arboricultural impact assessment report

AIA-01

Revision A, Issued for Urban Design Review Panel
15 May, 2019

DOCUMENT INCLUDES

- T-01 Tree Protection Specifications
- T-02 Tree Retention Value Plan
- T-03 Tree Protection & Removal Plan

PROJECT

St Dominic's College – Block E

21 Copeland Street
Kingswood, NSW 2747

CLIENT / PRINCIPAL

St Dominic's College

21 Copeland Street
Kingswood, NSW 2747

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i EXECUTIVE SUMMARY

On the 10 December 2018, Arterra was engaged by PMDL on behalf of St Dominic's College (the client) to undertake an arboricultural assessment of the trees located at 21 Copeland Street Kingswood (the site) and prepare the relevant arboricultural reports and plans to help guide the proposed re-development. A tree assessment and impact schedule were completed for all the trees. (Refer to Appendix 4.3 – Tree Impact Assessment Schedule).

There are currently **31 trees** recorded and assessed on, or immediately adjacent to the development site (the arboricultural study area). The proposal is to construction a new multipurpose building. The building is designed to address both the oval level and the adjoining Copeland Street frontage. There is also a basement carparking area linking to the existing surface car parking to the west. The proposed building replaces the existing COLA and demountable structures. Its size, position and the required grading will necessitate the removal of the trees between the COLA/ demountable class rooms and Copeland Street.

We concede that as a 'grouping' of trees, when one considers the larger row of along Copeland Street, the trees do positively contribute to the wider streetscape of Copeland Street. They are visually prominent trees and part of the larger row planting. We do note that the majority of these trees, particularly the larger trees, have been heavily pruned, by energy authorities, on the Copeland Street side to maintain clearances away from the adjoining high and low voltage power lines. This has rendered many of these trees with a less than desirable form.

The decision to remove the trees along the Copeland Street frontage has not been taken lightly. As with all aspects in the development and construction process, the tree related constraints have to be weighed up against many other relevant development opportunities and constraints. A number of different options were fully considered by the team for retaining the majority of trees, but ultimately considered unfeasible.

In summary the proposal:

- Requires the **removal of 16** trees.
  - **10** are moderate retention value.
  - 2 are **low value**.
  - 4 are **very low value**.
- The proposal involves the replacement planting of approximately **30 new trees** located primarily between the Copeland Street and the new building.
- Currently the overall site has approximately 183 trees, therefore the removal of 16 trees represents **less than 9%** of the current population being removed. With the replacement trees, there will be net increase in tree numbers on the site.
- The existing canopy coverage of the site is approximately 7,440m2. It is proposed to remove approximately 470m2 and reinstate approximately 350m2. This is a net reduction in canopy coverage of **only 120m2**.
- The new tree planting **more positively addresses the street** frontage and is designed to minimise interference or future conflicts with the existing powerlines thereby reducing ongoing tree maintenance and pruning requirements. Although it is acknowledged that the majority of new trees are smaller in stature to those removed, we advocate that the proposed landscaping represents a balanced and appropriate outcome. It also provides a lower level and human-scale screening of the proposed building, particularly the basement carparking level.

As with all aspects in the development and construction process, the tree related constraints have to be weighed up against many other relevant development opportunities and constraints. The retention of the trees on the site must also consider economic, social, environmental, construction and practical realities. This document has been prepared by Arterra Design Pty Ltd, using the expertise of our in-house consulting arborist (AQF Level 5), Robert Smart. Robert is a member of the International Society of Arboriculture - Australian Chapter and is also a Registered Consulting Arborist with Arboriculture Australia.

Robert Smart AAILA , ISA, AA
Director, Registered Landscape Architect (054), Registered Consulting Arborist (1804).

1.0 INTRODUCTION

1.1 Background

On the 10 December 2018, Arterra Design was engaged by St Dominic's College to undertake an arboricultural assessment of a portion of the grounds at St Dominic's College and prepare the relevant reports and plans to help guide the re-development. This assessment was restricted to a group of trees, adjacent to the main oval, immediately adjacent to the southern site boundary along Copeland Street, that were likely to be impacted by the proposed works associated with the development of **Block E**. The other trees within the broader site and unlikely to be impacted by the above works are not specifically addressed as part of this report.

The client proposes to construct a new multifunction building (Block E) with basement carparking along the southern side of the existing oval, adjacent to the southern site boundary along Copeland Street. This portion of the site currently contains demountable classrooms located at the same level as the existing playing surface of the oval. It appears the immediate area has been formed using cut and fill to attain the current level of the oval. There is a moderately steep batter that slopes from the footpath level of Copeland to the surface level of the oval. The batter between the oval and Copeland Street currently has scattered row of trees, some small garden beds and other minor infrastructure along its length. Given the location and proposed construction work on this portion of the site, a number of trees in this area will need to be removed.

Arterra completed a "Pre-development Assessment" of the existing trees that identified the trees and ranked their relative significance, health and retention values. This work was distributed to the client and also to the design team to help guide the building and development proposals.

This impact assessment report, and accompanying plans, has been prepared to identify the trees to be retained and removed as part of the development and so that the client can take a proactive approach to the management of the trees to be retained, and put in place appropriate measures to protect them during the construction.

1.2 Aims of This Report

The aim of this report is to assess the impact of the new development on the existing trees within the site. Specifically the report aims to:-

- Assess the health and condition of the trees;
- Accurately record information relevant to the existing trees;
- Assess the significance, Safe Useful Life Expectancy (SULE) and retention values of the existing trees;
- Provide clear recommendations as to which trees should ideally be retained and protected;
- Identify the proposed Tree Protection Zones (TPZ) of the tree being retained and identify and assess the likely arboricultural impacts of the development on the trees and
- Provide preliminary advice on the tree protection measures that will be required during construction to ensure the trees are successfully retained.

The following limitations apply to this report's use: -

1. Plans: All plans are based on information provided to Arterra. They should only be used relating to tree issues and are not suitable for any other purpose.
2. Notification of proposed alterations to disturbance within TPZs: Arterra must be clearly notified of any proposed alterations to the plans or additional disturbance in TPZs, so that we can advise on the implications before any work is undertaken.

1.3 Relevant Controls or Legislation

Penrith Council planning instruments that apply to the site's trees:-

- Local Environment Plan 2010 (PLEP 2010)
- Development Control Plan 2014 (PDCP 2014)
    - PDCP Part C2- Vegetation Management

A tree for the purposes of this report and as prescribed under section 5.9 of the PDCP 2014, is defined in Appendix F1 of the PDCP 2014. A Tree means: a living perennial plant that has a height of three (3) metres or more or a trunk circumference exceeding 300mm at 400mm above ground level or individual trees, gardens or native vegetation listed as Significant Trees and Gardens.

It is our understanding the site is not listed as a heritage item in the LEP nor does the site contain any trees listed on Councils' Register of Significant Trees.

1.4 Conduct and Author Qualifications

Given the above stated aims of this report, as author of this report, Arterra Design confirms that Robert Smart is suitably qualified (AQF 5 Consulting Arborist) to provide comment and the required arboricultural advice pertaining to these matters.

Furthermore, Mr Smart confirms that he has read and agrees to be bound by the NSW Uniform Civil Procedure Rules 2005, Part 31 Division 2 Provisions, Schedule 7 - Expert witness code of conduct.

Arterra provides specialist consulting arborist services only and does not provide any physical tree work services such as climbing, pruning, removal, root investigations or root pruning. Our advice is based on impartial professional assessment only, as we do not derive any financial benefit from specifying pruning or other physical services. We will not specify any such activities unless we determine them to be essential to ongoing tree health or stability.

1.5 Key Definitions and Abbreviations

The following abbreviations are used throughout this report.

"TPZ" = Tree Protect Zone
This is the area as defined by AS 4970 – "Protection of Trees on Development Sites" and means the typical minimum area above and below ground at a given distance from the trunk to provide for protection of the tree. Most importantly it represents the root zone required to be left undisturbed to maintain a healthy and viable tree. Please note, that roots will usually extend well beyond this zone, so this represents the minimum remaining root zone required, assuming all others are lost or damaged due to construction. It is typically calculated as a circle centred on the trunk unless existing site conditions can be assessed and indicate otherwise.

"SRZ" = Structural Root Zone
This is the area as defined by AS 4970 – "Protection of Trees on Development Sites" and means the area immediately around the base of the tree at a given distance from the trunk within which the woody roots and soil cohesion are considered vital to the structural stability of the tree. Disturbance, damage or removal of soil and roots within this area will typically render the tree unstable and require its removal. It is typically calculated as a circle, centred on the trunk, unless existing site conditions can be assessed and indicate otherwise.

DBH = Diameter at Breast Height
This is the diameter of the trunk measured at 1.4m above ground level.

DGL = Diameter at Ground Level
This is the diameter of the trunk measured at ground level, but just above any root flare.

Inclusion or Included Bark Branch Union
Growth of bark at the interface of two or more branches on the inner side of the branch union which is unable to be lost from the tree and accumulates, or is trapped, between the acutely divergent branches. This can form a weakened branch union in some species.

1.6 Documents Reviewed

Plans and documents referenced and reviewed as part of this tree impact assessment:-
LTS Lockley Surveyors:-

- Detail and Levels Survey – Ref# 42641DT, dated 16/11/2015

PMDL architects:-
Preliminary DA set issued 19/02/2019:

- 2794 DA001-Cover Sheet & Site Location.pdf
- 2794 DA020-Block E - Perspectives 01.pdf
- 2794 DA021-Block E - Perspectives 02.pdf
- 2794 DA022-Block E - Perspectives 03.pdf
- 2794 DA100-Block E - Partial Survey.pdf
- 2794 DA101-Site Analysis Plan.pdf
- 2794 DA110-Block E - Partial Site Plan L0.pdf
- 2794 DA120-Block E - Proposed Plans L0_ L1.pdf
- 2794 DA121-Block E - Proposed Plans L2_ Roof.pdf
- 2794 DA122-Block E - Bridge Link Plans.pdf
- 2794 DA200-Street Elevation.pdf
- 2794 DA201-Block E - Elevations 01.pdf
- 2794 DA202-Block E - Elevations 02.pdf
- 2794 DA320-Block E - Sections 01.pdf

- 2794 Section Facade 20190218.pdf
- 2794 SK001-Block E - Building Height Comparison.pdf
- 2794 SK010-Existing Street Elevation.pdf
- 2794 SK011-Street Elevation.pdf

At present we have not reviewed any of the proposed detailed servicing plans for the development but have assumed, and been advised by PMDL Architects, that no new services are proposed to be extended into the proposed TPZs, and any existing services that are no longer required will be capped off and left in situ.

1.7 Site Location, History and Context

The site is located approximately 2.0km east of Penrith CBD. It is an existing school, bordered by Copeland Street to the south, Parker Street to the west, Gascoigne Street to the north and Phillip Street to the east. The school is surrounded by a variety of established residential, commercial and industrial development. The site appears to have been predominantly cleared to accommodate the construction of the school buildings and sporting ovals. The ovals appear to have been formed with cut and filling, to provide level playing surfaces. On the southern side of the oval this results in an area above the original surface levels. A scattered and informal row of trees have been planted by the School along the Copeland street frontage. The trees are typically planted in two rows running east - west along the batter which slopes down to the southern site boundary. Near the existing COLA and demountable classrooms the trees are typically in a single row. It is unlikely that any of the trees surveyed and assessed are remnants of the natural site vegetation and most appeared to be less than 20 years in age. The COLA and demountable class roooms where installed around December 2006.

Figure 1 – The site and surrounds – Subject trees along southern boundary, adjacent existing COLA demountable classrooms. (Image: Nearmap October 2018)

1.8 Site Ownership and Zoning

The site identified as Lot 1 of DP 76600 (21 Copeland Street, Kingswood), with an approximate arear of 5.50ha, is owned and managed by St Dominic's College.

The site is currently zoned R2 (Low Density Residential) under Penrith Council LEP 2010 Land Zoning Map (https://www.planningportal.nsw.gov.au/find-a-property/2541030_21_Copeland_Street_1_Kingswood_DP76600 accessed 21/2/2019).

1.9 Assessment Methodology

On the 10 December 2018, Robert Smart of Arterra completed a detailed assessment of existing trees located within the site and those immediately adjacent and likely to be impacted by the proposed development. The trees' health and condition were assessed via a visual inspection of the trees from the ground only. Requisite

tree data (including DBH, DGL, height & canopy spread, condition & proximity to services) were recorded using an Apple iPad and Filemaker Pro database.

The basic health and condition criteria that were inspected for each tree can be summarised as follows: -

- Tree size, broad age-class and general balance of the tree;
- Above ground obstructions;
- Evidence of recent site disturbance;
- Canopy foliage size, colour and density;
- Dieback and epicormic growth;
- Trunk or branch wounding, branch tear outs and pruning history;
- Structural defects such as any co-dominant stems, cracks, splits, included bark, decay and
- Pests and disease evidence or occurrence.

All of the trees were photographed and given a unique identification number and plotted onto a scaled base plan for referencing and identification throughout the report and for future discussions and co-ordination. (Refer Appendix 4.3 and 4.1 TP-01 'Tree Impact Plan'). The photographic record of trees and general site context was taken using the inbuilt Apple iPad camera and a Panasonic Lumix TZ220 digital camera with GPS recording. Files have been resized, dated, named and filed in accordance with normal office procedures and protocols. No other image manipulation has been undertaken.

Tree trunk diameters were measured using a metric diameter tape measure. Tree heights were measured using the two-point clinometer function of a Nikon Forestry Pro laser range finder. Canopy spreads were estimated by pacing out distances along the cardinal axis of the canopy and cross-referencing to survey information and aerial photos. Canopy position and extents were then altered on the plans to more accurately portray the canopy extent and position.

A representative soil sample was taken in the immediate vicinity of the trees and tested for pH, structure, colour and soil texture class to get a basic understanding of likely soil conditions and topsoil depths surrounding the trees. The sample was extracted using a Dormer 50mmØ hand soil auger

Tests for pH were done using a Manutec field pH test kit. Soil structure was assessed by observation of soil pedality and soil texture assessment was done using procedures outlined for the field-testing of a moist bolus by McDonald et al, 1998 and Roberts, et al, 2006.

No exploratory excavations were done to determine location and condition of roots and no detailed soil laboratory testing was undertaken. No specialised equipment or methods were employed to test for the extent of decay in any of the trees, apart from a nylon 'sounding' mallet. No plant samples were analysed or independently tested to verify or formally identify any pests or diseases.

Desktop Review and Research

Digital AutoCAD files of the proposed works were imported into Arterra's standard CAD software (ArchiCAD v19) and superimposed over the tree and site survey information. The extent of site disturbance was analysed for the proposed building works, landscaping, services and other site grading. An assessment was made of the likely extent of impacts on the TPZs, taking into account the likely construction impacts depending on the type of work being undertaken (ie: cut or fill, suspended slabs, decks, service trenches). Various area calculations and measurements were made in the CAD software of the likely incursions into the TPZs or SRZs.

Recent aerial photography data was obtained from the Nearmap website with aerial photos of the site dating from October 2018 imported into the above software for cross checking and assessment. (http://www.nearmap.com/ accessed 04.12. 2017)

Climatic data was obtained from the Bureau of Meteorology using statistics from Orchard Hills Treatment Works AWS which is located approximately 5.5km to the south of the site. (http://www.bom.gov.au/climate/data/ accessed 21 Feb 2019)

1.10 Pre-Development Tree Assessment – SULE and Tree Retention Values

The information gathered in the field was tabulated and the retention value and tree risk assessed using a combination of techniques commonly used and recognised in the arboricultural industry. The tree life expectancy was established using the Safe Useful Life Expectance (SULE) system. A brief summary of these systems is provided below.

SULE

This is a system developed by Jeremy Barrell in 1993 that determines the time a tree may be expected to be retained based on its age, health, condition, safety and location. This is then moderated by the economics of

maintenance or other costs of retaining the tree. A long SULE means the tree is presently expected to live longer than 40 years with minimal intervention and cost. A short SULE indicates a tree that is not expected to live longer than 5 years or may require substantial intervention or costs to retain it.

RETENTION VALUE
The proposed retention value of the trees was determined based on a considered combination of the size, age, condition and suitability of the tree.

Each tree was then ranked according to one of 4 retention categories.

1. **"High" Retention Value** – these are trees that are typically in good or very good condition, large and visually prominent, historically or environmentally important. They may also be lesser quality trees, but part of an important grouping of trees. They should represent a serious physical constraint to the development and their removal avoided where possible and feasible.
2. **"Moderate" Retention Value** – these are trees that are in good to reasonable condition and should be retained where possible and feasible to do so. They may also be lesser trees, but part of an important grouping of trees and therefore warrant retention based on the group's value.
3. **"Low" Retention Value** – these are trees that are in poor condition or have structural defects, are particularly small or commonplace, are not historically, environmentally or socially significant and should not be considered as a constraint to the development. They could be retained only if they are not likely to be impacted by, or constrain potential desirable, development outcomes.
4. **"Should Remove" / No Retention Value** – these are trees that are in very poor health, exhibit poor form, or have serious structural defects, are considered weeds or combination of all these, and therefore should be considered for removal regardless of any development.

Consideration has also been given to the relationship of the trees to one and other and their proximity to the likely development areas on the site. For example, trees that are part of a closely spaced group, or are likely to be significantly misshapen or unstable with the removal of surrounding trees and structures are considered with these factors in mind.

1.11 Tree Assessment – Tree Protection Zones

In order to ensure the long-term survival and growth of any tree to be retained on the development site, a suitable area is required to be protected around the tree. This area should typically be as large as possible. It should also take into consideration: -

- The size and age of the tree;
- Above and below ground properties;
- The health and condition of the tree;
- The species of tree and its tolerance to disturbance;
- Soil conditions, type, depth and site hydrology and
- Site specific conditions and any existing obstructions to root development

The Tree Protection Zones (TPZs) have been calculated using the formula and criteria outlined in AS 4970-2009 Protection of Trees on Development Sites. In summary the standard applies the calculation for the radius of the TPZ as 12 x (the tree trunk diameter (in metres) calculated at breast height (DBH)). DBH is taken at 1.4m above ground level.

A maximum TPZ radius will be 15m (unless crown protection is required) while the minimum TPZ radius shall be 2m.

The TPZ is typically assumed to be radial and centred on the centre of the tree's trunk unless other site factors or tree canopy size and location dictate an adjustment. Encroachments of up to 10% of the area may be accepted within the TPZ as long as it is outside of the Structural Root Zone (SRZ). This is known as a "minor encroachment". Encroachments greater than this, known as "major encroachments" will only be accepted with additional specific evidence that the tree will not be unduly impacted.

Whenever an encroachment is made into a TPZ, a suitable compensation should be made elsewhere and physically contiguous to the remaining TPZ.

The Structural Root Zone (SRZ) is the area defined as the minimum area required to retain the structural stability of the tree. The formula for calculating the SRZ is outlined in AS 4970 Section 3.3.5. No encroachment into the SRZ shall typically be allowed.

2.0 KEY FINDINGS & OBSERVATIONS

2.1 The Proposed Development and Tree Retention Discussion

The proposal is to construct a new multipurpose building. The building is designed to address both the oval level and the adjoining Copeland Street frontage (approximately 1.8m different). There is also a basement carparking area linking to the existing surface car parking to the west. The proposed building replaces the existing COLA and demountable classroom structures. Its size, position and the required grading will necessitate the removal of the existing trees between the COLA/ demountable class rooms and Copeland Street.

It is important to note that of the 16 trees proposed for removal, 4 are very low value trees and should be removed regardless of the development. None of the trees proposed to be removed are considered to be high retention value trees. High value trees are trees that are typically in good or very good condition, large and visually prominent, historically or environmentally important. They may also be lesser quality trees, but part of an very important grouping of trees. We concede that as a 'grouping' of trees, when one considers the larger row of trees along Copeland Street, some of the trees are important as part of that larger group.

For the purposes of this report and assessment we acknowledge that 10 of the trees are reasonable trees, and as such have been given a 'moderate' retention value ranking. They are visually prominent trees and part of the larger row planting. We believe a ranking of 'moderate' still conveys that they should be seen as a constraint to development and their removal avoided where feasible. We do note that the majority of these trees, particularly the larger trees, have been heavily pruned by electricity authorities, on the Copeland Street sides, to maintain clearances away from the adjoining high and low voltage power lines. This has rendered many of these trees with a less than desirable form.

The decision to remove some of the trees along the Copeland Street frontage has not been taken lightly. As with all aspects in the development and construction process, the tree related constraints have to be weighed up against many other relevant development opportunities and constraints. The retention of the trees on the site must also consider economic, social, environmental, construction and practical realities. A number of options were considered at length by the team that looked at retaining the majority of the trees.

To successfully retain the trees, building offsets to an appropriate distance would be required and no changes made to the levels around the trees. To retain the trees, the building would have to be located a minimum of 4.7m away from the centre of the largest tree, being T72. When these distances and grading were looked at in detail it was considered that the requirements to retain the trees, and still achieve the building parameters, were considered unfeasible. This is due to the following key factors:

- Student safety – reducing the safety buffer, runoff areas and remaining area around the oval would present an unacceptable risks to students during sports.
- The roof would still have impacted with tree canopies, even at this offset.
- Relocation of the building further north and retaining the existing oval position would result in a building internal width and arrangement that was impractical. If the 'oval' was relocated further north, it would result in removal and impacts to other trees located to the north of the oval.
- Relocation of the building further north and retaining the existing grades for the trees would preclude the use of natural ventilation for the proposed basement carpark and require installation a mechanical ventilations system.
- The trees that are proposed to be removed to facilitate the project have been heavily and unsympathetically pruned by electricity authorities. Many are suppressed or exhibit asymmetric forms and none could be considered outstanding examples of their species.
- Retention of the trees, and maintaining the existing grades around them, would severely impact the ability to provide access and egress from the building to Copeland street which was considered a key aspect and benefit of the development.

The landscape concept designs and proposed building design and layout have been developed in close consultation with the Client and Architects. Arterra, as both the consulting arborists and landscape architects for the project have aimed to minimise the impact on the existing trees to be retained and the design has been modified to this effect wherever possible. The trees noted for removal, as well as those to be retained, have been given very careful consideration.

Implementation of the current design will result in the removal of all the trees along the southern frontage of the proposed building. As the current design has been developed in consultation with the consulting arborist, appropriate changes have, where practicable, been implemented throughout the design development process to accommodate existing trees. On this basis there are no recommendations to alter the design any further at this time.

In summary the proposal:

- Requires the removal of **16** trees.
  - 10 are moderate retention value
  - 2 are low value
  - 4 are very low value
- The proposal involves the replacement planting of approximately **30 new trees** located primarily between the Copeland Street and the building.
- Currently the overall site has approximately 183 trees, therefore the removal of 16 trees represents less than **9% of the current population**. Being removed. With the replacements, there will be net increase in trees.
- The existing canopy coverage of the site is approximately 7,440m2. It is proposed to remove approximately 470m2 and reinstate approximately 350m2. This is a net reduction in canopy coverage of **only 120m2**.
- The new tree planting more positively addresses the street frontage and is designed to minimise interference or future conflicts with the existing powerlines thereby reducing ongoing tree maintenance and pruning requirements. Although it is acknowledged that the majority of new trees are smaller in statue to those removed, we still believe the proposed landscaping represents a balanced and appropriate outcome. It also provides lower level and human scale screening of the proposed building, particularly the basement carparking level.

2.2 Climate and Microclimate

Kingswood is located in Sydney's western suburbs, and therefore would share the general climate of this region with moderate temperatures, good rainfall and minimal climatic and weather extremes. It is typically described as a temperate climate with hot to warm summers and cool winters, with relatively uniform rainfalls greater than 800mm / year. There is no distinct dry season.

The site is located approximately 5.5km form the Bureau of Meteorology automated weather station at Orchard Hills. It has an average annual rainfall of 822mm, fairly evenly spread across the year but with a slightly drier period during the late winter and early spring months. The highest rainfall period is usually February with an average of 110mm and the driest month being July with an average of 36mm.

Maximum average daily temperatures range from 28.5ºC in December to 17.2ºC in July. The minimum average daily temperatures range from a high of 17.4ºC in February down to lows of 5.3ºC in July.

The primary wind direction is from the south or east in the afternoons while it is predominantly from the south and south-west in the mornings. This is common of coastal areas dominated by "sea breeze" affects. Sea breezes are caused by unequal heating and cooling of adjacent land and sea surfaces. A sea breeze is one that blows from the sea to the land in consequence of this differential heating. With a weak general wind circulation, a sea breeze will commence over the coastline soon after the land temperature begins to exceed the sea temperature (late morning to early afternoon). As the difference increases, so the sea breeze will become stronger and will extend farther inland. (Source: Australian Bureau of Meteorology)

The strongest winds (>40km/h) are normally experienced from the west or south-westerly directions and later in the day. There are no prominent microclimatic influences over the site.

2.3 Soils and Landform

The site has an undulating landform that is likely to have been highly disturbed during the construction of the school and the ovals. The portion of the site subject of this assessment appears to have been filled significantly to bring the oval to its current level.

Soil landscape mapping of the area describes the soils of the site as part of the Luddenham soil association, overlying Wianamatta Group Shales. The topsoil is expected to be a friable dark brown loam over a hardsetting brown clay loam with an apedal massive or weakly pedal structure. The soil is expected to be pedal, with localised impermeable highly plastic subsoil, with low wet strength and low available water capacity (Chapman 1989). They may be subject to high erosion.

The soil sampling results are summarised below. The soil observed on site was sandy and at all depths, the structure was largely consistent throughout and was found to be apedal to a depth of approximately 300mm with some small blocky peds present between 300-500mm. This sandy loam soil was most likely imported top soil placed over filling undertaken for the oval. The auger was rejected at a depth of approximately 500mm at which rubble was encountered.

Figure 2 – Typical soil profile to a depth of 500mm. (Photo: Arterra)

2.4 Tree Assessment - General

The following is a summary of the trees found on the site and some relevant factors regarding development of the site. There are currently **31 trees** recorded and assessed on, or immediately adjacent to the development site (arboricultural study area). These are the trees that would be considered 'trees' under the above Council criteria. Very small trees and shrubs (<3m), dead trees or obviously known weeds have typically not been assessed in detail. It should be noted the trees have been previously surveyed and tagged with a numbered tag by Arborsite as part of the Colleges asset management program. We have retained the Arborsite tree numbering in the interest of consistency and ease of tree identification on plan and in the field. One street tree, adjacent to the site on Copeland Street was assessed as it may be impacted by the proposed future works. The tree was identified and allocated a new identification number (S01 – *Callistemon viminalis cv.*) as it was not on the College's existing numbering system.

Detailed information on each tree including; heights, trunk diameters, canopy spreads, age classes and condition are all provided in Appendix 4.3 - 'Tree Impact Assessment Schedule'.

Table 1 - Summary of Trees Recorded on Site

Common Name	Species	Qty.	% total pop.
Spotted Gum	*Corymbia maculata*	15	48%
Forest Red Gum	*Eucalyptus tereticornis*	6	19%
White Sally Wattle	*Acacia floribunda*	3	10%
Lemon Scented Gum	*Corymbia citriodora*	2	6%
Brushbox	*Lophostemon confertus*	2	6%
Weeping Bottlebrush	*Callistemon viminalis cv.*	1	3%
River Sheoak	*Casuarina cunninghamiana*	1	3%
Tallowood	*Eucalyptus microcorys*	1	3%
Grand Total		**31**	**100%**

Consideration has also been given to the relationship of the trees to one and other and their proximity to the likely development areas on the site. For example, trees that are part of a closely spaced group, or are likely to be significantly misshapen or unstable with the removal of surrounding trees and structures are considered with these factors in mind. The number and the percentage of the total population of trees in the different retention values are shown in the following table:-

Table 2 - Summary of Trees Retention Values

Retention Value	Qty.	% total pop.
High	-	0%
Moderate	15	48%
Low	12	39%
V Low / Remove	4	13%

It appears likely, given their approximate age and location, that all the assessed trees were 'planted' on the site, by the School. As shown in Table 2 above, no trees were given a High retention value and the remainder of the population were either Moderate (48%) or Low or Very Low (52%).

Many of the trees, including those that are proposed for removal along the Copeland Street boundary, have been subject to repeated pruning for clearance by electricity authorities. As a result, most trees along this boundary are suppressed and or have very asymmetric canopy structure and none could be said to be an outstanding example of their species.

The proposed removal of these poorly pruned and misshapen trees provides an opportunity for the new landscape planting to be more appropriate to the location, taking into account the overhead power lines while providing appropriate screening and softening of the new building when viewed from Copeland Street.

Figure 3 – View to west along Copeland Street. Note severe clearance pruning resulting in asymmetric canopies. (Photo: Arterra)

2.5 Tree Biology and Tree Care Basics

Trees are dynamic living organisms. Trees can be very susceptible to damage, stress and declining rapidly if overly impacted by construction. Trees take decades to grow but can be injured and killed in a very short time frame. This is particularly due to the irreparable damage to the often shallow, extensive and unseen root systems. It is rarely possible to repair a stressed or damaged tree, after the damage has occurred. Proper protection is the key to minimising construction related impacts. Severing of roots within the Structural Root Zone (SRZ) can also lead to potentially unsafe instability of the tree as a structure.

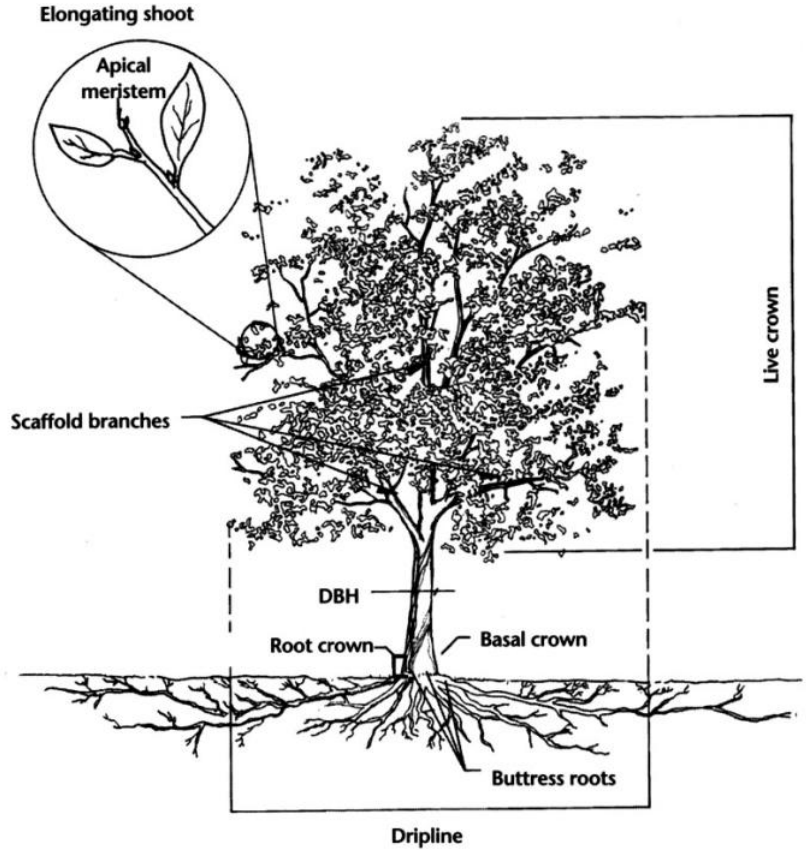

Figure 4 – Typical form and structure of a tree illustrating the typical form, location and extent of root growth (Source: Matheny and Clark, 1998)

Basic Tree Needs

As a living organism a tree remains alive by completing the following chemical reaction -
Carbon Dioxide and water in combination with chlorophyll and light is converted to Glucose and Oxygen [CO_2 + H_2O + light = sugar (CH_2O [Glucose]) + O_2]

The process ultimately leads to the plant cells 'respiring' and producing energy for survival, a natural requirement for all living cells. Anything that affects a plant's photosynthesis and then cellular respiration will affect the overall plant health. The limiting factors of photosynthesis and respiration will typically be the availability of oxygen, water and nutrients that make up the important chemical molecules and reactions.

Trees therefore have five basic requirements to survive and successfully grow:-

1. Oxygen (and particularly oxygen within the soil);
2. Water (a cellular necessity and primarily taken up by the tree roots);
3. Light & Sufficient Foliage (in order to photosynthesise and create the resources needed for cellular survival);
4. Soil (for physical anchorage and critical chemical nutrients) and
5. Physical Space (both above and below ground to grow).

Importantly, a minimum of 15% soil oxygen is required for active root growth and nutrient uptake. Less than 10% available soil oxygen starts to restrict root extension and growth and a minimum of 3% soil oxygen is required to just maintain root existence. Less than this will result in root death (Harris 1999).

One of the most insidious effects of construction on trees is often that of soil compaction or covering of root zones with impervious surfaces, as it:-

- Reduces infiltration rates of surface water;
- Reduces the availability of water to the roots as they can't naturally extract remaining moisture when soil becomes too dry;
- Reduces air to roots (roots cease to function properly and die without oxygen);
- Increased soil strength caused by compaction mean that roots need more energy to growth through it or can't even physically penetrate the soil;
- Roots are physically broken or crushed and there is increased potential for fungal and pathogen attack. (Harris 1999).

Tree Tolerance

Typically, older and larger trees are less tolerant of construction impacts. Different species also have different tolerance of injury and disturbance. Importantly it needs to be stressed, that a tree does not "heal" from injury as animals do. Typically, any injury made to a tree results in the tree expending considerable energy reserves to create new growth that "seals" and surrounds a wound and then attempting to compensate structurally and physically for any losses. Impacts to trees are therefore cumulative and a series of otherwise small and unrelated impacts can easily result in the death of a tree.

A tree that is already compromised or showing signs of stress is far less likely to tolerate construction impacts due to its lower levels of energy reserves and already weakened state. Therefore, a tree that is only in a fair condition or poor condition is less likely to tolerate construction impacts than a young tree in good or excellent condition.

Weakened or stressed trees are also far less able to combat the myriad of normal environmental stresses and pathogens that are naturally imposed against them such as drought, decay, fungi, bacteria and insect pests.

2.6 Tree Impact Assessment

The intention of this assessment is to clearly illustrate the trees to be retained and removed as part of the development. It is also to determine any incursions into the retained trees' root zones and canopies by the proposed development and evaluate the likely impact of the proposed works on the trees. A detailed summary of the incursions and likely impacts of the proposed development on each tree is shown in Appendix 4.3 – Tree Impact Assessment Schedule.

Of the 34 trees assessed:-

- 16 will require removal to facilitate the construction.
- The remaining 15 trees will experience no foreseeable impact from the construction related activity;

The trees and the required tree protection measures also outlined graphically in Appendix 4.1 TP-03 - Tree Protection and Removal Plan.

2.7 Potential Tree Related Impacts to be Managed During Construction

The main potential impacts from the proposed construction activity can be summarised as tree damage and 'reduced life expectancy' caused by:-

- Root loss and disturbance due to excavation for the driveway;
- Compaction of the root zone from storage and stockpiling of materials;
- Contamination of the soil from; the preparation of chemicals, wash down/ cleaning of equipment, refuelling of vehicles and dumping of waste;
- Compaction of the root zone from haul roads and the parking of vehicles/ plant equipment;
- Root disturbance from cut and fill and soil level changes;
- Physical damage to the tree trunks and branches from passing machinery;
- Damage to the tree roots from landscaping and pedestrian pathway construction.

The following Section provides clear recommendations and proposed measures that aim to minimise these impacts as much as realistically possible. They are also reiterated in Appendix 4.1 TP-01 - Tree Protection Specifications, which can be issued, and form part of any future construction contracts.

3.0 RECOMMENDATIONS

3.1 The Proposal and Tree Impacts

The proposed building and development will result in a major site disturbance. This will potentially have a significant impact on the other remaining trees within and adjacent to the construction area.

Specifically the proposed development will involve:-

- Demolition works;
- Use of large scale civil and earthmoving equipment;
- Access to and from the site with large trucks and construction plant;
- Major excavations;
- Large stockpiles of excavated material and demolition waste;
- Stockpiles/ storage of building materials;
- Regrading and filling of the surface levels;
- Trenching for services;
- Major building works involving concreting, painting and general construction;
- Use of large cranes;
- Parking for site personnel and deliveries;
- Paving and retaining walls and
- Landscaping.

Key Assumptions:-

- All excavations are to be undertaken and retained using sheet, soldier or contiguous piling techniques. Even relatively small excavations, when done near trees are to be retained using soldier piling or similar.
- Despite the above, the line of disturbance outside of the building line has been typically estimated at 1.5m from the face of the building to allow for provision of water proofing, services, access and scaffolding around the building during construction.
- All services for the building will be clear of any retained trees TPZs
- All construction access and deliveries are to be made from the Copeland Street main entrance. Concrete will typically be pumped and will not require any truck movements through TPZs.
- Where no spot levels are indicated it is assumed that the existing surface levels are retained.
- It is assumed that any new landscape grading within the TPZs will be minimal.
- That traditional cantilevered retaining wall footings will be used (ie: footings extending to the rear of the face of the wall, typically equalling the height of the wall).

3.2 Key Recommendations to Reduce Tree Impacts

The following recommendations are made to potentially reduce the negative construction impacts on the retained trees.

- Ensure that an appropriately qualified Arborist is on site and supervises any demolition work within any of the identified TPZ areas.
- Appropriately fence all TPZs outside of any noted incursion for the duration of all major site construction work. See Appendix 4.2 TP-02 'Tree Protection & Removal Plan' for locations and extent
- Carefully control and fence access to and from the construction area so that movement does not occur through any TPZ other than any noted incursions.
- Ensure all the above and below ground services are excluded from running through any TPZs beyond the noted building incursion.
- Minimise the re-grading of the ground surfaces within any TPZ, beyond any noted incursions, to meet and match proposed pathways and building levels. Where it is required, limit re-grading to a maximum depth of 300mm above existing ground levels and ensure only quality sandy manufactured organic garden mix is used.
- Mulching of the nearby TPZ, for the nearby retained trees. This will aid tree health with moisture retention, remove competition from grasses, and improve soil condition within the TPZs. It will also limit any compaction that may happen should the TPZ area be breached for construction access.
- Avoid digging into existing root zones for the installation of the proposed landscaping around the trees and installation sizes of new plants to be 5L or less to ensure that excavations are less than 200mm in depth. Build up soil levels when planting to a maximum of 200mm to enable the planting to occur without disturbing roots.

- Do not allow storage or stockpiling of any materials or site sheds within established TPZs unless that it can be demonstrated that this will not impact on the tree retention and is approved in writing by the Consulting Arborist.

3.3 Proposed Tree Protection & Construction Activity Sequencing

The following sequence of activities should be followed for this project: -

1. A Tree Protection Specification & Plan be prepared and issued as part of the construction contract prior to any construction work. (Refer to Appendix 4.2)
2. Project Consulting Arborist, Landscape Architect, Civil and Structural Engineers, Client and Contractor Site Foreman are to meet prior to beginning any work on the site to discuss and review all work procedures, construction access routes, stockpiling and tree protection measures (ie: fence types and locations, access, cranage points, piling methods etc.).
3. Contractor's to discuss locations and type of any sediment and erosion controls (if any) and install them with minimal tree impact when within or passing through the TPZ.
4. Existing pathways, fences, driveways, furniture and shrubs are to be carefully removed from within the TPZ, where they are to be demolished.
5. Existing surrounding trees are to be removed. Where within 5m of existing trees to be retained, stumps are to be ground to avoid the use of excavators and the like from grubbing out stumps, which may lead to damage of any intertwined roots.
6. Designated TPZ areas are to be mulched with 75mm of recycled hardwood woodchip mulch to improve soil conditions around tree and remain in place until future landscaping.
7. The Construction Phase TPZ is to be defined and fenced off with a 1.8m high metal or plywood temporary fence prior to any further work within the vicinity of the trees. Any required rumble boards installed to protect TPZ areas where access is required.
8. Install temporary irrigation system to TPZs where mulching is applied.
9. Although none is expected at this stage, if required a utility Arborist is to undertake selective pruning of any canopy or branches to facilitate construction of the building and the use of any large scale piling equipment without accidental damage to the tree canopy. This is to be overseen and approved by the project consulting arborist. Pruning to be done in accordance with AS4373 - Pruning of Amenity Trees and performed by staff with minimum AQF 3 qualification.
10. Plywood is to be placed under any scaffolds or works paths when they are running through TPZs
11. Building works to be completed (external).
12. Contractor to remove the TPZ fencing and then install final pathways and landscaping within the TPZ under the trees, only after construction of the building exterior is completed.

3.4 Demolition Work Near Trees or within TPZs

Demolition of paths and other structures required within a TPZ shall be done with small tracked equipment or by hand, with care to limit damage and disturbance of the root zone. All such work within TPZs shall be supervised and overseen by a qualified Project Consulting Arborist.

3.5 Tree Protection Fencing & Definition of TPZs

Establish a clearly defined tree protection zone as indicated in Appendix 4.2 - "T-02 Tree Protection and Removal Plan". Install a 1.8m high temporary fence with either plywood hoarding or temporary steel mesh or chain wire fencing with adequate lateral bracing. Fencing shall comply with the requirements of AS 4687-2007 Temporary fencing and hoardings. These areas around the trees shall be delineated as a "Tree Protection Zone" during the remaining construction process, via appropriate weatherproof signage. Access will typically be excluded from these zones and the levels will be left largely at the existing levels with the exception of the installation of the 75mm of mulch. No stockpiling, excavation, trenching, re-fuelling or material storage should be allowed in this area.

3.6 Provision of Temporary Irrigation

A temporary and automated (battery powered timer is sufficient) watering system to be placed within the TPZs to maintain adequate water to the retained trees and help maintain their health and condition during construction. This can be a surface mounted 'residential-style' soaker hose and/or surface sprinkler systems. It is to be surface visible and spray delivered so that is operation can be easily visible and verified. It should be on a designated supply line, separate from other construction related water supplies to minimise its likelihood of being disconnected.

Typically, during spring and summer months it should be set to run for a minimum of 30 minutes every day, in the early morning. During, autumn and winter months it should be set to run for 1 hour once every week. The operation can be suspended temporarily in periods of extensive and prolonged rain.

The system is to remain in place for the duration of construction, or until the project consulting arborist approves it's removal. It may be removed to allow final landscape treatments to proceed. If accidentally disturbed or damaged by construction activities, it is to be reinstated as soon as practicable.

3.7 Final Building and Pedestrian Clearance Pruning

Although none is currently expected, once the final levels and finishes are in place the Project Consulting Arborist shall supervise the selective pruning of any lower peripheral branches to retained trees to achieve any clearances for final pedestrian access. This shall be minimised as much as possible. It is anticipated that the final pruning of any of the retained trees will be less than 5% of the existing canopy and will not have any serious impact to the trees health or habit.

The branches of the tree shall only be pruned as specifically needed and directed by the Project Consulting Arborist. Work is to be in strictly accordance with to AS4373 - Pruning of Amenity Trees. Do not treat wounds. Only clean, sharp pruning implements shall be used for all pruning work, ensuring that cuts are made without damage, tearing or bruising of the vascular tissue.

3.8 Other Tree Protection Measures to be Implemented

The following is a summary of the main measures that will be required during construction. These should be adopted for the Construction Contract and conditioned by Council.

Controlled Construction Access & Parking

Construction access points and stockpiling and storage areas shall be clearly identified and fenced where appropriate. Uncontrolled access points and parking of vehicles outside of designated areas is to be avoided. If temporary access is required through a tree protection zone, ground protection shall be employed to limit soil compaction and root damage and disturbance.

Clearing and Removal of Trees to be Removed

Removal and clearing of existing trees should be done by qualified arboricultural staff with care not to impact or damage other surrounding trees throughout the process. Existing stumps should be grubbed out or ground in a controlled fashion to remove wood that may decay and promote unwanted pathogens.

Communication - Tool Box Meetings and Construction Inductions

All contractors and subcontractors shall be inducted prior to working on the site. All inductions shall include description and identification of the Tree Protection Zones and the restriction on work and activities with regard to trees. The site foreman shall ensure that all new staff and contractors are appropriately inducted and that brief "tool box" meetings are conducted regularly to ensure Tree Protection is maintained at the forefront of all construction workers minds.

3.9 References

- Harris, R.W, Clark, J.R & Matheny, Nelda P, 1999*, Arboriculture: Integrated management of landscape trees, shrubs and vines*. 3rd Ed. Prentice Hall. New Jersey, US
- Matheny, Nelda P and Clark J.R, 1998, *Trees and development - a technical guide to preservation of trees during land development*, International Society of Arboriculture, Illinois, US.
- Roberts, J. Jackson, N. and Smith, M. 2006. *Tree roots in the built environment. No.8* Research for Amenity Trees, Dept. for Communities and Local Government, London.
- Standards Australia, 2007, *AS 4373-2007 Pruning of amenity trees*. Standards Australia, Sydney.
- Standards Australia, 2009, *AS 4970-2009 Protection of Trees on Development Sites*. Standards Australia, Sydney.
- Standards Australia, 2007, AS 4687-2007 Temporary fencing and hoardings. Standards Australia, Sydney.

- End of report.

4.0 APPENDICES

4.1 T-01 Tree Protection Specifications and T-02 Tree Retention Value Plan

Example image of acceptable tree tree protection battens

Example image of acceptable tree protection fencing measures to be applied. (1.8m high rigid metal fencing with appropriate lateral bracing)

Example image of acceptable ground protection rumble boards

TREE PROTECTION SPECIFICATIONS

1. Tree Protection Measures and Protocols.
All work around existing trees to be retained shall be in accordance with AS 4970-2009 Protection of trees on development sites with the clear establishment of the required Tree Protection Zones (TPZ's). If the scope of work allowed within or the extent of the Tree Protection Zones of existing trees is not clear, please refer to the Contract Manager or Project Consulting Arborist for clarification.

Before any site works commence tree protection zones and other measures must be established and conveyed to those all working on the site. The Contractor shall ensure all subcontractors are inducted prior to working on the site. All inductions shall include description and identification of the Tree Protection Zones and the restriction on work and activities with regard to trees.

Damage to roots or degradation of the soil through compaction and/or excavation within TPZ's is likely to cause serious damage to the tree. Any work operations required within TPZ's must be carried out with extreme care. All trees, palms and other shrubs within TPZ's are to be retained unless shown otherwise on the Tree Protection Plan(s). Trees marked for retention shall not be used to display signage, or as fence or cable supports for any reason. No materials stockpiling, chemicals or washout areas are permitted immediately upslope of or within the Tree Protection Zone. The washing down of wheel barrows, paint cans/brushes, acids and the like shall not to be done near existing trees as the runoff is very harmful to tree roots.

No fuel powered pumps or generators or air compressors are to be placed within TPZ's. No fuel or chemicals shall be stored and no equipment or vehicles shall be serviced or re-fuelled within a TPZ.

2. Controlled Construction Access
Construction access points, stockpiling and storage areas shall be clearly identified on site and fenced off where appropriate. Uncontrolled access and parking of vehicles inside TPZ's shall be avoided. If access is required through a tree protection zone, the access way shall be treated with ground protection.

3. Tree Protection Fencing & Signage
The Tree Protection Plan(s) shows the extent of areas to be fenced and protected. Protection measures shall be certified as adequate by the Project Consulting Arborist. This fencing may form part of the general construction site fencing, where practical. It shall remain in place as long as possible and typically not be removed until the final landscape installation in those areas begins.

All tree protection fencing shall be 1800mm high galvanised chain wire or welded steel mesh. Fencing must be bolted together and secured with the necessary back stays and bracing.

Star pickets with bunting or danger tape shall not constitute acceptable tree protection fencing.

Suitable signage as defined by AS 4970-2009 Appendix C shall be affixed to the external side of the fencing at a spacing of not less than 1 sign per 20 lineal metres of fence.

If fence locations conflict with the proposed works, contact the Project Consulting Arborist and Contract Manager for resolution. No new services (unless under-bored) shall be located within or through the Tree Protection Zone.

4. Trunk and Lower Branch Protection
A trunk barrier is to be erected around the circumference of the tree trunk and root buttress where shown. This barrier will consist of a double layer of used carpet or carpet underfelt placed around the trunk. A layer of battens is to be placed over the underfelt. The battens are to have a maximum spacing of 50mm. The height of the battens is to be 2 metres or to the height of the first branches. Lower large branches may require the same protection if likely to be damaged by passing vehicles or equipment. Secure in place with galvanised steel bracing straps. Do not nail into or otherwise injury the trunk or bark. Battens may be made from any suitable waste timber of similar sizes and depths. All sharp or protruding edges are to be properly covered with tape or similar padding.

5. Works within the TPZ
All work within the root zone of existing trees shall be undertaken with the utmost care. If by necessity a tree requires removal of branches for building or access, pruning shall be done in strict accordance with accepted arboriculture techniques and AS 4373-2007. No rubbish, spoil or new materials shall be placed on the root zone of any existing tree or against their trunks.

6. Ground Protection
If it is proposed to create any access route, or similar, within the TPZ of a retained tree, the Contractor shall install rumble boards over the TPZ ground surface. No excavation shall be allowed. Contractor shall first place a suitable permeable geotextile to the extent required and then a 100mm thick layer of wood chip mulch or coarse no-fines gravel over the extent to be covered. Then place hardwood boards (minimum 3600 x 200 x 75mm) on their flat edge, side by side, with a 30 - 50mm gap to form a rumble strip. These boards are to be held together with three galvanised metal bracing straps nailed to each board. The two outer straps are to be approximately 200mm in from the ends of the boards. The third strap is to be along the centre line of the boards.

7. Provision of Temporary Irrigation
A temporary and automated (battery powered timer is sufficient) watering system to be placed within the TPZs of all trees to maintain adequate water to the retained trees and help maintain their healthy condition. This shall be a surface mounted 'residential-style' soaker hose and/or similar surface sprinkler systems. It is to be surface visible and spray delivered so that is operation can be easily visible and verified. It should be on a designated supply line, separate from other construction related water supplies to minimise its likelihood of being disconnected.

Typically, during spring and summer months it should be set to run for a minimum of 30 minutes every day, in the early morning. During, autumn and winter months it should be set to run for 1 hour once every week. The operation can be suspended temporarily in periods of extensive and prolonged rain.

The system is to remain in place for the duration of construction, or until the project consulting arborist approves it's removal. It may be removed to allow final landscape treatments to proceed. If accidentally disturbed or damaged by construction activities, it is to be reinstated as soon as practicable.

8. Structural Demolition Within TPZ's
Project Consulting Arborist shall be on site during all demolition work within the TPZ's to monitor and advise on tree protection. Secateurs and a handsaw shall be available to deal with and cleanly cut any exposed roots that have to be cut. Machines with a long reach may be used if they can work from outside TPZ's or from protected areas within TPZ's. They shall not encroach onto unprotected soil in TPZ's.

Debris to be removed from TPZ's must be moved across existing hard surfacing or temporary ground protection in a way that prevents compaction and disturbance of soil. Alternatively, it can be lifted out by machines provided this does not disturb TPZ's or damage the canopy. If appropriate, leave below ground structures such as footings and disused pipes in place if their removal will cause excessive root disturbance.

When pulling up existing paving the Contractor shall work backwards, lifting demolished paving back onto the existing paving. Roots may be found growing under the pavement and should not be trafficked. Roots growing into existing sub-base should be left and new surface finishes placed over the top without disturbance.

9. Excavations or Trenching within TPZ's
Excavation within TPZ's shall not be allowed using mechanical equipment such as excavators or backhoes. Excavation within TPZ's shall only be carried out carefully by hand taking care not to damage the bark and wood of any roots. Specialist tools for removing soil around roots using compressed air (air spade), or water vacuum extraction shall be an appropriate alternative to hand digging and is the preferred method.

Exposed roots to be removed shall be cut cleanly with a sharp saw or secateurs at the face of the excavation. Roots temporarily exposed must be protected by appropriate covering with damp hessian or sand. Roots greater than 50mm in diameter are to be retained and shall only be cut in exceptional circumstances and only after consultation with the Project Consulting Arborist. Roots greater than 100mm in diameter shall typically not be allowed to be cut and must be worked around.

10. Soft Landscaping Installation
Final trimming and planting shall be judiciously undertaken around trees. All soft landscaping within the tree protection zones will be installed with care to avoid root disturbance from irrigation trenching, lighting installation and the planting of larger plants. Permanent irrigation (if used) shall be installed as spray heads located outside of TPZ's and spraying inwards. All other services such as small-scale electrical services shall also be designed and installed to avoid any excavation or trenching around the trees.

No significant excavation or cultivation, especially by rotary hoes or excavators, shall occur within TPZs. Where new designs require the levels to be increased, good quality and permeable top soil shall be used. It should be firmed into place but not over compacted. All areas close to tree trunks shall be kept at the original ground level. Where turf is to be installed tree trunks shall have mulched rings applied rather than grass laid up to the trunk.

The size of the installed plants shall typically be less than 5L pots so that the maximum depth of the new root balls is less than 200mm. Any planting proposed that is larger than this shall be only installed outside of the SRZ and with care to not injure roots while digging planting holes.

11. Canopy Pruning
The Contractor shall prune branches of protected trees only as directed by the Project Consulting Arborist. Pruning is only to be undertaken by a qualified arborist (under the supervision of a person with AQF Level 4 or above). The Project Consulting Arborist is to be present at all times during the pruning work. Work is to be in strict accordance with AS4373 Pruning of Amenity Trees. Do not treat wounds.

12. Root Pruning
Pruning of roots of protected trees shall only be as directed the Project Consulting Arborist. The Tree Contractor shall use only a qualified arborist (AQF Level 4 or above). The Project Consulting Arborist is to be present at all times during the root pruning.

Roots are not to be cut using normal excavation machinery of any sort. This usually results in splitting and massive disturbance well past the intended line of cut. When required to cut roots, use hand methods and sharp hand tools (e.g. secateurs, hand saw) such that the remaining root systems are preserved intact and undamaged. Roots are to be cut back by hand square to the direction of the root travel (or edge of the excavation). Do not cut any tree roots exceeding 40mm diameter unless permitted. Excavations within root zones should be kept open for as short a period as possible. Any excavated face containing roots is to be temporarily supported, where necessary, to prevent soil loss from around the other retained roots.

13. Accidental Tree Damage
Should a tree be accidentally damaged, the Contractor shall immediately notify the Project Consulting Arborist. Timing can be of the essence, particularly with bark injuries, trunk damage or chemical contaminations.

If a branch has been broken, it shall be removed and the damaged end pruned to a suitable branch collar. If the branch has been torn out of the trunk, assessment shall be made and the damage cleaned up by as much as possible without further damage to the tree.

If roots are accidentally disturbed or excavated, any broken, crushed and torn sections shall be exposed and pruned leaving clean cuts to minimise risk of infection by fungal pathogens and promote good conditions for new root growth.

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NOTE
Refer to the accompanying Arboricultural Impact Assessment Report for full description of trees, measurements and methods used to assess the trees, and proposed tree protection measures.

REVISION	DESCRIPTION	CHKD	DATE
A	For Design Review Panel Submission	RWS	15/5/19

PROJECT & CLIENT
St. Dominic's College Block E
St. Dominic's College

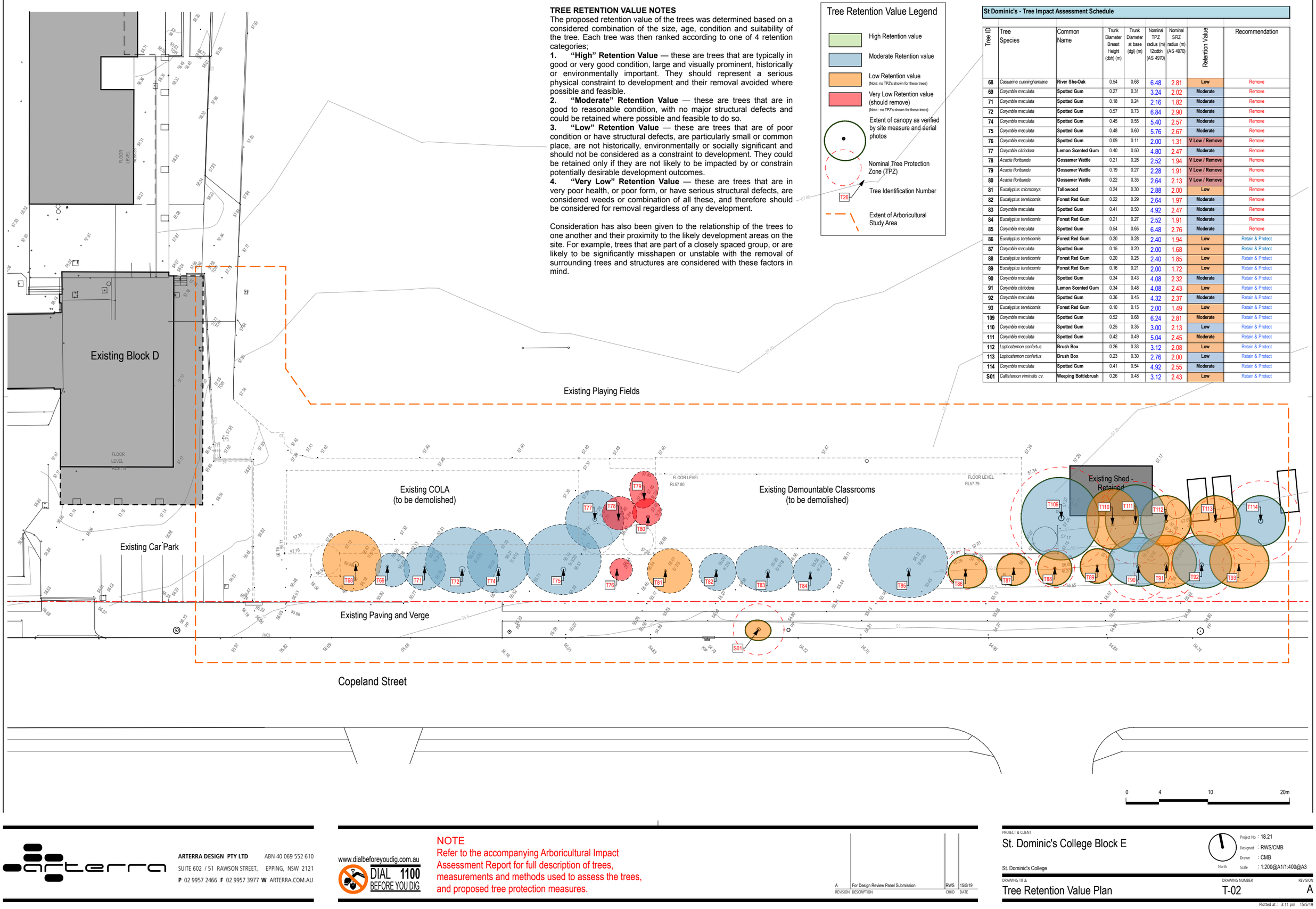
Project No : 18.21
Designed : RWS/CMB
Drawn : CMB
North
Scale : 1:200@A1/1:400@A3

DRAWING TITLE
Tree Protection Specifications

DRAWING NUMBER
T-01

REVISION
A

Plotted at : 3:10 pm 15/5/19



TREE RETENTION VALUE NOTES

The proposed retention value of the trees was determined based on a considered combination of the size, age, condition and suitability of the tree. Each tree was then ranked according to one of 4 retention categories;

1. **"High" Retention Value** — these are trees that are typically in good or very good condition, large and visually prominent, historically or environmentally important. They should represent a serious physical constraint to development and their removal avoided where possible and feasible.
2. **"Moderate" Retention Value** — these are trees that are in good to reasonable condition, with no major structural defects and could be retained where possible and feasible to do so.
3. **"Low" Retention Value** — these are trees that are of poor condition or have structural defects, are particularly small or common place, are not historically, environmentally or socially significant and should not be considered as a constraint to development. They could be retained only if they are not likely to be impacted by or constrain potentially desirable development outcomes.
4. **"Very Low" Retention Value** — these are trees that are in very poor health, or poor form, or have serious structural defects, are considered weeds or combination of all these, and therefore should be considered for removal regardless of any development.

Consideration has also been given to the relationship of the trees to one another and their proximity to the likely development areas on the site. For example, trees that are part of a closely spaced group, or are likely to be significantly misshapen or unstable with the removal of surrounding trees and structures are considered with these factors in mind.

St Dominic's - Tree Impact Assessment Schedule

Tree ID	Tree Species	Common Name	Trunk Diameter Breast Height (dbh) (m)	Trunk Diameter at base (dgl) (m)	Nominal TPZ radius (m) 12xdbh (AS 4970)	Nominal SRZ radius (m) (AS 4970)	Retention Value	Recommendation
68	*Casuarina cunninghamiana*	**River She-Oak**	0.54	0.68	6.48	2.81	Low	Remove
69	*Corymbia maculata*	**Spotted Gum**	0.27	0.31	3.24	2.02	Moderate	Remove
71	*Corymbia maculata*	**Spotted Gum**	0.18	0.24	2.16	1.82	Moderate	Remove
72	*Corymbia maculata*	**Spotted Gum**	0.57	0.73	6.84	2.90	Moderate	Remove
74	*Corymbia maculata*	**Spotted Gum**	0.45	0.55	5.40	2.57	Moderate	Remove
75	*Corymbia maculata*	**Spotted Gum**	0.48	0.60	5.76	2.67	Moderate	Remove
76	*Corymbia maculata*	**Spotted Gum**	0.09	0.11	2.00	1.31	V Low / Remove	Remove
77	*Corymbia citriodora*	**Lemon Scented Gum**	0.40	0.50	4.80	2.47	Moderate	Remove
78	*Acacia floribunda*	**Gossamer Wattle**	0.21	0.28	2.52	1.94	V Low / Remove	Remove
79	*Acacia floribunda*	**Gossamer Wattle**	0.19	0.27	2.28	1.91	V Low / Remove	Remove
80	*Acacia floribunda*	**Gossamer Wattle**	0.22	0.35	2.64	2.13	V Low / Remove	Remove
81	*Eucalyptus microcorys*	**Tallowood**	0.24	0.30	2.88	2.00	Low	Remove
82	*Eucalyptus tereticornis*	**Forest Red Gum**	0.22	0.29	2.64	1.97	Moderate	Remove
83	*Corymbia maculata*	**Spotted Gum**	0.41	0.50	4.92	2.47	Moderate	Remove
84	*Eucalyptus tereticornis*	**Forest Red Gum**	0.21	0.27	2.52	1.91	Moderate	Remove
85	*Corymbia maculata*	**Spotted Gum**	0.54	0.65	6.48	2.76	Moderate	Remove
86	*Eucalyptus tereticornis*	**Forest Red Gum**	0.20	0.28	2.40	1.94	Low	Retain & Protect
87	*Corymbia maculata*	**Spotted Gum**	0.15	0.20	2.00	1.68	Low	Retain & Protect
88	*Eucalyptus tereticornis*	**Forest Red Gum**	0.20	0.25	2.40	1.85	Low	Retain & Protect
89	*Eucalyptus tereticornis*	**Forest Red Gum**	0.16	0.21	2.00	1.72	Low	Retain & Protect
90	*Corymbia maculata*	**Spotted Gum**	0.34	0.43	4.08	2.32	Moderate	Retain & Protect
91	*Corymbia citriodora*	**Lemon Scented Gum**	0.34	0.48	4.08	2.43	Low	Retain & Protect
92	*Corymbia maculata*	**Spotted Gum**	0.36	0.45	4.32	2.37	Moderate	Retain & Protect
93	*Eucalyptus tereticornis*	**Forest Red Gum**	0.10	0.15	2.00	1.49	Low	Retain & Protect
109	*Corymbia maculata*	**Spotted Gum**	0.52	0.68	6.24	2.81	Moderate	Retain & Protect
110	*Corymbia maculata*	**Spotted Gum**	0.25	0.35	3.00	2.13	Low	Retain & Protect
111	*Corymbia maculata*	**Spotted Gum**	0.42	0.49	5.04	2.45	Moderate	Retain & Protect
112	*Lophostemon confertus*	**Brush Box**	0.26	0.33	3.12	2.08	Low	Retain & Protect
113	*Lophostemon confertus*	**Brush Box**	0.23	0.30	2.76	2.00	Low	Retain & Protect
114	*Corymbia maculata*	**Spotted Gum**	0.41	0.54	4.92	2.55	Moderate	Retain & Protect
S01	*Callistemon viminalis cv.*	**Weeping Bottlebrush**	0.26	0.48	3.12	2.43	Low	Retain & Protect

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NOTE
Refer to the accompanying Arboricultural Impact Assessment Report for full description of trees, measurements and methods used to assess the trees, and proposed tree protection measures.

REVISION	DESCRIPTION	CHKD	DATE
A	For Design Review Panel Submission	RWS	15/5/19

PROJECT & CLIENT
St. Dominic's College Block E
St. Dominic's College

Project No : 18.21
Designed : RWS/CMB
Drawn : CMB
North
Scale : 1:200@A1/1:400@A3

DRAWING TITLE
Tree Retention Value Plan

DRAWING NUMBER T-02
REVISION A

Plotted at : 3:11 pm 15/5/19

4.2 T-03 Tree Protection and Removal Plan

LEGEND

- Existing Tree Retained — Extent of canopy as verified by site measure and aerial photos
- Existing Tree Removed (Note: no TPZ's shown for these trees)
- Tree Identification Number (T26)
- Construction Period Tree Protection Zone - consolidated area
- Tree Protection Zone temporary fencing
- Trunk Protection Battens to be installed
- Expected loss of roots due to excavation or trenching
- Surface impact to be managed - minimal root loss expected
- Nominal Tree Protection Zone Radius (TPZ)
- Nominal Structural Root Zone (SRZ) only shown where relevant
- Proposed Future Building
- Existing building to be demolished
- Extent of ground modification and disturbance
- Extent of arboricultural study area

St Dominic's - Tree Impact Assessment Schedule

Tree ID	Tree Species	Common Name	Trunk Diameter Breast Height (dbh) (m)	Trunk Diameter at base (dgl) (m)	Nominal TPZ radius (m) 12xdbh (AS 4970)	Nominal SRZ radius (m) (AS 4970)	Retention Value	Recommendation
68	*Casuarina cunninghamiana*	**River She-Oak**	0.54	0.68	6.48	2.81	**Low**	Remove
69	*Corymbia maculata*	**Spotted Gum**	0.27	0.31	3.24	2.02	**Moderate**	Remove
71	*Corymbia maculata*	**Spotted Gum**	0.18	0.24	2.16	1.82	**Moderate**	Remove
72	*Corymbia maculata*	**Spotted Gum**	0.57	0.73	6.84	2.90	**Moderate**	Remove
74	*Corymbia maculata*	**Spotted Gum**	0.45	0.55	5.40	2.57	**Moderate**	Remove
75	*Corymbia maculata*	**Spotted Gum**	0.48	0.60	5.76	2.67	**Moderate**	Remove
76	*Corymbia maculata*	**Spotted Gum**	0.09	0.11	2.00	1.31	**V Low / Remove**	Remove
77	*Corymbia citriodora*	**Lemon Scented Gum**	0.40	0.50	4.80	2.47	**Moderate**	Remove
78	*Acacia floribunda*	**Gossamer Wattle**	0.21	0.28	2.52	1.94	**V Low / Remove**	Remove
79	*Acacia floribunda*	**Gossamer Wattle**	0.19	0.27	2.28	1.91	**V Low / Remove**	Remove
80	*Acacia floribunda*	**Gossamer Wattle**	0.22	0.35	2.64	2.13	**V Low / Remove**	Remove
81	*Eucalyptus microcorys*	**Tallowood**	0.24	0.30	2.88	2.00	**Low**	Remove
82	*Eucalyptus tereticornis*	**Forest Red Gum**	0.22	0.29	2.64	1.97	**Moderate**	Remove
83	*Corymbia maculata*	**Spotted Gum**	0.41	0.50	4.92	2.47	**Moderate**	Remove
84	*Eucalyptus tereticornis*	**Forest Red Gum**	0.21	0.27	2.52	1.91	**Moderate**	Remove
85	*Corymbia maculata*	**Spotted Gum**	0.54	0.65	6.48	2.76	**Moderate**	Remove
86	*Eucalyptus tereticornis*	**Forest Red Gum**	0.20	0.28	2.40	1.94	**Low**	Retain & Protect
87	*Corymbia maculata*	**Spotted Gum**	0.15	0.20	2.00	1.68	**Low**	Retain & Protect
88	*Eucalyptus tereticornis*	**Forest Red Gum**	0.20	0.25	2.40	1.85	**Low**	Retain & Protect
89	*Eucalyptus tereticornis*	**Forest Red Gum**	0.16	0.21	2.00	1.72	**Low**	Retain & Protect
90	*Corymbia maculata*	**Spotted Gum**	0.34	0.43	4.08	2.32	**Moderate**	Retain & Protect
91	*Corymbia citriodora*	**Lemon Scented Gum**	0.34	0.48	4.08	2.43	**Low**	Retain & Protect
92	*Corymbia maculata*	**Spotted Gum**	0.36	0.45	4.32	2.37	**Moderate**	Retain & Protect
93	*Eucalyptus tereticornis*	**Forest Red Gum**	0.10	0.15	2.00	1.49	**Low**	Retain & Protect
109	*Corymbia maculata*	**Spotted Gum**	0.52	0.68	6.24	2.81	**Moderate**	Retain & Protect
110	*Corymbia maculata*	**Spotted Gum**	0.25	0.35	3.00	2.13	**Low**	Retain & Protect
111	*Corymbia maculata*	**Spotted Gum**	0.42	0.49	5.04	2.45	**Moderate**	Retain & Protect
112	*Lophostemon confertus*	**Brush Box**	0.26	0.33	3.12	2.08	**Low**	Retain & Protect
113	*Lophostemon confertus*	**Brush Box**	0.23	0.30	2.76	2.00	**Low**	Retain & Protect
114	*Corymbia maculata*	**Spotted Gum**	0.41	0.54	4.92	2.55	**Moderate**	Retain & Protect
S01	*Callistemon viminalis cv.*	**Weeping Bottlebrush**	0.26	0.48	3.12	2.43	**Low**	Retain & Protect

Existing Block D

Existing Field and Grass Retained and Protected

Existing Playing Fields

Proposed Building Over

Proposed Building

TREES NEED TO BE REMOVED FOR BUILDING/GRADING AND SERVICES CONNECTION

New Car Park Ramp

Proposed Building

Proposed Roof Over

Proposed Roof Over

Existing Field and Grass Retained and Protected

Existing Shed - Retained

Existing Trees and Landscape Retained and Protected

New Entry

Tree protection zone to be established throughout construction period. Existing surface levels to be maintained and any new services or trenching to be excluded. Area to be mulched with 50mm recycled wood chip and temporary irrigation to be provided to maintain optimum tree health to extent shown hatched red

Existing street tree to be retained and protected. No services or trenching to be undertaken with nominal TPZ and protection fencing to be placed as shown to prevent damage to tree and foliage from construction access

Copeland Street

0 4 10 20m

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REVISION	DESCRIPTION	CHKD	DATE
A	For Design Review Panel Submission	RWS	15/5/19

PROJECT & CLIENT
St. Dominic's College Block E
St. Dominic's College

Project No : 18.21
Designed : RWS/CMB
Drawn : CMB
North Scale : 1:200@A1/1:400@A3

DRAWING TITLE
Tree Protection & Removal Plan

DRAWING NUMBER T-03

REVISION A

Plotted at : 3:11 pm 15/5/19

4.3 Tree Impact Assessment Schedule

St Dominic's - Tree Impact Assessment Schedule

Tree ID	Tree Species	Common Name	Height (m)	Spread North (m)	Spread West (m)	Spread South (m)	Spread East (m)	Trunk Diameter Breast Height (dbh) (m)	Trunk Diameter at base (dgl) (m)	Nominal TPZ radius (m) 12xdbh (AS 4970)	Nominal SRZ radius (m) (AS 4970)	Age Class	Current Vigour	Current Form	Noted Defects	SULE Rating	Retention Value	General Comments and Notes	Incursion and Impact	Recommendation
68	*Casuarina cunninghamiana*	**River She-Oak**	14.0	4.0	4.0	3.0	3.0	0.54	0.68	6.48	2.81	Mature	Fair	Average		Long (>40 years)	**Low**	Extensive pruning to road side for power line clearance.	In footprint of works	Remove
69	*Corymbia maculata*	**Spotted Gum**	14.0	1.5	1.5	2.5	2.5	0.27	0.31	3.24	2.02	Semi-mature	Fair	Average		Long (>40 years)	**Moderate**		In footprint of works	Remove
71	*Corymbia maculata*	**Spotted Gum**	12.0	2.5	2.5	2.5	2.5	0.18	0.24	2.16	1.82	Semi-mature	Fair	Average	Deadwood-Minor	Long (>40 years)	**Moderate**		In footprint of works	Remove
72	*Corymbia maculata*	**Spotted Gum**	19.0	5.0	4.5	3.0	4.0	0.57	0.73	6.84	2.90	Mature	Good	Good	Deadwood-Minor	Long (>40 years)	**Moderate**		In footprint of works	Remove
74	*Corymbia maculata*	**Spotted Gum**	19.0	5.0	3.5	2.5	4.0	0.45	0.55	5.40	2.57	Mature	Good	Average	Deadwood-Minor	Long (>40 years)	**Moderate**	Pruned for powerlines clearance.	In footprint of works	Remove
75	*Corymbia maculata*	**Spotted Gum**	19.0	5.5	4.5	2.5	4.5	0.48	0.60	5.76	2.67	Mature	Good	Average		Long (>40 years)	**Moderate**		In footprint of works	Remove
76	*Corymbia maculata*	**Spotted Gum**	4.5	1.5	1.0	1.5	1.5	0.09	0.11	2.00	1.31	Semi-mature	Fair	Suppressed	Root Impacts, Lean-Minor	Remove (<5 years)	**V Low / Remove**	Prominent butt sweep. Movement noted in tree base when Burnley Test applied. Root defects likely.	In footprint of works	Remove
77	*Corymbia citriodora*	**Lemon Scented Gum**	12.0	3.5	3.5	3.5	3.5	0.40	0.50	4.80	2.47	Semi-mature	Good	Average		Long (>40 years)	**Moderate**		In footprint of works	Remove
78	*Acacia floribunda*	**Gossamer Wattle**	4.0	2.5	1.5	1.0	2.0	0.21	0.28	2.52	1.94	Over-mature	Fair	Poor	Pest/Disease, Co-dominant Stems, Decay-Minor	Remove (<5 years)	**V Low / Remove**	Poor condition and borers noted in trunks	In footprint of works	Remove
79	*Acacia floribunda*	**Gossamer Wattle**	4.0	3.0	1.5	1.0	2.0	0.19	0.27	2.28	1.91	Over-mature	Fair	Poor	Pest/Disease, Lean-Major, Co-dominant Stems	Remove (<5 years)	**V Low / Remove**	Poor condition and borers noted in trunks	In footprint of works	Remove
80	*Acacia floribunda*	**Gossamer Wattle**	5.0	2.0	1.5	1.0	1.5	0.22	0.35	2.64	2.13	Over-mature	Fair	Average	Pest/Disease, Inclusions, Co-dominant Stems	Remove (<5 years)	**V Low / Remove**	Poor condition and borers noted in trunks	In footprint of works	Remove
81	*Eucalyptus microcorys*	**Tallowood**	8.5	2.5	2.0	2.5	3.5	0.24	0.30	2.88	2.00	Semi-mature	Fair	Poor		Long (>40 years)	**Low**	Extensive pruning to road side for powerline clearance	In footprint of works	Remove
82	*Eucalyptus tereticornis*	**Forest Red Gum**	13.0	2.0	1.5	2.5	2.5	0.22	0.29	2.64	1.97	Semi-mature	Good	Good		Long (>40 years)	**Moderate**		In footprint of works	Remove
83	*Corymbia maculata*	**Spotted Gum**	17.5	3.0	4.0	2.0	3.0	0.41	0.50	4.92	2.47	Mature	Good	Average	Epicormic Growth, Asymmetric Canopy	Long (>40 years)	**Moderate**	Pruned for powerlines clearance.	In footprint of works	Remove
84	*Eucalyptus tereticornis*	**Forest Red Gum**	14.5	2.5	2.0	2.0	2.5	0.21	0.27	2.52	1.91	Semi-mature	Good	Good		Long (>40 years)	**Moderate**	Minor pruning to road side for power line clearance, otherwise good tree.	In footprint of works	Remove
85	*Corymbia maculata*	**Spotted Gum**	17.5	5.0	5.0	3.0	5.0	0.54	0.65	6.48	2.76	Mature	Good	Good	Epicormic Growth	Long (>40 years)	**Moderate**	Pruned for powerlines clearance, otherwise good tree.	In footprint of works	Remove
86	*Eucalyptus tereticornis*	**Forest Red Gum**	11.0	2.0	2.0	2.0	2.0	0.20	0.28	2.40	1.94	Semi-mature	Fair	Poor	Epicormic Growth	Long (>40 years)	**Low**	Extensive pruning to road side for powerline clearance. Top pruned out for power lines clearance. Basal wound to north and east. Good reaction wood observed around wounds.	No impact from works	Retain & Protect
87	*Corymbia maculata*	**Spotted Gum**	10.5	2.0	2.0	2.0	2.0	0.15	0.20	2.00	1.68	Semi-mature	Fair	Average		Long (>40 years)	**Low**	Pruned for power lines clearance.	No impact from works	Retain & Protect
88	*Eucalyptus tereticornis*	**Forest Red Gum**	11.0	2.0	2.0	2.0	2.0	0.20	0.25	2.40	1.85	Semi-mature	Fair	Poor	Epicormic Growth	Long (>40 years)	**Low**	Extensive pruning to road side for powerline clearance. Top pruned out.	No impact from works	Retain & Protect
89	*Eucalyptus tereticornis*	**Forest Red Gum**	10.0	2.0	2.0	2.0	2.0	0.16	0.21	2.00	1.72	Semi-mature	Fair	Poor	Epicormic Growth, Asymmetric Canopy	Long (>40 years)	**Low**	Extensive pruning to road side for powerline clearance. Top pruned out. Very poor condition.	No impact from works	Retain & Protect
90	*Corymbia maculata*	**Spotted Gum**	15.5	3.5	4.0	2.0	4.0	0.34	0.43	4.08	2.32	Semi-mature	Fair	Average	Asymmetric Canopy, Epicormic Growth	Long (>40 years)	**Moderate**		No impact from works	Retain & Protect
91	*Corymbia citriodora*	**Lemon Scented Gum**	16.0	4.0	3.5	2.5	4.0	0.34	0.48	4.08	2.43	Semi-mature	Fair	Poor	Asymmetric Canopy, Epicormic Growth	Long (>40 years)	**Low**	Extensive pruning to road side for powerline clearance.	No impact from works	Retain & Protect
92	*Corymbia maculata*	**Spotted Gum**	17.5	4.0	3.5	2.5	4.0	0.36	0.45	4.32	2.37	Mature	Fair	Average		Long (>40 years)	**Moderate**	Minor pruning for power line clearance.	No impact from works	Retain & Protect
93	*Eucalyptus tereticornis*	**Forest Red Gum**	9.0	4.0	3.5	2.5	4.0	0.10	0.15	2.00	1.49	Semi-mature	Fair	Poor	Epicormic Growth	Long (>40 years)	**Low**	Extensive pruning to road side for power line clearance. Top pruned out.	No impact from works	Retain & Protect
109	*Corymbia maculata*	**Spotted Gum**	14.5	5.0	5.0	5.0	5.0	0.52	0.68	6.24	2.81	Mature	Good	Good		Long (>40 years)	**Moderate**		No impact from works	Retain & Protect
110	*Corymbia maculata*	**Spotted Gum**	12.0	4.0	3.0	3.0	3.0	0.25	0.35	3.00	2.13	Mature	Fair	Suppressed	Asymmetric Canopy	Long (>40 years)	**Low**		No impact from works	Retain & Protect
111	*Corymbia maculata*	**Spotted Gum**	15.0	4.0	3.5	3.0	3.5	0.42	0.49	5.04	2.45	Mature	Good	Good		Long (>40 years)	**Moderate**		No impact from works	Retain & Protect
112	*Lophostemon confertus*	**Brush Box**	7.0	3.0	3.0	3.0	3.0	0.26	0.33	3.12	2.08	Semi-mature	Poor	Poor	Tip Dieback	Replaceable (Small/Young)	**Low**	Very sparse and slightly suppressed canopy.	No impact from works	Retain & Protect
113	*Lophostemon confertus*	**Brush Box**	6.5	3.0	3.0	3.0	3.0	0.23	0.30	2.76	2.00	Semi-mature	Fair	Average	Lean-Minor	Replaceable (Small/Young)	**Low**	Sparse canopy and minor lean to east.	No impact from works	Retain & Protect
114	*Corymbia maculata*	**Spotted Gum**	14.0	3.0	3.0	3.0	3.0	0.41	0.54	4.92	2.55	Mature	Good	Average		Long (>40 years)	**Moderate**		No impact from works	Retain & Protect
S01	*Callistemon viminalis cv.*	**Weeping Bottlebrush**	4.5	1.0	1.5	1.5	1.0	0.26	0.48	3.12	2.43	Mature	Good	Poor	Epicormic Growth	Medium (15-40 years)	**Low**	Extensive pruning of upper canopy for power line clearance.	No impact from works	Retain & Protect

4.4 Tree Data Summary Sheets

ID # 01
Species: Callistemon viminalis cv.
Common: Weeping Bottlebrush

Tree Origin:	Native		
DBH:	0.26	DGL:	0.48
TPZ:	3.12	SRZ:	2.43
Current Form:	Poor		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Medium (15-40 years)		
QTRA_ROH:			

Retention Value: Low

ID # 72
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.57	DGL:	0.73
TPZ:	6.84	SRZ:	2.9
Current Form:	Good		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 68
Species: Casuarina cunninghamiana
Common: River She-Oak

Tree Origin:	Endemic		
DBH:	0.54	DGL:	0.68
TPZ:	6.48	SRZ:	2.81
Current Form:	Average		
Current Vigour:	Fair		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Low

ID # 74
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.45	DGL:	0.55
TPZ:	5.4	SRZ:	2.57
Current Form:	Average		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 69
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.27	DGL:	0.31
TPZ:	3.24	SRZ:	2.02
Current Form:	Average		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 75
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.48	DGL:	0.60
TPZ:	5.76	SRZ:	2.67
Current Form:	Average		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 71
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.18	DGL:	0.24
TPZ:	2.16	SRZ:	1.82
Current Form:	Average		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 76
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.09	DGL:	0.11
TPZ:	2	SRZ:	1.5
Current Form:	Suppressed		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Remove (<5 years)		
QTRA_ROH:			

Retention Value: V Low / Remove

ID # 77
Species: Corymbia citriodora
Common: Lemon Scented Gum

Tree Origin:	Native		
DBH:	0.40	DGL:	0.50
TPZ:	4.8	SRZ:	2.47
Current Form:	Average		
Current Vigour:	Good		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 78
Species: ***Acacia floribunda***
Common: Gossamer Wattle

Tree Origin:	Endemic		
DBH:	0.21	DGL:	0.28
TPZ:	2.52	SRZ:	1.94
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Over-mature		
SULE:	Remove (<5 years)		
QTRA_ROH:			

Retention Value: V Low / Remove

ID # 79
Species: ***Acacia floribunda***
Common: Gossamer Wattle

Tree Origin:	Endemic		
DBH:	0.19	DGL:	0.27
TPZ:	2.28	SRZ:	1.91
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Over-mature		
SULE:	Remove (<5 years)		
QTRA_ROH:			

Retention Value: V Low / Remove

ID # 80
Species: ***Acacia floribunda***
Common: Gossamer Wattle

Tree Origin:	Endemic		
DBH:	0.22	DGL:	0.35
TPZ:	2.64	SRZ:	2.13
Current Form:	Average		
Current Vigour:	Fair		
Age Class:	Over-mature		
SULE:	Remove (<5 years)		
QTRA_ROH:			

Retention Value: V Low / Remove

ID # 81
Species: ***Eucalyptus microcorys***
Common: Tallowood

Tree Origin:	Native		
DBH:	0.24	DGL:	0.30
TPZ:	2.88	SRZ:	2
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Low

ID # 82
Species: ***Eucalyptus tereticornis***
Common: Forest Red Gum

Tree Origin:	Endemic		
DBH:	0.22	DGL:	0.29
TPZ:	2.64	SRZ:	1.97
Current Form:	Good		
Current Vigour:	Good		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 83
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.41	DGL:	0.50
TPZ:	4.92	SRZ:	2.47
Current Form:	Average		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 84
Species: ***Eucalyptus tereticornis***
Common: Forest Red Gum

Tree Origin:	Endemic		
DBH:	0.21	DGL:	0.27
TPZ:	2.52	SRZ:	1.91
Current Form:	Good		
Current Vigour:	Good		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 85
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.54	DGL:	0.65
TPZ:	6.48	SRZ:	2.76
Current Form:	Good		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 86
Species: ***Eucalyptus tereticornis***
Common: Forest Red Gum

Tree Origin:	Endemic		
DBH:	0.20	DGL:	0.28
TPZ:	2.4	SRZ:	1.94
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Low

ID # 87
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.15	DGL:	0.20
TPZ:	2	SRZ:	1.68
Current Form:	Average		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Low

ID # 88
Species: ***Eucalyptus tereticornis***
Common: Forest Red Gum

Tree Origin:	Endemic		
DBH:	0.20	DGL:	0.25
TPZ:	2.4	SRZ:	1.85
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Low

ID # 89
Species: ***Eucalyptus tereticornis***
Common: Forest Red Gum

Tree Origin:	Endemic		
DBH:	0.16	DGL:	0.21
TPZ:	2	SRZ:	1.72
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Low

ID # 90
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.34	DGL:	0.43
TPZ:	4.08	SRZ:	2.32
Current Form:	Average		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 91
Species: Corymbia citriodora
Common: Lemon Scented Gum

Tree Origin:	Native		
DBH:	0.34	DGL:	0.48
TPZ:	4.08	SRZ:	2.43
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Low

ID # 92
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.36	DGL:	0.45
TPZ:	4.32	SRZ:	2.37
Current Form:	Average		
Current Vigour:	Fair		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: Moderate

ID # 93
Species: ***Eucalyptus tereticornis***
Common: Forest Red Gum

Tree Origin:	Endemic		
DBH:	0.10	DGL:	0.15
TPZ:	2	SRZ:	1.5
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: **Low**

ID # 94
Species: ***Eucalyptus tereticornis***
Common: Forest Red Gum

Tree Origin:	Endemic		
DBH:	0.14	DGL:	0.22
TPZ:	2	SRZ:	1.75
Current Form:	Poor		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: **Low**

ID # 109
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.52	DGL:	0.68
TPZ:	6.24	SRZ:	2.81
Current Form:	Good		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: **Moderate**

ID # 110
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.25	DGL:	0.35
TPZ:	3	SRZ:	2.13
Current Form:	Suppressed		
Current Vigour:	Fair		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: **Low**

ID # 111
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.42	DGL:	0.49
TPZ:	5.04	SRZ:	2.45
Current Form:	Good		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: **Moderate**

ID # 112
Species: Lophostemon confertus
Common: Brush Box

Tree Origin:	Native		
DBH:	0.26	DGL:	0.33
TPZ:	3.12	SRZ:	2.08
Current Form:	Poor		
Current Vigour:	Poor		
Age Class:	Semi-mature		
SULE:	Replaceable		
QTRA_ROH:			

Retention Value: **Low**

ID # 113
Species: Lophostemon confertus
Common: Brush Box

Tree Origin:	Native		
DBH:	0.23	DGL:	0.30
TPZ:	2.76	SRZ:	2
Current Form:	Average		
Current Vigour:	Fair		
Age Class:	Semi-mature		
SULE:	Replaceable		
QTRA_ROH:			

Retention Value: **Low**

ID # 114
Species: Corymbia maculata
Common: Spotted Gum

Tree Origin:	Native		
DBH:	0.41	DGL:	0.54
TPZ:	4.92	SRZ:	2.55
Current Form:	Average		
Current Vigour:	Good		
Age Class:	Mature		
SULE:	Long (>40 years)		
QTRA_ROH:			

Retention Value: **Moderate**