

**Arboricultural Impact Assessment
Young High School - Main Works 2019 V1**

1. Introduction.

There is a Joint Use Library Planned for the township of Young in NSW. The library will be constructed in the grounds of Young High School and serve as the library for both the Hilltops Community and Young High School. Other upgrades are also planned to the High School.

The project is planned in both the Young High School grounds and Carrington Park. Hayball Architects have been engaged by the NSW Department of Education to provide architectural services for the project.

There are two parts to the overall project – Part 1 Early Works Package and Part 2 - Young High School - Main Works

This report covers part 2 - Young High Main Works which includes;

- New library – Block NN
- Associated landscape works adjacent to Block NN
- Landscape works to Carrington Park including adjustments to Carrington Park carpark.
- Refurbished Existing library – Block EE
 - No impacts to trees proposed in main works stage.

As part of the planning and development stage a recording and background assessment of the tree vegetation was undertaken in August 2018, and a further expanded area in April 2019.

Some 88 trees were evaluated and documented in total. Final plans have been developed for the development application and an Arboricultural impact assessment is required as part of the process.

2. Scope, purpose and methodology.

The report has been commissioned by Hayball Architects' on behalf of School Infrastructure NSW. The Hayball contact is Mr. James Cristallo, Project Manager who can be contacted on 02 9660 9329. The site was visited, and field data recorded on Wednesday 1 August 2018 and 2 April 2019.

The primary purpose of the report is to;

- Provide details on species, dimensions, condition
- Provide guidance and recommendations on the trees that have been identified for retention and those identified for removal.

- Identification of other issues that may be relevant to the trees and development impacts involving trees.
- Recommendations for issues identified.

Interpretation of impacts and recommendations are based on the author's interpretation of *Australian Standard 4970-2009 Protection of trees on development sites*.

[Tree Protection Zone](#) (TPZ) and other key definitions are contained at the conclusion of the report.

- A Tree Map was developed as Annexure 1 with tree numbers allocated and plotted for the initial report, it has been updated as version 2 (2019) – a separate PDF file.
 - The same tree numbers have been used by the Landscape Design plans.
 - Note – the Conservation management strategy report uses different tree numbering system.
 - *Annexure 1 – Tree Map Young High School and Carrington Park Project V2.*
- A Tree Register was developed as Annexure 2 as a Microsoft Excel file. The register contains all the details on the specific trees and can be filtered for review and other management purposes.
 - *Annexure 2 – Young High and Carrington Park Tree Data File – Main Works V1.*

3. Location and Background.

Diagrams one and two provide the location of the proposed works. Various Plans were supplied to assist in tree impact evaluation. They are referenced at the end of the report.

A new library – Block NN is proposed for construction on a demolished site, (Part 1) and notable landscaping upgrades are proposed to link Carrington Park and public entrance to the new library from Olympic Way to the east and Capel Street to the west.

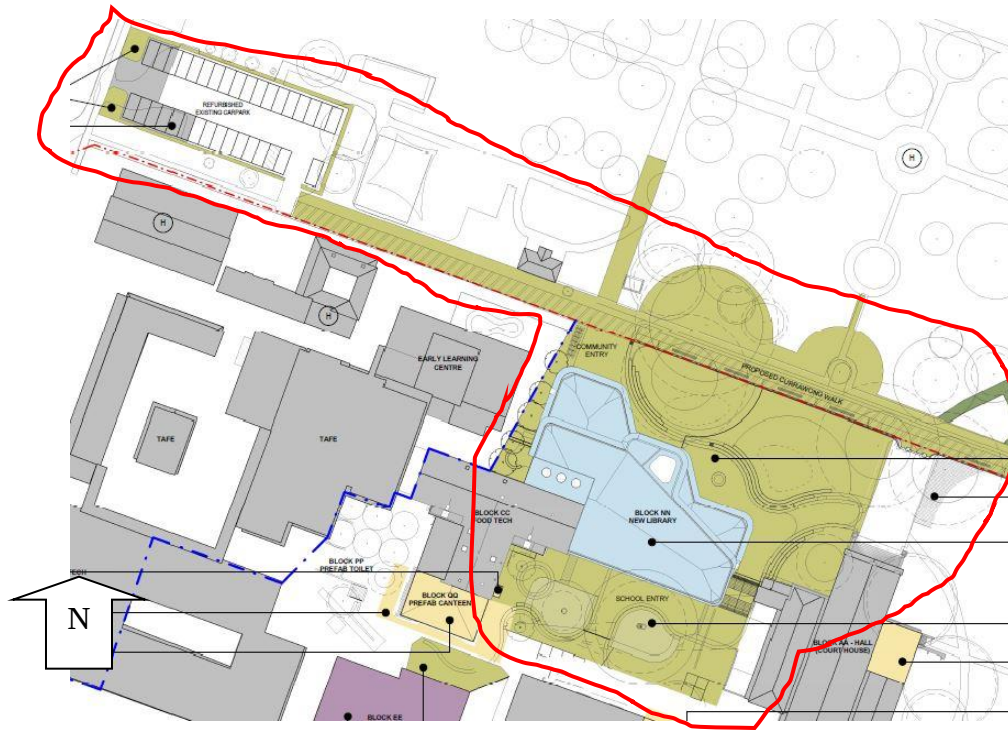


Diagram One – Plan of Young High School and Carrington Park to north. Main Works development area inside red line. Blue footprint is proposed Block NN, and olive green area is proposed new landscaping. Adapted from Hayball – Site Plan – Main Works – proposed 27/08/2019.

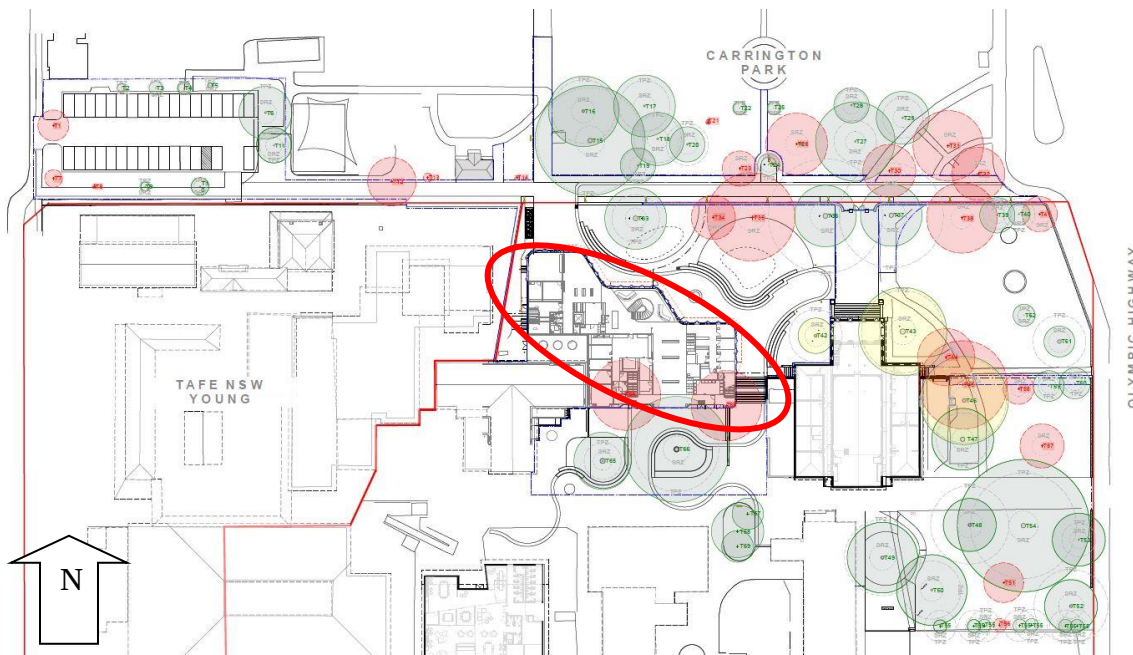


Diagram two – Plot of trees relative to the Main Works. Trees retained in green, trees proposed for removal in red. Location of new library – Block NN circled. Adapted from 360 Degrees Tree Protection & Removal Plan LO5 – 28/8/19.

4. Summary of Impacts.

23 trees have been identified for removal as part of the Main Works project.

11 trees are identified as significant trees, most with heritage status. There are a number of potential impacts from the development that will need to be carefully managed to maintain tree root systems, vitality and provide sufficient root space for ongoing vigour of trees.

[Table 1](#) provides a summary of trees identified for removal and comments or reasons for removal.

[Table 2](#) provides a summary of significant trees and identified potential impacts that will require management and/or amelioration. Data is extracted from *Annexure 2 – Young High and Carrington Park – Tree Data File V1*.

Table 1 – Trees recommended for removal.			
Tree No	Species	Recommendation for Main Works – Sep 19	Comments or Justification
1	Canadian Maple - Possibly Acer rubrum	Removal	Modification of car park required - small tree easily replaced in 5 years.
7	Canadian Maple - Possibly Acer rubrum	Removal	Modification of car park required - small tree easily replaced in 5 years. Tree in poor condition - will not mature into quality amenity tree
8	Acer Species - Lipstick Maple	Removal	Modification of car park required - small tree easily replaced in 5 years. Tree stem moderate damage - tree unlikely to mature into quality amenity tree
12	Grevillea robusta Silky Oak	Removal	Construction of new pathway very close to tree. Tree in poor condition from previous construction impacts. Poor life expectancy - tree in decline
13	Ulmus glabra lutescens Golden Elm	Removal	Construction of new pathway very close to tree. Small tree in only fair condition - Pest infestation - Elm Leaf Beetle - poor retention values. Easily replaced in 3 years

Table 1 – Trees recommended for removal.			
Tree No	Species	Recommendation for Main Works – Sep 19	Comments or Justification
14	Ulmus glabra lutescens Golden Elm	Removal	Construction of new pathway very close to tree. Small tree in only fair condition - Pest infestation - Elm Leaf Beetle - poor retention values. Easily replaced in 3 years
21	Ulmus glabra lutescens Golden Elm	Removal	Tree in excess of 10 years old - has performed very poorly - new tree far better option.
23	Picea pungens Blue Spruce	Removal	Required to assist the longevity of tree 24 - which has significant cultural values
26	Cedrus deodara Himalayan cedar	Removal	Required to assist the longevity of tree 24 - which has significant cultural values
30	Eucalyptus cinerea - Argyle Apple	Removal	Identified by Heritage consultant as intrusive planting. Tree also has significant structural fault in stem system - and will be located adjacent to new footpath
31	Cedrus deodara Himalayan cedar	Removal	Tree in poor condition - life expectancy poor
32	Ulmus glabra lutescens Golden Elm	Removal	Stem immediately adjacent to new footpath - cannot be retained.
34	Eucalyptus pseudoglobulus Blue Gum	Removal	Tree has already been removed.
35	Eucalyptus pseudoglobulus Blue Gum	Removal	Identified by Heritage consultant as intrusive planting. Tree also has significant structural defects in upper canopy.
38	Olea europaea - African Olive	Removal	Identified by Heritage consultant as intrusive planting.
40	Araucaria cunninghamii Hoop Pine	Removal	Identified by Heritage consultant as intrusive planting.

Table 1 – Trees recommended for removal.			
Tree No	Species	Recommendation for Main Works – Sep 19	Comments or Justification
41	Acer negundo - Box Elder	Removal	Tree in poor condition - life expectancy poor
44	Liquidambar styraciflua	Removal	Identified by Heritage consultant as intrusive planting.
45	Laurus species (Bay Tree??) not identified to species	Removal	Identified by Heritage consultant as intrusive planting.
51	Ulmus glabra lutescens Golden Elm	Removal	Tree with significant structural defect in stem system
56	Prunus species - flowering cherry - 3	Removal	Small suppressed tree - poor condition - poor life expectancy
57	Arbutus unedo - Irish Strawberry Tree	Removal	Tree Dying
58	Pyrus species - ornamental Pear	Removal	Tree has recent stem failure - poor life expectancy - poor amenity values.



Photo 1 – Tree 7 –
*Marked for removal -
Small young tree
with extensive stem
damage. Unlikely to
develop into a quality
amenity tree.*



Photo 2 – Tree 12
*– Marked for removal
to accommodate new
pathway. Tree of
some age, however it
is in decline due to
extensive
development –
construction of
retaining wall has
removed large
portion of root
system.*



Photo 3 – Tree 13
– *Small Ulmus glabra lutescens*
Golden Elm - Marked for removal for new pathway – species does not perform well in lower rainfall, and prone to elm leaf beetle and borers.



Photo 4 – Tree 13
– Borer infestation circled. Typically will spread through the tree over time and tree will decline.



Photo 5 – Tree 30
– *Eucalyptus cinerea*
– Argyle Apple –
marked for removal.
One of number of
trees identified by
Heritage Consultant
as invasive palting.
Tree also has noted
stem defect, and
pathway to be re-
developed close to
stem.



Photo 6 – Tree 30
– close up of
bifurcation in stem
system – failure
likely.



Photo 7 – Tree 40 -
Araucaria cunninghamii
Hoop Pine – young tree - marked for removal a recent planting identified by Heritage consultant as intrusive planting – younger tree that was planted to replace original lost tree – but incorrect location



Photo 8 – Tree 44 -
Liquidambar styraciflua – marked for removal - also identified by Heritage consultant as intrusive planting. (Note in Heritage report the tree is nominated as *Platanus acerfolia*.)

Table 2 – Summary of Significant Trees and potential Impacts			
Tree No	Species	Recommendation for Main Works – Sep 19	Impacts, Comments or Issues
15	<i>Ulmus species</i> (procera) English Elm	Significant Tree - Identified by Heritage Consultant	Works inside TPZ require consultation with project arborist - Proposed Granit pavement should be acceptable - unless excavation is required. Prudent and important to maintain current soil levels
16	<i>Ulmus species</i> (procera) English Elm	Significant Tree - Identified by Heritage Consultant	Works inside TPZ require consultation with project arborist - Proposed Granit pavement should be acceptable - unless excavation is required. Prudent and important to maintain current soil levels
24	<i>Eucalyptus melliodora</i> Yellow Box	Significant Tree - Identified by Heritage Consultant	Major works inside TPZ require consultation with project arborist - Proposed Granit pavement should be acceptable - unless excavation is required. Prudent and important to maintain current soil levels
33	<i>Araucaria cunninghamii</i> Hoop Pine	Significant Tree - Identified by Heritage Consultant	Major encroachments planned into the TPZ for this tree - this will require careful planning as the tree is in fair condition only. Vigour looks to be declining slightly. Works inside the TPZ for this tree require consultation with Project Arborist. New pathway should respect current soil levels in Carrington Park - excavation well inside TPZ would likely be detrimental - pathways potentially present 25-30% encroachment in addition to encroachments on south side. Consider maintaining current levels and elevating or constructing pathway over current level. Works area also inside TPZ on south side - project arborist will need to be consulted before works commence - also for electrical supply for lighting and irrigation system. Tree will definitely require supplementary watering during development.
36	<i>Araucaria cunninghamii</i> Hoop Pine	Significant Tree - Identified by Heritage Consultant	Works inside the TPZ for this tree require consultation with Project Arborist. New pathway should respect current soil levels in Carrington Park - excavation well inside TPZ would likely be detrimental - pathways potentially represent 25-30% encroachment.

Table 2 – Summary of Significant Trees and potential Impacts			
Tree No	Species	Recommendation for Main Works – Sep 19	Impacts, Comments or Issues
			Works area also inside TPZ on south side - project arborist will need to be consulted before works commence - specifically for electrical supply or any other services. Tree will require supplementary watering during development.
37	<i>Araucaria cunninghamii</i> Hoop Pine	Significant Tree - Identified by Heritage Consultant	Works inside the TPZ for this tree require consultation with Project Arborist. New pathway should respect current soil levels in Carrington Park - excavation well inside TPZ would likely be detrimental - pathways potentially represent 25-30% encroachment. Works area also inside TPZ on south side - project arborist will need to be consulted before works commence - specifically for electrical supply or any other services. Tree will require supplementary watering during development.
42	<i>Arbutus unedo</i> - Irish Strawberry Tree	Significant Tree - Identified by Heritage Consultant	See also recommendations with regard to Early Works Package - Annexure 2. Works inside the TPZ for this tree require consultation with Project Arborist. Removal of current pavement needs to be conducted by hand work. Any excavation inside TPZ would likely be detrimental to root system. Electrical supply to lighting needs to be considered - no trenching across TPZ. Soil levels need to be maintained at current height. Tree will require supplementary watering during development.
43	<i>Arbutus unedo</i> - Irish Strawberry Tree	Significant Tree - Identified by Heritage Consultant	No direct impacts identified. Tree canopy will likely require protection from passing development traffic.
52	<i>Brachychiton populneus</i> Kurrajong	Significant Tree - Identified by Heritage Consultant	TPZ needs to be respected - Any works inside TPZ - needs to be considered.
54	<i>Pinus pinea</i> - Stone Pine	Significant Tree - Identified by Heritage Consultant	TPZ needs to be respected - Any works inside TPZ - needs to be considered. Tree will require supplementary watering as part of any development.

Table 2 – Summary of Significant Trees and potential Impacts			
Tree No	Species	Recommendation for Main Works – Sep 19	Impacts, Comments or Issues
66	<i>Corymbia citriodora</i> - Lemon Scented Gum	Significant Tree – Large imposing tree in landscape – long life expectancy – Very High amenity values.	Works inside the TPZ require Project Arborist consultation. Specifically - removal of bitumen hard surface under proposed raised timber area needs to be done by hand - no damage to root system in TPZ and specifically near the SRZ. Pier system will support tree vigor and removal of bitumen will support tree vigor. Tree site conditions should be improved by development.



Photo 9 – Trees 15 and 16 *Ulmus species (procera)*
English Elm – Noted by Heritage Consultant as significant, and larger tree potentially planted by Lord Carrington. Pathway is to be constructed inside the Tree Protection zone – this needs to be considered in relation to the root zone impacts on the trees.



Photo 10 – Tree 33 –
Araucaria cunninghamii -
Hoop Pine Significant tree
with heritage values. Tree
protection zone over 13
meters – tree needs
consideration for what work
and how work is conducted.
Specifically proposed
footpath to north of tree and
parallel to current fence.



Photo 11 – Tree 36 *Araucaria*
cunninghamii - Hoop Pine.

*Large and significant tree with
heritage values. Tree protection
zone 13 meters – tree needs
consideration for what work and
how work is conducted.
Specifically proposed footpath to
north of tree and parallel to
current fence.*



Photo 12 – Tree 37 *Araucaria cunninghamii* - Hoop Pine.

Large and significant tree with heritage values. Tree protection zone 12 meters – tree needs consideration for what work and how work is conducted. Specifically proposed footpath to north of tree and parallel to current fence.



Photo 13 – Tree 42 - *Arbutus unedo* - Irish Strawberry Tree.

Aged and Significant tree with heritage values.

Note that the root zone is covered with hard surface, and the tree protection zone theoretically extends into both buildings. Work around the tree will need to be planned – including how the concrete is removed and building BB to right.

Once the building BB to right is removed the canopy will be opened up to new and increased wind loadings.



Photo 14 – Tree 42 - *Arbutus unedo* - Irish Strawberry Tree.

Close up of stem system – note bifurcation in stem with decay and necrotic zones. Once the building BB is removed the tree will be opened up to wind loading it has not been exposed to for many decades- stem failure is a real possibility of failure under wind loading. A bracing system is recommended to prolong the life of the heritage tree.

5. Construction of Block NN and associated Landscape works – specific issues to be managed.

Construction Traffic Movements, Equipment and storage and parking of vehicles through Young High School and Carrington Park needs to be planned so that TPZ for all trees are respected.

Installation of in-ground services - Potential Trenching.

Installation of in ground services, sewer, electricity, and irrigation need to respect the tree protection zones of all trees, or be designed as such that there is minimal trenching, and no trenching directly across TPZ. The majority of tree roots are in the top 300mm of soil, so even trenches this deep remove significant and large quantities of roots.

- Specifically trees 33, 36 & 37 – large Hoop Pines – there is proposal to run lighting along the footpath that traverses the TPZ of all three trees near the structural root zones – **this cannot occur** as general trenching in a line parallel to the footpath. This would equate to TPZ encroachment of 30%, and severing of root systems that currently will extend well past the TPZ and well into Carrington Park.

- Either the electrical line needs to run outside the TPZ's and then come directly to the lights or under bore the whole line and pothole for light installation.
 - If solar power is feasible then consider this option for the individual lights so that no trenching occurs.
- Also Tree 24 and 42 – the electrical supply for lighting will need to be carefully considered as above.

Irrigation Supply – design a system so that there is no trenching inside the TPZ – the delivery lines and sprinkler heads need to be installed outside the TPZ and throw into the TPZ.

Design and Construction of Pathways from Olympic Highway to Library Entrance – Carrington Park.

There is proposal for construction of concrete and granite pathways from the Olympic Highway west to the new Library entrance – under the canopy of trees 33, 36 and 37 to the edge of the structural root zone of the trees. The design needs to be such that excavation into the current soil does not occur. The pathway needs to be raised above the current soil level to prevent the severing of root systems. Excavation this close to the stems will not be an acceptable encroachment to the trees. Current root systems will extend well into Carrington Park and well past the TPZ.

Tree 24 – Reconciliation Tree could be effected in similar way.

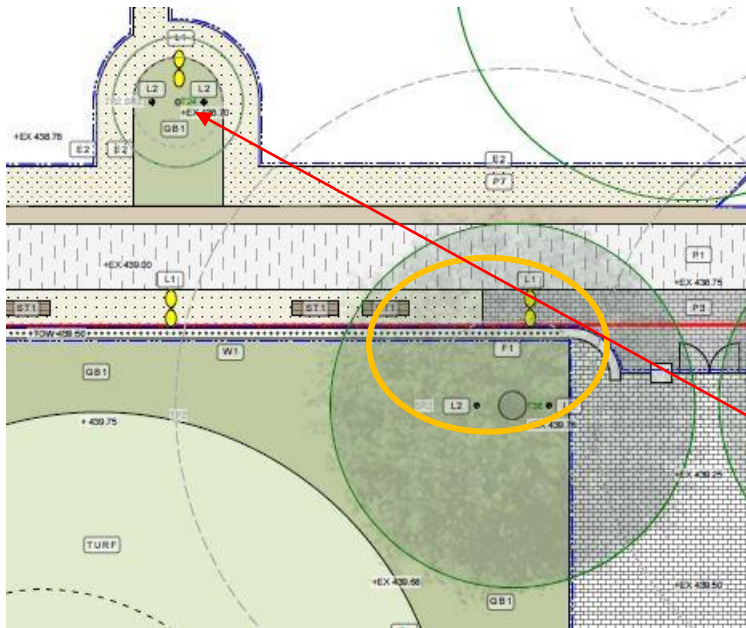
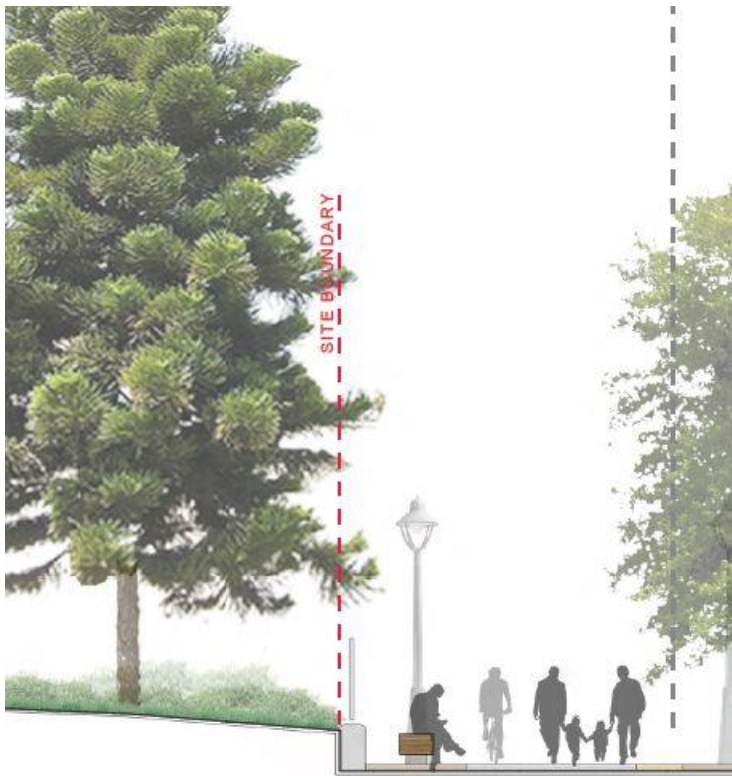


Diagram 3 – Extract from Landscape plans – pathway area constructions to edge of structural root zones of trees 33, 36 & 37 – Orange circle depicts how close to the stem the potential impact could be relative to Tree 36 as example. The design needs to prevent excavation into current soil levels.
Tree 24 – Reconciliation tree

Source - 360 Degrees – Landscape plan L-06.



**Diagram 4 –
Extract from
Landscape**

Depiction of
proposed pathway –
red line of site
boundary is the
location of the
structural root zone
of trees 33, 36 & 37.

Design and
construction is
critical for tree.

Source - 360 Degrees –
Landscape plan L-09

Isolation and protection of Trees 33, 36 & 37.

It should be noted that *Araucaria cunninghamii* - Hoop Pine is derived from the coastal areas of Northern NSW and Queensland where average rainfall is in excess of 1000mm and up to 2000mm per annum (Boland et al 2006). The Young District has now received three years of poor rainfall (BOM 2019) and is currently drought declared (DPI 2019). This will have had impacts on these trees, although not readily observable. Further significant impacts and major encroachments into the TPZ of these trees (root removal) will likely have adverse impacts on the tree vitality, and decline will be very likely. It cannot be overstated that management of these specific heritage trees needs to be carefully considered.

Tree 42 - Arbutus unedo - Irish Strawberry. Tree 42 is a Significant Tree – heritage values. Potentially the tree stands to gain from the development by an improved root zone, as the concrete coverage will be removed. The tree also needs careful management. Recommendations as below were also provided in Part one of the project – Early works package.

- Requirement for project arborist to meet with demolition organisation and plan demolition with regard to tree.

- Tree root system needs to be considered and viewed at point of demolition. Area around the tree needs to be preserved – root zone and canopy.
 - If bare roots are exposed when concrete is removed then they need to be covered by mulch until landscape construction is undertaken.
- Stem system needs to have bracing system installed to reduce the risk of it failing in a storm event. Tree currently receives full benefit of Block BB from wind loading, this will be removed – stem is in poor condition.
- The projected, or theoretical TPZ goes into the buildings that surround the tree – so effectively the tree root system is already confined in a smaller area than the TPZ. This means the root system that the tree currently has is critical to its ongoing vitality and viability. The current root system integrity must be maintained.

6. General Recommendations.

Following general recommendations are provided.

1. Project Arborist The appointment and direct involvement of a project arborist for both the demolition and Main works will be critical to the ongoing viability of the trees – specifically the aged significant trees with heritage values.
 - a. This project will require considerable inputs, and site visits by the project arborist to work with construction personnel and designers
2. TPZ Fencing – should be deployed for all trees within the work sites.
3. Stem protection is recommended for trees 24, 33, 36, 37 and 42.
4. Irrigation An supplementary irrigation program will need to be developed for significant trees or any other trees with major encroachments by the Project Arborist based on rainfall prior to development, during and a period after completion.
5. Installation of Services – Water, Electricity, Communications and Waste water. Trenching across the TPZ severs many roots, the location of the services needs to be carefully considered and avoid the TPZ.
6. Induction of Site Workers.

Strongly recommended that all site workers are inducted into general requirements of Tree Protection Zones – That TPZ are NO GO ZONES without specific permission from the site manager or supervisor. That no work, parking or storage of materials is allowed in the Tree Protection Zone without approval.
7. Pruning Requirements. If pruning of trees is required for clearances then this should only be conducted by level 3 Arborist – Certificate III

in Arboriculture or higher – all pruning should be conducted to Australian Standard 4373-2007 – pruning of amenity trees.

- a. If a Tree contractor does not know if he is a Level III or what Australian Standard is then do not engage them.

7. Concluding Note.

Trees are a most valuable asset and necessary part of both the urban and natural environment. They provide numerous benefits to the biodiversity and ecology of any area. They provide water balance stability, salinity and erosion control, amenity, cultural and aesthetic benefits. As an asset they require fiscal and management inputs.

It should be noted that trees cannot be guaranteed 'risk free'. All trees represent some degree of risk. Arboriculture is not an exacting science; rather it is an educated interpretation of the interaction of biotic and environmental circumstances, which change over time. It is not possible to determine or predict all limb or tree failures. This report is such an interpretation at the time of inspection.



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Associate Member – IACA (Institute of Australian Consulting Arboriculturists)

References.

- Australian Standards (2009). *Australian Standard 4970 – 2009 Protection of trees on development sites.*
- Australian Standards (2007). *Australian Standard 4373 –2007 Pruning of Amenity Trees.*
- D.J. Boland, M.I.H Brooker, G.M. Chippendale, N. Hall, R.D. Hyland, R.D. Johnson, D.A. Kleinig, M.W. McDonald and J.D. Turner. (2006). *Forest Trees of Australia.* pp. 42. CSIRO Publishing.
- BOM (2019). *Monthly Rainfall – Young Airport.* Australian Government Bureau of Meteorology accessed online 6/9/2019 at;
http://www.bom.gov.au/jsp/ncc/cdio/weatherData/av?p_nccObsCode=139&p_display_type=dataFile&p_stn_num=073138

- DPI (2019). Combined Drought Indicator – NSW Primary Producers. NSW Department of Primary Industries, accessed online 6/9/2019 at; <https://edis.dpi.nsw.gov.au/>

Documents supplied.

- *Site Plan – Main Works proposed. Young High School early works - Hayball – Project 2277 – Drawing A00.02 revision 15 dated 27/8/2019.*
- *Site Plan – Main works demolished and existing. Young High School early works - Hayball – Project 2277 Drawing A00.01 Revision 15 dated 27/8/2019.*
- *Young High School Hilltops Library and Community Facility. Landscape Works. 360 Degrees. L-00 to L-17 Revision C – dated 28/8/2019.*
- *Young High School and Carrington Park – Conservation Management Strategies. GML Heritage 20/12/2018*

Key Definitions. (Adapted from AS 4970)

Structural Root Zone (SRZ). *The area around the base of a tree required for the tree's stability in the ground. The woody root growth and soil cohesion in the area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in meters.*

- Breaching this zone can lead to destabilisation of the tree and whole tree failure.
- It is a much smaller zone than the TPZ.
- Work near this zone should not occur without consultation with qualified arboricultural advice

Tree Protection Zone. (TPZ) *A specified area above and below ground and a given distance from the trunk set aside for the protection of a tree's root system and crown to provide for the viability and stability of a tree to be retained where it is potentially subjected to damage from development.*

- TPZ is expressed in meters radially from the stem.
- TPZ is calculated as 12 times the stem diameter – with a maximum of 15m radially and minimum of 2m radially.
- Encroachment into the TPZ can and does occur on many developments – however this needs to be considered by qualified arboricultural advice – as there are a number of complex interacting issues that need to be taken into account relative to the tree and its surroundings.
- The TPZ is critical for maintaining the vitality of the tree – if a tree is impacted sufficiently by the development it will decline; it is more prone to pest and disease, water stress and may not recover.