



**NORTH SYDNEY PUBLIC SCHOOL,
182 PACIFIC HIGHWAY, NORTH SYDNEY
ARBORICULTURAL IMPACT ASSESSMENT**

PREPARED FOR:

NSW DEPARTMENT OF EDUCATION

PREPARED BY:

ANDREW MORRISON

Grad. Cert. Arboriculture, Melb Uni (Level 8)
Dip. Hort, Arboriculture Ryde TAFE (Level 5)
Dip. Hort, Landscape Design
Cert III Landscape Construction
Ass. Dip. Horticulture



<i>date</i>	<i>revision</i>	<i>prepared</i>	<i>checked</i>
19/08/2021	Issued Proposed Development Draft	AM	AS
25/08/2021	Issued Proposed Development	AM	AS

Executive Summary

This report was commissioned by NSW Department of Education to accompany their State Significant Development Application (SSDA) Proposal for Alterations and Additions to the existing North Sydney Public School within the North Sydney LGA at 182 Pacific Highway, North Sydney, Waverton. The aim of this report is to provide an assessment of the impacts of the proposed development on sixty-eight trees in accordance with AS4970 – 2009 Protection of trees on development sites.

This report collates and presents information collected by Andrew Morrison on the 02/09/2020. The data collected is located at **7. Tree Survey Table** (page 24) also see **8. Tree Survey Table Notes** (page 32) for notes relating to tree survey table.

Generally the site's vegetation was observed to have a majority native exotic tree canopy, with a mixed native and exotic shrub midstorey and an exotic turf and asphalt groundcover layer. The existing surveyed trees are shown at **9. Tree Location Plan** (page 36).

The SSDA plans indicate the proposed development will involve the construction of a multistorey, multipurpose educational spaces with associated administrative and para educational spaces with associated gardens, turf, paths, paving and retaining walls. This will involve the demolition of existing structures and regrading site levels through excavation, cutting and filling of soil on site. The extent of site works is also illustrated at **9. Tree Location Plan** (page 36).

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	-	56,	-	-
	Medium	2, 3, 4, 5, 6, 7, 8(M-H), 9, 10, 11, 12, 14, 15, 18, 19, 20, 21, 22(M-H), 23, 25, 26, 29, 32, 34(M-H), 35(M-H), 57, 58, 59, 61, 62, 67(M-H)		16(M-L), 38, 40, 41, 47, 54(M-H), 55(M- H),	17, 43(M-H), 50,
	Low	1, 23a(L-M), 24(L-M), 27(L- M), 28(L-M), 30(L-M), 31, 33, 42, 60, 63(L-M),	-	37(L-M), 39(L- M), 49, 51, 53, 65, 66	13(L-M), 36(L- M), 44(L-M), 45(L-M), 46, 48(L-M), 52, 64,
	Total Number of trees	42	1	14	11

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:

- The removal of Tree No.'s 17, 36, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 64, 65 & 66, if the development is approved as there is an unsustainable major encroachment into the tree protection zone.
- The replacement planting of 5 canopy trees shall be installed in 25L pot size to offset the loss of trees on site.
- The replacement planting of 5 small trees shall be installed in 25L pot size to offset the loss of trees on site.
- The retention of trees 1, 2, 3, 4, 5, 6, 7, 8(M-H), 9, 10, 11, 12, 14, 15, 18, 19, 20, 21, 22(M-H), 23, 23a, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34(M-H), 35(M-H), 57, 58, 59, 60, 61, 62, 63, & 67(M-H). They are located in positions that will allow their retention without impact from the proposed development in its current form.
- The retention of Tree No.'s 6, 7, 8, 40, 47, 54 & 55 have communications or electrical conduiting within their TPZ. Layouts showing these elements should show re-routing to avoid TPZ encroachment. Where this cannot be achieved, they should be underbored.
- The retention of Tree No. 56. The construction will provide a minor encroachment into the tree protection zone.
- The retention of Tree No. 13. Clarification of landscape plans is required to confirm no edging structure is providing unsustainable impact to the tree.
- The retention of Tree No. 47. It has a major but sustainable impact from building and scaffold. Pruning to 10% will be required to provide clearance to the scaffold. A shadow analysis of finalised building design should be carried out to determine if the amount of shade provided is sustainable to this tree.
- The retention of Tree No.'s 16, 37, 38, 39, 40 and 41. These trees will require the following design modification and construction detail to avoid and minimise impacts from the proposed major encroachment. Specifically:
 1. The project arborist should be engaged to liaise with the design development team during development of final design and construction drawings to achieve the following:
 2. The deck level must be lifted to provide for a minimum 100mm air gap to be achieved between existing soil levels and the underside of bearers, joists and other supporting members. Alternatively, consider a shallow profile metal mesh/polymer decking.
 3. The deck should be constructed to allow air and water to freely pass through to and from soil underneath without the need for excessive maintenance to clear out accumulated debris.
 4. The supporting piers should be located outside the SRZ (blue dashed circles on plan, radial dimensions shown on Tree Survey Table). The footing placement and bearing span design should allow flexibility of placement to avoid structural woody roots.
 5. The footings for piers should be carefully hand dug under minimum AQF Level 5 supervision to locate and achieve minimum damage to woody roots. When found, they should be exposed and retained until the arborist determines if they are to remain (and the footing is relocated) or if they can be pruned with acceptable impact to the tree.
 6. The deck and supporting members should be designed to allow a horizontal gap for expected radial trunk expansion of the tree in the near

to mid future (minimum of 200mm offset from trunk). Cable netting or similar be fixed in the gap should be considered to reduce pinch point hazards.

7. Where possible, an opening in the deck to be used by the relevant maintenance or technician crew should be provided to carry out inspections of the soil surface under the deck, and to provide soil ameliorants such as organic fertilisers, mulch and water.
 8. A management plan should be prepared with the Construction drawings to guide demolition of existing surfaces and construction methodology which minimises soil compaction within the TPZ and mechanical damage to the trunk and branches.
 9. Consideration should be given to incorporate an area of existing hardstand contiguous to Trees 16 & 40 to be converted to mulched garden to maximize the area of permeable soil surface (refer to Tree Location Plan). The preparation of the surrounding garden bed soil should avoid change to existing soil levels and be appropriate to the pH and nutrient tolerances of each tree. Species selected should not have high moisture and nutrient needs in order to reduce potential competition with the tree. Nursery stock in small containers should be used (e.g 75mm grow tubes or smaller).
 10. Reinstated asphalt or new softfall replacing asphalt should be at or above existing asphalt levels. Typical artificial turf/softfall installation specifications require deeper subbase preparation than asphalt which has been installed for some years and is likely to cut into soil containing roots. Existing sub-base should be retained in position without excavation into the soil beneath.
 11. Tree 16 will require pruning of 15% of the crown to provide clearance to scaffold during construction.
- The retention of Tree No.'s 54 and 55. These trees are of medium-high significance and will require the following detail and methodology in construction drawings to avoid and minimise impacts from the proposed major encroachment. Specifically, construction drawings should show:
 1. Refurbished paved area over existing pavement to not require excavation deeper than existing paving or beyond existing paving footprint.
 2. Stump grinding limited to immediately under the soil surface, following the removal of Trees 51, 52 & 53.
 3. Planting drawings should specify:
 - a. Smallest planting stock available (e.g 75mm grow tubes or 140mm if necessary).
 - b. No widespread soil replacement other than individually placed in hole at planting as necessary.
 - c. 75-100mm of coarse organic mulch having both wood and leaf litter components.
 4. Existing pathways should be removed carefully by hand within the TPZ of the trees without excavating below the sub-grade.
 - a. Trunks will require protection from mechanical damage and soil from compaction by machinery during construction.
 5. Methodology to limit damage to tree parts, and soil containing roots during demolition and reconstruction of high retaining wall and low garden retaining wall.

6. The construction of the new wall will be over the existing footings or beyond them where root growth from these trees is minimal. The impact from these works will be minimal, provided the existing footings are used where possible, or new footings are confined to the existing footing footprint.
 - a. Care must be taken to remove only the part of footings necessary to install the paving. Machinery used must only occupy the existing paved area.
 - b. The construction of the new wall should be over the existing footings where possible or new footings are confined to, or behind the existing footing footprint.
- Proposed planting around existing retained trees should disrupt trees as little as possible. Limiting planting to low density planting of small nursery stock within the TPZ and excluding planting totally within the SRZ.
- All retained Trees –
- The preparation of all subsequent architectural, landscape, civil (including bulk earthworks and stormwater), hydraulic, power, comms, sewerage or other service design development plans must be carried out in close liaison with the Project Arborist.
- A Tree Protection Plan should be prepared to guide construction methodology and barrier installation as necessary to protect the trees during construction works. The plan should be prepared following provision of a CMP (Construction Management Plan) and/or TMP (Traffic Management Plan), in liaison with Construction plans and consistent with any conditions of consent by the approval body and AS4970 (2009), sections 4 & 5.
- For additional tree protection information see **6. Tree Management Plan** (page 22) and **10. General Tree Protection Notes** (page 39).
- This arboricultural impact assessment should be reviewed upon the preparation of revised plans or proposed services. Changes to encroachments must be assessed and approved by the project arborist prior to approval or implementation.

Table of Contents

Executive Summary.....	2
Table of Contents.....	6
1. Introduction.....	7
2. Methodology.....	7
3. Observations.....	9
4. Discussion.....	12
5. Recommendations.....	19
6. Tree Management Plan.....	22
7. Tree Survey Table	24
8. Tree Survey Table Notes.....	32
9. Tree Location Plan	36
10. General Tree Protection Notes.....	39
11. References	43

1. Introduction

This report was commissioned by NSW Department of Education to accompany their State Significant Development Application (SSDA) Proposal for Alterations and Additions to the existing North Sydney Public School within the North Sydney LGA at 182 Pacific Highway, North Sydney, Waverton. The aim of this report is to provide an assessment of the impacts of the proposed development on sixty-eight trees in accordance with AS4970 – 2009 Protection of trees on development sites.

This report collates and presents information collected by Andrew Morrison on the 02/09/2020. The data collected is located at **7. Tree Survey Table** (page 24) also see **8. Tree Survey Table Notes** (page 32) 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 Andrew Morrison - Consulting Arborist 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 an 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 tree may not arise in the future.

No structural foundation design, stormwater or hydraulic plans have been supplied.

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 estimated using a measured stride paced out on site.
- 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 24). 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 32).

The physical data for tree locations, crown width and DRB is schematically described in **9. Tree Location Plan** (page 36).

2.5. Reference Documents

The report was written in coordination with:

- Detail Survey prepared by Project Surveyors, Rev B dated 05/07/21.
- Architectural Concept Site Plan and Demolition Plan prepared by Fulton Trotter Architects Revision F, dated 18/08/21.
- Landscape Drawings for SSDA, prepared by Taylor Brammer, LA001, Revision A, dated 13/08/21.
- Hydraulic Services Site Plan prepared by LCI Consultants, 210557-SKH-02, Rev P2, undated.
- Electrical Services Concept Design Drawings prepared by LCI Consultants, 210557-SKM-01, Rev P2, dated 13-08-21.
- The Australian Standard for the Protection of Trees on Development Sites (AS 4970 – 2009).

2.6. Council Tree Preservation Regulatory Controls

The North Sydney Council tree preservation controls define a tree as being:

- (a) Any tree or vegetation on public land, regardless of size;

- (b) Any tree or vegetation with a height of 10m, or a crown width of 10m, or a trunk circumference of 1.5m measured at 1m above ground level (existing); or
- (c) Any tree that is declared a noxious weed and comprises a mature canopy tree;
- (d) Any tree or vegetation more than 5 metre tall on land identified as a heritage item;
- (e) Any tree or vegetation that is declared a noxious weed on land identified as a heritage item under cl.5.10 of NSLEP 2013 regardless of size.

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 a locally native remnant; an endangered species; a part of an endangered ecological community; or does the tree provide critical habitat for an endangered species?
2. 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?
3. Is the tree visually prominent in the locality?
4. Is the tree well structured?
5. Is the tree in good health and/or does it display signs of good vigour?
6. Is the tree typically formed for the species?
7. Is the tree currently located in a position that will accommodate future growth?

3. Observations

3.1. Site Description

The site is a single block located at 182 Pacific Highway, North Sydney. It contains a primary school campus including educational spaces, administration and ancillary buildings, hardstand for car parking and play areas, sports fields, paths, turf areas and gardens. There was no evidence of recent earthworks/adjacent construction on site or adjoining sites. The site has a general westerly aspect.

3.2. Soil Landscape Map

The soils in this area are from the Blacktown soil landscape group ³. They are generally shallow to moderately deep <100 cm Red and Brown Podzolic Soils on crests, upper slopes and well-drained areas; deep 150-300 cm Yellow Podzolic Soils and Soloths on lower slopes and in areas of poor drainage.

Generally the landscape is characterised by gently undulating rises on Wianamatta Group shales and Hawkesbury shale. There is local relief to 30 m, and slope gradients usually less than 5%. Additionally there are broad rounded crests and ridges with gently inclined slopes ³.

These soils are generally limited by moderately reactive highly plastic subsoil, low soil fertility, and poor soil drainage. The critical soil characteristics of this soil type for trees growing on this site include poor drainage. ³

3.3. Native Vegetation Map

The Western Sandstone Gully Forest ecological community^{13, 14} is dominated by *Angophora costata*, *Corymbia gummifera* and *E. pilularis*, with *E. punctata* occurring sporadically on mid-slopes. A sparse layer of smaller trees is usually present, and dominated by *Ceratopetalum gummiferum* and *Allocasuarina littoralis*.

The shrub and ground strata are also sparse and often contain slightly fewer species relative to ridge top communities. Shrub species include *Acacia terminalis*, *Leptospermum trinervium*, *Persoonia linearis* and *Banksia spinulosa* var. *spinulosa*. ^{13, 14} In particularly sheltered gullies, mesic species such as *Backhousia myrtifolia* and *Pittosporum undulatum* form a dense small tree stratum.

In the ground stratum, the fern species *Pteridium esculentum* is invariably present, along with the climber *Smilax glycyphylla*. Other species frequently recorded in the ground stratum include *Entolasia stricta*, *Dianella caerulea*, *Lomandra obliqua*, *L. longifolia*, *L. gracilis*, *Lepidosperma laterale* and *Gonocarpus teucriodes*. ^{13, 14} Vines such as *Cissus hypoglauca* may also be locally abundant, and dense patches of fern such as *Caloclaena dubia* also occur.

There appears to be species representative of this vegetation community located on this site.

3.4. Summary of site inspection data

Generally the site's vegetation was observed to have a majority native exotic tree canopy, with a mixed native and exotic shrub midstorey and an exotic turf and asphalt groundcover layer. The existing surveyed trees are shown at **9. Tree Location Plan** (page 36).

3.5. Summary of Proposed Development

The SSDA plans indicate the proposed alterations and additions to the existing North Sydney Public School. The proposal entails:

- Demolition of the existing hall (building B), haven building (building C) and 6 temporary buildings;
- Construction of a three storey building comprising:
 - staff administration rooms;
 - 16 homebases
 - a new library;
 - hall;
 - out of school hours care facilities;
 - covered outdoor learning area;
 - bicycle parking and end of trip facilities for staff; and
 - services, amenities and access.
- New entry gate and forecourt from Bay Road;
- Internal refurbishment of building G ground floor from the existing library to 3 homebases;

- Capacity for an increase in student numbers from 869 to 1,012; and
- Associated tree removal, landscaping and excavation.

The proposal maintains:

- The gates and fence of former Crows Nest House including the entrance from Pacific Highway and Bay Road;
- Existing gate along McHatton Street;
- The outdoor play area to the east of Building A;
- Existing covered outdoor learning area adjacent to Building A;
- The basketball courts and staff carpark in the western portion of the site;
- The significant tree planting on all school boundaries;
- Buildings A, D and F noting minor internal refurbishments are being undertaken outside of the SSDA scope of work (exempt development) to improve student amenities and canteen; and
- Building G noting ground floor internal refurbishment is proposed in the SSDA.

The extent of site works is also illustrated at **9. Tree Location Plan** (page 36).

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	-	56,	-	-
	Medium	2, 3, 4, 5, 6, 7, 8(M-H), 9, 10, 11, 12, 14, 15, 18, 19, 20, 21, 22(M-H), 23, 25, 26, 29, 32, 34(M-H), 35(M-H), 57, 58, 59, 61, 62, 67(M-H)		16(M-L), 38, 40, 41, 47, 54(M-H), 55(M-H),	17, 43(M-H), 50,
	Low	1, 23a(L-M), 24(L-M), 27(L-M), 28(L-M), 30(L-M), 31, 33, 42, 60, 63(L-M),	-	37(L-M), 39(L-M), 49, 51, 53, 65, 66	13(L-M), 36(L-M), 44(L-M), 45(L-M), 46, 48(L-M), 52, 64,
	Total Number of trees	42	1	14	11

4. Discussion

4.1. Trees with a Minor TPZ Encroachment

The proposed construction encroaches within the TPZ by 10% or less.

- Tree 56 is located 9.9m from refurbished and expanded paved area, providing a 10% (minor) encroachment within TPZ. This tree is considered to be of high significance and should be retained and protected.

This encroachment is considered to be a low impact and sustainable by the tree. The tree is proposed to be retained.

4.2. Trees with a Major TPZ Encroachment

The proposed construction encroaches within the TPZ by more than 10% or is within the SRZ.

- Tree 16 is encroached by a number of elements:

Located within area of proposed elevated platforms providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ of 40%.

It is located 2.4m from hardstand providing 50% encroachment.

It is located 2.37m from anticipated scaffolding to be used during construction of Building J. Crown encroachment of 14 % from clearance for scaffold of Building I.

The tree is located in confined garden beds surrounded by existing asphaltic concrete and/or undulating soft-fall surfaces currently covering around 70% of the TPZ. Given the soil profile (Blacktown clay topsoil – see **3.2 Soil Landscape Map** (page 9) and typical asphalt surface construction, it is likely there is some root proliferation under the existing asphalt.

This tree was showing good health at the time of inspection. The species is moderately tolerant of root and crown loss and development disturbance.

The proposed landscape plans show a timber/lightweight platform with bench seating, surrounding the trunk of the trees. Planted garden beds are indicated beyond the seating, typically on two sides of each tree.

It is unknown if asphalt will be reinstated beyond the decking, seating and garden areas.

As there is deck encroachment within the SRZ, there is potential for the following tree impacts to be significant to roots within the TPZ:

- A. If typical wooden deck construction is used, the proposed finished level would require excavation within the SRZ which would be an unsustainable impact on the tree.
- B. Structural woody roots can be damaged or severed directly by excavation for footings. At worst, this may destabilise the tree. It is more likely, however, that indiscriminate damage to roots by implementation of a design which fails to minimise damage to the tree roots, root crown, trunk and branches, is likely to contribute to the mid to long term accelerated demise of the tree (by cutting off transport lines of water and nutrients and by creating suitable conditions for wood decay organism development).
- C. Compaction of soil containing feeder and connecting roots, causing mid-long term arresting of fine/feeder root development within the limited soil volume not covered by impermeable surfaces (i.e. asphalt, concrete).
- D. Excessive grade changes during asphalt paving reinstatement. Cut will have the potential to remove existing feeder roots beneath the existing asphalt pavement and provide a significant and unsustainable impact to the tree. It should be avoided.

However, if the platform, seating, planter beds and reinstated asphalt are constructed to achieve the characteristics listed below, these structures will minimise tree damage from construction and are capable of providing a low-moderate sustainable level whilst minimising most typical on-going school student impacts:

1. The project arborist should be engaged to liaise with the design development team during development of final design and construction drawings to achieve the following:
2. The deck level must provide for a minimum 100mm air gap to be achieved between existing soil levels and the underside of bearers, joists and other supporting members. We note that the current ground levels are around 86.25-86.33 and the design RL for decking is 86.40. This will need to be raised in the final construction drawings to accommodate the supporting structure. An alternative is to consider a shallow profile metal mesh/polymer decking.
3. The deck should be constructed to allow air and water to freely pass through to and from soil underneath without the need for excessive maintenance to clear out accumulated debris.
4. The supporting piers should be located outside the SRZ (blue dashed circles on plan, radial dimensions shown on Tree Survey Table). The footing placement and bearing span design should allow flexibility of placement to avoid structural woody roots.
5. The footings for piers should be carefully hand dug under minimum AQF Level 5 supervision to locate and achieve minimum damage to woody roots. When found, they should be exposed and retained until the arborist determines if they are to remain (and the footing is relocated.) or if they can be pruned with acceptable impact to the tree.
6. The deck and supporting members should be designed to allow a horizontal gap for expected radial trunk expansion of the tree in the near to mid future (minimum of 200mm offset from trunk). Cable netting or similar be fixed in the gap should be considered to reduce pinch point hazards.
7. Where possible, an opening in the deck to be used by the relevant maintenance or technician crew should be provided to carry out inspections of the soil surface under the deck, and to provide soil ameliorants such as organic fertilisers, mulch and water.
8. A management plan should be prepared with the Construction drawings to guide demolition of existing surfaces and construction methodology which minimises soil compaction within the TPZ and mechanical damage to the trunk and branches.
9. Consideration should be given to incorporate a portion of the existing garden bed and hardstand to the north in a new area of mulched garden to maximize the area of permeable soil surface (refer to Tree Location Plan). The preparation of the surrounding garden bed soil should avoid change to existing soil levels and be appropriate to the pH and nutrient tolerances of the tree. Species selected should not have high moisture and nutrient needs in order to reduce potential competition with the tree. Nursery stock in small containers should be used (e.g. 150mm diameter root balls or less).
10. Reinstated asphalt or new softfall replacing asphalt should be at or above existing asphalt levels. Typical artificial turf/softfall installation specifications require deeper subbase preparation than asphalt which

has been installed for some years and is likely to cut into soil containing roots. Existing sub-base should be retained in position without excavation into the soil beneath.

- Trees 37, 38 & 39 are located within/or have major encroachment by proposed elevated platforms providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ. Tree 16 is considered to be of medium-high significance and should be retained and protected. Tree 38 is considered to be of medium significance and suitable for retention. Trees 37 & 39 are considered to be low-medium significance.

The trees are located in confined garden beds surrounded by existing asphaltic concrete and/or undulating soft-fall surfaces. Given the soil profile (Blacktown clay topsoil – see **3.2 Soil Landscape Map** (page 9) and typical asphalt surface construction, it is likely there is some root proliferation under the existing asphalt.

Most trees are in fair-average to average health, showing good vigour and these species are moderate to highly tolerant of root loss and development disturbance.

The proposed landscape plans show a timber/lightweight platform with bench seating, surrounding the trunk of the trees. Planted garden beds are indicated beyond the seating, typically on two sides of each tree. Refer to discussion, Tree 16.

It is anticipated that asphalt will be reinstated beyond the decking, seating and garden areas. Refer to discussion, Tree 16.

The existing garden edging, timber and low masonry wall will be demolished.

As there is deck encroachment within the SRZ, there is potential for the following tree impacts to be significant to roots within the TPZ as outlined in **Points A-D in Tree 16, above.**

However, if the platform, seating, planter beds and reinstated asphalt are constructed to achieve the characteristics listed in **1- 10, Tree 16, above,** these structures will minimise tree damage from construction to a sustainable level whilst minimising most typical on-going school student impacts.

- Tree 40 Within proposed elevated platforms providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ 15.7%. 3.45m from proposed hardstand conversion to softfall providing 27% encroachment within TPZ. 1.77m from proposed demolished timber edging. This is a late mature tree and is considered to have a low-moderate tolerance to construction impacts due to its advanced age.

The impacts and recommended design for the platform, softfall, demolition of edging are discussed and listed above under **Tree 16, items A-D and 1-10.**

Communications conduit is indicated within TPZ. Electrical services conduit shown as demolished within the TPZ. Further information about the nature of these activities is required to determine tree impacts.

If excavation is required for **conduit work, it should be located outside the TPZ.** Tree 16 is considered to be of medium-high significance and should be

retained and protected. This tree is of medium significance and suitable for retention.

Consideration should be given to provide an area of mulched permeable garden area.

- Tree 41 is located 5.92m from retaining walls and 6.75m from elevated platforms providing discontinuous excavation and /or permeable lightweight decking with air gap within the TPZ. This is a medium significance tree with above average tolerance to construction impacts. It is suitable for retention.

The impacts and recommended design for the platform, softfall, demolition of edging are discussed and listed above under **Tree 16, items A-D and 1-10**.

- Tree 45 is located 0.55m from proposed stormwater pit and pipe, terraced stairs and path providing a 66% (major) encroachment within TPZ. Crown pruning and shading. Indicative communications conduit within TPZ. This tree is of low-medium significance and should not be considered a constraint on the development. This is a significant and unsustainable impact on the tree. It cannot be retained if the development is approved in its current form.
- Tree 47 is located 2.9m from proposed path providing a 20.4% encroachment within TPZ. Crown pruning to provide clearance to anticipated 1200mm wide scaffold is required. This will remove around 10% of the crown. Roof line at RL94.2 (at 12m above grade) will provide crown shading to the mid-lower crown. Indicative communications conduit within TPZ. This tree is considered to be of medium significance and suitable for retention.

When considered in isolation, the excavation encroachment is considered to be a moderate impact on the root system and sustainable by the tree.

A shadow analysis of finalised building design should be carried out to determine if the amount of shade provided is sustainable to this tree.

The external wall of the building will encroach within the crown. Scaffolding should be minimised within the crown area to retain the tree.

Following the finalisation of architectural design drawings, the amount of crown shading and pruning required can be determined. Its impact on the tree can be evaluated in more detail.

- Tree 49 is located 1.68m from proposed paving, stairs, proposed stormwater and building providing 37% encroachment within the TPZ. Stormwater discharge line within TPZ. Indicative communications conduit within TPZ. This tree is considered to be of low significance and in decline. It should not be a constraint on development. Due to its age and condition, it has a low tolerance to construction impacts.

When considered in isolation, the excavation encroachment is considered to be significant and unsustainable by this tree.

- Trees 51 & 53 are located 0.48m and 1.29m from expanded paved area over existing garden providing 38% & 32% encroachment respectively within the TPZ and encroachment within SRZ. They are both considered to be of low significance and should not be considered a constraint on the development.

- Trees 54 & 55 are located adjacent to and 3.7m from the enlarged paved area over existing pavement (22% & 16.5% respectively) and encroachment within the SRZ of Tree 54; located 2.16m to existing garden retained by the low retaining wall proposed to be retained and planted (13% & 7% respectively) and 4.8m & 7.24m from proposed retaining wall (6.8% & 3.6% respectively) providing a 41.6% & 27% encroachment within TPZ respectively. These trees are considered to be of medium-high significance and should be retained and protected. Indicative communications conduit within TPZ.

The encroachments from each of the proposed elements is outlined below:

- A. Refurbished paved area over existing pavement:
 - a. The impact from this element is low provided that existing pathways are removed carefully by hand within the TPZ of the trees without excavating below the sub-grade.
 - b. The level of the new paving should be higher than existing to allow for preparation of base under extended area of paving over existing garden bed.
 - c. Trunks will require protection from mechanical damage and soil from compaction by machinery during construction.
- B. Area of existing garden. The removal of trees 51, 52 & 53 should be carried out carefully to remove only necessary large roots joined to the root crown. The existing soil surface levels are indicated to be maintained. Planting stock used should be smallest feasible (e.g. grow tubes or 140mm dia pot size). Main impact is isolated excavation for tree stump removal and planting stock. This is considered to be a low impact if managed to minimise unnecessary excavation.
- C. Demolition of existing retaining wall and construction of new retaining wall towards the periphery of the TPZ: It is anticipated that the roots of these trees will be largely deflected by the footings of the existing wall. It is likely that there will be a proliferation of roots along the near (south) side of the footings. Therefore, the demolition of the walls has potential to damage the roots during demolition directly by excessive excavation and by compaction of the soil by heavy machinery used.

Construction plans should incorporate the following to retain and protect these trees:

1. Plans should show refurbished paved area over existing pavement to not require excavation deeper than existing paving or beyond existing paving footprint.
2. Plans should indicate limited stump grinding following the removal of Trees 51, 52 & 53.
3. Planting drawings should specify:
 - a. Smallest planting stock available (e.g 75mm grow tubes or 140mm if necessary).
 - b. No widespread soil replacement other than individually placed in hole at planting as necessary.
 - c. 75-100mm of coarse organic mulch having both wood and leaf litter components.
4. Plans showing communications conduits requiring excavation for installation should alter the layout to avoid the TPZ of these trees.

Construction and demolition should include to retain and protect these trees:

5. Methodology to limit damage to tree parts, and soil containing roots during demolition and reconstruction of high retaining wall and low garden retaining wall.
6. Care must be taken to remove only the part of footings necessary to install the paving. Machinery used must only occupy the existing paved area.
7. The construction of the new wall will be over the existing footings or beyond them where root growth from these trees is minimal. The impact from these works will be minimal, provided the existing footings are used where possible, or new footings are confined to the existing footing footprint.

The combined impact of the above elements is considered to be low-moderate and sustainable by the trees, providing the final concept and construction drawings incorporate the above items.

- Trees 65 & 66 are located within a proposed garden bed. Indicative communications conduit is indicatively located within TPZ. Tree 66 is widely regarded as a weedy species. These trees are considered to be of low significance and should not be considered a constraint on the development but have been indicated for removal in the landscape plan. Both species are highly tolerant of construction impacts.

To retain these trees, final plans locating any excavation for communications conduits would need to show them to be within a 600mm offset of the proposed building footprint.

4.3. Trees within the development footprint

- Tree 13 is located within a garden edge line. It is of Low-Medium significance and can be retained by modifying the drawing in subsequent revisions.
- Tree 17 is located within the proposed COLA. It is of Medium significance and suitable for retention. Extensive modification of the proposed development is required to retain this tree. It is proposed to be removed.
- Tree 36 is located within the area of proposed terraced excavation. It is of Low-Medium significance and should not be a constraint on development.
- Tree 43 is located within the proposed building 'I'. This mature tree is a species indigenous to the area and is considered to be of high significance. However, extensive redesign is required to protect and sustainably retain this tree.
- Trees 44 & 48 are located within the proposed building 'J'. Extensive redesign of the proposed building layout would be required to retain them. These trees are considered to be of low-medium significance and should not be considered a constraint on the development.
- Trees 46 & 64 are located within the area of proposed paved entry path. Communications conduit is indicated within the TPZ. They are of Low significance and should not be a constraint on development. They have been indicated for removal in the landscape plan.

- Tree 52 is within the expanded paved area. It is of low significance and should not be a constraint on development.
- Tree 50 is located within the proposed access path. This tree is considered to be of medium significance, however extensive redesign of the proposed building layout would be required to retain this tree. It cannot be retained if the development is approved in its current form.

4.4. Other Tree Comments

- Trees 1, 2, 3, 4, 5, 6, 7, 8(M-H), 9, 10, 11, 12, 14, 15, 18, 19, 20, 21, 22(M-H), 23, 23a, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34(M-H), 35(M-H), 57, 58, 59, 60, 61, 62, 63, & 67(M-H) are located in a positions that will allow their retention without impact from the proposed development in its current conceptual form. These trees are of medium to medium-high significance and are suitable for retention. Therefore, proposed services, stormwater, electricity feeds and substations, gas, communications and other built forms, trenching or grade changes should avoid the TPZ of these trees.
- Trees 6, 7, 8, 40, 47, 54, 55, 65 & 66 have communications or electrical conduiting within their TPZ. Layouts showing these elements should show re-routing to avoid TPZ encroachment. Where this cannot be achieved, they should be underbored.
- Tree 42 is located in a position having no or sustainable impact from built form of buildings, carriageways, retaining walls or associated hard surfaces but has been indicated for removal on the **landscape plan**. It is of low significance. should not be a constraint to development.
- Trees 1, 13(L-M), 23a(L-M), 24(L-M), 27(L-M), 28(L-M), 30(L-M), 31, 33, 60, 63(L-M), are located in positions that will allow their retention without impact from the proposed development in its current form. Whilst these trees are of low to low-medium significance, they collectively provide screening, shade and environmental services to the campus and locale. However, if proposed development elements within their TPZ is unavoidable, they should not be a constraint.

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:

- The removal of Tree No.'s 17, 36, 42, 43, 44, 45, 46, 48, 49, 50, 51, 52, 53, 64, 65 & 66, if the development is approved as there is an unsustainable major encroachment into the tree protection zone.
- The replacement planting of 5 canopy trees shall be installed in 25L pot size to offset the loss of trees on site.
- The replacement planting of 5 small trees shall be installed in 25L pot size to offset the loss of trees on site.
- The retention of trees 1, 2, 3, 4, 5, 6, 7, 8(M-H), 9, 10, 11, 12, 14, 15, 18, 19, 20, 21, 22(M-H), 23, 23a, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34(M-H), 35(M-H), 57, 58, 59, 60, 61, 62, 63, & 67(M-H). They are located in positions that will allow

their retention without impact from the proposed development in its current form.

- The retention of Tree No.'s 6, 7, 8, 40, 47, 54 & 55 have communications or electrical conduiting within their TPZ. Layouts showing these elements should show re-routing to avoid TPZ encroachment. Where this cannot be achieved, they should be underbored.
- The retention of Tree No. 56. The construction will provide a minor encroachment into the tree protection zone.
- The retention of Tree No. 13. Clarification of landscape plans is required to confirm no edging structure is providing unsustainable impact to the tree.
- The retention of Tree No. 47. It has a major but sustainable impact from building and scaffold. Pruning to 10% will be required to provide clearance to the scaffold. A shadow analysis of finalised building design should be carried out to determine if the amount of shade provided is sustainable to this tree.
- The retention of Tree No.'s 16, 37, 38, 39, 40 and 41. These trees will require the following design modification and construction detail to avoid and minimise impacts from the proposed major encroachment. Specifically:

12. The project arborist should be engaged to liaise with the design development team during development of final design and construction drawings to achieve the following:
13. The deck level must be lifted to provide for a minimum 100mm air gap to be achieved between existing soil levels and the underside of bearers, joists and other supporting members. Alternatively, consider a shallow profile metal mesh/polymer decking.
14. The deck should be constructed to allow air and water to freely pass through to and from soil underneath without the need for excessive maintenance to clear out accumulated debris.
15. The supporting piers should be located outside the SRZ (blue dashed circles on plan, radial dimensions shown on Tree Survey Table). The footing placement and bearing span design should allow flexibility of placement to avoid structural woody roots.
16. The footings for piers should be carefully hand dug under minimum AQF Level 5 supervision to locate and achieve minimum damage to woody roots. When found, they should be exposed and retained until the arborist determines if they are to remain (and the footing is relocated) or if they can be pruned with acceptable impact to the tree.
17. The deck and supporting members should be designed to allow a horizontal gap for expected radial trunk expansion of the tree in the near to mid future (minimum of 200mm offset from trunk). Cable netting or similar be fixed in the gap should be considered to reduce pinch point hazards.
18. Where possible, an opening in the deck to be used by the relevant maintenance or technician crew should be provided to carry out inspections of the soil surface under the deck, and to provide soil ameliorants such as organic fertilisers, mulch and water.
19. A management plan should be prepared with the Construction drawings to guide demolition of existing surfaces and construction methodology which minimises soil compaction within the TPZ and mechanical damage to the trunk and branches.
20. Consideration should be given to incorporate an area of existing hardstand contiguous to Trees 16 & 40 to be converted to mulched garden to maximize the area of permeable soil surface (refer to Tree

Location Plan). The preparation of the surrounding garden bed soil should avoid change to existing soil levels and be appropriate to the pH and nutrient tolerances of each tree. Species selected should not have high moisture and nutrient needs in order to reduce potential competition with the tree. Nursery stock in small containers should be used (e.g 75mm grow tubes or smaller).

21. Reinstated asphalt or new softfall replacing asphalt should be at or above existing asphalt levels. Typical artificial turf/softfall installation specifications require deeper subbase preparation than asphalt which has been installed for some years and is likely to cut into soil containing roots. Existing sub-base should be retained in position without excavation into the soil beneath.
 22. Tree 16 will require pruning of 15% of the crown to provide clearance to scaffold during construction.
- The retention of Tree No.'s 54 and 55. These trees are of medium-high significance and will require the following detail and methodology in construction drawings to avoid and minimise impacts from the proposed major encroachment. Specifically, construction drawings should show:
 7. Refurbished paved area over existing pavement to not require excavation deeper than existing paving or beyond existing paving footprint.
 8. Stump grinding limited to immediately under the soil surface, following the removal of Trees 51, 52 & 53.
 9. Planting drawings should specify:
 - a. Smallest planting stock available (e.g 75mm grow tubes or 140mm if necessary).
 - b. No widespread soil replacement other than individually placed in hole at planting as necessary.
 - c. 75-100mm of coarse organic mulch having both wood and leaf litter components.
 10. Existing pathways should be removed carefully by hand within the TPZ of the trees without excavating below the sub-grade.
 - b. Trunks will require protection from mechanical damage and soil from compaction by machinery during construction.
 11. Methodology to limit damage to tree parts, and soil containing roots during demolition and reconstruction of high retaining wall and low garden retaining wall.
 12. The construction of the new wall will be over the existing footings or beyond them where root growth from these trees is minimal. The impact from these works will be minimal, provided the existing footings are used where possible, or new footings are confined to the existing footing footprint.
 - c. Care must be taken to remove only the part of footings necessary to install the paving. Machinery used must only occupy the existing paved area.
 - d. The construction of the new wall should be over the existing footings where possible or new footings are confined to, or behind the existing footing footprint.
 - Proposed planting around existing retained trees should disrupt trees as little as possible. Limiting planting to low density planting of small nursery stock within the TPZ and excluding planting totally within the SRZ.

- All retained Trees –
- The preparation of all subsequent architectural, landscape, civil (including bulk earthworks and stormwater), hydraulic, power, comms, sewerage or other service design development plans must be carried out in close liaison with the Project Arborist.
- A Tree Protection Plan should be prepared to guide construction methodology and barrier installation as necessary to protect the trees during construction works. The plan should be prepared following provision of a CMP (Construction Management Plan) and/or TMP (Traffic Management Plan), in liaison with Construction plans and consistent with any conditions of consent by the approval body and AS4970 (2009), sections 4 & 5.
- For additional tree protection information see **6. Tree Management Plan** (page 22) and **10. General Tree Protection Notes** (page 39).
- This arboricultural impact assessment should be reviewed upon the preparation of revised plans or proposed services. Changes to encroachments must be 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	Responsibility	Certification	Timing of Inspection
1	Complete foundation design so to avoid woody roots greater than 40mm	Principal Contractor	Project Arborist	Prior to construction certificate application
2	Indicate clearly (with spray paint on trunks) trees approved for removal only	Principal Contractor	Project Arborist	Prior to demolition and site establishment.
3	Install TPF and additional root, trunk and/or branch protection	Principal Contractor	Project Arborist	Prior to demolition and site establishment.
4	Supervise all excavation works proposed within the TPZ	Principal Contractor	Project Arborist	As required prior to the works proceeding adjacent to tree
5	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Quarterly during construction period
6	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Following the removal of tree protection measures from HP 3
7	Final Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Prior to issue of occupation certificate.

7. Tree Survey Table

	-	Highest retention value trees (M-H to H)
	-	Medium retention value trees (M)

Impact unknown

No impact

Minor encroachment

Major encroachment

Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Significance	Am	Eco	Form	Development Setback and Encroachment 2021 Draft SSD	Comments
1	Melaleuca	quinquenervia	Broad-leaved Paperbark	9	9	580				580	620	2707	6960	M	F	Av	L	L	M	CD,M,B,Su	No impact	Crown skewed south.Multi trunked at 2m.
2	Melaleuca	quinquenervia	Broad-leaved Paperbark	17	12	950				950	990	3295	11400	M	Av	Av	M	M	M	D,M,B	No impact	-
3	Melaleuca	quinquenervia	Broad-leaved Paperbark	17	10	850				850	860	3106	10200	M	Av	Av	M	M	M	CD,M	No impact	-
4	Melaleuca	quinquenervia	Broad-leaved Paperbark	9	10	450				450	500	2474	5400	M	Av	Av	M	M	M	CD,Su,B	No impact	-
5	Melaleuca	quinquenervia	Broad-leaved Paperbark	16	12	780				780	780	2981	9360	M	Av	Av	M	M	M	D,B	No impact	DBH at 0.5m
6	Melaleuca	quinquenervia	Broad-leaved Paperbark	10	13	930				930	850	3091	11160	M	Av	Av	M	M	M	CD,B	Indicative communications conduit within TPZ. Impact Unknown - More information required	-
7	Corymbia	citriodora	Lemon Scented Gum	22	11	560				560	640	2744	6720	M	Av-G	Av	M	M	M	D,B	Indicative communications conduit within TPZ. Impact Unknown - More information required	Rubbing branch from T8
8	Corymbia	citriodora	Lemon Scented Gum	22	11	770				770	830	3060	9240	M	Av-G	G	M-H	M	M	CD,B	Indicative communications conduit within TPZ. Impact Unknown - More information required	Previously lopped at 6m. Crown skewed N.
9	Corymbia	citriodora	Lemon Scented Gum	22	11	645				645	800	3013	7740	M	Av-G	G	M	M	M	CD,B	No impact	Located in 3m retained bed T
10	Corymbia	citriodora	Lemon Scented Gum	25	15	690				690	780	2981	8280	M	Av-G	Av	M	M	M	CD,B	No impact	Crown skewed to west.
11	Corymbia	citriodora	Lemon Scented Gum	21	12	620				620	690	2832	7440	M	Av-G	G	M-H	M	M	CD,B	No impact	-
12	Corymbia	citriodora	Lemon Scented Gum	20	15	570				570	640	2744	6840	M	Av-G	Av	M	M	M	CD,B	No impact	Crown skewed to east.
13	Melaleuca	quinquenervia	Broad-leaved Paperbark	13	5	480				480	480	2431	5760	M	Av	F-Av	L-M	L-M	M	CD,U	Within development footprint - landscape planting	Lean to S.
14	Jacaranda	mimosifolia	Jacaranda	14	11	370				370	440	2344	4440	M			M				No impact	
15	Jacaranda	mimosifolia	Jacaranda	14	9	440				440	460	2388	5280	M	G	Av	M	M	L	CD,L,B	Within development footprint - landscape planting	Lean to North D.5-2.0m
16	Syzygium	smithii	Lilly Pilly	13	15	420	500			653	650	2762	7836	M	G	G	M-H	H	H	D,B	Located within area of proposed elevated platforms providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ of 40%. 2.4m from hardstand providing 50% encroachment. Crown encroachment of 14 % from clearance for scaffold of Building I.	

	-	Highest retention value trees (M-H to H)
	-	Medium retention value trees (M)

Impact unknown

No impact

Minor encroachment

Major encroachment

Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Significance	Am	Eco	Form	Development Setback and Encroachment 2021 Draft SSD	Comments
17	<i>Tristania</i>	<i>laurina</i>	Water Gum	12	13	310	320	350		567	590	2652	6804	M	G	G	M	M-H	M	D,B	Within development footprint - landscape planting	Light lean to North
18	<i>Liquidambar</i>	<i>styraciflua</i>	Sweet Gum	14	18	670				670	790	2997	8040	M		Av	M	M	L	CD,B	No impact	DW ro 120mm / 200mm stub on ? To FOB, V
19	<i>Eucalyptus</i>	<i>botryoides</i>	Southern Mahogany	20	15	690				690	760	2949	8280	M	Av-G	Av	M	M	H	CD,B,CS	No impact	40% crown epicormic growths to 1m length
20	<i>Eucalyptus</i>	<i>paniculata</i>	Grey Ironbark	21	10	470				470	510	2494	5640	M	G	Av	M	M	H	CD,SU	No impact	-
21	<i>Corymbia</i>	<i>citriodora</i>	Lemon Scented Gum	21	14	440				440	490	2453	5280	M	Av-G	Av	M	M	M	CD,U	No impact	-
22	<i>Corymbia</i>	<i>maculata</i>	Spotted Gum	20	12	640				640	710	2866	7680	M	G	G	M-H	M	M	CD,B	No impact	-
23	<i>Eucalyptus</i>			11	8	300				300	320	2051	3600	SM	G	G	M	M	H	CD,U	No impact	-
23a	<i>Fraxinus</i>			9	6	250				250	340	2104	3000	SM	?	Av	L-M	L-M	L	CD,CS	No impact	Crown skewed S.
24	<i>Jacaranda</i>	<i>mimosifolia</i>	Jacaranda	10	7	200	260			329	380	2204	3948	SM	Av-G	Av	L-M	L-M	L	CD,M	No impact	-
25	<i>Fraxinus</i>	sp.	Ash	11	8	420				420	500	2474	5040	M	?	Av	M	M	L	CD,B	No impact	Health unknown. Winter deciduous sp. Epis c
26	<i>Eucalyptus</i>	<i>microcorys</i>	Tallowwood	15	9	460				460	570	2613	5520	M	G	G	M	M	M	D,B	No impact	In full flower
27	<i>Banksia</i>	<i>integrifolia</i>	Coast Banksia	15	5	250				250	270	1910	3000	SM	G	G	L-M	L-M	H	CD,U	No impact	
28	<i>Banksia</i>	<i>integrifolia</i>	Coast Banksia	14	1	200				200	220	1752	2400	SM	G	F-Av	L-M	L-M	H	CD,L	No impact	Lean to W.

	-	Highest retention value trees (M-H to H)
	-	Medium retention value trees (M)

Impact unknown

No impact

Minor encroachment

Major encroachment

Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Significance	Am	Eco	Form	Development Setback and Encroachment 2021 Draft SSD	Comments
29	Pinus	radiata	Radiata Pine	17	11	600				600	660	2779	7200	M	F-Av	Av	M	M	L	D,U	No impact	Crown bias to N. Somewhat sparse.
30	Washingtonia	filifera	California Fan Palm	13	4	680				680		1500	8160	M	G	G	L-M	L-M	L	CD,Pa	No impact	-
31	Erythrina	crista-galli	Cockspur Coral Tree	6	4	400				400	500	2474	4800	M	?	F-Av	L	L	L	CD,CS,L	No impact	Health & structure unknown. Winter decidu
32	Pinus	radiata	Radiata Pine	15	8	550				550	620	2707	6600	M	Av	Av	M	M	L	CD,U	No impact (<1%)	
33	Pinus	radiata	Radiata Pine	9	5	300				300	350	2129	3600	M	Av	F-Av	L	L	L	CD,L	No impact (<1%)	Lean to South
34	Corymbia	citriodora	Lemon Scented Gum	22	15	660				660	740	2916	7920	M	G	G	M-H	M-H	M	D,B	No impact	-
35	Quercus	robur	English Oak	15	16	790				790	920	3195	9480	M	G	Av	M-H	H	L	CD,Sp	No impact	-
36	Jacaranda	mimosifolia	Jacaranda	9	10	600				600	600	2670	7200	M	P-F	Av	L-M	M	L	CD,CS,M	Within development footprint - Cut for terraced excavation	Located within area part covered with asp
37	Jacaranda	mimosifolia	Jacaranda	9	8	300				300	360	2155	3600	M	F-Av	Av	L-M	L-M	L	CD,CS	Within proposed elevated platform providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ. Encroachment from demolished low masonry wall and conversion of existing hardstand to softfall under shade sails.	Located within area part covered with asp
38	Jacaranda	mimosifolia	Jacaranda	9	10	400				400	450	2366	4800	M	Av	Av	M	M	L	CD,CS,M	Within proposed mulched area and 1.2m from elevated platforms providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ.	Located within area part covered with asp
39	Jacaranda	mimosifolia	Jacaranda	10	11	360				360	360	2155	4320	M	Av	Av	L-M	L-M	L	CD,CS,M	Within edge of proposed elevated platform and mulched area providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ. Encroachment from demolished low masonry wall and resurfacing of existing hardstand under shade sails.	Located within area part covered with asp

	-	Highest retention value trees (M-H to H)
	-	Medium retention value trees (M)

Impact unknown

No impact

Minor encroachment

Major encroachment

Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Significance	Am	Eco	Form	Development Setback and Encroachment 2021 Draft SSD	Comments
40	Cupressus	glabra	Arizona Cypress	11	12	1330				1330	1330	3730	15960	M	Av	Av	M	M	L	CD,M	Within proposed elevated platforms providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ 15.7%. 3.45m from proposed hardstand conversion to soffitall providing 27% encroachment within TPZ. 1.77m from proposed demolished timber edging. Indicative communications conduit within TPZ. Electrical services conduit shown as demolished within the TPZ.	Located within area part covered with asp
41	Cinnamomum	camphora	Camphor Laurel	14	15	790				790	900	3166	9480	M		Av	M	M	L	D,B	Located 5.92m from retaining walls and 6.75m from elevated platforms providing 15.7% continuous and discontinuous excavation and /or permeable lightweight decking with air gap within TPZ .	Located within area part covered with asp

	-	Highest retention value trees (M-H to H)
	-	Medium retention value trees (M)

Impact unknown

No impact

Minor encroachment

Major encroachment

Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi- cance	Am	Eco	Form	Development Setback and Encroachment 2021 Draft SSD	Comments
42	Lophostemon	confertus	Brush Box	10	3	200				200	250	1849	2400	J		G	L	L	M	CD,U	Located adjacent proposed elevated platform providing discontinuous excavation and /or permeable lightweight decking with air gap within TPZ and SRZ and interaction between trunk and deck in the near future.	Located within area part covered with asp
43	Eucalyptus	paniculata	Grey Ironbark	21	13	680				680	770	2965	8160	M	G	G	M-H	M-H	H	D,U	Within development footprint - Building I	-
44	Eucalyptus	punctata	Grey Gum	15	7	370				370	400	2252	4440	SM	Av	G	L-M	M	H	D,Up	Within development footprint - asphalt	20% epis.
45	Liquidambar	styraciflua	Sweet Gum	12	6	400				400	430	2322	4800	SM	G	F	L-M	L-M	L	CD,U	Located 0.55m from proposed stormater pit and pipe, terraced stairs and path providing a 66% (major) encroachment within TPZ. Crown pruning and shading. Indicative communications conduit within TPZ.	Congested multiple leaders at 2m. Include
46	Eucalyptus	nicholii	Narrow-leaved Black Peppermint	11	8	580				580	540	2555	6960	M	P-F	F-Av	L	L	M	CD	Within development footprint - ramp and path. Indicative communications conduit within TPZ.	In stress. 40% crown live epis. 40% crown de
47	Eucalyptus	camaldulensis	River Red Gum	16	9	470				470	500	2474	5640	M	G	G	M	M	M	CD,B	Located 2.9m from proposed path providing a 20.4% encroachment within TPZ. Crown pruning to 10% and shading from roof line at RL94.2 (12m above grade). Indicative communications conduit within TPZ.	-
48	Melia	azedarach	White cedar	10	13	440				440	500	2474	5280	SM	Av	G	L-M	M	M	CD,Sp	Within development footprint - building	Winter deciduous.
49	Pinus	radiata	Radiata Pine	18	11	930				930	1010	3323	11160	M	P-F	Av	L	L	L	CD,B	Located 1.68m from proposed paving, stairs, proposed stormwater and building providing 37% encroachment within the TPZ. Stormwater discharge line within TPZ. Indicative communications conduit within TPZ.	Crown dieback to 30% of crown (mid to low)
50	Syzygium	oleosum	Blue Cherry	11	5	440				440	600	2670	5280	M	G	G	M	M	M-H	D,U	Within development footprint - path	-

	-	Highest retention value trees (M-H to H)
	-	Medium retention value trees (M)

Impact unknown

No impact

Minor encroachment

Major encroachment

Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Significance	Am	Eco	Form	Development Setback and Encroachment 2021 Draft SSD	Comments
51	Celtis	australis	European Nettle Tree	10	5	280				280	280	1939	3360	M	G	G	L	L	L	CD,U	Located 0.48m from expanded paved area over existing garden providing 38% encroachment within the TPZ and encroachment within SRZ.	Widely considered to be weedy species.
52	Casuarina	cunninghamiana	River Sheoak	12	4	280				280	340	2104	3360	SM	G	G	L	L	M	CD,U	Within development footprint - paving	-
53	Celtis	australis	Hackberry	10	8	430				430	450	2366	5160	M	G	G	L	L	L	CD,B	Located 1.29m from expanded paved area over existing garden providing 32% encroachment within the TPZ and encroachment within SRZ.	Widely considered to be weedy species.
54	Eucalyptus	botryoides	Southern Mahogany	20	9	880				880	870	3121	10560	M	Av-G	Av	M-H	M-H	H	CD,B	Located adjacent to refurbished paved area over existing pavement (22%) (encroachment within the SRZ); located 2.16m to existing retaining low retaining wall and proposed planted area of existing garden bed (13%) and 4.8m from proposed retaining wall (6.8%) providing a 41.6% (major) encroachment within TPZ. Indicative communications conduit within TPZ.	DBH raken at 1.1m above grade.
55	Angophora	costata	Smooth-barked Apple	20	18	465	595			756	860	3106	9072	M	G	G	M-H	M-H	H	CD,B,L	Located 3.7m from refurbished paved area over existing pavement (16.5%), located 5.51m to low retaining wall and proposed planted area of existing garden bed (7.0%) and 7.24m from proposed retaining wall (3.6%) providing a 27.0% (major) encroachment within TPZ. Indicative communications conduit within TPZ.	Crown skewed SE. Light lean to SE.
56	Angophora	costata	Smooth-barked Apple	20	20	1050				1050	990	3295	12600	M	G	G	H	H	H	CD,B,M	Located 9.9m from refurbished and expanded paved area, providing a 1.0% (minor) encroachment within TPZ.	3 main stems.
57	Eucalyptus	sp.	Stringybark	14	8	380				380	480	2431	4560	M	G	Av	M	M	H	CD,CS,L	No impact	Crown skewed S
58	Eucalyptus	globoidea	White Stringybark	14	9	250	450			515	770	2965	6180	M	G	Av	M	M	H	CD,CS,L	No impact	Crown skewed S
59	Melaleuca	stypelioides	Prickly-leaved Paperbark	12	10	775				775	775	2973	9300	M	G	Av	M	M	M	CD,M,B	No impact	DBH measured at .5m Multi trunked at 1.0m
60	Melaleuca	quinenervia	Broad-leaved Paperbark	10	4	290				290	390	2228	3480	SM	F-Av	Av	L	L	M	CD,U	No impact	Forest form
61	Pinus	radiata	Radiata Pine	19	9	630				630	710	2866	7560	M	F-Av	Av	M	M	L	CD,B	No impact	Die back in lower mid crown. Late mature.
62	Eucalyptus	botryoides	Southern Mahogany	20	10	690				690	810	3029	8280	M	Av-G	Av-G	M	M	MH	D,B	No impact	Damaged exposed surface lateral root, S t
63	Corymbia	calophylla rosea	Pink Flowered Marri	7	10	420				420	470	2410	5040	M	F-Av	Av	L-M	L-M	M	CD,Sp	No impact	DBH at 1.0m. Crown somewhat sparse.

	-	Highest retention value trees (M-H to H)
	-	Medium retention value trees (M)

Impact unknown

No impact

Minor encroachment

Major encroachment

Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Significance	Am	Eco	Form	Development Setback and Encroachment 2021 Draft SSD	Comments
64	Erythrina	x sykesii	Indian Coral Tree	8	8	500				500	590	2652	6000	M	Av	Av	L	L	L	CD	Within development footprint - path. Indicative communications conduit within TPZ.	Resumed winter deciduous tree.
65	Lagerstroemia	indica	Crepe Myrtle	6	6	800				800	800	3013	9600	M	Av	Av	L	L	L	CD,M,B	Within landscaped garden. Indicative communications conduit within TPZ.	DBH at ground level.
66	Schefflera	actinophylla	Umbrella Tree	7	7	550				550	600	2670	6600	M	G	G	L	L	L, M	CD,B	Within landscaped garden. Indicative communications conduit within TPZ.	Widely considered to be weedy species. N
67	Araucaria	cunninghamiana	Hoop Pine	18	9	933				933	980	3281	11196	M	G	G	L	L	M	CD,B	No impact	Large Tree located north east of Block G. E

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, Spread, Trunk Dia, DBH and DRB

- The tree's height and spread 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

The age class of each tree is estimated as either:

- **J** – Juvenile, a young sapling, easily replaced from nursery stock.
- **SM** - Semi Mature, a tree that has not grown to mature size.
- **M** - Mature, a tree that has reached mature size and will slowly increase in size over time.
- **OM** - Over Mature, a tree that has been mature for a long period and is beginning to display signs of decline, e.g. large dead branches.
- **S** - Senescent, an over mature tree that is now in 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 9). 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 trees contribution to the environment. It is determined by the trees 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 or weed species.
- **Ha** – Habitat, is the tree valued by fauna for food (ie. foliage fruit or sap) or shelter (ie. nesting, roosting, dray or hollow).

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; **(U)** Upright, **(B)** Broad, **(C)** Conical, **(Sh)** Shrub, **(BC)** Bias Crown **(CS)** Crown Shy (also referenced is the adjacent dominant tree canopy ie. **T4**), **(V)** Vase, **(D)** Dome, **(P)** Palm, **(S)** Spreading, **(L)** Leaning or **(BM)** Basal Multi Trunked.

Crown form may also be assessed in accordance with the relationship with the neighbouring tree and recorded as either: **S** - Suppressed, the crown is located beneath another larger crown and is leaning away (Crown Shy); **CD** - Codominant, the crown is adjacent to another crown of similar size, their crown areas may appear joined; **D** - Dominant, the crown is above other lower crowns; **E** - Emergent, 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)

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):

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

8.12. TPZ (Tree Protection Zone)

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.

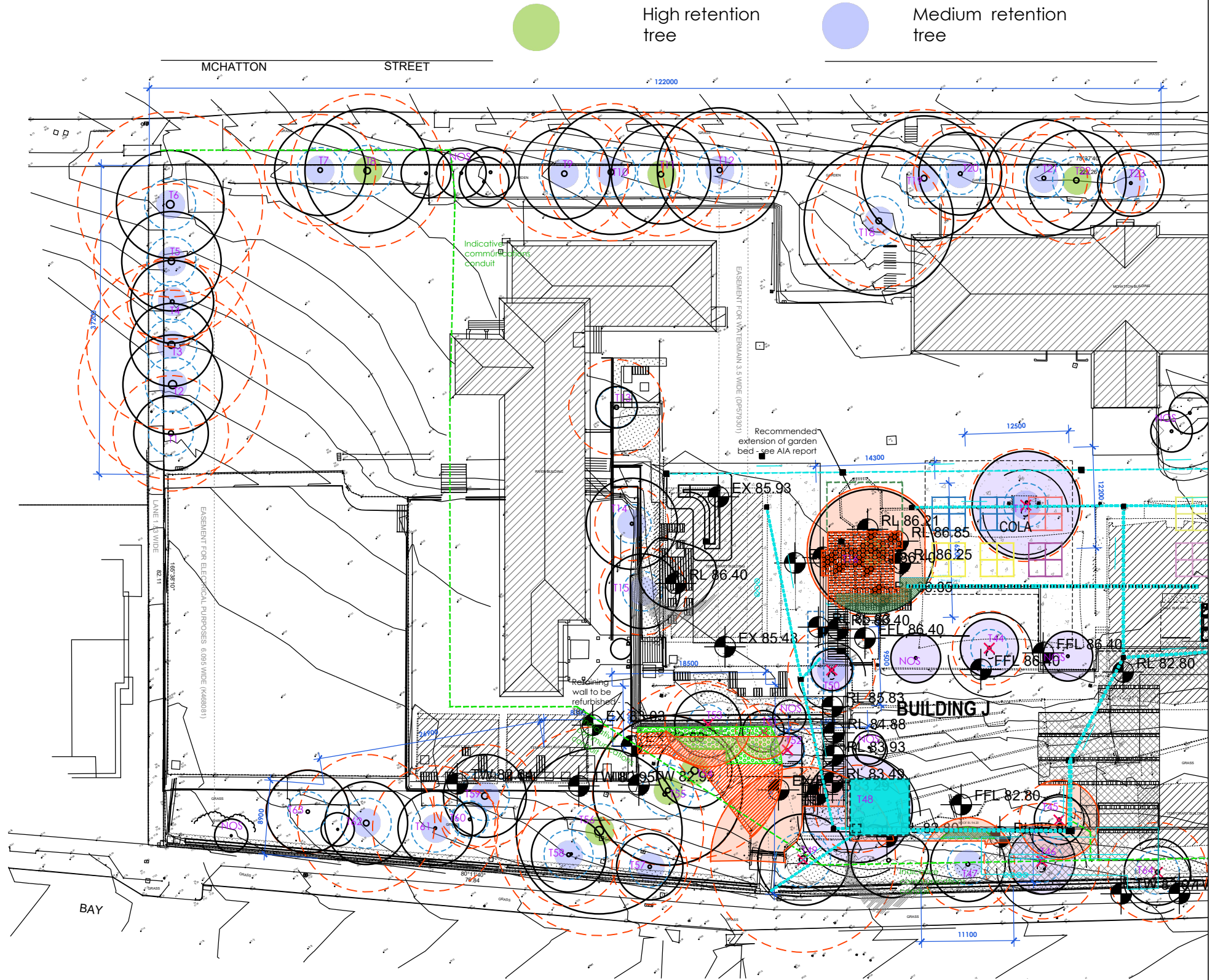
8.14. Comments



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

LEGEND

- | | |
|--|---|
| | <p>Existing levels</p> <p>Proposed levels</p> <p>Proposed Top Of Wall levels</p> <p>Boundary</p> <p>To be removed / demolished</p> <p>Hydraulic lines - SW</p> <p>Building under</p> <p>Building</p> <p>Building over</p> <p>Retaining walls</p> <p>Fence</p> <p>Earthworks</p> |
| | <p>Tree Protection Zone</p> <p>Indicative crown spread</p> <p>Existing tree</p> <p>Structural Root Zone</p> <p>Trunk diameter</p> |
| | <p>Assessed tree within development footprint</p> |
| | <p>Cut encroachment into Tree Protection Zone</p> |
| | <p>Proposed Paving encroachment into Tree Protection Zone</p> |
| | <p>Encroachment from permeable timber deck on pier footings</p> |
| | <p>Encroachment from proposed planted area</p> |



REVISION		DESCRIPTION	DRAWN	CHECK	DATE	ADDRESS		PROJECT				
A		SUBMITTED TO CLIENT FOR COMMENT	OC+AM	AS	20-09-19	 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)		NEW RESIDENCE				
B		SUBMITTED TO CLIENT FOR COMMENT	OC+AM	AS	14-04-20			DRAWING TREE LOCATION PLAN				
C		SUBMITTED TO CLIENT REVISED LANDSCAPE DRAWINGS	AM	AS	19-08-21			SCALE	ISSUE	SHEET		
D		SUBMITTED TO CLIENT REVISED LANDSCAPE DRAWINGS	AM	AS	25-08-21			1:500 @ A3	DA	T - 01		
						CLIENT		SCALE 1:500 @ A3 ISSUE DA SHEET T - 01 DRAWN AM+OC CHECK AS DATE 25-08-21 REVISION D				
						NORTH SYDNEY PUBLIC SCHOOL		DET NSW				
						1. Do not scale from drawings 2. Verify all measurements on site 3. Notify ecodesign of any inconsistencies 4. Copyright © arboreport. All rights reserved 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				

LEGEND

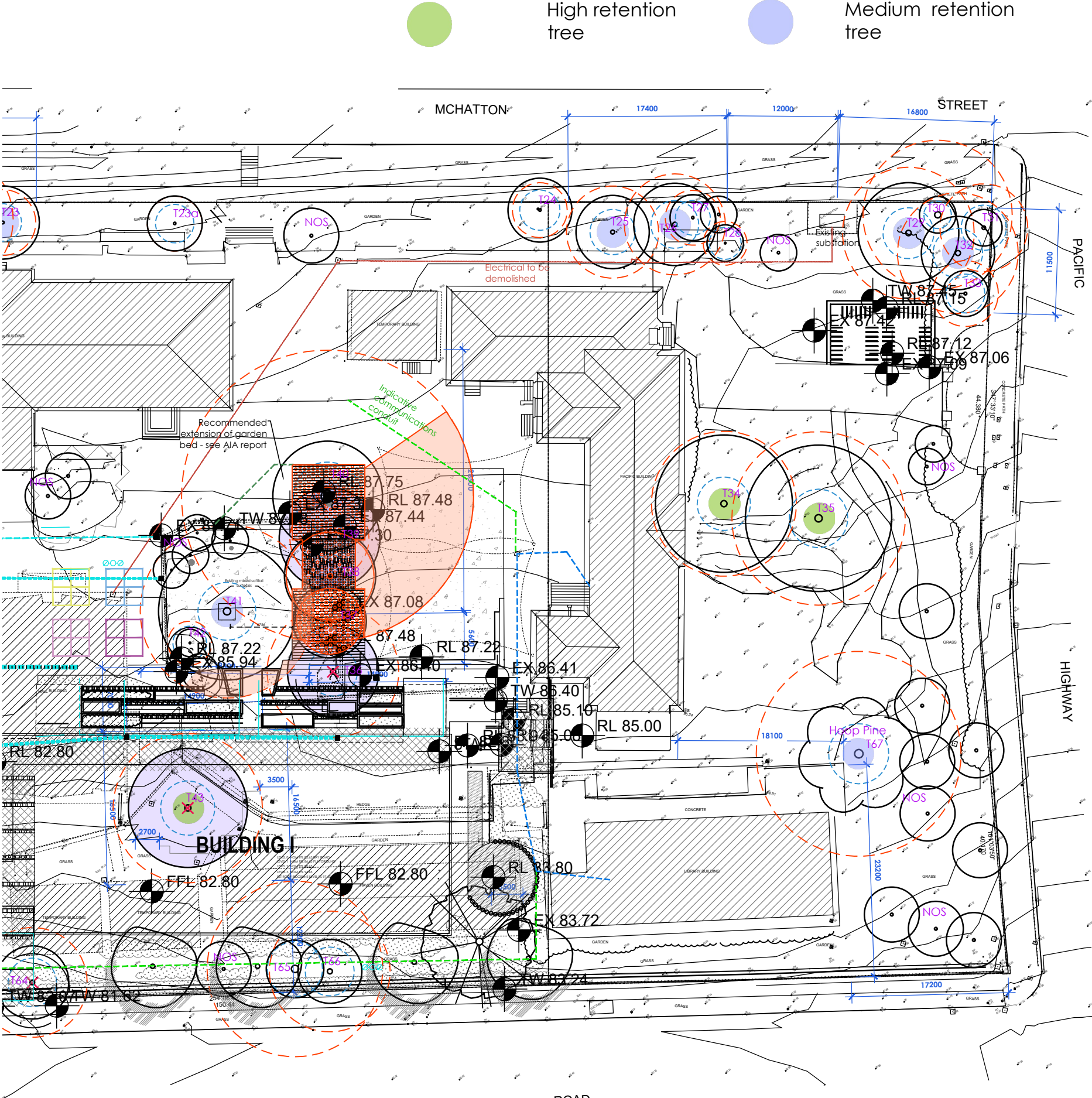
- +101.45

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

- Tree Protection Zone
- Indicative crown spread
- Existing tree
- Structural Root Zone
- Trunk diameter
- Assessed tree within development footprint
- Cut encroachment into Tree Protection Zone
- Proposed Paving encroachment into Tree Protection Zone
- Encroachment from permeable timber deck on pier footings
- Encroachment from proposed planted area



REVISION	DESCRIPTION	DRAWN	CHECK	DATE
A	SUBMITTED TO CLIENT FOR COMMENT	OC+AM	AS	20-09-19
B	SUBMITTED TO CLIENT FOR COMMENT	OC+AM	AS	14-04-20
C	SUBMITTED TO CLIENT REVISED LANSCAPE DRAWINGS	AM	AS	19-08-21
D	SUBMITTED TO CLIENT REVISED LANSCAPE DRAWINGS	AM	AS	25-08-21



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. Copyright © arboreport. All rights reserved

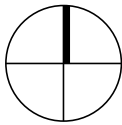
5. Drawing remains the property of arboreport
6. All work to comply with relevant Australian Standards or Building Code of Australia

7. All work to be performed by a suitably qualified tradesperson

8. For application purposes only - NOT FOR CONSTRUCTION

ADDRESS	NORTH SYDNEY PUBLIC SCHOOL		
CLIENT	DET NSW		

PROJECT	NEW RESIDENCE		
DRAWING	TREE LOCATION PLAN		
SCALE	1:500 @ A3	ISSUE	DA
DRAWN	AM+OC	CHECK	AS
SHEET	T - 02	DATE	25-08-21
REVISION	D		



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:

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

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:

- To enclose as much of the TPZ as can reasonably be enclosed, allowing for pedestrian access and 1m offset around construction footprint and scaffolding.
- Cyclone chain link wire fence or similar, with lockable access gates.
- Certified and Inspected by the Project Arborist
- Installed prior to the commencement of the works.

- Prominently signposted with 300mm x 450mm boards stating “**NO ACCESS TO THIS AREA - TREE PROTECTION ZONE CONTACT PROJECT ARBORIST 0407 006 852**”.

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 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.

Further Whilst work is being carried out by climbing arborists (AQF Level 3) aerial inspection of stems, branches and their attachments should be made when work is being carried out. 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.

11. References

1. **AS 4970 - 2009 Protection of Trees on Development Sites**; Standards Australia.
2. **AS 4373 - 2007 Pruning of Amenity Trees**; Standards Australia.
3. Chapman, G.A, Murphy, C.L.; **Soil Landscapes of the Sydney 1:100 000 Sheet**; Soil Conservation Service of NSW, Sydney; 2004.
4. Henderson,L.; **Sydney Soil Landscape Series Sheet 9130**; NSW Department of Land and Water Conservation; 2004.
5. Fairley, A., Moore, P.; **Native Plants of the Sydney District an Identification Guide**; New Holland; Sydney; 2002.
6. Fakes, J.; **Arboriculture and Tree Care and Maintenance Notes**; TAFE NSW; 2004.
7. Barrell, J.; **Tree AZ**; <http://www.barrelltreecare.co.uk/treeaz> ; 2005.
8. Fairley, A., Moore, P.; **Native Plants of the Sydney District an Identification Guide**; New Holland; Sydney; 2002.
9. Fakes, J.; **Arboriculture and Tree Care and Maintenance Notes**; TAFE NSW; 2004.
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. NPWS; **Native Vegetation of the Cumberland Plain Maps 1 to 16**; NPWS; Sydney; 2002.
17. NPWS; **Native Vegetation Maps of the Cumberland Plain Western Sydney Interpretation guidelines**; NPWS; Sydney; 2002.
18. Robinson, L.; **Field Guide to the Native Plants of Sydney**; Kangaroo Press; Sydney; 1994.
19. Wrigley, J. W., Fagg, M. A.; **Australian Native Plants Cultivation, Use in Landscaping and Propagation**; Kangaroo Press; Sydney; 2003.