

10 June 2021



**smart  
arbor  
professional**  
CONSULTING



## 194 Bennett Road, St Clair

Arbor Impact Assessment  
Version 1.0

Client: Marguerite Mansfield

Prepared By

**Luke Smart**  
AQF V Consulting Arborist



Arboriculture Australia™



# Contents

1.	DISCLAIMER .....	3
2.	EXECUTIVE SUMMARY .....	4
	<b>Schedule of Tree Management Processes .....</b>	<b>5</b>
3.	PURPOSE .....	6
4.	METHOD .....	7
5.	OBSERVATIONS .....	11
6.	TREE DATA COLLECTION FORM .....	13
7.	DISCUSSION .....	14
	<b>7.1 – Trees with a Low Impact (&gt;10%) .....</b>	<b>14</b>
	<b>7.2 - Moderately Impacted Trees (&gt;10%; &lt;20%) .....</b>	<b>14</b>
	<b>7.3 - Other Trees Assessed and General Notes .....</b>	<b>15</b>
8.	RECOMMENDATIONS .....	15
9.	TREE LOCATION PLAN .....	16
10.	TREE PROTECTION PLANNING .....	17
11.	APPENDIX .....	21
12.	REFERENCES .....	22
13.	PHOTO REFERENCE .....	23

## 1. DISCLAIMER

The information provided within this report from Smart Arbor Professional Consulting is independently gathered by the author as an unbiased party and represents only the opinions and summations of the consulting arborist; compiled using the data gathered from the site inspection/s and any relevant information provided by the client or client representative.

It is assumed that any information provided by the client or client representative is accurate, unless later found conflicting with the consulting arborist's findings. In the event of this type of conflict all parts of this report are to be withheld until the matter is resolved.

All recommendations provided in this report relate to the time and date of the initial, and any following, site assessment/s. In the absence of historical records or information provided by the client or client representative, assumptions and findings of the consulting arborist are deemed the relevant data used in this report.

Measurements and locations noted in this report are an approximation and may be based on information found in surveys and further documentation not completed by the author. Exact locations and measurements of landscape require the assessment of a qualified surveyor. Soil profiles and/or samples, tissue samples, invasive testing or aerial/below ground analysis are not completed as part of this service but may be recommended within the report to assist with further investigation.

This report is subject to copyright and no part of it may be used, reproduced, advertised, or used for any media services or separate party consultation without the written consent of the author. No responsibility is accepted for the unauthorized use of this report. If the author and/or consulting arborist is required to provide testimony in a court in relation to this report, this would be deemed as a variation on the scope and will incur additional fees.

No part of this report is to be provided or conveyed to any third party or authority until full payment of invoice is received, or an agreement of a later payment is granted by the author.

No guarantees are implied for any findings or recommendations made within this report. Deficiencies, defects, climatic impacts, environmental changes, vandalism, mechanical impacts, or any other variable that may change the current state of the tree/s assessed are not covered in this report and will not be relevant to the opinions and findings provided.

## 2. EXECUTIVE SUMMARY

The report has been commissioned by Marguerite Mansfield to provide a qualified assessment for tree specimens on a proposed development site located at 194 Bennett Road, St Clair; a residential property located in the Penrith City Council LGA and subject to Local Government Tree Management policies.

The general vegetation on the site is noted to be a combination made up of 1 exotic tree specimen, exotic shrubs and an exotic turf underlay. The vegetation assessed was 1 tree located on the property and 1 tree in a neighbouring property.

The proposed development that bears any impact to trees on site includes a new driveway and carpark construction at the rear of the property; the widening of an existing driveway and the installation of a new concrete path at the front of the property; and soft landscaping of the property. This will involve construction activities including demolition of existing structures, regrading site levels by excavation and cut/fill processes.

1 tree specimen (Tree No. 1) is located within proximity to the proposed development, creating a low impact encroachment within the TPZ (<10%).

1 tree specimen (Tree No. 2,) is located within proximity to the proposed development, creating a moderate impact encroachment within the TPZ (>10%; <20%).

Recommendations in reference to the vegetation assessed and information on the proposed development provided within this report is as follows:

- Tree 1 is suitable for retention due to its contribution to shade and aesthetic of the property. Selective pruning should be completed to crownlift the tree away from the adjacent brick wall and remove lower epicormic shoots from the base of the tree as per Fig. 1.2 (**PHOTO REFERENCE**, page 23) prior to installation of tree protection or site establishment. All recommended tree pruning works should be completed by an experienced Arborist with a minimum AOF III qualification in Arboriculture who holds Public Liability and Workers Compensation insurance. All pruning works must be carried out in accordance with Australian Standard for Pruning of amenity trees (AS4373 - 2007)<sup>(a)</sup>.  
An exclusion zone is to be implemented around Tree 1 that extends around the edge of the measured Tree Protection Zone (as indicated on the **TREE LOCATION PLAN**, page 16), yet provides a 1m clearance from the edge of the proposed carpark to allow for construction activities.
- Tree 2 is suitable for and should be retained due to being located on the neighbouring property. An exclusion zone is to be implemented on the client's side of the boundary of Tree 2 that extends to the edge of the proposed widened driveway (allowing for installation of formwork), then extends along the fenceline, maintaining the same width, to the edge of the measured Tree Protection Zone (as indicated on the **TREE LOCATION PLAN**, page 16).

- The Exclusion Zones must be implemented as per **10.2- TREE PROTECTION FENCING**, page 17 of this report.
- An organic mulch should be installed within the exclusion zones at a depth of 100mm to reduce compaction to the soil and provide supplemental organic matter to the tree.
- A Project Arborist with a minimum AQF V qualification should be engaged for the duration of the project to manage the implemented TPZs and certify Tree Protection Measures.

## Schedule of Tree Management Processes

Stage	Task	Responsible Parties	Process Timing
1	Engagement of Project Arborist to oversee tree health and management	Principal Contractor	Prior to site establishment
2	Undertake pruning of Tree 1	Principal Contractor	Prior to site establishment
3	Install Tree Protection Measure for all trees	Principal Contractor	Prior to site establishment.
4	Certification of Pruning and Tree Protection Measures	Project Arborist	Prior to site establishment.
5	Supervise all excavation works proposed within the TPZ	Principal Contractor Project Arborist	As required prior to the works proceeding adjacent to tree
6	Final Inspection and certification of trees	Project Arborist	Following the removal of tree protection measures from Stage 3

## 3. PURPOSE

### 3.1 - PROPOSAL

The report has been commissioned by Marguerite Mansfield to provide a qualified assessment for tree specimens on a proposed development site located at 194 Bennett Road, St Clair; a residential property located in the Penrith City Council LGA and subject to Local Government Tree Management policies.

The objective of this report is to complete a Visual Tree Assessment (Mattheck and Breloer 1994 standard)<sup>(d)</sup> and take data to assess and provide advice on the impacts posed on vegetation protected by Local Government policies and provide recommendations to assist and guide management of tree species with the view of retaining and protecting suitable specimens.

Determinations and conclusions are drawn in this report by identifying key factors such as:

- Significant tree specimens
- Trees protected under the Penrith Development Control Plan (Penrith Development Control Plan 2014; C2 – Vegetation Management)<sup>(e)</sup>
- Trees protected under the Threatened Species Conservation Act (NSW 1995) and/or the Environment Protection and Biodiversity Conservation Act (Commonwealth 1999)
- Trees suitable for retention
- Trees unsuitable for retention
- The impacts by proposed structures to currently existing tree specimens.

The data collected can be read in summarized table form in **TREE DATA COLLECTION FORM** (page 13).

### 3.2 - LOCAL GOVERNMENT TREE PROTECTION

The site is located within the Penrith City Council LGA and is thus governed by their Development Control Plan. The Penrith Development Control Plan<sup>(e)</sup> prescribes vegetation protected under the policy as:

- i) Any native tree (both living and dead) or other vegetation that is on land zoned E2 Environmental Conservation in the Penrith LEP 2010 Land Zoning Map, or on natural resources sensitive land identified in the Penrith LEP 2010 Natural Resources Sensitivity Land Map.
- ii) In all areas, any native vegetation community including remnant native vegetation.

- iii) In all areas, any tree or other vegetation whether native or introduced having a height of 3.5 metres or more or a trunk diameter exceeding 100mm at 1400mm above ground level.
- iv) Any tree or other vegetation that is, or forms part of, a heritage item or is within a heritage conservation area.
- v) Any tree or other vegetation that is culturally, socially or biologically significant or a unique specimen and has been formally recognised by an appropriate government authority (e.g. a significant tree or vegetation register).

Exemptions apply to protected vegetation that are described on the Council's website, including trees listed on Council's exempt tree species list, which can be pruned or removed without a vegetation permit. One tree specimen assessed in this report (Tree 1) is listed on the Exempt Tree Species List, however this is under the condition that the tree is "*growing within 3 metres of underground services, such as sewer lines, water pipes and stormwater lines, where there is documented evidence (e.g. reports by suitably qualified persons) of ongoing damage to services that cannot feasibly be repaired without tree removal.*" No documented evidence of damage to services has been supplied prior to the completion of this report.

---

## 4. METHOD

### 4.1 – METHODOLOGY

A visual assessment of the trees (VTA<sup>8</sup> - Mattheck and Breloer 1994 standard)<sup>(d)</sup> was performed on 18th May, 2021. VTA<sup>8</sup> is an industry recognised and standard assessment of an individual tree from ground level to identify tree health and structural symptoms. VTA<sup>8</sup> is limited to view at ground level, and does not observe symptoms below ground level, or up in the canopy not viewable from ground.

In order to view tree conditions below ground level, excavation around the root base would be required. For viewing areas of the canopy not viewable from ground, an aerial inspection would be required. Neither of these methods were completed at the time of assessment.

## 4.2 - INSPECTION DATA

- Genus and species
- Age  
(Juvenile, Semi-Mature, Mature, Over-Mature, Senescent)
- Vigor  
(Good, Average, Poor, Dead)
- Growth Habit  
(Upright, Spreading, Leaning, Over-Extended, Dominant, Co-Dominant, Multi-Stemmed)
- Crown<sup>1</sup> Form  
(Symmetrical, Asymmetrical, Dense, Sparse, Dormant)
- Height (Estimation),
- Canopy Spread (Estimation)
- DBH (Diameter at Breast Height) and DRB (Diameter at Root Base) with Diameter Tape
- IACA STARS<sup>®</sup> Significance value  
(High, Medium, Low)
- Defects
- General Comments

Data collected is then subject to the SULE (© Jeremy Barrell 2001)<sup>(e)</sup> methodology of assessment, which influences any conclusions drawn and recommendations made.

## 4.3 - TREE DATA DEFINITIONS

- **Age:** The definitions for tree age refer to the stage of life and maturity the tree is currently in that is relevant to tree species. Juvenile (**J**) is where the tree is in a small or sapling form and has not yet reached a stage where it is producing fruit. This category can often refer to a tree specimen that is under Local Government minimum requirements for classification of a tree, but is not necessarily defined by this parameter. A juvenile specimen can grow at an accelerated rate in comparison to the other categories depending on competing species. Semi-Mature (**SM**) is an age of the tree where it may have reached fruiting ability, however the size and habit does not reflect what would be classified as a fully mature example of its species. This category is governed by tree species and their growth habits. Mature (**M**) is the category where the tree has reached fruiting ability and the size and habit reflect what is expected from a fully mature specimen. A mature tree will continue to have steady annual growth. Over-Mature (**OM**) is a mature tree that has considerably slowed its growth rate and has neared its useful life expectancy. Senescent (**S**) is a stage where the tree is still alive, but no longer capable of putting on new growth. This is the final live stage of a tree.
- **Vigor:** The definitions for vigor correlate with how well the tree is performing in its environment and inclusive of canopy growth, branch growth and habit, and expression of



general shape from the species in question. Good (**G**) is signs of new growth both in leaf/canopy and branches. 'Flushing'<sup>4</sup> is a general good indicator. Average (**AV**) is little to no signs of 'Flushing'<sup>4</sup>, however growth is stabilizing and there is no significant loss of canopy growth, nor is there excessive presence of deadwood. Poor (**P**) is when the tree shows signs of decline, usually with excessive amounts of deadwood or epicormic<sup>3</sup> growth, along with less canopy leaf presence and little to no progress in branch and trunk growth. Dead (**D**) means no signs of growth, and the tree is irreversible of its condition.

- **Growth Habit:** The definitions for growth habit apply to condition and habit of the tree and the form features that impact its shape and other factors. Upright (**U**) means the tree is generally growing straight up and reaching skyward with little deviation of direction from the point of the root base. Leaning (**L**) means the tree has deviated from the point of the root base and is favoring a direction that is leaning away. Over-extended (**OE**) means the tree has an excessive lean that could over-balance the tree, and extreme weather conditions may pose a threat of uprooting the tree. Co-Dominant (**CD**) means the main leader of the tree has split into two or more main leaders that have started growing their own primary and secondary laterals. Multi-Stemmed (**MS**) means the tree has begun growth of multiple leaders from the root base that have started their own scaffold of primary and secondary branches.
- **Crown Form:** The definitions for crown form describe the shape and habit of the canopy, or crown, and touch upon the vigor or leaf growth habit of the crown also. Symmetrical (**S**) describes the canopy as being generally even and balanced in all directions, without favoring a direction. Asymmetrical (**AS**) could refer to a lean or unbalanced canopy, generally seen in species inhibited by other species or unevenly pruned. Dense (**DE**) describes the canopy as generally full for its species, with decent or 'Flushing'<sup>4</sup> growth. Sparse (**SP**) describes the canopy as having less decent growth, or open gaps in the canopy. Dormant (**DO**) describes the canopy as being non-existent, i.e. no leaves, however this is not necessarily a sign of death or poor vigor as the tree may be deciduous and just during its dormancy stage.
- **Significance Value:** The definitions for significance value are determined using the IACA Significance of a Tree, Assessment Rating System (STARS)<sup>®/™</sup>. This rating system assists with tree management in the planning processes for a proposed development that impacts trees protected under Local Government Tree Management Policies. The system defines three categories of significance as **High**, **Medium** and **Low** within the landscape. Once assessment criteria defines the significance of the tree in the landscape, a retention value can then be determined utilising the Priority Matrix as displayed on the next page:

		Significance				
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
Estimated Life Expectancy	1. Long >40 years					
	2. Medium 15-40 Years					
	3. Short <1-15 Years					
	Dead					
Legend for Matrix Assessment						
	<b>Priority for Retention (High)</b> - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 <i>Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.					
	<b>Consider for Retention (Medium)</b> - These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.					
	<b>Consider for Removal (Low)</b> - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.					
	<b>Priority for Removal</b> - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.					



Other variations on values defined and attributed to the significance value of a tree is at the discretion of the author utilizing experience and professional opinion. All such results are discussed in a report's recommendations.

## 5. OBSERVATIONS

### 5.1 - SITE DESCRIPTION

The trees are located on and adjacent to a residential block that composes of a single-storey residence, existing driveway, paved paths and footways, brick fencing and landscaped gardens. The block is generally flat with only a gentle north-easterly aspect.

The proposed development that bears any impact to trees on site includes a new driveway and carpark construction at the rear of the property; the widening of an existing driveway and the installation of a new concrete path at the front of the property; and soft landscaping of the property. This will involve construction activities including demolition of existing structures, regrading site levels by excavation and cut/fill processes.

The general vegetation on the site is noted to be a combination made up of one exotic tree specimen, exotic shrubs and an exotic turf underlay. The vegetation assessed was 1 tree located on the property and 1 tree in a neighbouring property.

The approximate location of each tree specimen can be identified on the **TREE LOCATION PLAN** (page 16)

### 5.2 - VEGETATION COMMUNITY

The local vegetation community is The Shale Plains Woodland<sup>(f)</sup>. National Parks & Wildlife Services; **Native Vegetation of the Cumberland Plains Maps 1-16**; 2002 states this ecological community has "a treescape dominated by *Eucalyptus moluccana* and *E. tereticornis* with *E. crebra*, *E. eugenioides* and *Corymbia maculata* present as well. Other tree species that populate the area are *Exocarpus cupressiformis*, *Acacia parramattensis* subsp. *parramattensis* and *Acacia decurrens*.

The mid canopy and shrub population is dominated by *Bursaria spinosa*. Common ground species include *Dichondra repens*, *Aristida vagans*, *Microlaena stipoides* var. *stipoides*, *Themeda australis*, *Brunoniella australis*, *Desmodium varians*, *Opercularia diphylla*, *Wahlenbergia gracilis* and *Dichelachne micrantha*."

Shale Plains Woodland is the most widely distributed community on the Cumberland Plain however it is listed as endangered under the Threatened Species Conservation Act 1995

No tree species from this community was identified on site.

### 5.3 - REFERENCE MATERIAL

- Proposed Site Plan & Landscape Plan by **Lara's Design Building Design & Drafting** rev.A 28/04/21
- NSW Government; **The SEED Initiative**; 2021
- NSW Government Department of Planning, Industry & Environment website; article "**Cumberland Plain Woodland in the Sydney Basin Bioregion - critically endangered ecological community listing**" 18/12/09
- Penrith City Council Development Control Plan (Penrith Development Control Plan 2014) by **Penrith City Council**
- IACA Significance of a Tree, Assessment Rating System (STARS) by the **Institute of Australian Consulting Arboriculturalists**; 2010



ADDRESS: 194 Bennett Rd, St Clair

INSPECTION: 18/05/21

NO#	Genus	Species	Common Name	Age	Vigor	Growth Habit	Crown Form	Height (m)	Canopy Spread (m)	DBH 1	DBH 2	DBH 3	DBH 4	DBH	DRB	SRZ	TPZ	STARS® Rating	Defects	General Comments	Encroachment
1	<i>Liquidambar</i>	<i>styraciflua</i>	Liquidambar	M	Av	U, CD	As	10	8	290	200			353	470	2410	4236	L-M	Minor canopy suppression to N from T1	Codominant @0.4m. Adjacent feature wall to NE lifting, likely due to root activity.	3.2m from proposed carpark installation providing a 1.5% cut encroachment to the TPZ
2	<i>Melaleuca</i>	<i>viminalis</i>	Weeping Bottlebrush	M	G	CD	AS	4	4	190	190	180	160	361	290	1968	4332	L	2 x leaders from base, 4 x leaders from 1m. Creeper vine in lower canopy	Tree located in neighbouring property, against separating wall, 2.9m from NW corner of building	2m from proposed widened driveway works providing an 18.6% cut encroachment to the TPZ

## 7. DISCUSSION

None of the tree species assessed are part of any highly significant local vegetation community and canopy line. The proposed development appears to be taking an approach in order to retain and maintain the single tree on site as an asset to the development itself.

The extent of impacts to trees on development sites can be broadly rated using the following scale of impact to the tree's health and structure (Guy Parossien):

0% of encroachment into the Tree Protection Zone –	No Impact
0 to 10% of encroachment into the Tree Protection Zone –	Low Impact
10 to 15% of encroachment into the Tree Protection Zone –	Low to Moderate Impact
15 to 20% of encroachment into the Tree Protection Zone –	Moderate Impact
20 to 25% of encroachment into the Tree Protection Zone –	Moderate to High impact
25 to 35% of encroachment into the Tree Protection Zone –	High Impact
>35% of encroachment into the Tree Protection Zone –	Significant Impact

### 7.1 – Trees with a Low Impact (>10%)

- Tree 1 is located on the property frontage and is 3.2m from a proposed carpark, providing a 1.5% encroachment within the Tree Protection Zone. This tree is a Liquidambar (*Liquidambar styraciflua*) and is considered to be of low-medium significance. The encroachment posed is sustainable, therefore the tree should be retained and protected.

The landscape design for the development incorporates the tree into an area proposed for soft landscaping. An exclusion zone implemented that extends to the edge of the TPZ (allowing for a 1m clearance from the proposed carpark for construction activities) and is kept in place until the proposed landscaping soft works would reduce impact to the root system.

### 7.2 - Moderately Impacted Trees (>10%; <20%)

- Tree 2 is located 2m from the proposed widened driveway, providing an 18.6% cut encroachment within the Tree Protection Zone. The tree, a Weeping Bottlebrush (*Melaleuca viminalis*), is located on the neighbouring property beside the property boundary and was not included on any supplied plans. Regardless of significance, this tree must be retained and protected unless both owner and governing body give consent for its removal.

The measured Tree Protection Zone of this tree is calculated to a greater area than Tree 1, despite being a smaller tree specimen. This is attributed to multiple stems providing a greater average Diameter at Breast Height (DBH) than the single stemmed specimen that is Tree 1. With this consideration in mind the provision of an exclusion zone installed from the fenceline, extending to the proposed edge of the widened driveway, and extending 4.5m on either side of the tree along the fenceline at the same width should compensate towards a sustainable impact to the tree.

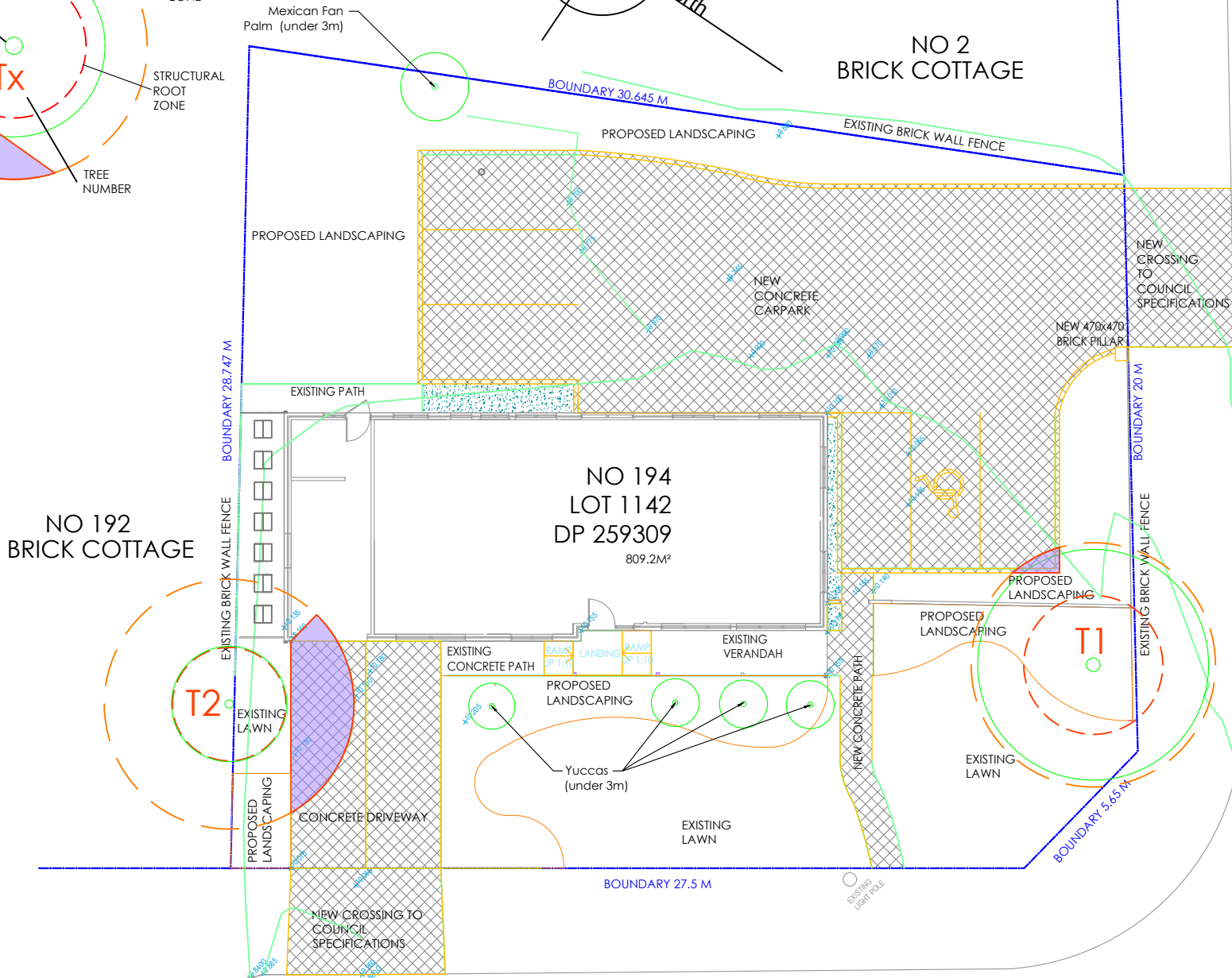
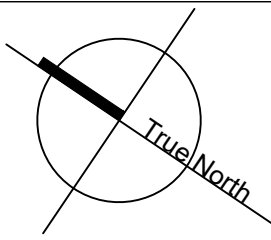
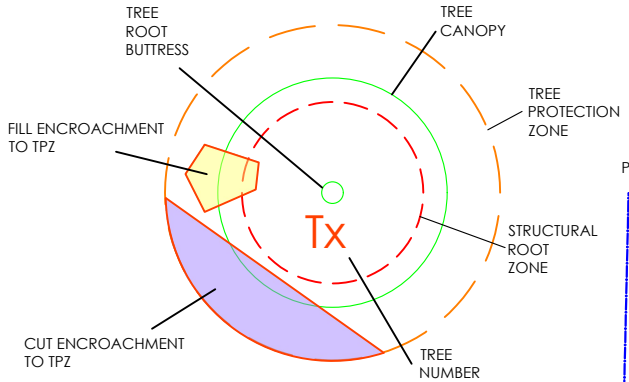
### 7.3 - Other Trees Assessed and General Notes

- Multiple small tree specimens were identified on site including Yuccas, a Mexican Fan Palm, and multiple Viburnum shrubs. All of these trees were measured as under 3m and/or having a stem DBH less than 100mm and were not assessed as part of this report.

---

## 8. RECOMMENDATIONS

- Tree 1 is suitable for retention due to its contribution to shade and aesthetic of the property. Selective pruning should be completed to crownlift the tree away from the adjacent brick wall and remove lower epicormic shoots from the base of the tree as per Fig. 1.2 (**PHOTO REFERENCE**, page 23) prior to installation of tree protection or site establishment. All recommended tree pruning works should be completed by an experienced Arborist with a minimum AOF III qualification in Arboriculture who holds Public Liability and Workers Compensation insurance. All pruning works must be carried out in accordance with Australian Standard for Pruning of amenity trees (AS4373 - 2007)<sup>(a)</sup>.  
An exclusion zone is to be implemented around Tree 1 that extends around the edge of the measured Tree Protection Zone (as indicated on the **TREE LOCATION PLAN**, page 16), yet provides a 1m clearance from the edge of the proposed carpark to allow for construction activities.
- Tree 2 is suitable for and should be retained due to be located on the neighbouring property. An exclusion zone is to be implemented on the client's side of the boundary of Tree 2 that extends to the edge of the proposed widened driveway (allowing for installation of formwork), then extends along the fenceline, maintaining the same width, to the edge of the measured Tree Protection Zone (as indicated on the **TREE LOCATION PLAN**, page 16).
- The Exclusion Zones must be implemented as per **10.2- TREE PROTECTION FENCING**, page 17 of this report.
- An organic mulch should be installed within the exclusion zones at a depth of 100mm to reduce compaction to the soil and provide supplemental organic matter to the tree.
- A Project Arborist with a minimum AOF V qualification should be engaged for the duration of the project to manage the implemented TPZs and certify Tree Protection Measures.



MCLAREN GROVE

BENNETT ROAD



## 10. TREE PROTECTION PLANNING

### 10.1 – Engagement of A Project Arborist

The engagement of a Project Arborist is required to oversee and certify tree protection measures implemented prior to any site establishment works and maintained for the duration of the construction process. The Project Arborist is to perform additional site inspections as required at each stage of the development that may impact tree health including supervision of construction works with a tree's measure TPZ, pruning of trees away from construction activities, etc. The Project Arborist should also be notified in the event the protected trees are damaged or are showing signs of decline which may require further management recommendations.

### 10.2 - Tree Protection Fencing

When required as part of an approved Development Application, tree protection fencing shall be installed prior to site establishment to establish the TPZ for trees to be retained. Tree protection fencing shall be maintained for the duration of the development schedule. The Tree Protection Fencing should enclose as much of the TPZ as can reasonably be fenced off, allowing for pedestrian access and a minimum 1m offset around construction footprint and scaffolding. The fencing should be made up of steel with a chain mesh or fence palings with plywood panels that is lockable and a minimum 1.8m in height. All Tree Protection Fencing should be sign posted with a 'no access' instruction and contact details for the Project Manager and Project Arborist. This should all be certified by the Project Arborist.

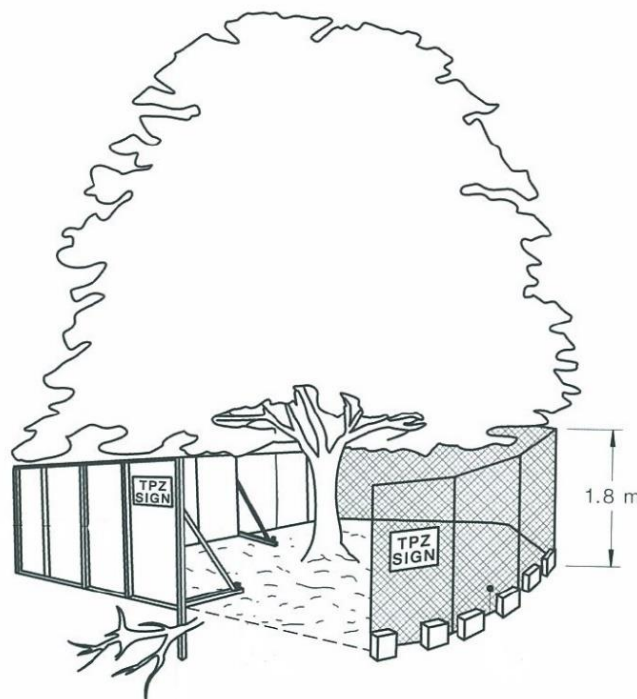


Image from AS 4970 'Protection of Trees on Development Sites'; Standards Australia, 2009

## 10.3 - Other Tree Protection Measures

Other measures that can assist with the protection of the canopy, trunk, branches, or roots from the risk of damage can include:

- A 100mm layer of approved mulch to be installed to the TPZ.
- A temporary drip irrigation system to be installed to the TPZ.
- Ground protection matting for staff, equipment and machinery access over tree roots.
- Trunk and branch battens and/or wrapping.

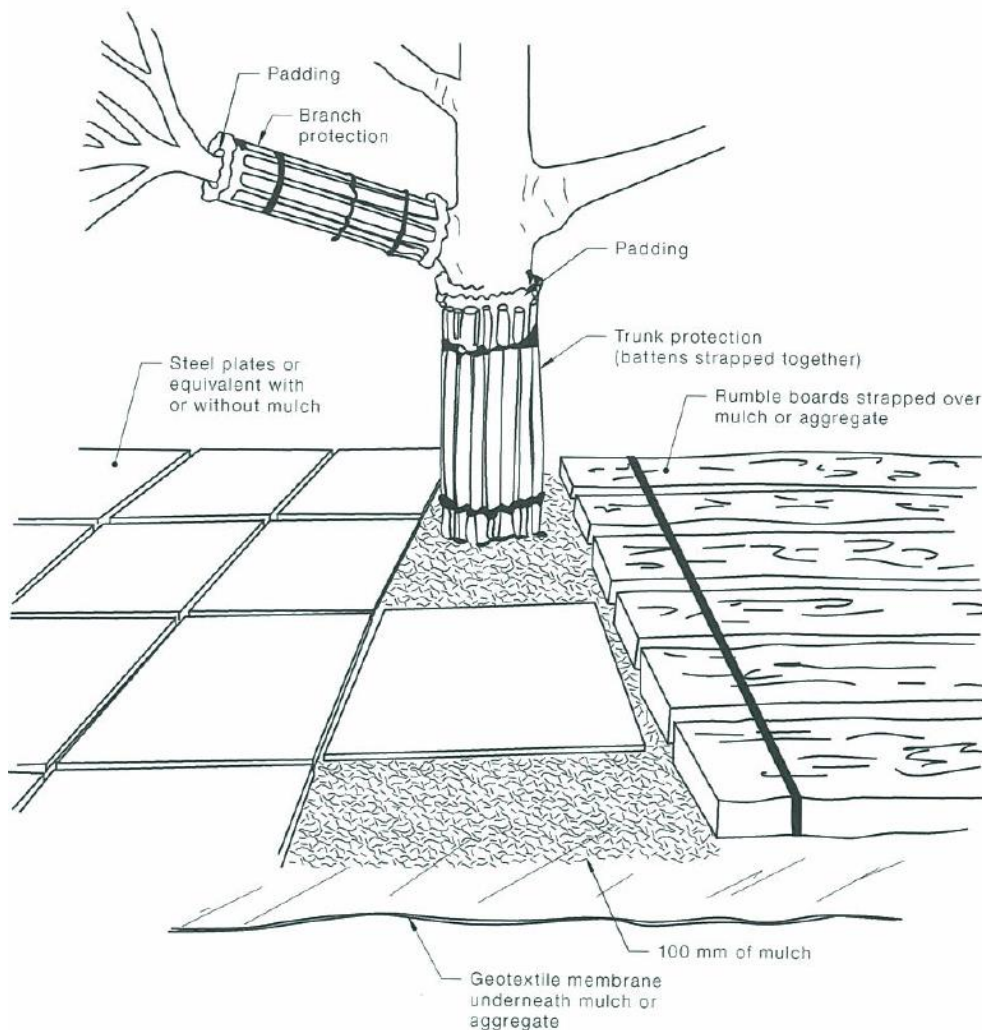


Image from AS 4970 'Protection of Trees on Development Sites'; Standards Australia, 2009

## 10.4 - Excavation within the TPZ

Excavation within the TPZ should be avoided, however this is not always realistically the case during a development. All efforts to preserve tree root systems should be taken including:

- Supervision from the Project Arborist during excavation.
- Excavation to be completed by hand when reasonable to avoid damage to roots.
- Root mapping may be required prior to excavation and should be completed with the use of either ground penetrating radar, air spade, water laser or by hand excavation; and should be certified by the Project Arborist.
- Where roots >50mm diameter are encountered, alternative construction methods should be considered to ensure roots are not damaged. Allowance should also be made for future root growth.
- Under-boring for services proposed below the root ball of the tree should be considered and certified by the Project Arborist.

## 10.5 - Fill

All fill material to be placed within the TPZ should be approved prior by the Project Arborist and be interfaced with a large diameter gravel or pebble to provide aeration and percolation to the root zone.

## 10.6 - Paving

Proposed paved areas within the TPZ should be placed on or above grade to minimise excavation and avoid root severance and/or damage. Pavements should be permeable or porous.

## 10.7 - Pruning

All recommended pruning works (including root pruning) should be in accordance with Australian Standard for Pruning of amenity trees (AS4373 - 2007)<sup>(a)</sup>. If required, roots should be severed with clean sharp implement flush with the face of the excavation and maintained in a moist condition. Root pruning shall be performed under the supervision of the Project Arborist.

## 10.8 - Tree Removal

Tree removal work shall be carried out by an experienced Arborist in accordance with the NSW Work Cover Code of Practice for the Amenity Tree Industry (1998) and holds Public Liability and Workers Compensation insurance. Care shall be taken to avoid damage to trees during the felling operation. Stumps shall be grinded using a mechanical stump grinder to a minimum depth of 300mm without damage to other retained root systems.

## 10.9 - Tree Damage

In the event of damage to a tree or the TPZ of a tree to be retained, the Project Arborist should be advised in order to provide advice on remedial action. This should be implemented as soon as practicable and certified by the Project Arborist.

## 10.10 - Post Construction Tree Management

Tree protection fencing with additional trunk and root protection shall be removed following completion of the development schedule. Any mulch layer installed for root protection should be reduced to a 75mm layer and retained on site. In the event of any tree deteriorating in health after the development schedule is complete, the Project Arborist should be engaged to provide advice on any remedial action.

## 11. APPENDIX

1. **Crown:** The canopy of the tree from the starting point of the tree's first primary lateral.
2. **Deadwood:** Leaves and branches that have died back and are of an irreversible condition.
3. **Epicormic:** The growth that occurs at the point of the epicormic bud that become active shoots when reacting to damage or stress in the tree.
4. **Flushing:** Fast green leaf growth occurring in reaction to ideal or high nutrient conditions for the tree.
5. **Tree Protection Zone (TPZ):** The area calculated  $(DBH \times 12)$  as a protective buffer to isolate a tree from construction and excavation disturbance so the tree may remain viable.
6. **Structural Root Zone (SRZ):** The area calculated  $((DBH \times 50)^{0.42} \times 0.64)$  that estimates root growth requiring to be retained for stability of the tree.
7. **Encroachment:** An activity or disturbance that takes place within proximity to the tree and inside the Tree Protection Zone.
8. **Visual Tree Assessment (VTA):** a non-invasive biomechanically based system of Tree Assessment developed by Claus Mattheck and Helge Breloer, examining the health and structural condition of individual trees.
9. **Canker:** A symptom of an infectious fungal pathogen that has entered between the bark cambium and heartwood that can display as a discolouration, a depression in the bark, or a wound that continues to attempt to heal but is continuously expanding.

## 12. REFERENCES

- a) Standards Australia; **AS 4373 Pruning of amenity trees**; 2007
- b) Standards Australia; **AS 4970 Protection of trees on development sites**; 2009
- c) Penrith City Council; **Penrith Development Control Plan; C2 – Vegetation Management**, 2014
- d) Claus Mattheck; Helge Breloer; **The body language of trees : a handbook for failure analysis**; 1994
- e) Jeremy Barrell; **SULE: Its use and status into the New Millennium**; modified paper, 2001
- f) Institute of Australian Consulting Arboriculturalists; **IACA Significance of a Tree, Assessment Rating System (STARS)®**; 2010
- g) NSW Government; **The SEED Initiative**; 2021
- h) NSW Government Department of Planning, Industry & Environment website; **article “Cumberland Plain Woodland in the Sydney Basin Bioregion - critically endangered ecological community listing”** 18/12/09
- i) Richard W. Harris; James R. Clark; Nelda P. Matheny; **Arboriculture: Integrated Management of Landscape Trees, Shrubs , and Vines**; 4th Edition 2004

### 13. PHOTO REFERENCE



Fig 1.1 - Tree 1



Fig 1.2 - Tree 2 – recommended pruning



Fig 2.1 - Tree 2

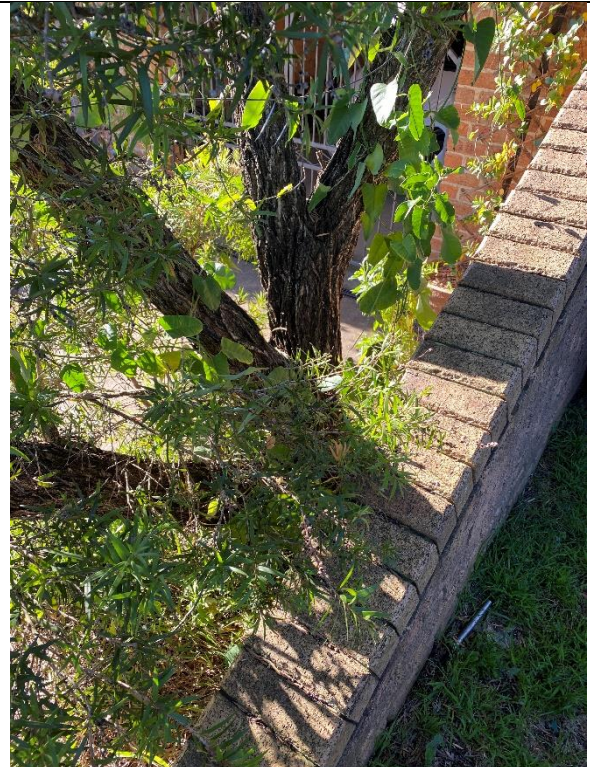


Fig 2.2 - Tree 2 – proximity to boundary