arboreport™
Vegetation Management Consultants

28-32 BOURKE ROAD ALEXANDRIA

ARBORICULTURAL IMPACT ASSESSMENT

PREPARED FOR:

ALEXANDRIA PROPERTY DEVELOPMENT PTY LTD

PREPARED BY:

DENNIS MARSDEN

CONSULTING ARBORIST

An alumnus of NSIT Ryde:
Dip. Hort, (Arboriculture Level 5), with Distinction,
Assoc. Dip. App. Science – Landscape, with Distinction
Adv. Cert Urban Horticulture, with Distinction
Cert. Tree Surgery

date	*revision*	*prepared*	*checked*
09/06/22	Issued Development Application	DM	DM
13/10/22	Stormwater revision	DM	DM

Executive Summary

This report was commissioned by Alexandria Property Developments Pty Ltd to accompany a health Development Application within the precinct of the City of Sydney at the site address of 28-32 Bourke Road Alexandria. The aim of this report is to provide an assessment in accordance with AS4970 – 2009 *'Protection of trees on development sites'* of the potential impacts of the proposed development upon three trees.

This report collates and presents information collected by Dennis Marsden on the 03/05/22. The data collected is located at **7. Tree Survey Table** (page 13) also see **8. Tree Survey Table Notes** (page 15) for notes relating to tree survey table.

The subject site is located within a commercial district with no remnant native forest vegetation. The site's vegetation comprises three street trees, each of which is Australian native. The existing surveyed trees are shown at **9. Tree Location Plan** (page 20).

The proposed development will involve the demolition of the existing site structures and construction of a private construction of a private hospital with associated accessway. The extent of site works is also illustrated at **9. Tree Location Plan** (page 20).

The matrix below gives a brief overview summary of tree significance and level of encroachment from the proposed development of numbered trees.

	ENCROACHMENT WITHIN TPZ Numbering of trees as shown on Tree Location Plan				
TREE LANDSCAPE SIGNIFICANCE		**No Impact**	**Minor Encroachment** (<10% of TPZ)	**Major Encroachment** (>10% of TPZ)	**Within Development Footprint**
	High	-	-	-	-
	Medium	-	-	#2	#1
	Low	#3	-	-	-
	Total Number of trees	**1**	**-**	**1**	**1**

In consideration of the data collected recommendations are provided for the removal or retention of trees including specific tree protection measures required to reduce the anticipated impacts from the proposed construction on those trees proposed to be retained. This report specifically recommends:

I. The removal of Tree 1 Broad-leaved Paperbark should the development proceed in its current form as it is located within the footprint of the proposed laneway.
II. The removal of Tree 2 Broad-leaved Paperbark should the development proceed in its current form as there is an unsustainable impact from the stormwater pipework.
III. The retention and protection of Tree 3 Brush Box. The construction will not directly impact this tree.
IV. An AQF Project Arborist shall be engaged to certify the tree protection works in accordance with the hold points provided at **6.3. Schedule of** Hold Points (page12).
V. For additional tree protection notes see **10. General Tree Protection Notes** (page 22).

VI. This arboricultural assessment should be reviewed upon the revision of stormwater, landscape, civil engineering, architectural plans or others.

VII. Layouts of all proposed mains water, gas, electricity and sewer have not been provided. Plans of all such proposed services must be reviewed, assessed and approved by the project arborist prior to approval or implementation.

Table of Contents

1. Introduction

This report was commissioned by Alexandria Property Developments Pty Ltd to accompany a health Development Application within the precinct of the City of Sydney at the site address of 28-32 Bourke Road Alexandria. The aim of this report is to provide an assessment in accordance with AS4970 – 2009 *'Protection of trees on development sites'* of the potential impacts of the proposed development upon three trees.

This report collates and presents information collected by Dennis Marsden on the 03/05/22. The data collected is located at **7. Tree Survey Table** (page 13) also see **8. Tree Survey Table Notes** (page 15) for notes relating to tree survey table.

2. Methodology

2.1. Limitations

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible. However Arboreport can neither guarantee nor be responsible for the accuracy of information provided by others. Unless stated otherwise:

- Information contained in this report covers only the tree/s examined and reflects the health and structure of the tree at the time of inspection. The documented, observations, results, recommendations and conclusions given may vary after the site visit due to environmental conditions. Liability will not be accepted for damage to person or property as a result of natural processes, unforeseeable actions or occurrences.
- Observations recorded for trees located within adjacent properties have been made without entering that property. Deciduous trees inspected during winter and all trees obscured by other vegetation are not able to be properly assessed. As a result measurements for these trees are estimated. Similarly these trees were not subject to a complete visual inspection and defects or abnormalities may be present but not recorded.
- Defects such as cambial damage, cracks, decay or hollows may be present which are not visible from the ground. This report does not include an aerial survey of the crown.
- Defects such as root damage, cracks or decay may be present under the ground. This report does not include any subterranean survey of the root plate.
- The inspection was limited to visual examination from the base of the subject tree without dissection, excavation, probing or coring (unless specifically noted otherwise).
- There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.

2.2. Site Inspection

A visual inspection of the tree/s was performed from ground level, data collected includes:

- Genus, Species, Common Name;
- Height, Width, DBH (Diameter at Breast Height), DRB (Diameter above Root Buttress);
- Age, Health & Vigour;
- Significance, Amenity and Ecological Value;
- Form and Structural Condition;
- Visible Defects or Evidence of Wounding.

2.3. Measurement

- Tree locations are supplied by client on the survey plan or triangulated using a measuring tape.
- Diameter at breast height (DBH) and Diameter above Root Buttress (DRB) are measured using a diameter tape.
- Height is measured using a clinometer or Nikon Forestry Pro.
- Canopy width is measured with a Leica Disto (laser distometer).
- Structural Root Zone (SRZ) and Tree Protection Zone (TPZ) radii are calculated (in accordance with AS 4970-2009).
- Development impact/setback is measured from the nearest face of the trunk to the face of the structure in Auto CAD using the perpendicular distance function.

2.4. Recording Data

Data collected is collated in the tree survey table located at **7. Tree Survey Table** (page 13). The tree survey table contains abbreviations for terms describing the tree's characteristics; explanatory notes pertaining to these are located at **8. Tree Survey Table Notes** (page 15).

The physical data for tree locations, crown width and DRB is schematically described in **9. Tree Location Plan** (page 20).

2.5. Reference Documents

The report was written with reference to:

- Survey & Level Plans prepared by LTS P/L ref 51596001DT sheets 1-3 dated 02/12/21.
- Architectural Plans prepared by NBRS ref 21476-NBRS-SD-A-SD44 - 49, dated 14/04/22.
- Civil Engineering Draft SSDA Report prepared by enstruct group p/l dated July 2022.
- Australian Standard 4970-2009 'Protection of Trees on Development Sites'.
- Draft Sydney Development Control Plan 2012 – Southern Enterprise Area. City of Sydney

2.6. Council Tree Preservation Regulatory Controls

All trees growing on public lands within the City of Sydney are protected irrespective of species or size and require a permit from Council for any form of tree works.

2.7. Determining a tree's significance

The significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. When determining a tree's significance within the landscape context, the following questions are asked of each tree. Significance may be expressed in increments of High, Medium or Low. For a High rating the majority (≥4) of the answers will be yes; For a Medium-High rating 3.5 of the answers will be yes; for a Medium rating half (=3) of the answers will be yes; for a Low-Medium rating 2.5 of the answers will be yes; and for the Low rating the minority of answers will be yes (≤2).

1. Is the tree of botanical interest; Is it included in a significant tree register or listed as a heritage item under the Federal State or Local Regulations?

2. Is the tree visually prominent in the locality?

3. Is the tree well structured?

4. Is the tree in good health and/or does it display signs of good vigour?
5. Is the tree typically formed for the species?
6. Is the tree currently located in a position that will accommodate future growth?

3. Observations

3.1. Site Description

The site is commercial premises located at 28-32 Bourke Road Alexandria. It currently contains attached single-story buildings occupying the entire site. The site has a general northerly aspect.

3.2. Soil Landscape Map

The native soils of this area are classified as Tuggerah, an Aeolian group. The landscape is characterised gently undulating to rolling coastal dunefields with a local relief to 20 m, slope gradients generally 1–10%, but occasionally can be up to 35%. North–south oriented dunes with convex narrow crests, moderately inclined slopes and broad gently inclined concave swales are present. The landscape is now extensively cleared and once featured open-forest and eucalypt/apple woodland. The soils are deep (>200 cm) on dunes and Podzols/Humus Podzol intergrades and on swales. The soil limitations extreme wind erosion hazard, non-cohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high water-tables. [5]

3.3. Native Vegetation Map

The original native vegetation of this area was characterised by Sydney Turpentine-Ironbark Forest (STIF) (Benson and Howell 1990 [4]), which is a tall open forest found on shale and shale-enriched sandstone soils on the coast and hinterland of Sydney. It has been extensively cleared but was once widely distributed between Sutherland and the Hornsby plateau with outlying examples found on shale-rich deposits at Campbelltown, Menai, Kurrajong and Heathcote. The primary distribution of this forest is in areas receiving between 900 and 1250 millimetres of mean annual rainfall at elevations between 10 and 180 metres above sea level.

The forest is characterised by open midstrata of mesic and sclerophyllous shrubs and small trees with a grassy ground cover. The composition of the canopy is variable depending on location and substrate. Typically it is recognised by a canopy dominated by turpentine *(Syncarpia glomulifera)*, red mahogany *(Eucalyptus resinifera)* and various ironbarks of which *Eucalyptus paniculata* is most often recorded. On the north shore these forests are found on shale-enriched sheltered sandstone slopes where ironbarks are less common and blackbutt (Eucalyptus pilularis) is prevalent. In the western suburbs drier forms of this forest are found at Concord, Bankstown and Auburn although remnants are small and highly disturbed. This map unit is referable to a community of the same name in Tozer *et al.* 2010 and includes some sites previously identified as Sydney Turpentine Ironbark Margin Forest in NPWS (2002b) and Tozer (2003). [6, 8]

Sydney Turpentine-Ironbark Forest was initially listed as an *Endangered Ecological Community* under the NSW *Threatened Species Conservation Act 1995* and later under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999, both of which are now repealed. Sydney Turpentine-Ironbark Forest is currently listed as a Critically Endangered Ecological Community under Part 1 of Schedule 2 of the *Biodiversity Conservation Act 2016.* Different location inclusions/exclusions and condition thresholds apply under the State and Commonwealth determinations. This community is represented in Wallumatta NR.

There is however no remnant vegetation from this vegetation community located on the subject site.

3.4. Summary of site inspection data

The subject site is located within a commercial district with no remnant native forest vegetation. The site's vegetation comprises three street trees, each of which is Australian native. The existing surveyed trees are shown at **9. Tree Location Plan** (page 20) and in the photograph below.

Photograph 1. The site trees.

3.5. Summary of Proposed Development

The proposed development will involve the demolition of the existing site structures and construction of a private construction of a private hospital with associated accessway. The extent of site works is also illustrated at **9. Tree Location Plan** (page 20).

3.6. Tree significance and encroachment matrix

The matrix below gives a brief overview summary of tree significance and level of encroachment from the proposed development of numbered trees.

	ENCROACHMENT WITHIN TPZ Numbering of trees as shown on Tree Location Plan				
TREE LANDSCAPE SIGNIFICANCE		**No Impact**	**Minor Encroachment** (<10% of TPZ)	**Major Encroachment** (>10% of TPZ)	**Within Development Footprint**
	High	-	-	-	-
	Medium	-	-	#2	#1
	Low	#3	-	-	-
	Total Number of trees	**1**	**-**	**1**	**1**

4. Discussion

4.1. Trees Not Impacted by the Proposal

- **High Significance Trees:** Nil.
- **Medium Significance Trees:** Nil.
- **Low Significance Trees:** Tree 3 Brush Box is located in a position where it is unlikely to be adversely impacted by the proposed works.

4.2. Trees with a Minor TPZ Encroachment

(Where the proposed construction encroaches within the TPZ by 10% or less).

- **High Significance tree:** Nil.
- **Medium significance tree:** Nil.
- **Low significance trees:** Nil.

4.3. Trees with a Major TPZ Encroachment

(Where the proposed construction encroaches within the TPZ by more than 10% or is within the SRZ).

- **High Significance trees:** Nil.

- **Medium significance trees:** Tree 2 Broad-leaved Paperbark. There is a pre-existing encroachment of 31.5% from the current building, which occupies nearly one-third of the theoretical spread of the root zone. However the potential encroachment by the stormwater options range 27 to 43%, and extend through the structural root zone. This impact is considered unsustainable. AS 4970 recommends investigative trenching to determine potential impacts within the SRZ, which in this particular instance would not be practical given the surrounding infrastructure. The tree will require removal to facilitate the current form of the proposal.

- **Low significance trees:** Nil.

4.4. Trees within the development footprint

- **High Significance trees:** Nil.

- **Medium significance trees:** Tree 1 Broad-leaved Paperbark is located within the developmental footprint, specifically, within an area marked as "Proposed public domain dedication or easement" in Council's *Draft Sydney Development Control Plan 2021 – Southern Enterprise Area.* Under the proposal this will become a laneway allowing access to the medical centre (among others).

- **Low significance trees:** Nil.

5. Recommendations

In consideration of the data collected recommendations are provided for the removal or retention of trees including specific tree protection measures required to reduce the anticipated impacts from the proposed construction on those trees proposed to be retained. This report specifically recommends:

I. The removal of Tree 1 Broad-leaved Paperbark should the development proceed in its current form as it is located within the footprint of the proposed laneway.

II. The removal of Tree 2 Broad-leaved Paperbark should the development proceed in its current form as there is an unsustainable impact from the stormwater pipework.

III. The retention and protection of Tree 3 Brush Box. The construction will not directly impact this tree.

IV. An AQF Project Arborist shall be engaged to certify the tree protection works in accordance with the hold points provided at **6.3. Schedule of** Hold Points (page12).

V. For additional tree protection notes see **10. General Tree Protection Notes** (page 22).

VI. This arboricultural assessment should be reviewed upon the revision of stormwater, landscape, civil engineering, architectural plans or others.

VII. Layouts of all proposed mains water, gas, electricity and sewer have not been provided. Plans of all such proposed services must be reviewed, assessed and approved by the project arborist prior to approval or implementation.

6. Tree Management Plan

6.1. Management Objectives:

The prioritisation of the following objectives is integral for the successful management of site trees:

1. Protection of the TPZ of retained trees;
2. Protection of the trunk and branches of retained trees;
3. Reduction of stress on retained trees from construction;
4. To ensure the viability of retained trees after practical completion.

6.2. Tree Management Actions:

The above general tree management objectives are achieved by:

- Appointment of a Level 5 AQF Project Arborist experienced in managing trees on construction sites to prepare and certify a Tree Management Plan.
- The installation of a Tree Protection Fence to enclose and protect the TPZ.
- Installation of additional root, trunk and branch protection as required to protect retained trees where minor encroachments within the TPZ are anticipated.
- Supervision, monitoring, inspections and certification of tree protection as outlined in the Tree Management Plan.

6.3. Schedule of Hold Points, Inspections and Certification

To ensure this plan is implemented, hold points (**HP**) have been specified in the schedule of works (below). Once each stage is reached the work will be inspected and certified by the Project Arborist and the next stage may commence.

Alterations to this schedule may be required due to necessity however this shall be through consultation with the Project Arborist only.

Hold Point	Task	Respons ibility	Certifi cation	Timing of Inspection
1	Indicate clearly (with spray paint on trunks) trees approved for removal only.	Principal Contractor	Project Arborist	Prior to demolition and site establishment.
2	Install Tree Protection Fencing in form of hardwood tree-guard to Tree 3.	Principal Contractor	Project Arborist	Prior to demolition and site establishment.
3	Inspection of tree by Project Arborist	Principal Contractor	Project Arborist	Quarterly during construction period
4	Inspection of tree4s by Project Arborist	Principal Contractor	Project Arborist	Following the removal of tree protection measures from HP 2
5	Final Inspection of tree by Project Arborist	Principal Contractor	Project Arborist	Prior to issue of occupation certificate.

7. Tree Survey Table

(Following page)

arboreport™
Vegetation Management Consultants

28-32 BOURKE ROAD ALEXANDRIA

DATE OF SURVEY: 03/05/2022

NO#	Botanic Name	Common Name	Height (m)	Spread (m)	DBH (mm)	DRB (mm)	SRZ (mm)	TPZ (mm)	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments
1	*Melaleuca quinquenervia*	Broad-leaved Paperbark	11.6	11.75	750	1100	3445	9000	Mature.	G	Av	M	H	M	(U) Branches ascending.	Primaries likely deflected by footings, no apparent heave or tilt. Within footprint of proposed laneway.	Crown 9 west, 4.5 south, 5 east, 5 north. Footpath 1.27 wide. Tree in cut-out 220L x 360 W then 170W. 2m from base to edge apron driveway. ABC through crown.
2	*Melaleuca quinquenervia*	Broad-leaved Paperbark	11.2	10.25	650	900	3166	7800	Mature.	G	Av	M	H	M	(U) Branches ascending.	Primaries likely deflected by footings, no apparent heave or tilt. Building encroaches 31.5%; stormwater 27-43%..	Crown 5.3 west, 5.2 south, 4.7 east, 5.3 north. Cut-out 1.8W, footpath 1.75W, base of tree 2.3m from front edge wall. ABC through crown.
3	*Lophostemon confertus*	Brush Box	4.5	2.1	85	100	1500 (min)	2000 (min)	Juvenile	G	G	L	L	L	(U) Branches ascending.	No direct impact.	Young tree, good form, good H&C.

www.arboreport.com.au

High
Medium
Low

No impact
Minor encroachment
Major encroachment
Within development footprint

8. Tree Survey Table Notes

8.1. Genus, Species and Common Name

The botanical and common name of each tree is identified and recorded. Occasionally the exact species name is unknown; *sp.* is recorded to indicate this.

8.2. Height (m), Spread (m), Trunk Dia, DBH and DRB (mm)

- The tree's height and spread (diameter) is recorded in metres.
- The tree **DBH** is recorded in millimetres. DBH is an abbreviation of Diameter (of the trunk) measured at Breast Height (or 1.2m from the base of the trunk). If more than one trunk is present the DBH is calculated in accordance with AS4970-2009 Protection of Trees on Development Sites.
- If the tree has multiple trunks multiple trunks each trunk DBH (**Trunk Dia**) will be recorded individually.
- The tree **DRB** is recorded in millimetres. DRB is an abbreviation of Diameter (of the trunk) measured above the Root Buttress. It is required to calculate the SRZ in accordance with AS4970-2009 Protection of Trees on Development Sites when there is major encroachment within the TPZ, ie. greater than 10% is encroached upon or if there is an encroachment within the SRZ.

8.3. Age (Maturity)

The age class of each tree is estimated as either:

- **Y = Young**; a well-established but juvenile tree.
- **SM = Semi-mature**; a tree at growth stages between immaturity and full size.
- **EM = Early-mature**; a tree that is more-or-less of mature dimensions yet still vigorously growing.
- **M = Mature**; a full-sized tree with some capacity for further, expansive crown growth.
- **LM = Late Mature**; a tree of full, mature dimensions with little capacity for expansive growth, many years away from decline.
- **OM = Over-mature**; a tree of old age in a phase of slow decline.

8.4. Health and Vigour

The trees health and vigour is recorded as a measurement of:

- **G** - Good - the tree does not appear stressed with no excessive dieback, insect infestation, decay, dead wood or epicormic shoots.
- **Avg** - Average Health - the tree appears stressed and have some crown dieback, and/or a few epicormic shoots, and/or some dead wood in the crown and some new growth at branch tips. These trees may benefit from remediation of the growing environment to reduce stress and return it to good health.
- **F** - Fair - the tree may have areas of crown dieback, and/or epicormic shoots, and/or areas of decay, and/or reduced new growth at branch tips. These trees have been stressed for a short period of time, remediation of the growing environment may improve the trees health.
- **P** - Poor - the tree may have large areas of crown dieback, and/or many epicormic shoots, and/or reduced new growth at branch tips. These trees have been stressed for a long time, remediation of the growing environment would not return the tree to good health.
- **D** – Dead the tree is dead

8.5. Structural Condition (Crown)

The structural condition of each tree is assessed and recorded as either:

- **G** - Good Condition: the tree appears to have no visible indication of inherent structural defects.
- **Avg** - Average Condition: the tree has minor structural defects which may be corrected with remedial works or pruning, allowing the tree to return to Good Condition.
- **F** - Fair Condition: the tree has visible structural defects such as (but not limited to) dead branches, and/or an unbalanced crown, and/or leaning trunk and/or areas of decay. These trees do not demonstrate the typical form of their species, or have been damaged or have begun to deteriorate. Remedial works or pruning may return the tree to Average Condition.
- **P** - Poor Condition: the tree has significant structural defects such as (but not limited to) very large dead branches, and/or extremely unbalanced crown, and/or subsiding trunk and/or large areas of decay. These trees do not demonstrate the typical form of their species, or have been severely damaged or have deteriorated significantly. Remedial pruning would not return the tree to Fair Condition.

8.6. Significance

Measured as High, Medium or Low, see **2.7 Determining a tree's significance** (page 6). Significance may be expressed in increments of High, Medium or Low. For a High rating the majority (≥4) of the answers will be yes; For a Medium-High rating 3.5 of the answers will be yes; for a Medium rating half (=3) of the answers will be yes; for a Low-Medium rating 2.5 of the answers will be yes; and for the Low rating the minority of answers will be yes (≤2).

8.7. Amenity Value

Amenity value is a subjective measurement based on the tree's contribution to the landscape, it may be based on the tree's visual form, however it also includes non-visual attributes such as provision of shade for a seat, screening of poor views or for privacy, or if it has historical significance. The amenity value is recorded as:

- **H** - High, the trees form is an excellent example of its species and it makes a great specimen and/or it has other attributes such screening, or is historical significance. These trees are visually prominent and valuable to the community or public domain.
- **M** - Medium, the tree may have an altered form and/or it has attributes that provides amenity to local residents only.
- **L** – Low, the tree is not a good specimen and it does not provide substantial benefit to local residents or the community.

8.8. Ecological Value

Ecological value is a measurement of the tree's contribution to the environment. It is determined by the tree's area of origin, its potential to provide habitat to native fauna and its potential to become an environmental pest. The ecological value is recorded as:

- **H** - High, the tree is locally native or remnant and/or it has habitat value for native fauna.
- **M** - Medium the tree is native but not locally native.
- **L** - Low, the tree is not native and/or it may be a listed nuisance
- **Ha** – Habitat, is the tree valued by fauna for food (ie. foliage fruit or sap) or shelter (ie. nesting, roosting, dray or hollow).
- **Wd** – tree is a weed or invasive species.

8.9. Form

The form, structure or shape of each tree is assessed and recorded as either one or a combination of several of the below terms:

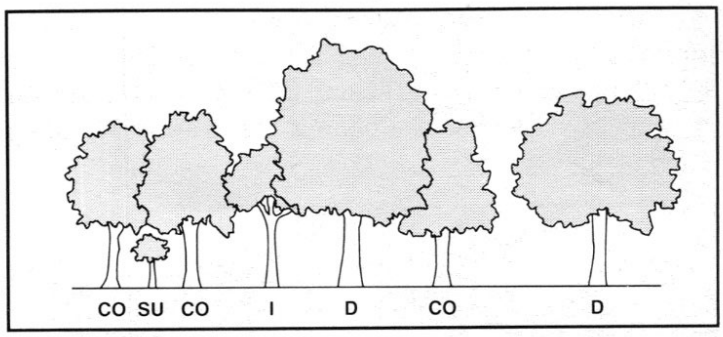
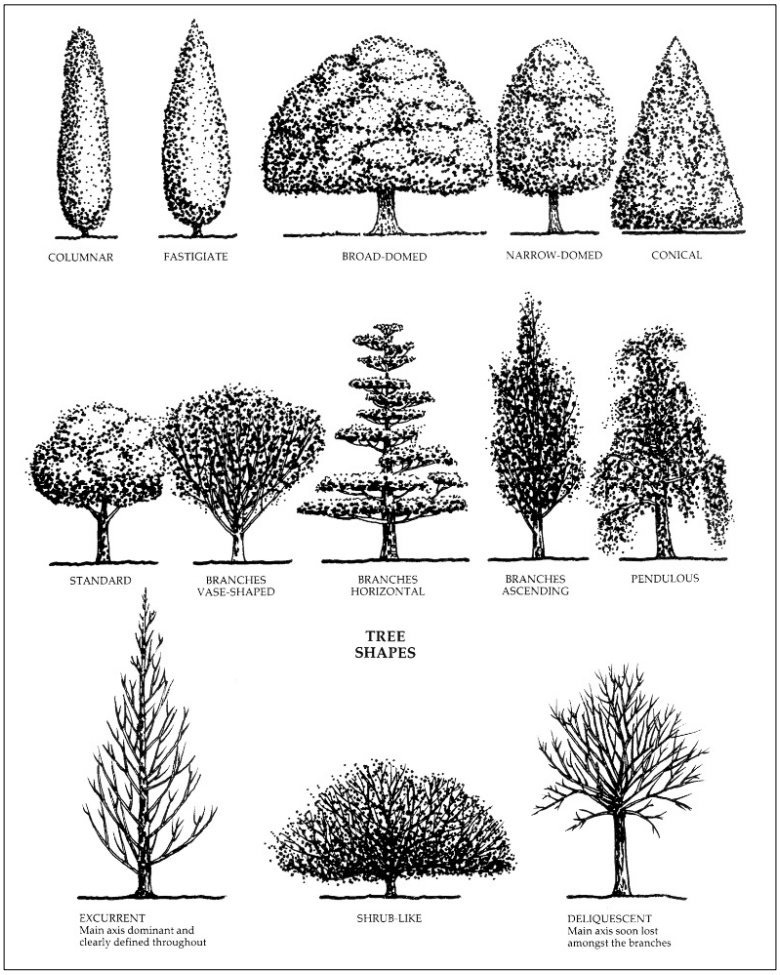


Figure 13. Crown Class is a description of the overall form of the tree as dominant (D), codominant (CO), intermediate (I) or suppressed (SU). Crown class is influenced by the proximity of the tree to other trees. (Adapted from The Hazard Tree Assessment Program, Recreation and Park Dept., City and County of San Francisco)

Forest forms (F) [20]: Dominant; Codominant; Intermediate; Suppressed. For sites that contain remnant native vegetation.



Urban Tree forms (U) [29]: Columnar; Fastigiate; Broad-domed; Narrow-domed; Conical; Standard; Branches Vase-shaped; Branches Horizontal; Branches Ascending; Pendulous' Excurrent; Shrub-like; Deliquescent. For sites that mainly contain Urban trees.

Modifiers: Bias Crown/Asymmetry (**BC**); Crown Shy (**CS**) (also referenced is the adjacent dominant tree canopy i.e. **T4**); Palm (**P**), Leaning (**L**); Basal Multi Trunked/stump sprout (**BM**); Emergent **(E)**, the crown emerges from a lower canopy formed by other dominant or codominant crowns.

8.10. Defects

The presence of one or a combination of several defects is recorded (**W**) Wound, (**D**) Decay, (**F**) Fungus, (**B**) Bulge, (**FB**) Fibre Buckling, (**C**) Cracks, (**S**) Split, (**H**) Hollow, (**DB**) Die Back, (**E**) Epicormic shoots, (**DW**) Dead Wood, (**I**) Inclusion, (**CA**) Cavities, (**PF**) Previous Failure, (**R**) Root Damage, (**P**) Pruning wound, (**PD**) Pests and diseases, (**ST**) Storm Damage.

8.11. SRZ (Structural Root Zone) – Radius (mm)

The SRZ is a radial area extending outwards from the centre of the trunk. This area contains the majority of the structural woody roots. This area is responsible primarily for stability. Root damage or root loss within this zone greatly increases the opportunity for decay fungi to ingress into the heartwood, causing internal decay in addition to destabilising the tree's structural integrity. The SRZ is calculated as follows (This calculation is derived from the Australian Standard 4970 – 2009 Protection of Trees on Development Sites, where D = stem diameter in metres):

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

8.12. TPZ (Tree Protection Zone) – Radius (mm)

The TPZ is a circular area with a radius measured by multiplying the DBH by twelve (12), or a circular area the size of the tree's drip line whichever is greater. This area contains the majority of the essential structural and feeder roots responsible for stability, gaseous exchange and water and nutrient uptake. Excavation, back filling, compaction or other disturbance should not occur in this area.

The TPZ is used to identify the minimum area required for the safe retention of a given tree. This calculation is derived from the Australian Standard 4970 – 2009 Protection of Trees on Development Sites. An incursion to 10% within the TPZ is potentially acceptable if no other option is available. A major encroachment (in excess of 10%) is required to be clearly justified by the project Arborist and compensated for elsewhere. Justification methodology may vary depending on site or the individual tree's health, vigour and ability to withstand disturbance and may require root investigation.

8.13. Development Setback / Impact

The successful retention of trees on construction sites is dependent on the adequate allocation and management of the space above, below and around trees to be retained.

The trunk and canopy of trees to be retained must be protected to ensure the trunk and branches are not damaged during construction. The removal of bark and / or branches allows the potential ingress of micro-organisms which may cause decay. Similarly the removal of bark restricts the tree's ability to distribute water, mineral ions and glucose.

It is essential to prevent the disturbance of the soil beneath the drip line of each tree, because this is the area where oxygen, water and mineral ions are absorbed by tree roots. Oxygen, water and mineral ions are essential for healthy plant growth. If soil becomes compacted, the ability of roots to function correctly is greatly reduced. Similarly the removal or damage of roots will reduce the ability of roots to function correctly. Woody roots provide stability for the tree and they also transport nutrients to the leaves.

The potential implications of removing or damaging roots are threefold:

1. The risk of whole tree failure is increased, as tree roots anchor and stabilise the tree. Woody roots are developed to assist in the support of the tree in prevailing wind, with these roots removed wind throw may occur, which would result in the mass failure of the tree.

2. The ability of the tree to absorb and transfer the essential nutrients, oxygen and water from the soil to the leaves is greatly affected. This will place the tree under stress and reduce the tree's ability to photosynthesise, and in turn cause the tree to use up stored energy reserves. These energy reserves are used to fight infection and insect attack, for new growth, maintenance of existing tissues and also for healing wounds. Once energy reserves become depleted a tree is much more susceptible to drought, disease and pest attack.

3. Open wounds are sites by which decay-causing pathogens can enter the tree. The severance or damage of woody roots creates sites where pathogens may gain ingress. Whilst the effect of decay may not be immediately apparent, the long term health and structure of the tree will be compromised.

8.14. Comments

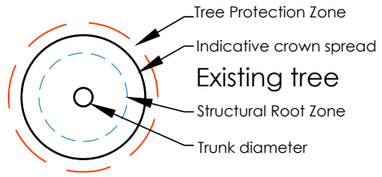
Comments generally relate to the suitability for retention. The comments allow for a brief notation of other factors relevant to the assessment of the tree.

9. Tree Location Plan

(Following page).

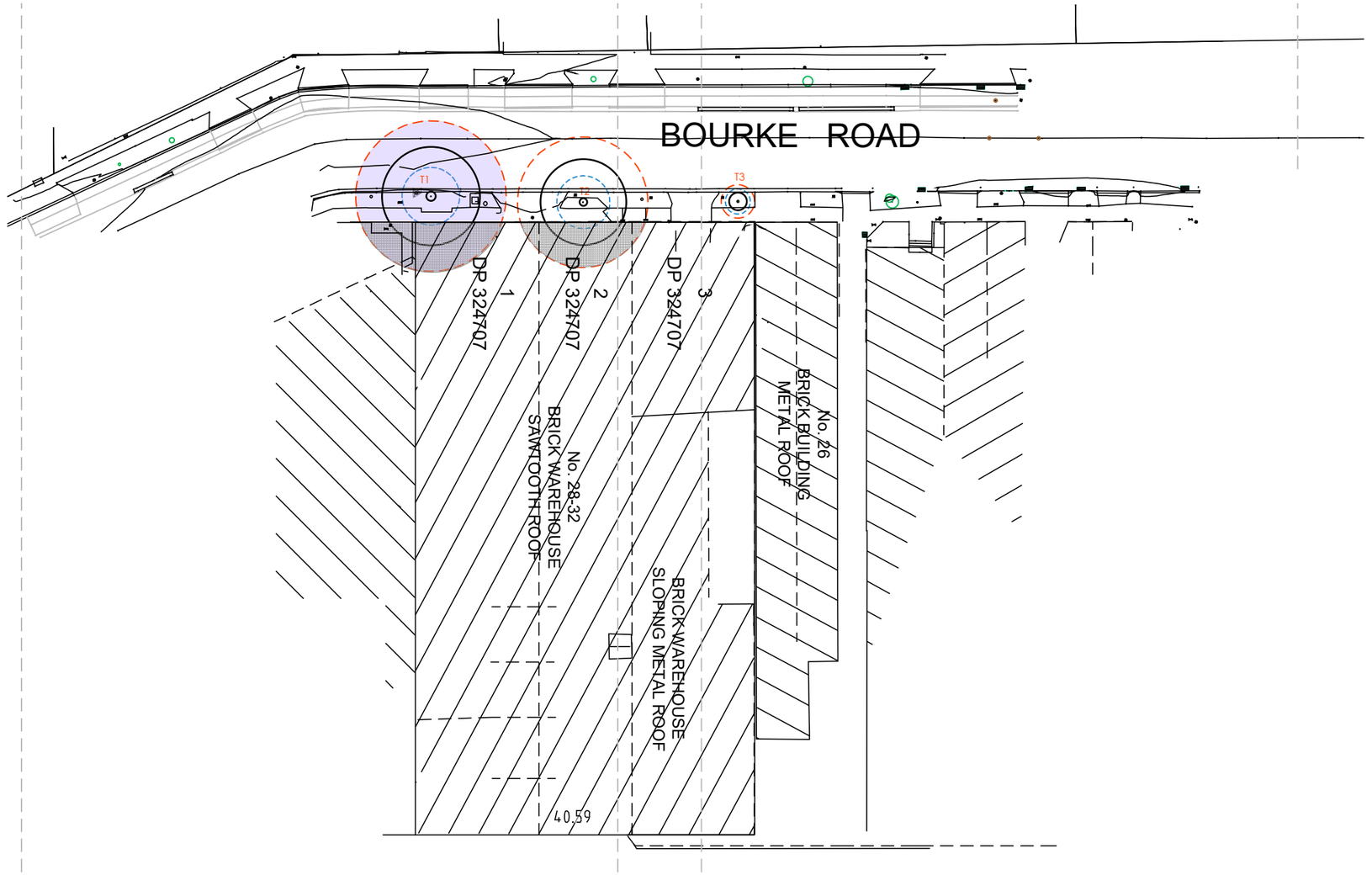
LEGEND

- +101.45 — Existing levels
- + RL 101.55 — Proposed levels
- + TOW 101.55 — Proposed Top Of Wall levels
- Boundary
- To be removed / demolished
- Hydraulic lines - SW
- Building under
- Building
- Building over
- Retaining walls
- Fence
- Earthworks



Assessed tree within development footprint

Roots likely deflected by existing structures



REVISION	DESCRIPTION	DRAWN	CHECK	DATE
A	SUBMITTED TO CLIENT FOR COMMENT	DM	DM	09.05.22
B	ISSUED FOR D.A.	DM	DM	09.06.22
C	REVISED FOR PDA	DM	DM	13.10.22

arboreport™ Vegetation Management Consultants
PO Box 8136, Baulkham Hills, NSW 2153
Ph: (02) 9680 7713 Fax: (02) 9680 7705
Email: info@arboreport.com.au
Web: www.arboreport.com.au
Member of the Institute of Australian Consulting Arboriculturists (IACA)

1. Do not scale from drawings
2. Verify all measurements on site
3. Notify ecodesign of any inconsistencies
4.
5. Drawing remains the property of arboreport
6. All work to comply with relevant Australian Standards or Building Code of Australia
7. All work to be performed by a suitably qualified tradesperson
8. For application purposes only - NOT FOR CONSTRUCTION

ADDRESS
28-32 BOURKE ROAD, ALEXANDRIA NSW

CLIENT
ALEXANDRIA PROPERTY DEVELOPMENT P/L

PROJECT: HEALTH DEVELOPMENT
DRAWING: TREE LOCATION PLAN
SCALE: N.T.S. @ A3 | ISSUE: DA | SHEET: T - 01
DRAWN: DM | CHECK: DM | DATE: 09.05.22 | REVISION: C

10. General Tree Protection Notes

10.1. Structural Root Zone (SRZ)

The SRZ is a radial area extending outwards from the centre of the trunk calculated as follows, where D is the stem Diameter in metres:

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

10.2. Tree Protection Zone (TPZ)

The TPZ is a radial area extending outwards from the centre of the trunk equal to the DBH x 12. This area shall be protected by a TPF (*see below*). For all trees to be retained a TPZ is to be created and maintained.

The TPZ function is primarily to protect the root zone by restricting access however the canopy of the tree shall also be protected from damage or injury. The Project Arborist shall approve the extent of the TPZ.

The TPZ shall be mulched to a depth of 75mm with an approved organic mulch. Supplementary watering shall be provided in dry periods to reduce water or construction stress, particularly to those trees which may have incurred root disturbance.

An area equivalent to the encroachment is required to be provided (additional to and contiguous with the remaining TPZ) to offset against the encroachment. This additional area is to be protected during construction.

In the TPZ the following activities shall be excluded:

- Excavation, compaction or disturbance of the existing soil.
- The movement or storage of materials, waste or fill.
- Movement or storage of plant, machinery, equipment or vehicles.
- Any activity likely to damage the trunk, crown or root system.
- Scaffolding.

10.3. Tree Protection Fencing (TPF)

Prior to site establishment, tree protection fencing shall be installed to establish the TPZ for trees to be retained. Tree protection fencing shall be maintained entire for the duration of the construction program.

Tree protection fencing shall be:

- For Tree 3 only, a hardwood tree guard (figure A, p25).
- Certified and Inspected by the Project Arborist
- Installed prior to the commencement of the works.

10.4. Trunk, Lower Branches and Root Zone Protection

Other measures may be required in addition to tree protection fencing. These specific protection measures will be installed as directed by the Project Arborist to protect the canopy, trunk or branches from the risk of damage.

Trunk and lower branch protection may be required to alleviate mechanical damage to a height of 3m. The minimum trunk protection shall consist of an initial padding layer beneath and battens consistent with *The Australian Standard for the Protection of Trees on Development Sites (AS 4970 – 2009), Section 4 and paragraph 4.5.2 and Figure 4*. The battens shall consist of lengths of 100 x 50mm (or varied to accommodate risk and tree structure) timber boards secured side by side, spaced 50mm apart with galvanised steel banding for the full circumference of the trunk without driving nails or screws into the trunk or branches. Trunk protection should be installed prior to any site works, maintained throughout the construction program and removed post construction.

Root protection may be required if it site access and construction activities will not be able to be excluded from the entire TPZ as the installation of the tree protection fence is not reasonably practicable. Installation of root protection prior to the commencement of works to prevent the damage to roots such as i)Rumble boards as per section 4.5.3 - Ground protection and Figure 4 of AS4970 Protection of trees on development sites; or ii) construction of the above ground driveway.

The Project Arborist shall be consulted if there is risk of damage to a retained tree. The Project Arborist may require:

- A 75mm layer of approved mulch to be installed to the TPZ.
- A temporary drip irrigation system to be installed to the TPZ.

10.5. Tree Damage

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

10.6. Excavation within the TPZ

Excavation within the TPZ shall be avoided. All care shall be undertaken to preserve tree root systems. Excavation within the TPZ shall subject to the approval and supervision of the Project Arborist.

Excavation shall be executed by hand to avoid damage to roots by first excavating a narrow trench to the depth required. This will allow the location of woody structural roots greater than 40mm which can then be retained intact as necessary or pruned cleanly by and AQF level 3 Arborist or Horticulturalist. Final cut of roots should result in a clean cut, using appropriate tools as prescribed by the Australian Standard *AS4970-2009 Protection of trees on development sites*.

If excavation within the TPZ is required other than that anticipated in this report the Project Arborist shall be notified. A root mapping exercise may be required and should be certified by the Project Arborist. Root mapping shall be undertaken by either ground penetrating radar (GPR), air spade, water laser or by hand excavation. The purpose shall be to locate woody structural roots greater than 40mm in diameter.

Where roots 40mm dia. or greater are encountered, alternative construction method shall be considered to ensure roots are not severed. Adequate allowance must also be made for future radial root growth. In paved areas, consideration should be given to raising the proposed pavement level and using a porous fill material in preference to excavation.

If there is no avoiding placing services through the TPZ excavate outside the TPZ and underbore below the root ball of the tree as directed by the Arborist.

10.7. Fill

All fill material to be placed within the TPZ should be approved by Arborist and equal to 5-7mm Round River Pea Gravel to provide aeration and percolation to the root zone. Otherwise no fill should be placed within the TPZ of trees to be retained.

10.8. Pavements

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 avoided otherwise.

10.9. Pruning

All pruning work required (including root pruning) should be in accordance with Australian Standard No *4373 -2007 - Pruning of Amenity Trees*. A Pruning Specification Report may be required if pruning works are proposed.

Roots should be severed with clean sharp implement flush with the face of the excavation and maintained in a moist condition. Severing roots by earthmoving equipment is unacceptable as this results in tearing damage to roots, putting the tree at greater risk of root decay and/or structural instability. Root pruning shall be performed under the supervision of the Project Arborist.

If required, branch reduction should be made to internal lateral branches or stems which are at least 1/3rd of the diameter of the branch being cut – or – removed at the branch collar, consistent with AS 4373 -2007; Sections 6.4 a) & b) and 7.3. Deadwooding should be carried out as required.

Whilst work is being carried out by climbing arborists (AQF Level 3) an aerial inspection of stems, branches and their attachments should be made. If minor additional works are needed to remove or correct defects it should be done at that time. If significant defects are found requiring heavy pruning or whole tree removal, photos should be taken and an AQF Level 5 Arborist be consulted prior to work being done.

10.10. Tree Removal

Tree removal work shall be carried out by an experienced Level 3 Arborist in accordance with the NSW Work Cover Code of Practice for the Amenity Tree Industry (1998).

Care shall be taken to avoid damage to trees during the felling operation. Stumps shall be grubbed-out using a mechanical stump grinder to a minimum depth of 300mm without damage to other retained root systems.

10.11. Post Construction Maintenance

In the event of any tree deteriorating in health after the construction period, the Project Arborist shall be engaged to provide advice on any remedial action. Remedial action shall be implemented as soon as practicable and certified by the Project Arborist.

Tree protection fencing with additional trunk and root protection shall be removed following completion of construction. The mulch layer in the TPZ shall be retained and replenished where required to maintain a 75mm thickness.

Figure A. Hardwood tree guard. Sourced from Outdoor Design Source.

11. References

1. Committee EV-018 (2009) **AS 4970 - 2009 Protection of Trees on Development Sites**; Standards Australia.

2. Committee EV-018 (2007) **AS 4373 - 2007 Pruning of Amenity Trees**; Standards Australia.

3. Fairley, A., Moore, P.; **Native Plants of the Sydney District an Identification Guide**; New Holland; Sydney; 2002.

4. Fakes, J.; **Arboriculture and Tree Care and Maintenance Notes**; TAFE NSW; 2004.

5. NSW Government, Office of Environment and Heritage, 2017, accessed 06.05.2022, http://www.environment.nsw.gov.au/**eSpade**Webapp

6. Benson, D, and Howell, J (1990) **'Taken for Granted: The bushland of Sydney and its suburbs'** Kangaroo Press in association with The Royal Botanic Gardens Sydney, NSW

7. Office of Environment and Heritage, **'The Native Vegetation of the Sydney Metropolitan Area – Volume 1: Technical Report'** Version 3.0, 2016, NSW Government.

8. Office of Environment and Heritage, **'The Native Vegetation of the Sydney Metropolitan Area – Volume 2: Vegetation Community Profiles'** Version 3.0, 2016, NSW Government.

9. Pellow, BJ, Henwood, MJ, and Carolin, RC (2009 5th ed.) ***'Flora of the Sydney Region'*** Sydney University Press, Sydney

10. Harris, R.W., Clark, J.R; & Matheny, N.P; **Arboriculture; Integrated Management of Landscape Trees, Shrubs & Vines 3rd Edition**; Prentice Hall, New Jersey; 1999.

11. Institute of Australian Consulting Arboriculturists (IACA); **IACA Significance of a Tree, Assessment Rating System (STARS)**; 2010.

12. Institute of Australian Consulting Arboriculturists (IACA); **Sustainable Retention Index Value (SRIV)**; Version 4; 2010.

13. Lonsdale, D.; **Principles of Tree Hazard Assessment and Management**; The Stationery Office; London; 2005.

14. Matheny, N.P. & Clark, J.R.; **Trees & Development: A Technical Guide to Preservation of Trees During Land Development**; International Society of Arboriculture, Savoy, Illinois 1998.

15. Mattheck, Dr. Claus R., Breloer, Helge; **The Body Language of Trees - A Handbook for Failure Analysis 6th Edition**; The Stationery Office; London. England; 1994.

16. Rowell, R.J (1991) ***'Ornamental Flowering Trees in Australia'*** New South Wales University Press, Kensington, NSW.

17. Schwarze, F.W, Engels, J, and Mattheck, C (2000) ***'Fungal Strategies of Wood Decay in Trees'*** Springer, Berlin.

18. Shigo, A. L.; **Modern Arboriculture Touch Trees**; Shigo and Trees Associates; New Hampshire; 2003.