

CIVICA



31 January 2023

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Arboricultural Impact Assessment Report regarding twenty (20) trees located within the vicinity of the proposed Manning Base Hospital development at 26 York Street, Taree

Dear Sean,

We are pleased to provide you with the following Arboricultural Impact Assessment Report for twenty (20) trees within the grounds of Manning Base Hospital.

Complete use of this report is authorised under the conditions limiting its use as stated in Appendix A Item 7 of "*Arboricultural Reporting Assumptions and Limiting Conditions*".

Should you have any queries relating to this report, its recommendations, or the options considered please do not hesitate to contact us on 1300 272 671.

Yours sincerely,



Adam Demler
Consulting Arborist
AQF 5 (dip.) Arboriculture

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1 Executive Summary

- 1.1.1 The following Arboricultural Impact Assessment (Report) encompasses twenty (20) trees located within and adjacent to the grounds of Manning Base Hospital. The subject site was identified by GeoLINK Consulting Pty Ltd (the Client) as possessing trees that may be impacted upon by a proposed development.
- 1.1.2 In part, the project scope was to nominate subject trees that can be retained, or require removal to facilitate the proposed development, as well as identify and reduce potential conflicts between subject trees and site development. Accurate information on the area required for tree retention and methods/techniques suitable for tree protection during construction have been provided.
- 1.1.3 An arborist inspection of the subject tree was undertaken on 2 March 2022, where tree data was collected.
- 1.1.4 Tree retention values have been determined based upon a modified version of the British Standard and which have been prescribed into one of the following four (4) categories, A, B, C and U. Refer to Appendix C for further detail. Generally, relevant consent authorities will consider:
- **A** retention value trees as a site constraint and may require alterations to the proposed development design and/or specific protection measures to allow retention, unless the proposed development outweighs the retention value of the tree
 - **B** retention value trees as a site constraint consideration, lesser changes should be considered to retain such trees
 - **C** retention value trees are not considered a site constraint
 - **U** retention value trees are considered a site opportunity, as such trees are recommended for removal regardless of the proposed development.
- 1.1.5 Trees impacted by the proposed development:

Category	Description	Total	Removal		Retain	
			located within development footprint	irrespective of future development	with specific protection	with generic protection
A	High retention value trees	0				
B	Moderate retention value trees	14	1, 3, 4		15	6, 7, 8, 10, 12, 13, 16, 17, 18, 19
C	Low retention value trees	5	2, 5, 11, 14			20
U	Trees to be removed irrespective of proposed development	1		9		

- 1.1.6 Trees 1, 2, 3, 4, 5, 11 and 14 are located within the footprint of the proposed development and require removal to facilitate the project.
- 1.1.7 Trees 6, 7, 8, 10, 12, 13, 15, 16, 17, 18, 19 and 20 are Greater Taree City Council street trees on adjacent streets beyond the northern and western boundary. These trees are isolated from the site by 1.8m boundary fencing.

- 1.1.8 With exception of Tree 15, proposed development activities are located outside of the respective Tree Protection Zone's (TPZ) of trees being retained. These trees can be protected under generic protection measures outlined throughout the report in accordance with Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.
- 1.1.9 Tree 15 is expected to incur an ~20% encroachment within its TPZ during widening of an existing driveway, that being a major encroachment under AS 4970–2009. Tree 15 can be protected using a combination of specific and generic protection measures, detailed within the report.
- 1.1.10 One (1) Council Street tree (Tree 9) is recommended for removal irrespective of development due to significant lower trunk decay making ongoing stability unpredictable. Roadside carparking, which could be utilised by construction workers, is within the potential impact zone of a whole tree failure. Taree Council should be notified to undertake assessment and removal.
- 1.1.11 Irrespective of the proposed development it was recommended that Council Street Tree 7 has the dead eastern stem overhanging the hospital boundary fence removed down to the trunk union at 2m to reduce hazards for construction workers. Taree Council should be notified to undertake the works.

2 Introduction

- 2.1.1 ArborSafe Australia Pty Ltd was engaged by Sean Cochran on behalf of GeoLINK Consulting Pty Ltd to complete an Arboricultural Impact Assessment (AIA) Report on twenty (20) trees located within or adjacent to the Manning Base Hospital at 26 York Street, Taree.
- 2.1.2 The proposed development has been reviewed and in summary consists of
- the demolition of existing Building 09 Administration (Refer to Figure 1 for demolition drawing)
 - subsequent reconstruction of a new building across a similar footprint with separate vehicular driveways connecting to York Street.
- 2.1.3 The report was intended to provide information on site trees and how they may be impacted upon by the proposed development. Report findings and recommendations provided are based upon guidance provided within Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.
- 2.1.4 Observations and recommendations provided within this report are based upon information provided by the Client and an arborist site visit.

3 Scope

- 3.1.1 Carry out a visual examination of the twenty (20) trees located within the vicinity of the proposed development, including adjacent street trees located on the Greater Taree City Council footpath.
- 3.1.2 Various insignificant trees, which were deemed easily replaced or transplanted, or insignificant due to their age class, weed status and/or size and various smaller shrubs have not been included within this report.
- 3.1.3 Provide an objective appraisal of the subject trees in relation to their species, estimated age, health, structural condition, useful life expectancy (ULE) and viability within the landscape.
- 3.1.4 Based on the findings of this investigation, provide independent recommendations on the retention value of the trees.
- 3.1.5 Nominate subject trees that can be retained or require removal to facilitate the development.
- 3.1.6 Evaluate the possible demolition methodologies to be used.
- 3.1.7 Identify and reduce potential conflicts between subject trees and site development by providing accurate information on the area required for tree retention and methods/techniques suitable for tree protection during construction.
- 3.1.8 Provide information on restricted activities within the area nominated for tree protection, as well as suitable construction methods to be adopted during demolition and/or construction.

4 Methodology

4.1 Data Collection

- 4.1.1 Andy Clark of ArborSafe Australia Pty Ltd carried out a site inspection of the subject trees on 2 March 2022.
- 4.1.2 Trees that are the subject of this report were identified during discussions with the Client, reviewing relevant supplied development documentation.
- 4.1.3 Small trees/shrubs within the site have been omitted from the report based on their species, current size and/or potential future size and contribution to local amenity.
- 4.1.4 The subject trees were inspected from the ground using the initial component of Visual Tree Assessment (VTA) (Matthek, 1994). No foliage or soil samples were taken and no aerial, underground or internal investigations were undertaken.
- 4.1.5 Tree height and canopy width were estimated and have been provided to the nearest whole metre. Trunk diameter at breast height (DBH) and trunk diameter at the root crown (DRB) were measured with a diameter tape and provided to the nearest centimetre.
- 4.1.6 Encroachments into Tree Protection Zones (TPZ) are estimated based on observations during the site assessment and review of supplied plans. No technical drawings were prepared as part of the assessment.
- 4.1.7 The site was not determined to contain vegetation with Environmental and Heritage significance or protection.
- 4.1.8 Data collected on site was analysed by Adam Demler, collated into report format, and relevant recommendations were formulated.
- 4.1.9 TPZ's and structural root zones (SRZ) were calculated in accordance with the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites* (refer to Section 7.6).
- 4.1.10 Due to the site boundary and tree locations not being captured in the supplied plans, encroachment into the TPZ has been estimated based on observations made during the site assessment and a review of aerial imagery of existing infrastructure within the site captured on 9 April 2021 (Nearmap).
- 4.1.11 No underground services have been identified on the supplied plans.
- 4.1.12 Retention values have been determined based upon a modified version of the British Standard BS 5837–2012: *Trees in Relation to Design, Demolition and Construction* (refer to Appendix C).
- 4.1.13 All photographs were taken at the time of the site inspections by the author and have not been altered for brightness or contrast, nor have they been cropped.
- 4.1.14 Plans of the existing site and of the proposed development were provided to ArborSafe in February 2022.
- 4.1.15 No proposed underground service locations have been reviewed in the preparation of this report.

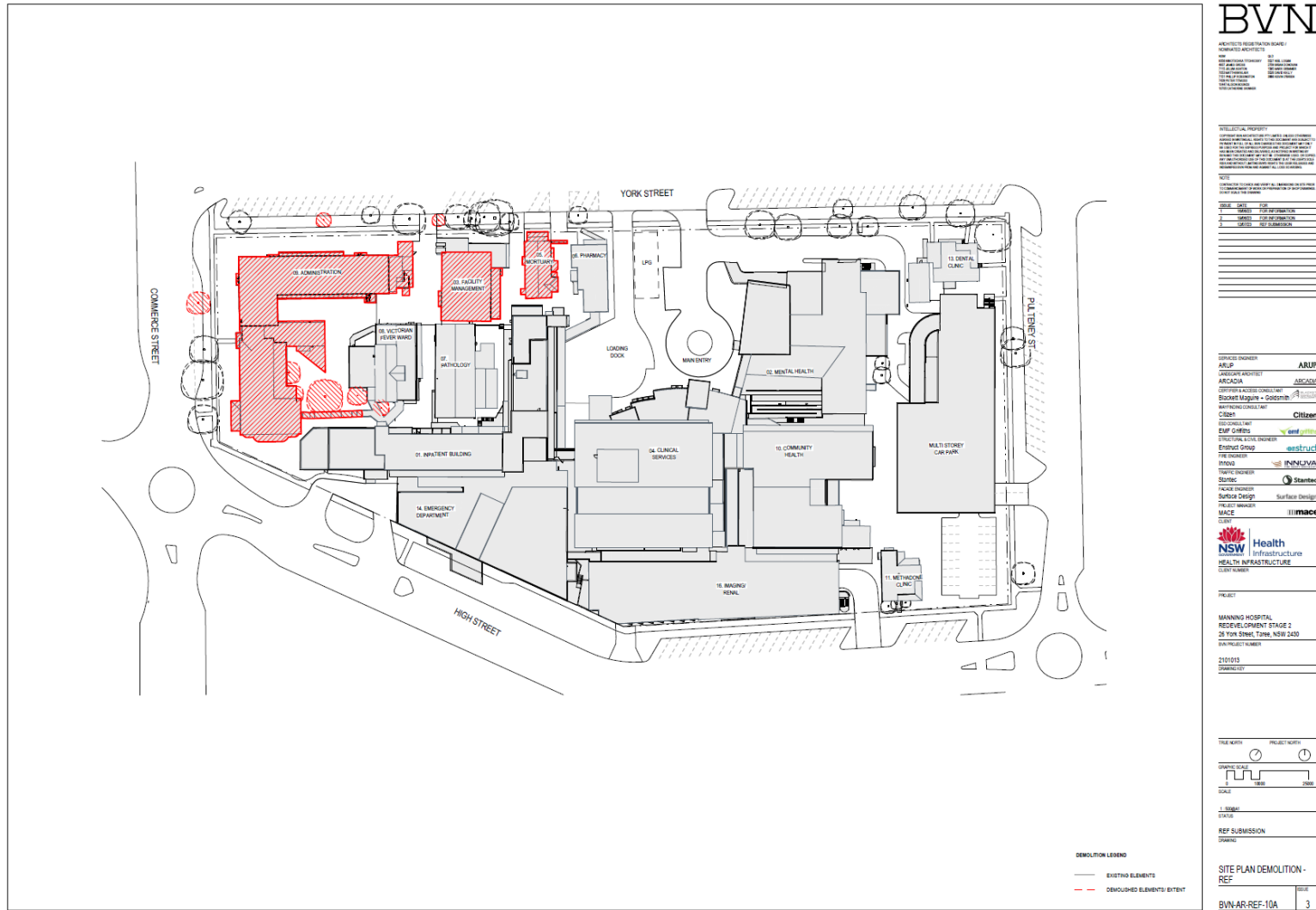


Figure 1. Excerpt from Site Demolition Plan – (Dwg BUN-AR-REF-10A, Issue 3). (BVN Architects, 12 July 2023).

5 Observations

5.1 Location

- 5.1.1 The proposed development site is located within the grounds of Manning Base Hospital (Figure 2). Specifically, the area designated in this report, surrounds Building 08 (Administration) on the north-western aspect of the hospital grounds, bounded by York Street and Commerce Street, also encompassing the main entrance off York Street. The site also includes Council footpaths and nature strip bounding the hospital grounds running parallel to York Street (east-west) and Commerce Street (north-south).
- 5.1.2 The site was located within the Greater Taree City Council Local Government Area (LGA).
- 5.1.3 The site is located within an urban community nearby to residential and commercial buildings. Vehicle parking is located on Council streets adjacent to the site. Council streets bordering the site have established trees planted and managed by the Greater Taree City Council. These trees have been included within the AIA for their potential to be impacted by the development.
- 5.1.4 Due to the nature of urban construction, underlying soils are considered to have been altered and therefore inconsistent with the original soil formation of the site. Statewide land and soil mapping list the soil profile of the site that of Hydrosols and Sodosols (NSW Government, 2022). Hydrosols cover a wide range of soils that are seasonally or permanently saturated, for at least 2-3 months in most years. Further, Sodosols are soils which display a strong texture contrast between surface (A) and subsoil (B) horizons which are sodic (Isbell, 2002).
- 5.1.5 No soil sampling or diagnostic soil testing was undertaken however it is expected that soil media influencing growing conditions of the trees is harsh, with higher ranges of bulk density (compaction) to support adjacent infrastructure. Typically, trees growing in compacted soils have a limited root development in comparison to trees growing in areas of open space and may be more sensitive to root disturbance. Council trees exist on nature strips between concrete pathways and roads. This can result in an asymmetrical root system which runs parallel with the pathways growing in more favourable soils.



Figure 2. Whole site image (location). Red lines delineate the site and area containing the subject trees that are to be impacted by the proposed development. (SIX Maps, March 2022).

5.2 Site Trees

- 5.2.1 The subject trees (Figure 3) have been numbered in line with the ArborSafe tree numbering system. Trees 1–5 can be identified on site using white tree tags which are typically located at approximately 2.0m from ground level on the trunk. Council Trees have not been tagged.
- 5.2.2 Trees 6–9 are Council trees on the grassed verge running north-south, parallel to Commerce Street. Trees 10–20 are Council trees on the grassed verge running east-west, parallel to York Street.
- 5.2.3 All trees are of low-moderate retention value except for Tree 9 which is in such condition that it cannot be practicably retained for longer than 5 years.
- 5.2.4 Trees 1–5 are semi-mature to mature specimens located within hospital grounds adjacent to Building 08 on maintained grassed areas. These trees are a mixture of native, endemic, and exotic species, planted within the site. The species are common to the area and aren't considered to provide any outstanding significance outside of general amenity value i.e. shade, aesthetics etc. The trees are well established and maintained exhibiting good health and fair to good structure (Figure 5).
- 5.2.5 Tree 9 is a semi-mature *Lophostemon confertus* (Queensland Box) with fair health and poor structure. The tree exhibits significant lower trunk decay which makes ongoing stability unpredictable. The specimen is semi-mature and is not considered to hold any significance outside of general protection within the Greater Taree Local Environmental Plan (LEP). Tree 9 is a Greater Taree City Council Street tree, and any action should be undertaken by the Council or with direct consent from the Council.

5.2.6 Trees 6–20 are street trees owned and maintained by the Greater Taree City Council. The trees are located outside hospital grounds, on adjacent streets (York Street, Commerce Street) isolated from the site by 1.8m boundary fencing. The species are a mixture of native and endemic specimens. The trees range from fair to good health and structure with the exception of Tree 9 which exhibits poor structure due to significant lower trunk decay. The trees possess defects consistent with street trees growing in harsh limiting environments which include mechanical damage to surface roots, soil compaction, and historical pruning. Taller trees provide shade to adjacent car parking and footpaths and add character to the street.



Figure 3. Site map showing subject trees. Tree attributes are to be obtained from Appendix E – Tree Assessment Data. (ArborSafe, March 2022).



Figure 4. Tree 3, a mature *Lagerstroemia indica* (Crepe Myrtle) providing shade value to surrounding tables and seating within the site. (A. Clark, February 2022).

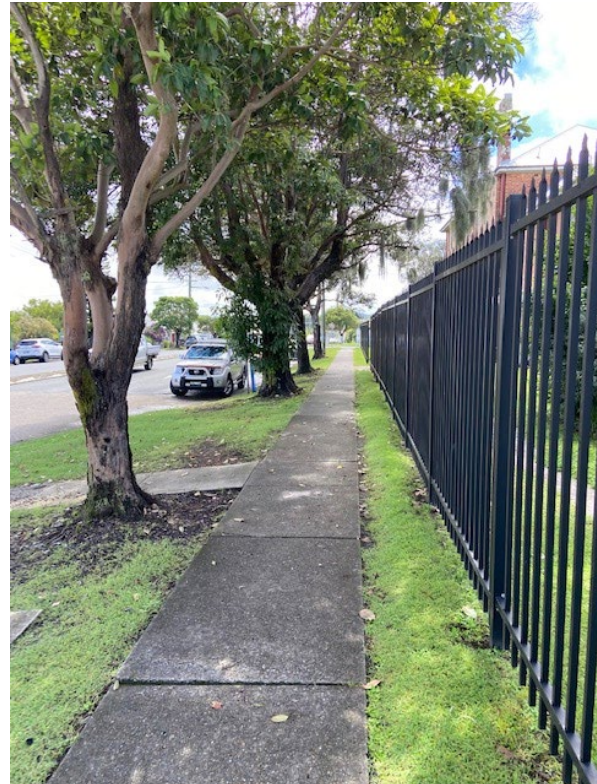


Figure 5. Council street trees adjacent to proposed development (western aspect), providing shade to pedestrian footpaths. (A. Clark, February 2022).



Figure 6. Council street trees adjacent to proposed development (western aspect) providing shade and aesthetic value to the amenity. (A. Clark, February 2022).



Figure 7. Tree 19 (tallest tree) a mature *Melaleuca quinquenervia* (Broad-leaved Paperbark) adjacent to proposed development (western aspect) providing shade and aesthetic value to the amenity. (A. Clark, February 2022).

5.3 Tree Retention Values

5.3.1 Retention values were determined based upon a modified version of the British Standard BS 5837–2012: *Trees in Relation to Design, Demolition and Construction*. This standard categorises tree retention value based upon assessment of the tree’s quality (health and structure), and life expectancy. Other criteria such as its physical dimensions, age class, location and its Amenity, Heritage and Environmental significance are also considered. A breakdown of attributes required for each category can be obtained from Appendix C – Tree Retention Values.

Category	Tree numbers
A	
B	1, 3, 4, 6, 7, 8, 10, 12, 13, 15, 16, 17, 18, 19
C	2, 5, 11, 14, 20
U	9

5.4 Heritage / Environment Status

5.4.1 Heritage Status

5.4.2 The proposed development site has no trees identified as being of national, state or local heritage significance. (SEED, 2022).

5.4.3 Botanical and Environmental Status

5.4.4 The site trees were considered common species in the local area and as such hold limited botanical significance.

5.4.5 Trees 1–5 are not considered to hold protection outside of general conservation.

5.4.6 Trees 6–20 are not considered to hold any significance outside of general protection within the Greater Taree LEP.

6 Discussion

6.1 Determining TPZ Encroachment

6.1.1 **Major encroachment.** As per the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*, a major encroachment into the TPZ of any tree is considered to occur when it is beyond 10% of the total TPZ area.

6.1.2 **Minor encroachment.** Under the aforementioned standard, a minor encroachment is determined as being less than 10% of the total TPZ area. Trees with minor encroachment may be retained with specific, generic or no protection requirements throughout the construction stage.

6.1.3 **No encroachment.** Trees with no encroachment may be retained with generic or no protection requirements throughout the construction stage.

6.1.4 For the purposes of this report, trees to be removed or retained have been identified as those:

- Requiring removal due to a level of encroachment into their TPZ that would likely result in a detrimental impact upon their future health and/or stability
- Retainable and requiring specific protection requirements throughout construction (i.e. generic requirements plus arborist supervision and careful construction methods within their TPZ)
- Retainable and requiring generic tree protection measures only (i.e. protective fencing and restriction of activities within the TPZ).

6.2 Impact of Proposed Development

6.2.1 Review of the proposed design has been undertaken in the context of tree retention and removal across the site.

6.2.2 The trees affected by direct conflict with the proposed construction footprint would require removal under the current design. To retain any of these trees a redesign or relocation of the development would be required. Refer to Appendix E for full detail.

6.2.3 Trees 1–5

6.2.4 Trees 1–5 are located within the proposed construction footprint and would therefore require removal to facilitate the proposed development.

6.2.5 Trees 11 and 14

6.2.6 Trees 11 and 14 have direct conflicts with two (2) proposed locations of entry/exit vehicle driveways off York Street and would therefore require removal to facilitate the proposed development.

6.2.7 Trees 11 and 14 are Greater Taree City Council Street trees, and any action should be undertaken by the Council or with direct consent from the Council.

6.2.8 Tree 15

6.2.9 Tree 15 is expected to receive major encroachments of up to 20% within the TPZ from proposed widening of the existing entry/exit vehicle driveway off York Street. Impacts are likely to be in the form of soil compaction, grade changes and root severance.

6.2.10 Negative tree impacts can manifest as either a reduction in health and/or vigour due to root loss (absorption and/or transport roots) resulting in a reduction in water and nutrient absorption capability or on tree stability if larger roots are impacted. Ultimately, the outcome for the trees depends on a number of variable factors including species, age, current health, TPZ encroachment percentage, soil type, topography, previous site use and the proposed design and construction methodology.

6.2.11 Compacted soils, especially artificially compacted soils such as those found under driveways or building platforms, have a higher bulk density down to a deeper level of subsoil. Bulk density is the term used for describing the weight of soil per unit volume. The broad engineering thinking is that the higher the density the more stable the road surface due to less soil movement in expansion, contraction, or compression. A higher bulk density is produced by compacting the soil to reduce available pore space between the soil particles.

6.2.12 The effect of compacted soils on plants is somewhat influenced by the soil type but generally a reduction in available pore space reduces the available area for oxygen and water within the soil. A reduction in available soil water and oxygen inhibits root activity within the soil, as they are essential for root elongation and growth, and the lack of these properties is considered a major limiting factor.

6.2.13 A similar reduction in root activity, due to a reduction in pore space, can occur following significant soil level changes across the TPZ, although this generally occurs over a longer time frame than if the roots were directly severed. Root severance has the same effect, reduction in root function and capability, but on an instantaneous time scale where there is no time for the tree to adjust.

6.2.14 The assumption of allowable encroachment and minimal long-term health or structural impacts to the trees rely on a combination of the following being used - root sensitive construction methods being adhered to within the TPZ, minimal excavation within the TPZ to limit root severance (i.e. construction placed outside the TPZ where possible), fill rather than excavation utilised to affect level changes where possible (i.e. to minimise root severance and allow the trees root system time to adjust), no construction occurring within the SRZ, compensatory area being available around the unimpacted aspects of the trees and the enhancement of the existing TPZ area (i.e. mulched, soil conditioning and irrigation when required).

6.2.15 By implementing a combination of specific and generic protection measures (refer to Section 7) and ongoing Plant Health Care and Mulching (refer Appendix D), it is expected that the trees can remain viable with minimal long-term negative affects to health and structure.

6.2.16 Trees 6, 7, 8, 9, 10, 12, 13, 16, 17, 18, 19 and 20 (Council street trees)

6.2.17 Current boundary fencing offers physical protection to the trees. Additional protective fencing within the site is required to restrict access into the TPZ (located within perimeter fencing) of Trees 6, 7, 8, 9, 10, 12, 13, 15, 16, 17, 18, 19 and 20 (refer to Section 7.6 for TPZ fencing specifications). Ground protection can be utilised where protective fencing is not practical (refer to Section 7.7). Proposed building infrastructure is not expected to encroach within the respective TPZ of these trees being retained. It

	Direct Conflict		Major Encroachment		Minor Encroachment		No Encroachment	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Impact of Proposed Development	7	1, 2, 3, 4, 5, 11, 14	1	15	0		12	6, 7, 8, 9, 10, 12, 13, 16, 17, 18, 19, 20

7 Tree Protection and Management Recommendations

7.1 Tree Removal

7.1.1 Seven (7) trees would require removal to facilitate the proposed development.

7.1.2 One (1) Council Street tree (Tree 9) is recommended for removal irrespective of development due to significant lower trunk decay making ongoing stability unpredictable. Roadside carparking, which could be utilised by construction workers, is within the potential impact zone of a whole tree failure. Taree Council should be notified to undertake assessment and removal.

Recommendation	Category A High retention value		Category B Moderate retention value		Category C Low Retention value		Category U No retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Remove for development	0		3	1, 3, 4	4	2, 5, 11, 14	0	
Remove irrespective of development	0		0		0		1	9



Figure 8. Trees recommended for removal. (ArborSafe, September 2022).

7.2 Tree Retention

7.2.1 Twelve (12) trees were recommended for retention and require either specific or generic protection measures during demolition and construction to ensure they remain viable following the completion of works.

Recommendation (Refer Section 7.5–7.9)	Category A High retention value		Category B Moderate retention value		Category C Low Retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Retain, with, specific, protection, requirements	0		1	15	0	
Retain, with, generic, protection, requirements	0		10	6, 7, 8, 10, 12, 13, 16, 17, 18, 19	1	20

7.3 Specific Protection Measures

7.3.1 Where practicable vehicle driveways encroaching within TPZ's of Tree 15 should be constructed above existing grade and be of a permeable nature to allow the passage of air and moisture. It is suggested that a geogrid/web or similar is incorporated to ensure the rooting area below does not become compacted.

7.3.2 Excavation within the TPZ of Tree 15 (if required) is to be carried out only under arborist supervision. It is recommended that the proposed excavation commence at the outer extent of the TPZ and move inwards to minimise root damage to the trees. Excavation within the SRZ should be avoided.

7.3.3 Works should be undertaken using techniques that are sensitive to tree roots to avoid unnecessary damage. Such techniques include:

- Excavation using a high-pressure water jet and vacuum truck
- Excavation using an Air Spade with vacuum truck
- Excavation by hand.

7.3.4 Roots discovered are to be treated with care and minor roots (<40mm diameter) pruned with sharp, sterile handsaw or secateurs. All significant roots (>40mm diameter) are to be recorded, photographed and reported to the project arborist.

7.3.5 Encroachments to the TPZ should be compensated for by expanding in an eastern aspect by equal proportions to the area lost from encroachment.



Figure 9. Site map showing tree requiring specific protection measures. (ArborSafe, March 2022).

7.4 Proposed Pruning

7.4.1 One (1) trees require pruning to facilitate the development.

7.4.2 Irrespective of the proposed development it was recommended that the Council Street Tree 7, has the dead eastern stem overhanging the hospital boundary fence removed down to the trunk union at 2m to reduce hazards for construction workers. Taree Council should be notified to undertake the works. Detailed specifications are provided within Appendix E – Tree Assessment Data.

7.4.3 All pruning is recommended to be completed in accordance with the Australian Standard AS 4373–2007: *Pruning of Amenity Trees* (Standards Australia, 2007) and undertaken by a suitably qualified arborist (minimum AQF 3 arborist).

7.5 Generic Protection and Reporting Measures

7.5.1 All retained trees require generic protection measures (Figure 10). Refer to Section 7.5–7.8 for further detail.



Figure 10. Site map showing trees requiring generic protection measures. (ArborSafe, March 2022).

7.5.2 All trees to be retained require protection during the construction stage. Tree protection measures include a range of:

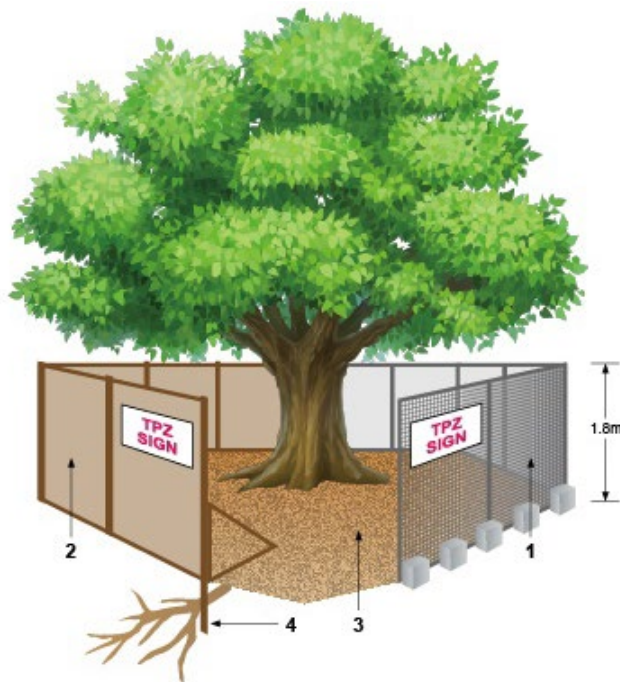
- Activities restricted within the TPZ
- Protective fencing
- Trunk and ground protection
- Tree protection signage
- Involvement from the project arborist
- Project milestones
- Compliance reporting

7.5.3 Activities Prohibited within the TPZ

- Machine excavation including trenching (excluding activities discussed in Section 6.2.9)
- Storage
- Preparation of chemicals, including cement products
- Parking of vehicles and plant
- Refuelling
- Dumping of waste
- Wash down and cleaning of equipment
- Placement of fill
- Lighting of fires
- Soil level changes
- Temporary or permanent installation of utilities and signs
- Physical damage to the tree

7.6 Protective Fencing Specification

- 7.6.1 Protective fencing (Figure 11) is to be installed as far as practicable from the trunk of any retained trees. Fencing should be erected as per the image below before any machinery or materials are brought to site and before commencement of works (including demolition).
- 7.6.2 In some areas of the site (i.e. protection of trees on neighbouring properties) existing boundary fencing may be used as an alternative to protective fencing.
- 7.6.3 Once erected, protective fencing must not be removed or altered without approval from the project arborist. The TPZ fencing should be secured to restrict access.
- 7.6.4 TPZ fencing is to be a minimum of 1.8m high and mesh or wire between posts must be highly visible. Fence posts and supports should have a diameter greater than 20mm and should ideally be freestanding, otherwise be located clear of the roots. See image below.
- 7.6.5 Tree protection fencing must remain intact throughout all proposed construction works and must only be dismantled after their conclusion. The temporary dismantling of tree protection fencing must only be done with the authorisation of a consulting arborist and/or the responsible authority.
- 7.6.6 The subject trees themselves must also not to be used as a billboard to support advertising material. Affixing nails or screws into the trunks of trees to display signs of any type is not a recommended practice in the successful retention of trees.



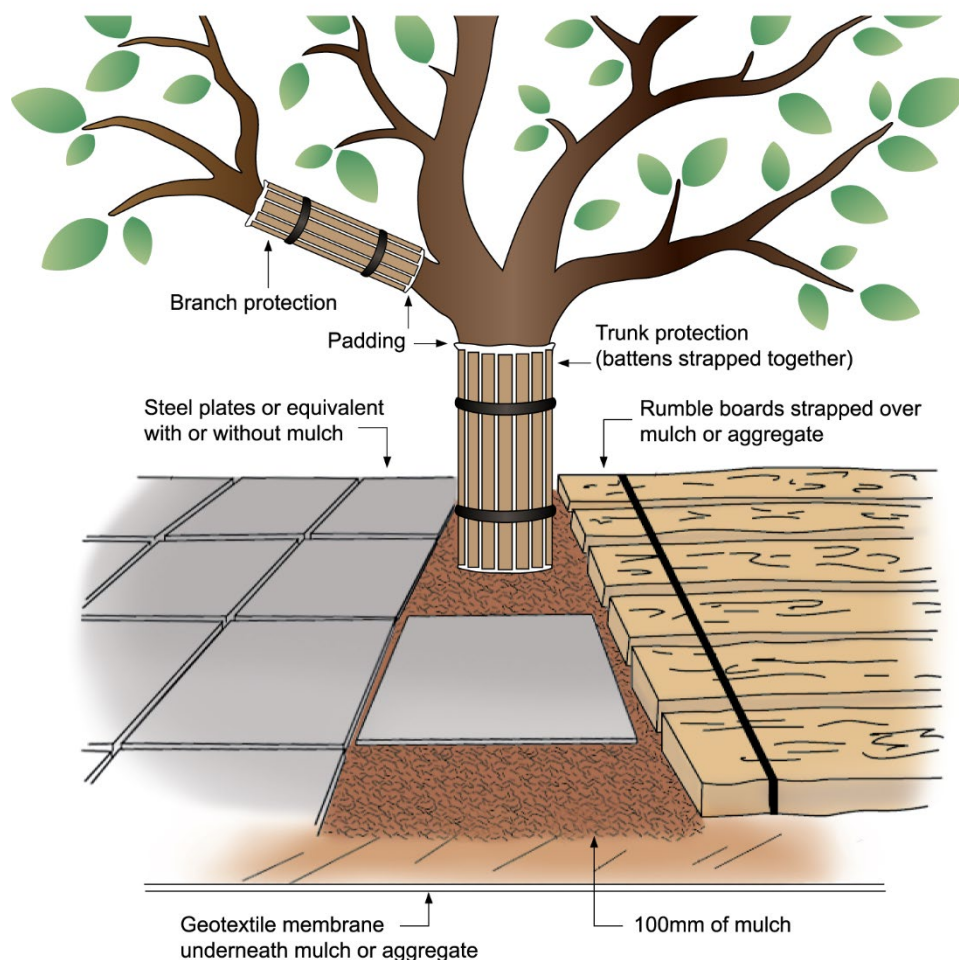
Legend:

1. Chain wire mesh panels with shade cloth attached (if required), 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 discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage materials of any kind are permitted within the TPZ
4. Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Figure 11. Depicts standard fencing techniques. (AS 4970–2009).

7.7 Trunk and Ground Protection

- 7.7.1 Given that proposed works are often within the TPZs of retained trees, standard protective fencing may not always be a viable method of protection. In these areas trunk protection and ground protection should be installed prior to the commencement of works and remain in place until after construction works have been completed.
- 7.7.2 Where construction access into the TPZ of retained trees cannot be avoided, the root zone of each tree must be protected using either steel plates or rumble board strapped over mulch/aggregate until such a time as permanent above ground surfacing (cellular confinement system or similar) is to be installed.
- 7.7.3 Trunk and ground protection (Figure 12) should be undertaken in line with the Australian Standard AS 4790–2009: *Protection of Trees on Development Sites* as per the image below:



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.

Figure 12. Depicts trunk and ground protection techniques. (AS 4790–2009).

7.8 Tree Protection Signs

- 7.8.1 Signs identifying the TPZ (Figure 13) should be placed at 10m intervals around the edge of the TPZ and should be visible from within the development site.



Figure 13. Depicts standard fencing techniques. (AS 4970–2009).

7.9 Project Arborist

- 7.9.1 An official “Project Arborist” must be commissioned to oversee the tree protection, any works within the TPZ’s and complete regular monitoring compliance certification.
- 7.9.2 The project arborist must have minimum five (5) years industry experience in the field of arboriculture, horticulture with relevant demonstrated experience in tree management on construction sites, and Diploma level qualifications in arboriculture – AQF Level 5.
- 7.9.3 Inspections are to be conducted by the project arborist at several key points during the construction in order to ensure that protection measures are being adhered to during construction stages and decline in tree health or additional remediation measures can be identified.

7.10 Project Milestones

7.10.1 The following visits and milestones were recommended as to when on-site tree inspection by the project arborist is required:

Item	Purpose of Visit	Timing of Visit(s)	Prerequisites
1	Signoff of works scheduled inside TPZ's as per Section 7.3	Whenever there is work planned to be performed within the TPZ's. Contractor to provide a minimum of two weeks advance notice for such visits.	Clear and accurate methodologies with supporting documents including technical drawing showing the location of trees and encroaching surface.
2	Signoff of works scheduled outside of Section 7.0 Tree Protection and Management Recommendations.	Whenever there is additional work planned to be performed within the TPZ's that is outside of the scope of Section 7. Contractor to provide a minimum of two weeks advance notice for such visits.	Clear and accurate direction of the amendment with supporting documents including technical drawing showing the location of trees potentially being impacted.
3	Final sign off	Following completion of works.	Practical completion of works and prior to tree protection removal.

7.11 Compliance Reporting

- 7.11.1 Following each inspection, the project arborist shall prepare a report detailing the condition of the trees. These reports should certify whether or not the works have been completed in compliance with the consent relating to tree protection.
- 7.11.2 These reports should contain photographic evidence where required to demonstrate that the work has been carried out as specified.
- 7.11.3 Matters to be monitored and included in these reports should include tree condition, tree protection measures and impact of site works which may arise from changes to the approved plans.
- 7.11.4 The reports and Compliance Statements shall be submitted to the Project Manager (as well as the Clients' nominated representative) following each inspection.
- 7.11.5 The reports and any Non-Compliance Statements shall be submitted to the Project Manager (as well as the Clients' nominated representative) if tree protection conditions have been breached. Reports should contain clear remedial action specifications to minimise any adverse impact on any subject tree.

7.12 Offset Tree Planting

- 7.12.1 Offset planting should reflect the number of trees removed and the initial loss of amenity and biomass. New trees should be of long-term potential and sourced from a reputable supplier.
- 7.12.2 Replacement tree species must suit their location on the site in terms of their potential physical size and their tolerance(s) to the surrounding environmental conditions. To avoid unethical or unprofessional tree selection and/or their placement within the landscape, replacement tree species must be selected in consultation with a consulting arborist, who can also assist in implementing successful tree establishment techniques.

7.12.3 Replacement tree species must have the genetic potential to reach a mature size potential of those trees removed to facilitate the development. As a guide, potential height will be a minimum of 10m (or more) and produce a spreading canopy so as they may provide amenity value to the property and contribute to the tree canopy of the surrounding area in the future.

7.13 Additional Excavation/Trenching within TPZs

7.13.1 In the event additional excavation is required within the TPZs of retained trees identified within this report, or any other site trees, arborist involvement will be required to ensure works are undertaken in accordance with the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.

7.13.2 Where excavation or trenching is required to facilitate installation of underground services within the TPZs of any site trees arborist supervision is required. Works should be undertaken using techniques that are sensitive to tree roots to avoid unnecessary damage. Such techniques include:

1. Excavation by hand
2. Excavation using a high-pressure water jet and vacuum truck
3. Excavation using an Air Spade with vacuum truck.

7.13.3 Machine excavation should be prohibited within the TPZs of retained trees unless undertaken at the direct consent from the project arborist and/or the responsible authority.

8 References

- Isbell, R. F., 2002. *The Australian Soil Classification*. Melbourne, Australia: CSIRO.
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- NSW Government, 2022. *NSW Department of Planning and Environment: eSPADE*. [Online] Available at: <https://www.environment.nsw.gov.au/topics/land-and-soil/information/espade> [Accessed March 2022].
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- Urban, J., 2008. *Up By Roots - Healthy Soils and Trees in the Built Environment*. Champaign (Illinois): International Society of Arboriculture.

Plans of the existing site and of the proposed development were provided to ArborSafe in February and include:

- Site Plan Demolition, Drawing BVN-AR-01-10A-XX-10, Issue 1, BVN Architects, 19 October 2022
- Site Plan Demolition, Drawing BVN-AR-REF-10A, Issue 3, BVN Architects, 12 July 2023

Appendix A. Arboricultural Reporting Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. Any titles and ownership of any property are assumed to be good. No responsibility is assumed for matters legal in character.
2. It is assumed that any property/project is not in violation of any applicable codes, ordinances, statutes or other government regulations.
3. Care has been taken to obtain all information from reliable sources. All data has been verified in so far as possible, however, the consultant can neither guarantee nor be responsible for the accuracy of the information provided by others.
4. The consultant shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services.
5. Loss or alteration of any part of this report invalidates the entire report.
6. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by anyone but the person to whom it is addressed, without the prior written consent of the consultant.
7. Neither all nor any part of the contents of this report, nor any copy thereof, shall be used for any purpose by anyone but the person to whom it is addressed, without the written consent of the consultant. Nor shall it be conveyed by anyone, including the Client, to the public through advertising, public relations, news, sales or other media, without the written consent of the consultant.
8. This report and any values expressed herein represent the opinion of the consultant and the consultant's fee is in no way contingent upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
9. Sketches, diagrams, graphs and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys unless expressed otherwise.
10. Information contained in this report covers only those items that were examined and reflect the condition of those items at the time of inspection.
11. Inspection is limited to visual examination of accessible components without dissection, excavation or probing. There is no warranty or guarantee expressed or implied that the problems or deficiencies of the plants or property in question may not arise in the future.

Appendix B. Explanation of Tree Assessment Terms

Tree number: Refers to the individual identification number assigned within the ArborSafe software to each assessed tree on the site and the number which appears of the tree's tag.

Tree location: Refers to the easting and northing coordinates assigned to the location of the tree as obtained from the geo-referenced aerial image within the ArborSafe software.

Tree species: Provides the botanic name (genus, species, sub-species, variety and cultivar where applicable) in accordance with the International Code of Botanical Nomenclature (ICBN), and the accepted common name.

Trees in group: The number of trees encompassing a collective assessment of more than one tree. Typically grouped trees have similar attributes that can be encompassed within one data record.

Height: The estimated range in metres attributed to the tree from its base to the highest point of the canopy. Where required height will be estimated to the nearest metre.

Diameter at Breast Height (DBH): Refers to the tree's estimated trunk diameter measured 1.4m from ground level for a single trunked tree. These estimates increase in 50mm increments. Where required DBH will be measured to give an accurate measurement for single trunked trees, trees with multiple trunks, significant root buttressing, bifurcating close to ground level or trunk defects and will be measured as per the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.

Tree Protection Zone (TPZ): A specified area above and below ground and at a given distance measured radially away from the centre of the tree's trunk and which is set aside for the protection of its roots and crown. It is the area required to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development. The radius of the TPZ is calculated by multiplying its DBH by 12. TPZ radius = DBH × 12. (Note "Breast Height" is nominally measured as 1.4m from ground level). TPZ is a theoretical calculation and can be influenced by existing physical constraints such as buildings, drainage channels, retaining walls, etc. (Standards Australia, 2009).

Structural Root Zone (SRZ): The area close to the base of a tree required for the tree's anchorage and stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres. SRZ radius = $(D \times 50)^{0.42 \times 0.64}$ (Standards Australia, 2009).

Canopy spread: The estimated range in metres attributed to the spread of the tree's canopy on its widest axis. Where required crown spread will be estimated to the nearest metre.

Origin: Refers to the origin of the species and its type.

Category	Description
Indigenous	Occurs naturally in the local area and is native to a given region or ecosystem.
State Native	Occurs naturally within State but is not indigenous.
Australian Native	Occurs naturally within Australia and its territories but is not a State native or indigenous.
Exotic Evergreen	Occurs naturally outside of Australia and its territories and typically retains its leaves throughout the year.
Exotic Deciduous	Occurs naturally outside of Australia and its territories and typically loses its leaves at least once a year.

Health: Refers to the health and vigour of the tree.

Category	Description
Excellent	Canopy full with even foliage density throughout, leaves are entire and are of an excellent size and colour for the species with no visible pathogen damage. Excellent growth indicators, e.g. seasonal extension growth. Exceptional specimen.
Good	Canopy full with minor variations in foliage density throughout, leaves are entire and are of good size and colour for the species with minimal or no visible pathogen damage. Good growth indicators, none or minimal deadwood.
Fair	Canopy with moderate variations in foliage density throughout, leaves not entire with reduced size and/or atypical in colour, moderate pathogen damage. Reduced growth indicators, visible amounts of deadwood, may contain epicormic growth.
Poor	Canopy density significantly reduced throughout, leaves are not entire, are significantly reduced in size and/or are discoloured, significant pathogen damage. Significant amounts of deadwood and/or epicormic growth, noticeable dieback of branch tips, possibly extensive.
Dead	No live plant material observed throughout the canopy, bark may be visibly delaminating from the trunk and/or branches.

Age: Refers to the life cycle of the tree.

Category	Description
Young	Newly planted small tree not fully established may be capable of being transplanted or easily replaced.
Juvenile	Tree is small in terms of its potential physical size and has not reached its full reproductive ability.
Semi-mature	Tree in active growth phase of life cycle and has not yet attained an expected maximum physical size for its species and/or its location.
Mature	Tree has reached an expected maximum physical size for the species and/or location and is showing a reduction in the rate of seasonal extension growth.
Senescent	Tree is approaching the end of its life cycle and is exhibiting a reduction in vigour often evidenced by natural deterioration in health and structure.

Structure: Refers to the structure of the tree from roots to crown.

Category	Description
Good	Sound branch attachments with no visible structural defects, e.g. included bark or acute angled unions. No visible wounds to the trunk and/or root plate. No fungal pathogens present.
Fair	Minor structural defects present, e.g. apical leaders sharing common union(s). Minor damage to structural roots. Small wounds present where decay could begin. No fungal pathogens present.
Poor	Moderate structural defects present, including bifurcations with included bark with union failure likely within 0–5 years. Wounding evident with cavities and/or decay present. Damage to structural roots.
Hazardous	Significant structural defects with failure imminent (3–6 months). Defects may include active splits and/or partial branch or root plate failures. Tree requires immediate arboricultural works to alleviate the associated risk.

Useful Life Expectancy (ULE): Useful life expectancy refers to an expected period of time the tree can be retained within the landscape before its amenity value declines to a point where it may detract from the appearance of the landscape and/or presents a greater risk and/or more hazards to people and/or property. ULE values consider tree species, current age, health, structure and location. ULE values are based on the tree at the time of assessment and do not consider future changes within the tree's location and environment which may influence the ULE value.

Category
0 Years
<5 Years
5–10 Years
10–15 Years
15–25 Years
25–50 Years
>50 Years

Defects: Visual observations made of the presenting defects of the tree and its growing environment that are, or have the capacity to impact upon, the health, structural condition and/or the useful life expectancy of the tree. Defects may include adverse physical traits or conditions, signs of structural weaknesses, plant disease and/or pest damage, tree impacts to assets or soil related issues.

Tree Significance: Includes environmental, social or historical reasons why the tree is significant to the site. The tree may also be rare under cultivation or have a rare or localised natural distribution.

Arborist Actions: A list of arboricultural and/or plant health care works that are aimed at maintaining or improving the tree's health, structural condition or form. Actions may also directly or indirectly reduce the risk potential of the tree such as via the removal of a particular branch or the moving of infrastructure from under its canopy.

Appendix C. Tree Retention Values

Based upon a modified version of the British Standard BS 5837–2012: *Trees in relation to design, demolition and construction – recommendations*.

Category and definition	Criteria (including sub-categories where appropriate)		
Category U			
Trees in such a condition that they cannot realistically be retained as viable trees in the context of the current land use for longer than 5 years.	<ul style="list-style-type: none"> Trees that have a severe structural defect that are not remediable such that their failure is expected within 12 months. Trees that will become unviable after removal of other Category U trees (e.g. where for whatever reason the loss of companion shelter cannot be mitigated by pruning). Trees that are dead or are showing signs of significant, immediate and irreversible overall decline. Trees infected with pathogens of significance to the health and or safety of other trees nearby Low quality trees suppressing adjacent trees of better quality. Noxious weeds or species categorised as weeds within the local area. <p>Note: Category U trees can have existing or potential conservation value* which might make it desirable to preserve.</p>		
	1. Arboricultural Qualities	2. Landscape qualities	3. Cultural and environmental values
Category A			
Trees of High Quality with an estimated remaining life expectancy of at least 25 years and of dimensions and prominence that it cannot be readily replaced in <20 years.	Trees that are particularly good examples of their species, especially if rare or unusual (in the wild or under cultivation); or those that are important components of groups or avenues.	Trees or groups of significant visual importance as arboricultural and/or landscape features. (e.g. feature and landmark trees).	Trees, groups or plant communities of significant conservation, historical, commemorative or other value (e.g. remnant trees, aboriginal scar trees, critically endangered plant communities, trees listed specifically within a Heritage statement of significance).
Category B			
Trees of Moderate Quality with an estimated remaining life expectancy of 15–25 years and of dimensions and prominence that cannot be readily replaced within 10 years.	Trees that might be included within Category A but are downgraded because of diminished condition such that they are unlikely to be suitable for retention beyond 25 years.	Trees that are visible from surrounding properties and/or the street but make little visual contribution to the wider locality.	Trees with conservation or other cultural value (trees within conservation areas or landscapes described within a statement of significance, locally indigenous species).
Category C			
Trees of Low Quality with an estimated remaining life expectancy of 5–15 years, or young trees that are easily replaceable.	Trees of very limited value or such impaired condition that they do not qualify in higher categories.	Trees offering low or only temporary/transient landscape benefits.	Trees with no material conservation or other cultural value.

* Where trees would otherwise be categorised as U, B or C but have significant identifiable conservation, heritage or landscape value even though only for the short term, they may be upgraded, although they might be suitable for retention only.

Tree Quality

		Health**			
		Excellent/ Good	Fair	Poor	Dead
Structure	Good	A	B	C	U
	Fair	B	B	C	U
	Poor	C	C	U	U
	Hazard *	U	U	U	U

* Structural hazard that cannot be remediated through mitigation works to enable safe retention.

** Trees of short term reduced health that can be remediated via basic, low cost plant health care works (e.g. mulching, irrigation etc.) may be designated in a higher health rating to ensure correct retention value nomination.

Category A	Typically trees in this category are of high quality with an estimated remaining life expectancy of at least 25 years and of dimensions and prominence that it cannot be readily replaced in <20 years. The tree may make significant amenity contributions to the landscape and may make high environmental contributions. In some cases, trees within this category may not meet the above criteria, however possess significant heritage or ecological value. Trees of this retention value warrant design consideration and amendment to ensure their viable retention.
Category B	Typically trees in this category are of moderate quality with an estimated remaining life expectancy of 15–25 years and prominence of size dimensions that cannot be readily replaced within 10 years. They may make moderate amenity contributions to the landscape and make low/moderate environmental contributions. Trees with this retention value warrant lesser design consideration in an attempt to allow for their retention.
Category C	Trees in this category are of low quality with an estimated remaining life expectancy of 5–15 years, or young trees that are easily replaceable, may have poor health and/or structure, are easily replaceable, or are of undesirable species and do not warrant design consideration.
Category U	Trees in this category are found to be in such a condition that they cannot realistically be retained as viable trees in the context of the current land use for longer than five years. These trees may be dead and/or of a species recognised as a weed that resulted in them being unretainable.

Guide to plant health tonics and root growth stimulants

Considering the varying sizes of trees in common urban landscapes, it is suggested that an application volume of combined water and product solution of 80–150L for small to medium sized trees (5-10m height), 150–250L for medium to large sized trees (10-20m height) and 250–400L for large to very large sized trees (>20m height). Note: a lesser volume of total mixed product could be used if a more concentrated mix is drenched and water irrigation used to further drench the area and therefore dilute the stronger mix application.

The following product recommendations have been based on previous successful works undertaken by ArborSafe. The information provided is to be used as a general guide only, depending on your tree species, health or location. We recommend you always refer to the manufacturers label before applying any product. You may need to further consult with ArborSafe or your Project Arborist to develop a more specific program for your tree needs.

- **Soil Conditioner** concentrate such as Kelpro, Seasol or similar 600–800mL/100L of water. A concentration of beneficial nutrients stimulating plant growth and root establishment, ideal for trees under stress.
- **Nitrogen Boost** concentrate such as Nitrosol liquid plant food or similar 300mL/100L of water. A general-purpose fertilizer that contains a nitrogen boost (the most abundantly used element for tree growth). NB: Care must be taken when applying general fertilizer, particularly where plants can be affected Phosphorus toxicity.
- **Root Biostimulant** concentrate such as Auxinone or similar 400mL/100L of water. A scientific blend of hormone root growth stimulants and vitamins assisting in the regeneration of roots.
- **Microbial Formulation** concentrate such as Nocate Liquid or similar 500mL/100L of water. Generally containing strains of beneficial soil microorganisms, humic acid, kelp, essential amino acids, vitamins, biotin, folic acid and natural sugars designed to enhance the establishment of beneficial microbial populations.
- **Carbohydrate Energy Source** such as Molasses 500-800mL/100L of water. Molasses is the by-product of sugar refining. It contains all the nutrients from the raw sugarcane plant and is a carbohydrate energy source that feeds soil microorganisms and increases microbial activity.
- **Surfactant/Wetting Agent** (optional) such as Dispatch (Liquid) 200–300ml/100L of water. Improves the infiltration and penetration of applied water and irrigation.

We recommend you always refer to the manufacturers label before applying any product using the above as a guide only.

Guide to mulching and maintenance for established trees

Whether a tree is a newly planted young tree, or a well-established mature tree, the area around its base is a key factor in its long-term retention and viability. Maintaining a soil environment that is conducive to tree root development is vital for trees of all ages. This guide provides information on appropriate maintenance practices around the base of trees including mulching and the restriction of activities that may cause harm to tree roots or trunks.

1. Why mulch?

Mulching is a plant health care action which can be undertaken to improve plant and soil health (Figure 14), as well as overall landscape aesthetics. Placing an organic (or sometimes inorganic) material on the soil surface reduces the level of direct sunlight contact. Mulching should not be confused with composting which involves incorporating organic matter such as composts or manures into the soil profile. All plants in their natural ecologies (except for some arid and coastal ecologies) are naturally mulched by the falling of leaves, bark, flowers and other organic material.

This action is of great importance in successful cultivation of plants as it:

- assists in the regulation of soil moisture and temperature levels
- helps to suppress weeds
- minimises soil compaction
- reduces run-off during periods of heavy rain
- adds organic matter to the soil, and
- improves overall structure, nutrition and water holding composition.

Mulch is best comprised of organic materials such as wood chips, leaf litter, straw or hay as these will degrade over time. Long-term mulching improves soil health and structure as it encourages the activities of earthworms, microflora and beneficial fungi. Inorganic materials such as stones and gravel can be moderately effective as mulch but will not provide the ongoing improvements to soil health.



Figure 14. An excellent example of how to mulch a young tree. (Lachlan Andrews, September 2015).

2. How to mulch

- Apply mulch to damp soil, as placing over dry soil makes it difficult to rehydrate. Applying during the cooler months of the year is an ideal time.
- If mulching on top of a pre-existing grass area, grass or weeds must first be hand weeded and/or sprayed with a non-selective herbicide and left to wilt and die before applying mulch.
- Mulch should be applied at a uniform thickness of 75–100mm and re-applied approximately every 12 months. Do not place mulch up against the trunk of a tree as the damp mulch can cause bark to decay.
- Apply over a wide area, at least as large as a tree's crown projection (preferably larger), within and outside the current root mass to encourage lateral root development and expansion.
- Wood chip mulch (such as that generated from wood chippers) is considered an ideal mulch for landscape use as it contains a wide variety of materials that are of different sizes (such as bark, foliage and timber), is relatively cheap to purchase, and can be obtained in large quantities. Stockpiling of mulch after tree contractors have conducted works at a site is a way of generating 'free' mulch and ensuring that plant material from tree pruning and/or removals is recycled on site, not imported from external suppliers, saving costs and making the site more self-sustaining.
- The use of mulch made from pine bark or red gum chips are discouraged as they seldom degrade and therefore do not add nutrition to the soil profile. The uniform particle size and resin content can provide an impervious layer to water as well as retarding gaseous exchange.
- Mulching within the canopy areas of larger trees (Figure 15) can not only improve long-term tree health but can also act to reduce tree risk by decreasing the number of targets that pass and/or congregate under their canopies. This in turn will minimise the likelihood of injury in the event of a branch failure.
- When using wood chip mulch, ensure that if it has been made from live plant material that is stored and allowed to compost for between 3 and 6 months prior to use. Never apply fresh, 'green' mulch around trees as this can induce what is called the nitrogen drawdown, which can result in the removal of nitrogen from the soil resulting in plants with nutrient deficiencies.

For further information refer to the Australian Standard AS 4454–2012: *Composts, Soil Conditioners and Mulches*.

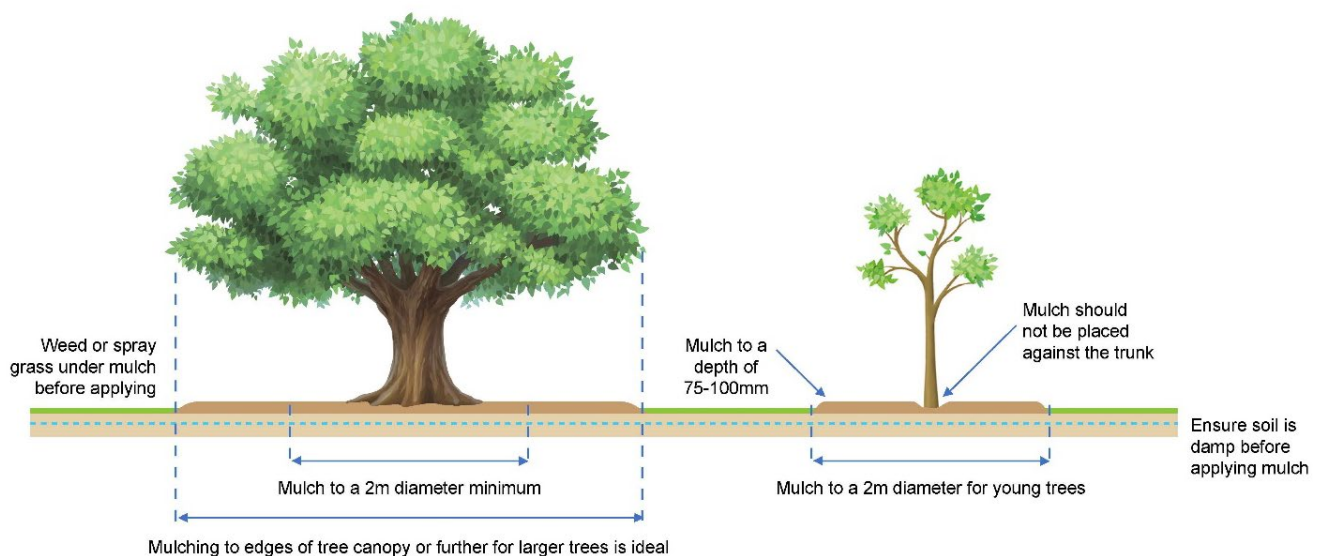


Figure 15. Mulching established and young trees (ArborSafe Australia, 2020).

3. Root and trunk damage

The function of tree roots is primarily to provide water and nutrient uptake for the tree, provide stability through structural roots that anchor it to the ground and as a means of food and nutrient storage. Damage to tree roots can lead to a reduction to any or all of these functions.

Damage to tree roots (Figure 16 and Figure 17) and the lower portion of a tree's trunk is a common and often unnecessary occurrence that can lead to the entry of decay fungi into a tree's structural framework. Once present, decay may develop in larger structural roots and/or the base of the trunk, which can result in a reduction in tree health and in severe cases even compromise stability.

Works such as trenching and excavation are often the cause of root damage to trees. Refer to ArborSafe's Guide – Tree protection during construction or the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites* for things to consider when performing construction activities near trees.

Everyday activities such as grass cutting via mowing or brush cutters can result in serious root damage or wounding to the lower trunk. Young trees with their trunks damaged by machinery often need replacing, while damage to the trunks and/or surface roots of established trees is not only detrimental to tree health but can also result in costly repairs to machinery.

Another advantage to mulching around the trunk and root crown is that it limits damage to both parts from mowing equipment. This in turn reduces mechanical damage and compaction.



Figure 16. An example of damage to tree roots caused via mowing. (Luke Dawson, June 2017).



Figure 17. Image showing wound caused to upper portion of surface root by mower. (Luke Dawson, June 2017).

4. How to avoid root and trunk damage

The following points serve to highlight ways to avoid damage to tree roots and trunks caused via grass cutting activities:

- Mulching around young and established trees negates the need for brush cutter and/or lawn mower use around the base of a tree. Mulching therefore not only creates a barrier between tree roots and trunk that are susceptible to damage, it improves soil condition, minimises soil compaction and decreases the total area required for mowing.
- Where mulching is not feasible, raising the cutting height of mowers and maintaining grass at a greater height can avoid unnecessary 'scalping' of roots and damage to mowers/blades.
- Where surface roots are located away from the trunk and in a location where neither the application of mulch nor the raising of mower height is inappropriate, it may be possible to raise the soil grade directly around the root/s to minimise damage. It is important that the application of new material does not result in significant changes to the soil profile that may inadvertently damage roots. Material applied should be permeable and allow the development of turf which will protect the roots. Coarse sand or a planting mix with a high sand to organic matter ratio (e.g. 80/20 mix) spread at a depth of 75–100mm could suitably protect the surface root from damage, while allowing turf to redevelop within the area.
- ArborSafe is able to answer any questions regarding the material, depth and method of application to be used to ensure the tree/s remain viable for the long-term.

Appendix E. Tree Assessment Data

Tree no.	Botanical Name	Common Name	Origin	Trees in group	DBH Total (cm)	DRB (cm)	Radial TPZ (m)	TPZ area (m ²)	Radial SRZ (m)	Tree Height (m)	Health	Structure	Age	TLE (Yrs.)	Defects	Significance	Arborist comments	Tree Quality Score	Tree Retention value subcategory	Recommendation
1	<i>Callistemon viminalis</i>	Weeping Bottlebrush	Native	1	30	36	3.5	39.45	2.2	5-10	Good	Fair	Mature	15-25	Co-dominant stems;Included bark;	Amenity value/shade;Attractive landscape feature;		B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
2	<i>Cupressus sempervirens 'Swanes Gold'</i>	Golden Italian Cypress	Exotic	1	21	25	2.5	19.95	1.8	6	Good	Fair	Semi-Mature	10-15	Co-dominant stems;Included bark;Poor pruning;	Amenity value/shade;	Previously lopped below 2nd storey gutterline.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
3	<i>Lagerstroemia indica</i>	Crepe Myrtle	Exotic	1	45	61	5.4	91.61	2.7	7	Good	Fair	Mature	15-25	Co-dominant stems;Crossing/rubbing branches;Decay;Epicormic growth;Included bark;Wound(s);	Amenity value/shade;Attractive landscape feature;	Tree historically lopped at 1.5m with upper canopy consisting of multiple stabilised epicormic shoots.	B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
4	<i>Cupressus sempervirens 'Swanes Gold'</i>	Golden Italian Cypress	Exotic	1	25	35	3.0	28.27	2.1	10-15	Good	Good	Semi-Mature	25-50		Amenity value/shade;Attractive landscape feature;		B	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
5	<i>Archontophoenix cunninghamiana</i>	Bangalow Palm	Endemic	4	21	24	2.5	19.95	1.8	5-10	Good	Good	Semi-Mature	25-50		Amenity value/shade;Attractive landscape feature;	A closely planted group of four palms. Easily transplantable or replaceable.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
6	<i>Lophostemon confertus</i>	Queensland Box	Endemic	1	52	56	6.2	122.33	2.6	5-10	Good	Fair	Semi-Mature	25-50	Mechanical damage to root(s);	Amenity value/shade;Attractive landscape feature;Avenue tree;	Untagged Council Street tree situated 2.5m from boundary fence.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
7	<i>Lophostemon confertus</i>	Queensland Box	Endemic	1	73	86	8.8	241.08	3.1	10-15	Good	Fair	Mature	15-25	Deadwood/stubs > 100mm;Dieback;Epicormic growth;Mechanical damage to root(s);Weak union(s);	Amenity value/shade;Attractive landscape feature;Avenue tree;	Untagged Council Street tree situated 2m from boundary fence. Remove the dead southern stem overhanging footpath and hospital grounds back to trunk union at 2m.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
8	<i>Lophostemon confertus</i>	Queensland Box	Endemic	1	44	58	5.3	87.58	2.6	5-10	Good	Fair	Semi-Mature	25-50	Deadwood/stubs < 30mm;Mechanical damage to root(s);	Amenity value/shade;Attractive landscape feature;Avenue tree;	Untagged Council Street tree situated 2.5m from boundary fence.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
9	<i>Lophostemon confertus</i>	Queensland Box	Endemic	1	53	58	6.4	127.08	2.6	5-10	Fair	Poor	Semi-Mature	<5	Deadwood/stubs > 60mm;Decay;Dieback;Epicormic growth;Excessive end weight;Mechanical damage to root(s);Previous failure(s);Weak union(s);Wound(s);	Amenity value/shade;	Untagged Council Street tree situated 2.5m from boundary fence. Significant lower trunk decayed wound makes ongoing stability unpredictable. Removal recommended. Road side car parking within potential impact zone.	U		Remove tree irrespective of future development.
10	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Endemic	1	54	68	6.5	131.92	2.8	5-10	Good	Fair	Mature	15-25	Co-dominant stems;Mechanical damage to root(s);	Amenity value/shade;Attractive landscape feature;	Untagged Council Street tree situated 3.5m from boundary fence.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
11	<i>Callistemon viminalis</i>	Weeping Bottlebrush	Native	1	23	32	2.8	23.93	2.1	<5	Fair	Fair	Mature	5-10	Dieback;Parasitic plant/mistletoe;	Amenity value/shade;	Untagged Council Street tree situated 4m from boundary fence. Canopy has a bias towards the carparking and is becoming smothered by mistletoe.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
12	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Endemic	1	48	54	5.8	104.23	2.6	5-10	Good	Fair	Mature	15-25	Mechanical damage to root(s);Wound(s);	Amenity value/shade;Attractive landscape feature;	Untagged Council Street tree situated 3.5m from boundary fence.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
13	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Endemic	1	37	43	4.4	61.93	2.3	5-10	Fair	Fair	Mature	15-25	Co-dominant stems;Dieback;Epicormic growth;Included bark;Mechanical damage to root(s);Wound(s);	Amenity value/shade;Attractive landscape feature;	Untagged Council Street tree situated 3.5m from boundary fence.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
14	<i>Callistemon viminalis</i>	Weeping Bottlebrush	Native	1	18	22	2.2	14.66	1.8	<5	Fair	Fair	Juvenile	10-15	Co-dominant stems;		Untagged Council Street tree situated 3.5m from boundary fence.	C	2	Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
15	<i>Melaleuca bracteata</i>	Black Tea Tree	Native	1	45	58	5.4	92.92	2.6	5-10	Good	Fair	Mature	15-25	Co-dominant stems;Included bark;	Amenity value/shade;Attractive landscape feature;	Untagged Council Street tree situated 3.5m from boundary fence.	B	2	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
16	<i>Melaleuca bracteata</i>	Black Tea Tree	Native	1	28	46	3.4	35.51	2.4	5-10	Good	Fair	Mature	15-25	Co-dominant stems;Suppressed;Wound(s);	Amenity value/shade;Attractive landscape feature;	Untagged Council Street tree situated 3.5m from boundary fence. Suppressed canopy shape due to proximity to neighbouring tree.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
17	<i>Melaleuca bracteata</i>	Black Tea Tree	Native	1	36	55	4.3	58.31	2.6	5-10	Good	Fair	Mature	15-25	Co-dominant stems;Included bark;Suppressed;Wound(s);	Amenity value/shade;Attractive landscape feature;	Untagged Council Street tree situated 3.5m from boundary fence. Suppressed canopy shape due to proximity to neighbouring tree.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
18	<i>Melaleuca quinquenervia</i>	Broad-leaved Paperbark	Endemic	1	83	93	10.0	311.65	3.2	10-15	Good	Fair	Mature	15-25	Co-dominant stems;Included bark;Mechanical damage to root(s);Wound(s);	Amenity value/shade;Attractive landscape feature;	Untagged Council Street tree situated 3.5m from boundary fence. The included co-dominant union at 1m appears inactive at this assessment (no cracking, canopy separation, sap exudation).	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
19	<i>Melaleuca bracteata</i>	Black Tea Tree	Native	1	39	58	4.7	70.44	2.6	7	Good	Fair	Semi-Mature	15-25	Co-dominant stems;Included bark;Suppressed;Wound(s);	Amenity value/shade;Attractive landscape feature;	Untagged Council Street tree situated 3.5m from boundary fence. Suppressed canopy shape due to proximity to neighbouring tree.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
20	<i>Callistemon viminalis</i>	Weeping Bottlebrush	Native	1	42	45	5.0	79.80	2.4	<5	Fair	Fair	Semi-Mature	5-10	Co-dominant stems;Dieback;Epicormic growth;Weak union(s);Wound(s);	Amenity value/shade;	Untagged Council Street tree. Historically lopped St 2m with upper canopy consisting of stabilised epicormic growth.	C	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).



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