remove
1494	Tallowood	<i>Eucalyptus microcorys</i>	Semi-mature	10	2	320					320	400	Good	Fair	Medium	1. Long	A1	3.8	2.3	Located directly adjacent to fence.	Remove
1496	Tallowood	<i>Eucalyptus microcorys</i>	Young	6	2	110					110	180	Good	Good	Low	5. Small/Young	Z1	2.0	1.6	None.	Remove
1497	Tallowood	<i>Eucalyptus microcorys</i>	Mature	11	3	200	220				297	500	Good	Fair	Medium	1. Long	A1	3.6	2.5	Located adjacent to fence.	Remove
1498	Grey Box	<i>Eucalyptus moluccana</i>	Young	6	1	100					100	120	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	None	Remove
1499	Grey Box	<i>Eucalyptus moluccana</i>	Semi-mature	12	2	210					210	260	Good	Good	Medium	1. Long	A1	2.5	1.9	None.	Remove
1500	Tallowood	<i>Eucalyptus microcorys</i>	Semi-mature	6	2	160					160	200	Good	Fair	Low	5. Small/Young	Z1	2.0	1.7	None.	Remove
1504	Grey Gum	<i>Eucalyptus punctata</i>	Mature	8	3	190	230				298	350	Good	Good	Medium	1. Long	A1	3.6	2.1	Located directly adjacent to fence.	Remove
1506	Grey Gum	<i>Eucalyptus punctata</i>	Young	4	1	100					100	150	Good	Fair	Low	5. Small/Young	Z1	2.0	1.5	Asymmetric crown shape.	Remove
1513	Camphor Laurel	<i>Cinnamomum camphora</i>	Mature	9	5	600					600	680	Poor	Poor	Low	4. Remove	Z4	7.2	2.8	In advanced stages of decline. Exempt species.	Remove
1514	Camphor Laurel	<i>Cinnamomum camphora</i>	Semi-mature	8	3	550					550	550	Poor	Poor	Low	5. Small/Young	Z4	6.6	2.6	In advanced stages of decline. Exempt species.	Remove
1516	Camphor Laurel	<i>Cinnamomum camphora</i>	Mature	6	4	500					500	550	Poor	Poor	Low	4. Remove	Z4	6.0	2.6	In advanced stages of decline. Exempt species.	Remove
1525	Camphor Laurel	<i>Cinnamomum camphora</i>	Semi-mature	5	2	300					300	300	Good	Fair	Low	3. Short	Z3	3.6	2.0	Located adjacent to fence. Exempt species.	Prune
1526	Camphor Laurel	<i>Cinnamomum camphora</i>	Semi-mature	5	2	200	250				320	400	Good	Fair	Low	2. Medium	Z3	3.8	2.3	Located adjacent to fence. Exempt species.	Prune
1527	Camphor Laurel	<i>Cinnamomum camphora</i>	Mature	6	3	500					500	500	Good	Fair	Low	2. Medium	Z3	6.0	2.5	Located adjacent to fence. Exempt species.	Prune
1528	Camphor Laurel	<i>Cinnamomum camphora</i>	Mature	6	4	400	250				472	580	Good	Fair	Low	5. Small/Young	Z3	5.7	2.6	Located adjacent to fence. Exempt species.	Prune
1529	Camphor Laurel	<i>Cinnamomum camphora</i>	Semi-mature	5	2	110	110	110	110		220	350	Good	Fair	Low	5. Small/Young	Z3	2.6	2.1	Located adjacent to fence. Exempt species.	Prune
1531	Broad Leaved Paperbark	<i>Melaleuca quinquenervia</i>	Mature	15	6	1000					1000	1000	Good	Good	High	1. Long	A1	12.0	3.3	Canopy extends into corridor.	Prune
1643	London Plane	<i>Platanus x hispanica</i>	Mature	9	3	300					300	360	Good	Good	High	1. Long	A1	3.6	2.2	None.	Prune
1647	London Plane	<i>Platanus x hispanica</i>	Semi-mature	9	3	260					260	350	Good	Good	Medium	1. Long	A1	3.1	2.1	None.	Remove
1656	Manchurian Pear	<i>Pyrus ussuriensis</i>	Semi-mature	5	1	120					120	150	Good	Good	Low	5. Small/Young	Z1	2.0	1.5	None.	Remove
1671	London Plane	<i>Platanus x hispanica</i>	Mature	9	4	340					340	400	Good	Good	Medium	1. Long	A1	4.1	2.3	None.	Remove
1675	Camphor Laurel	<i>Cinnamomum camphora</i>	Semi-mature	5	2	300					300	300	Fair	Fair	Low	5. Small/Young	Z3	3.6	2.0	Exempt species. DBH estimated at base.	Prune
1676	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	9	4	400					400	450	Good	Good	High	1. Long	A1	4.8	2.4	None.	Prune
1677	Silky Oak	<i>Grevillea robusta</i>	Mature	6	2	240					240	280	Fair	Poor	Medium	4. Remove	Z5	2.9	1.9	Topped at 6m.	Remove
1678	Chinese Hackberry	<i>Celtis sinensis</i>	Mature	6	3	250					250	400	Good	Fair	Low	2. Medium	Z3	3.0	2.3	Exempt species. DBH estimated at base.	Remove
1679	Chinese Hackberry	<i>Celtis sinensis</i>	Mature	9	1	450					450	450	Fair	Fair	Low	2. Medium	Z3	5.4	2.4	Exempt species. DBH estimated at base.	Remove
1682	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	9	5	500					500	550	Fair	Good	High	2. Medium	A2	6.0	2.6	Low foliage density for species.	Remove
1683	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	9	5	500					500	550	Good	Good	High	1. Long	A1	6.0	2.6	None.	Remove
1684	Queensland Brushbox	<i>Lophostemon confertus</i>	Semi-mature	8	2	220					220	260	Good	Good	Medium	1. Long	A1	2.6	1.9	None.	Remove

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	Recommendations
1685	Camphor Laurel	<i>Cinnamomum camphora</i>	Mature	6	3	500					500	550	Good	Fair	Low	2. Medium	Z3	6.0	2.6	Exempt species. DBH estimated at base.	Remove
1686	Silky Oak	<i>Grevillea robusta</i>	Mature	8	4	470					470	540	Good	Fair	Medium	3. Short	Z9	5.6	2.6	Topped.	Remove
1687	Chinese Hackberry	<i>Celtis sinensis</i>	Mature	8	2	200					200	250	Fair	Fair	Low	3. Short	Z3	2.4	1.8	Exempt species. DBH estimated at base.	Remove
1688	Chinese Hackberry	<i>Celtis sinensis</i>	Mature	9	3	300					300	350	Fair	Fair	Low	3. Short	Z3	3.6	2.1	Exempt species. DBH estimated at base.	Remove
1689	Broad Leaved Paperbark	<i>Melaleuca quinquenervia</i>	Mature	10	6	800					800	850	Good	Fair	High	2. Medium	A1	9.6	3.1	DBH estimated.	Remove
1690	Camphor Laurel	<i>Cinnamomum camphora</i>	Mature	6	4	260	240				354	500	Good	Poor	Low	4. Remove	Z5	4.2	2.5	Topped. Exempt species.	Remove
1691	Chinese Hackberry	<i>Celtis sinensis</i>	Mature	8	2	350					350	350	Fair	Fair	Low	3. Short	Z3	4.2	2.1	Exempt species. DBH estimated at base.	Remove
1692	Chinese Hackberry	<i>Celtis sinensis</i>	Semi-mature	7	2	200					200	200	Good	Fair	Low	2. Medium	Z3	2.4	1.7	Exempt species. DBH estimated at base.	Remove
1693	Chinese Hackberry	<i>Celtis sinensis</i>	Semi-mature	8	2	250					250	250	Good	Fair	Low	2. Medium	Z3	3.0	1.8	Exempt species. DBH estimated at base.	Remove
1694	Pear Species	<i>Pyrus spp</i>	Mature	5	3	300	200	120	150		409	500	Good	Fair	Low	2. Medium	Z1	4.9	2.5	None.	Remove
1696	Spotted Gum	<i>Corymbia maculata</i>	Semi-mature	6	2	150	150				212	350	Good	Fair	Low	5. Small/Young	Z1	2.5	2.1	Co-dominant stems at base.	Remove
1697	Unknown	<i>Unknown spp</i>	Mature	8	9	1200					1200	1200	Good	Fair	Medium	2. Medium	A1	14.4	3.6	DBH estimated at base.	Remove
1699	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	10	5	450					450	490	Good	Good	High	1. Long	A1	5.4	2.5	None.	Remove
1700	Snow In Summer	<i>Melaleuca linarifolia</i>	Mature	8	3	330					330	390	Fair	Good	Medium	2. Medium	A2	4.0	2.2	Low foliage density for species.	Remove
1701	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	8	4	360					360	440	Good	Good	High	1. Long	A1	4.3	2.3	None.	Remove
1704	Broad Leaved Privet	<i>Ligustrum lucidum</i>	Semi-mature	5	2	350					350	350	Good	Fair	Very Low	5. Small/Young	Z3	4.2	2.1	Exempt species. DBH estimated at base.	Remove
1705	Queensland Brushbox	<i>Lophostemon confertus</i>	Mature	7	4	370					370	480	Good	Good	High	1. Long	A1	4.4	2.4	None.	Remove
1706	Smooth Barked Apple	<i>Angophora costata</i>	Mature	9	4	360					360	400	Good	Fair	Medium	2. Medium	A1	4.3	2.3	None.	Remove
3520	Camphor Laurel	<i>Cinnamomum camphora</i>	Semi-mature	14	4	280					280	300	Good	Fair	Medium	3. Short	Z10	3.4	2.0	Pruning	Prune
3521	Camphor Laurel	<i>Cinnamomum camphora</i>	Mature	15	5	360	160				394	500	Good	Fair	Medium	3. Short	Z10	4.7	2.5	Pruning	Prune
3522	Camphor Laurel	<i>Cinnamomum camphora</i>	Semi-mature	10	4	260					260	280	Good	Good	Low	2. Medium	Z3	3.1	1.9	Pruning	Prune
3523	Broad Leaved Paperbark	<i>Melaleuca quinquenervia</i>	Mature	8	5	500					500	550	Good	Fair	Medium	2. Medium	A2	6.0	2.6	Pruning. Previously lopped.	Prune
3524	Forest Red Gum	<i>Eucalyptus tereticornis</i>	Young	4	2	100	50				112	200	Good	Fair	Low	5. Small/Young	Z1	2.0	1.7	Remove. Growing through fence.	Remove
3525	Grey Gum	<i>Eucalyptus punctata</i>	Young	4	1	100	100				141	250	Good	Fair	Low	5. Small/Young	Z1	2.0	1.8	Remove. Regrowth from stump.	Remove
G31	Mixed Species Group	<i>Mixed species</i>	Semi-mature	8	2	170					170	200	Good	Fair	Low	5. Small/Young	Z1	2.0	1.7	Group of 4 x <i>Celtis sinensis</i> and 1 x <i>Acacia saligna</i> . Rail corridor. Opposite side of culvert.	Remove

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.

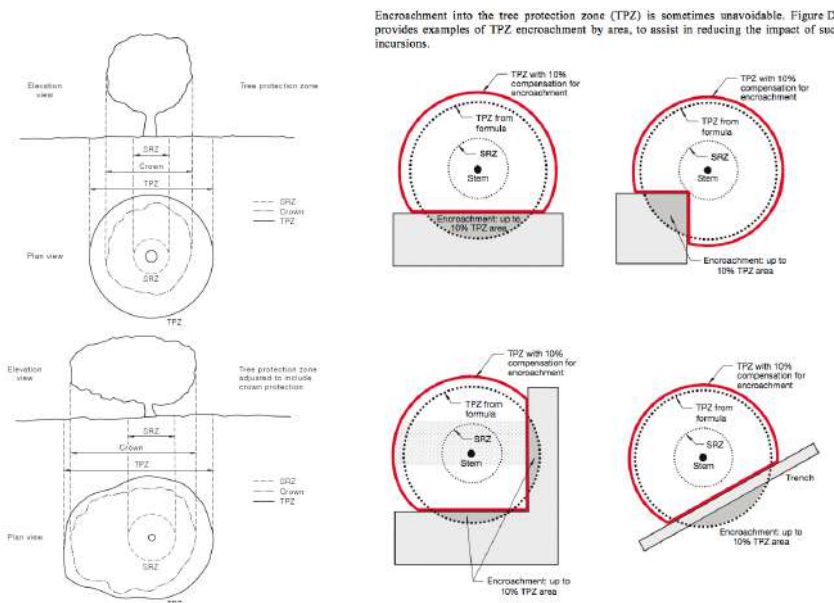
Recommendations: Retain, Prune, Remove. See report for detailed information.

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:** It 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 tree 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 have 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 statutory 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 tree's 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 structure's 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 be 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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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

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