Arboricultural Impact Assessment Report.

Prepared for; The NSW Department of Education. | Site Address; Mona Vale Public School 2 Waratah Street, Mona Vale NSW 2103 | Date Produced; 12th of April 2021.

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Arboricultural Impact Assessment Report.

Overview:

Paul Shearer Consulting (PSC) was engaged by Colliers International Project Leaders (Project Managers) on behalf of School Infrastructure NSW (SINSW) to produce this Arboricultural Impact Assessment Report (AIA). SINSW seeks approval for upgrades to Mona Vale Public School as part of project delivery phases 0-2. The proposal seeks approval via a Review of Environmental Factors (REF) and Complying Development (CDC) planning pathway for proposed works. The purpose of this AIA is to provide an assessment of protected trees located within 10m of proposed works, identify potential impacts to trees from proposed works and make recommendations for the retention or removal of trees in accordance with the Australian Standard AS4970-2009 Protection of Trees on Development Sites. The Australian Standard AS4970-2009 Protection of Trees on Development Sites has been used as a benchmark in the preparation of this report. The client has been proactive in minimizing tree impacts associated with this development and PSC was engaged to produce a Preliminary Tree Assessment Report (PTA) for this project. The PTA report may be read in conjunction with this report. This report is revision 01, this report has been revised to reflect the Pittwater LEP and DCP only.

Legislation, Policy and Standards:

This report has been produced with reference to the following:

- ✓ AS4970-2009 Protection of Trees on Development Sites.
- ✓ Pittwater Council LEP (2014)
- ✓ Pittwater DCP 21 (2014)
- ✓ (SEPP) 19 Bushland in Urban Areas (1986)
- ✓ (SEPP) Vegetation in Non-Rural Areas (2017).
- ✓ (SEPP) Educational Establishments & Childcare Facilities (2017).
- ✓ SEPP 44 Koala Habitat Protection
- ✓ The Biodiversity Conservation Act (2016).

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DISCLAIMER.

Limits of Scope Statement:

"I am not a solicitor," There is no substitute for current professional litigation consulting agri-horticultural matters and legal advice. This publication is not intended as, and SINSWs not represent legal advice and should not be relied upon to take the place of such advice. Although every effort has been made to assure the accuracy of the information included in this publication as of the date on which it was issued, laws, court and arbitration decisions and governmental regulations in Australia and New South Wales are subject to frequent change. To be included in all the standards and duties of evaluation, investigations, interpretations, methodology and contradictions in determining the failure for claims and litigation.

Assumptions:

Care has been taken to obtain information from reliable sources. All data has been verified insofar as possible, however, Paul Shearer Consulting can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless Stated Otherwise:

Information contained in this report covers only the tree/trees that were examined and reflects the condition of trees at the time of inspection.

Summary.

Paul Shearer Consulting (PSC) was engaged by Colliers International Project Management on behalf of School Infrastructure NSW (SINSW) to produce this Arboricultural Impact Assessment Report (AIA). School Infrastructure NSW (SINSW) will herein be referred to as the client. The subject site is Mona Vale Public School which is located at 2 Waratah Street Mona Vale NSW. The site is located adjacent to the Mona Vale town centre. The site is located within the Local Government Area (LGA) of Northern Beaches (Pittwater Ward) and the previous LGA's of Pittwater and Warringah. Relevant planning provisions from all three Councils were referenced for the purpose of producing this report. I have concluded that there is no special significance associated with the site, such as heritage, ecological or environmental etc., which may affect the significance of the site's tree population.

The site is dissected by a council footpath which provides pedestrian access between Wangara Street and Mona Vale Road. The main school site is located to the north of the council pathway and proposed works would be limited to this area. The southern area of the site provides usage for outdoor activities, has a significant tree population and adjoins the busy Mona Vale Road. As works are not proposed within the southern section of the site trees in this area were not surveyed. The northern area of the site will herein be referred to as the site.

The (SINSW) proposes an upgrade to the school as part of project delivery phases 0-2 as specified in the Scope of Works Option B. The proposal seeks approval via a Review of Environmental Factors (REF) and Complying Development (CDC) planning pathway for proposed works. The client seeks approval for the construction of a three storey Teaching and Learning Hub (T & L) building, a Performing Arts Centre (PAC) building, a modification of the Waratah Street car park, building refurbishments and landscaping. One of the major aims of the client is to create more connectivity within the school and its buildings.

The purpose of this AIA is to provide an impact assessment of proposed works on protected trees identified within the Preliminary Tree Assessment Report (PTA) located within 10m of proposed works. The Australian Standard AS4970-2009 Protection of Trees on Development Sites has been used as a benchmark in the preparation of this report. I am an AQF5 level Arborist and am qualified to produce Arborist Reports within the Northern Beaches LGA. Site plans illustrating landscaping and subgrade works have not been referenced for the purpose of producing this report.

The site covers a large area and has a significant tree population. A Tree Assessment Report produced in 2019 as part of the DEC Annual Tree Risk Assessment process has identified 296 trees on site. Protected trees located within 10m of proposed works were surveyed for the purpose of producing this report. Trees located within 10m of buildings where internal or external works are proposed, and no changes to the building footprint or building height is to occur, have not been included in this report.

Forty two (42) trees protected under Pittwater Council's DCP 21 (2014) were surveyed for the purpose of producing this report. I have maintained numbering in line with existing tree numbering from the DEC Tree Assessment Report (2019). Tree numbering in this report is therefore not numerically sequential. The SEED interactive vegetation mapping tool SINSWs not list an endemic vegetation community on the site and the site's tree population consists of a combination of endemic, introduced native and exotic plant species. The fifteen trees; T7, T122, T123, T124, T125, T126, T201, T202, T203, T204, T206, T207, T216, T217 & T222 are endemic to the Northern Beaches LGA (Pittwater Ward). The twenty four trees; T1, T2, T3, T4, T5, T6, T11, T121, T205, T208, T209, T210, T219, T220, T221, T223, T224, T225, T226, T227, T228, T229, T230 & T231 are introduced native species. The three trees; T8, T9 & T10 are exotic species. All of the subject trees are located within the school grounds.

I have completed an impact assessment in accordance with AS4970-2009 and concluded that construction of the proposed T & L building and modifications to the Waratah Street carpark will require removal of the twenty six trees; T1, T2, T3, T4, T5, T6, T7, T8, T9, T201, T203, T204, T205, T209, T210, T216, T222, T223, T224, T225, T226, T227, T228, T229, T230 and T231. Of the twenty six trees recommended for removal the seven trees; T4, T5, T7, T209, T216, T225 and T227 have been awarded a high retention value. I have concluded that construction of the PAC building will not result in any tree impacts which would require tree removal. The deck off the PAC building would be constructed within close proximity of the stem of the tree T121 and I have recommended that the deck be configured to avoid potential future tree building conflicts.

I have considered options for minimizing tree impacts and have concluded that this is not a practical or equitable option when relevant site and tree factors are considered. I have therefore recommended that consideration be given for removal the twenty six trees; T1, T2, T3, T4, T5, T6, T7, T8, T9, T201, T202, T203, T204, T209, T210, T216, T222, T223, T224, T225, T226, T227, T228, T229, T230 and T231. The removal of trees located adjacent to the school's Waratah Street boundary for construction of the T & L building and Waratah Street car park will no doubt have an impact on the streetscape character of Waratah Street. I have provided generic recommendations for landscaping and tree replenishment in lieu of a site plan illustrating proposed landscaping. I have provided a sensitive construction methodology and provided a tree protection plan to minimize tree impacts. I have provided generic recommendations for the installation of subgrade services in lieu of site plans illustrating civil works to assist in in minimizing tree impacts. I have recommended that a Project Arborist be engaged to oversee the implementation of the tree protection plan and tree management throughout the development process.

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1.0 Observations.

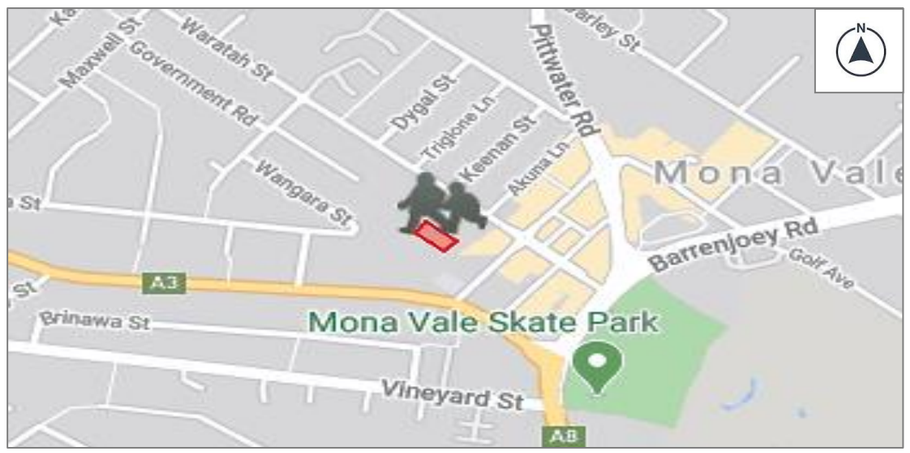
1.1 The Site.

Mona Vale Public School is located at number 2 Waratah Street Mona Vale NSW. (Figure 1) The school site was acquired in 1906 and the official school opening occurred in 1912. *(Rob Stokes 2012)* The site is located approximately 31 kilometres north of the Sydney CBD. The site is located adjacent to and west of the Mona Vale town centre. The site is located within the LGA of Northern Beaches and the previous LGA of Pittwater. Site usage is as a primary school, a privately operated childcare centre is located at the western corner of the site.

The site is dissected by a council footpath which provides pedestrian access between Wangara Street and Mona Vale Road. The (main school site) is located to the north of the council pathway. The southern area of the site has a significant tree population and adjoins the busy Mona Vale Road. As works are not proposed within the southern section of the site trees in this area were not surveyed. The northern area of the site will herein be referred to as the site.

The site is bounded by three local roads including; Waratah Street to the north, Wangara Street to the south and Bungan Street to the east. The western area of the site is bounded by residential properties. Mona Vale Road, which is a major arterial road, connects with Bungan Street at the southern corner of the (main site). Proposed works would occur within the northern main site area and trees located on the southern site area were not surveyed for the purpose of producing this report. The northern site area main site will herein be referred to as the site. The school area located to the south of the council pathway consists of a playground with basketball courts and a car park. The southern boundary of this part of the site is bounded by Mona Vale Road. Vehicular access to the site is via Waratah Street and pedestrian access is via Waratah Street, Bungan Street and Wangara Street. The school contains numerous buildings which are disjointed and spread across the site. Figure 2 (following page) is provided to assist with the local site context.

Figure 1. Indicative Site Location Map Mona Vale Public School, 2 Waratah Street Mona Vale NSW. ***(Image Source; NSW RFS 2020).***



1.1.1 10/50 Bushfire Mapping.

The site is not located within a designated 10/50 Bushfire Prone Area. *(NSW RFS 2020)* The 10/50 Code cannot be sued to remove vegetation on the site.

1.1.2 Physical Site Description.

† The site has a general north west to south east orientation.
The site comprises multiple allotments. *(Craig & Rhodes 2020)*
† Site area; the entire site covers an area of 46.930m^2. *(Architectus 2020)*
† Topography; the site topography is variable, the northern site area (main site) generally slopes to the east.
† Aspect; the site aspect is east.
† Drainage; the main site area drains to the east.
† Elevation; the site elevation is 36m at the western corner of site and 16m at the eastern corner. *(Google Earth 2020)*

1.1.3 LGA Site Information. *(Pittwater LEP 2014)* This list is not fully inclusive.

† The site is located on Sheets 012 and 018 of the Pittwater LEP (2014) Planning Maps.
† The area of the site surveyed is zoned SP2 (Infrastructure - Educational Establishment). An allotment located on the site's eastern boundary is zoned R2 (Low Density Residential).
† The site is not located within a designated Heritage Conservation Area.
† There are no Heritage Items identified on or adjacent to the site.
† There are no Archaeological Items identified on or adjacent to the site.
† The site is not located within a designated Biodiversity Area.
† The northern corner of the site is located within a designated Low Risk Flood Hazard Precinct.

1.1.4 State Environmental Protection Policy (SEPP) Site Information. *(NSW Planning Hub 2020)* This list is not fully inclusive.

The site is listed as 15 Waratah Street on the NSW Planning Hub website.

† SEPP Educational Establishments & Childcare Facilities (2017).
† SEPP 19 Bushland in Urban Areas.
† SEPP Vegetation in Non-rural Areas (2017).
† SREP 44 Koala Habitat Protection.

A summary of legislative planning instruments is provided in Appendix 5.

1.2 Flora.

1.2.1 Vegetation Communities. *(SEED 2020)*

The SEED interactive vegetation mapping of the Sydney basin SINSWs not indicate the presence of an endemic vegetation community on site. (Figure 3 - Page 8)

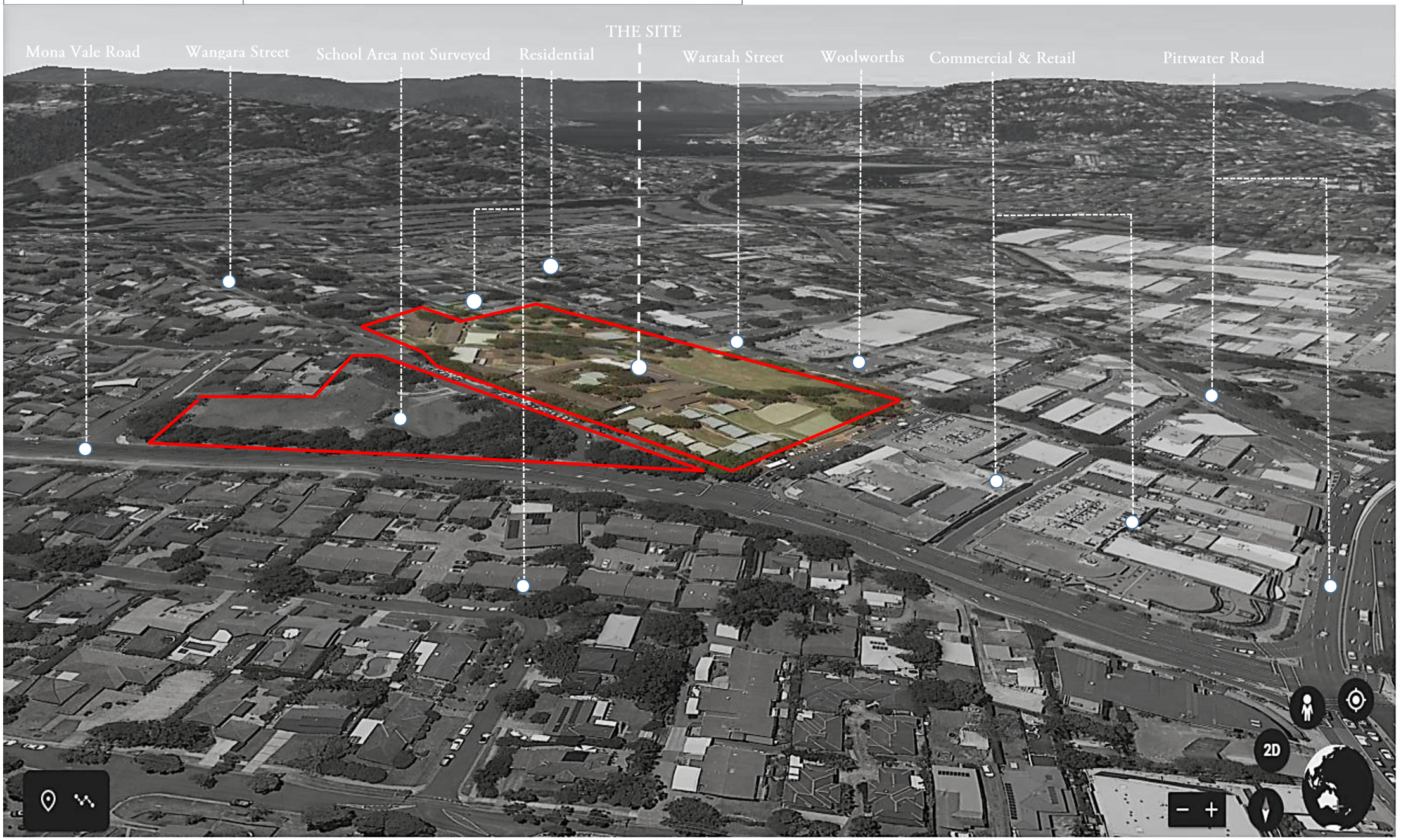
1.2.2 The Trees.

The site covers a large area and has a significant tree population. A Tree Assessment Report produced as part of the DEC Annual Tree Risk Assessment process by Arbor Safe (2019) has identified 296 trees on site. All of the trees identified by Arbor Safe have been tagged and numbered. I have maintained tree numbering in line with the report produced by Arbor Safe. The site's tree population consists of a combination of endemic, introduced native and exotic plant species. As is typical with school sites, significant planting has occurred adjacent to site boundaries. A number of trees, including upper canopy species, have also been planted within close proximity of school buildings and trees located to the north of D Block have been planted in partially raised masonry garden beds. Apart from a playing field area the site's tree population are fairly evenly spread across the site. Protected trees located within 10m of proposed works were surveyed for the purpose of producing this report. The site plan used to identify protected trees located within 10m of proposed works is provided as Attachment 4. Forty two (42) trees protected under Pittwater 21DCP (2014) were surveyed for the purpose pf producing this report. All of the subject trees are located within the grounds of the site. (Tree locations are provided in Figure 5).

1.2.3 Tree Geographical Point of Origin.

The fifteen trees; T7, T122, T123, T124, T125, T126, T201, T202, T203, T204, T206, T207, T216, T217 & T222 are endemic to the Northern Beaches LGA (Pittwater Ward). The twenty four trees; T1, T2, T3, T4, T5, T6, T11,

Paul Shearer Consulting ARBORICULTURAL CONSULTANTS	Figure 2. (South aspect). Local Site Context. *(Image Source; Google Earth 2020).*
	Client: SINSW Mona Vale Public School.
	Site Address: 2 Waratah Street Mona Vale NSW.



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T121, T205, T208, T209, T210, T219, T220, T221, T223, T224, T225, T226, T227, T228, T229, T230 & T231 are introduced native species. The three trees; T8, T9 & T10 are exotic species.

Figure 3. Vegetation Communities Map. ***(Image Source; SEED 2020)***

The SEED vegetation mapping tool does not illustrate the presence of an endemic vegetation community on the sire.

1.2.4 Tree Hazard Ratings.

The two trees; T222 and T231 have been awarded a Hazard Rating of 8 out of 12. The twenty four trees; T121, T122, T123, T124, T125, T126, T206, T207, T208, T209, T210, T216, T217, T219, T220, T221, T223, T224, T225, T226, T227, T228, T229, and T230 have been awarded a Hazard Rating of 6 out of 12. The sixteen trees; T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T201, T202, T203, T204 and T205 have been awarded a Hazard Rating of 4 out of 12. (Hazard Ratings have been calculated using the methodology by Harris, Clarke & Mattheny 2004. (Tree Hazard Rating definitions and calculations are provided in Attachment 2).

1.2.5 Tree Significance Ratings.

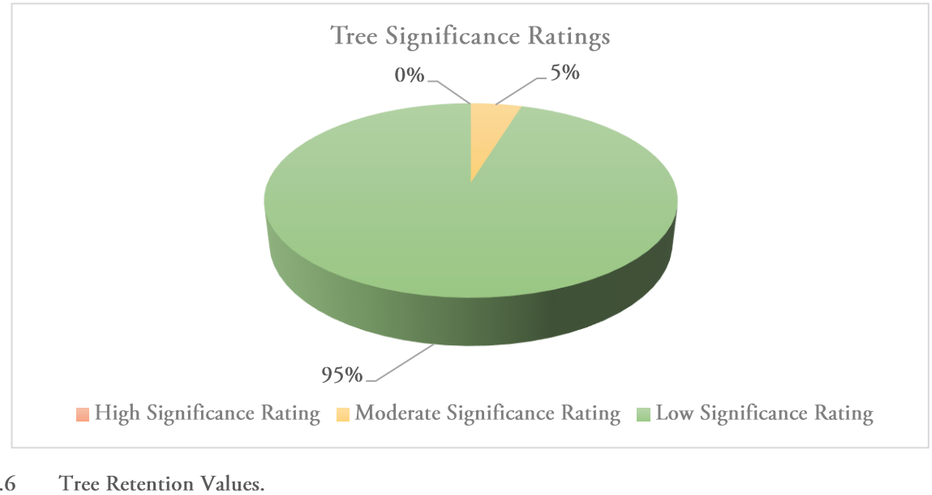
The two trees; T3 and T4 have been awarded a Significance Rating of 9 out of 12. The four trees; T7, T11, T202 and T219 were awarded a Significance Rating of 8 out of 12. The seventeen trees; T9, T124, T125, T203, T204, T206, T207, T216, T217, T220, T221, T222, T224, T227, T228, T230 and T231 have been awarded a Significance Rating of 7 out of 12. The fourteen trees; T2, T5, T121, T122, T123, T126, T201, T205, T209, T210, T223, T225, T226 and T229 were awarded a Significance Rating of 6 out of 12. The four trees; T1, T6, T10 and T208 has been awarded a Significance Rating of 5 out of 12. The tree; T8 has been awarded a Significant Rating of 4 out of 12.

Tree Significance Ratings have been calculated using the following 4 categories;

† Provenance. (Refers to a trees' geographical point of origin).
† Landscape Significance. (Refers to how prominent a tree is the landscape).
† Streetscape Significance. (Refers to how prominent a tree is in the streetscape).
† Cultural Significance. (Refers to a trees' cultural, heritage or archaeological/aboriginal status).

(Figure 4 illustrates Tree Significance Ratings for the site's tree population measured as a percentile. Tree Significance Rating definitions and calculations are provided in Attachment 2).

Figure 4. Illustrating Tree Significance Ratings as a Percentile (1-100) of Trees Surveyed.



1.2.6 Tree Retention Values.

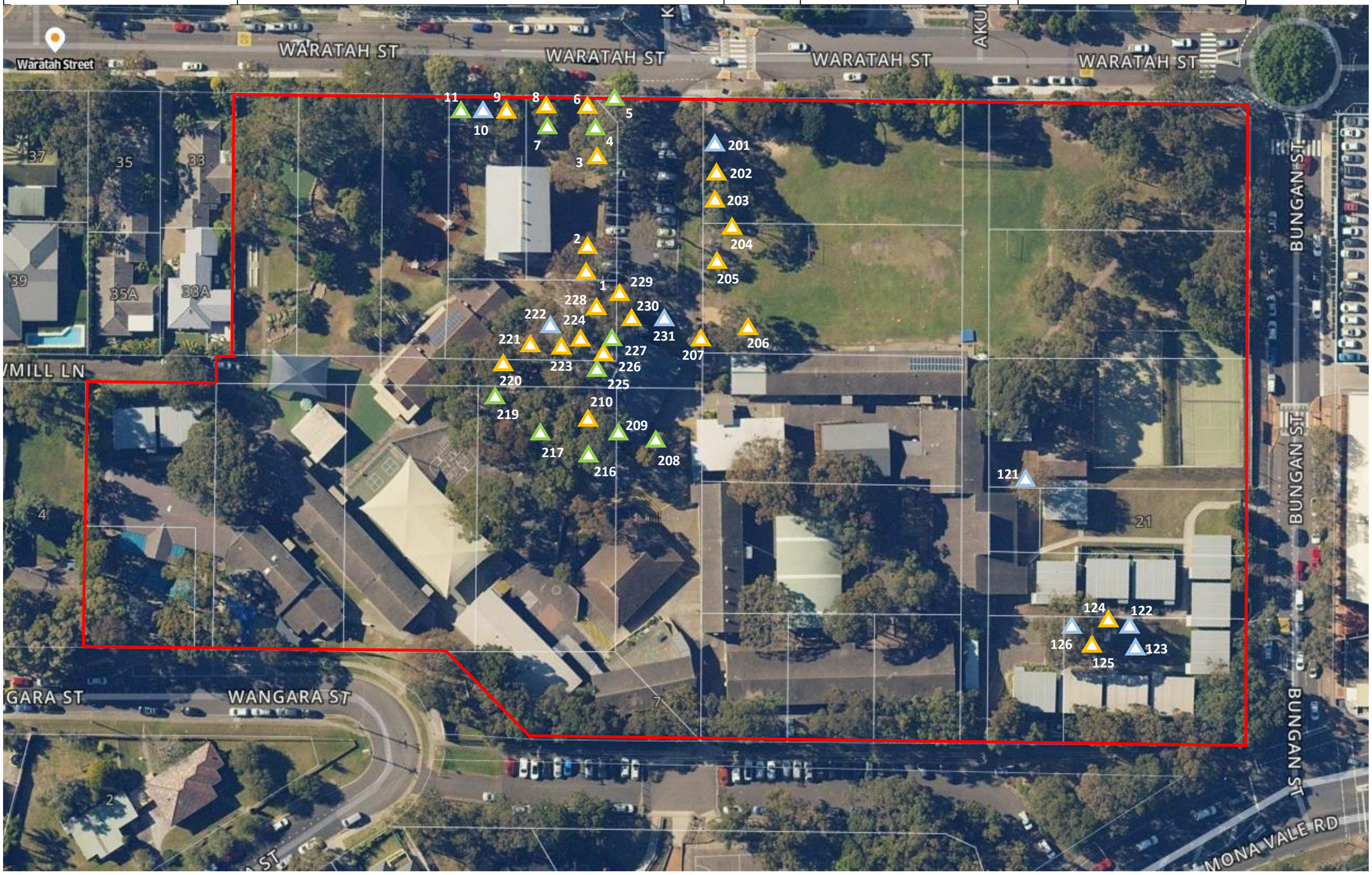
As there is currently no industry standard for quantifying Tree Retention Values, I have used a methodology produced by Paul Shearer Consulting (2017) to provide Tree Retention Values. The eleven trees; T4, T5, T7, T11, T208, T209, T216, T217, T219, T225 and T227 have been awarded a Retention Value of 11 out of 12. The twelve trees; T2, T3, T202, T203, T205, T210, T221, T223, T226, T228, T229 and T230 have been awarded a Retention Value of 10 out of 12. The eleven trees; T1, T6, T8, T9, T124, T125, T204, T206, T207, T220 and T224 have been awarded a Retention Value of 9 out of 12. The eight trees; T10, T121, T122, T123, T126, T201, T222 and T231 were awarded a Retention Value of 8 out of 12.

Tree Retention Values have been calculated using the following 4 categories;

† Health (vigour).
† Condition (form/structure).
† Situation. (Proximity to structures).
† Ecological considerations.

(Figure 6 illustrates Tree Retention Values for the site's tree population measured as a percentile. Tree Retention Value definitions and calculations are provided in Attachment 2).

Paul Shearer Consulting ARBORICULTURAL CONSULTANTS	Figure 5. Tree Location Schedule with Tree Retention Values. *(Eagleview 2020).*		Legend:	Low Retention Value; △
	Client: SINSW Mona Vale Public School 2 Waratah Street Mona Vale NSW.		High Retention Value; △	Indicative Site Boundary; —
	Comments: Tree locations & site boundaries are indicative. NTS.		Moderate Retention Value; △	



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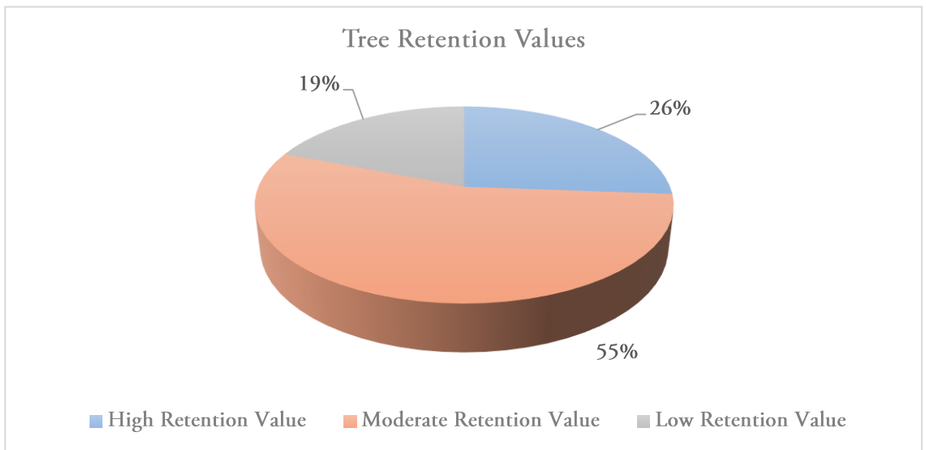
Tree Retention Values have been categorized as follows:

† High Retention Value - (11-12).
† Moderate Retention Value - (9-10).
† Low Retention Value - (4-8).

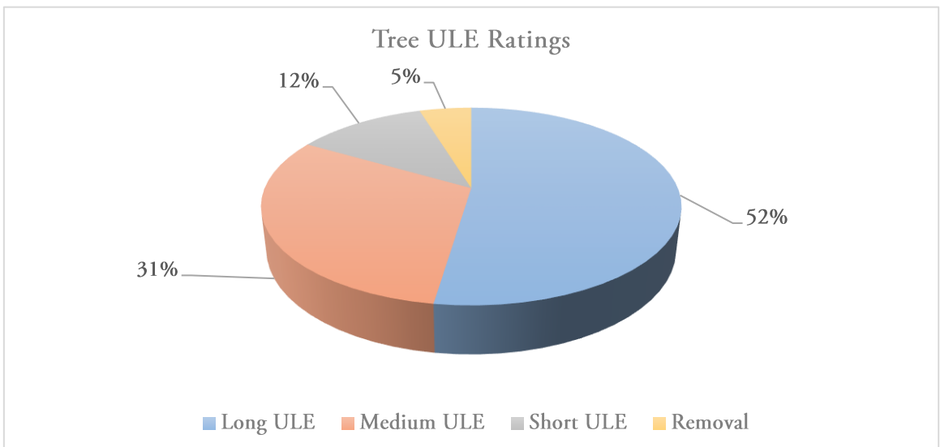
Figure 6. Illustrating Tree Retention Values as a Percentile (1-100) of Trees Surveyed.



1.2.7 Tree Useful Life Expectancy (ULE) Ratings. *(After Barrell, J. 2001).*

The twenty two trees; T4, T7, T11, T124, T125, T202, T206, T208, T209, T210, T216, T217, T219, T220, T221, T223, T225, T226, T227, T228, T229 and T230 have been awarded a Long ULE Rating of greater than 40 years. The thirteen trees; T1, T2, T3, T5, T8, T9, T121, T204, T205, T207, T222, T224 and T231 have been awarded a Medium ULE Rating of 15 - 40 years. The five trees; T6, T122, T123, T126 and T201 have been awarded a Short ULE Rating of 5 - 15 years. The two trees; T10 and T203 has been awarded a Removal ULE Rating. (Figure 7 illustrates Tree Useful Life Expectancy (ULE) Values for the site's tree population measured as a percentile.

Figure 7. Illustrating Tree ULE Ratings as a Percentile (1-100) of Trees Surveyed.



1.2.8 Threatened Species & Significant Tree Considerations. *(NPWS 2002 & Blacktown LEP 2015)*

The SEED interactive vegetation mapping tool SINSWs not list an endemic vegetation community on the site. The Pittwater Spotted Gum Forest, Littoral Rainforest and Duffys Forest vegetation communities are located within the Northern Beaches LGA (Pittwater Ward). The assemblage and form of vegetation on site is not consistent with these three vegetation communities.

1.2.9 Weeds.

The site's grounds are well maintained and no significant environmental weed infestations were identified on the site.

1.3 The Soil. *(eSpade 2020).*

The naturally occurring soil landscape is transitional. The naturally occurring soil landscape on the western area of the site is Erina (er) Erosional. The naturally occurring soil landscape on the eastern area of the site is Warriewood (wa) Swamp. Geology of the Erina soil landscape includes; sandstone and siltstone with minor sedimentary breccia, claystone and conglomerate. Sandstones may be highly weathered and friable. Geology of the Warriewood landscape includes; silty to peaty quartz sand with medium to fine marine sand with podzols.

Limitations of the Erina soil landscape includes:

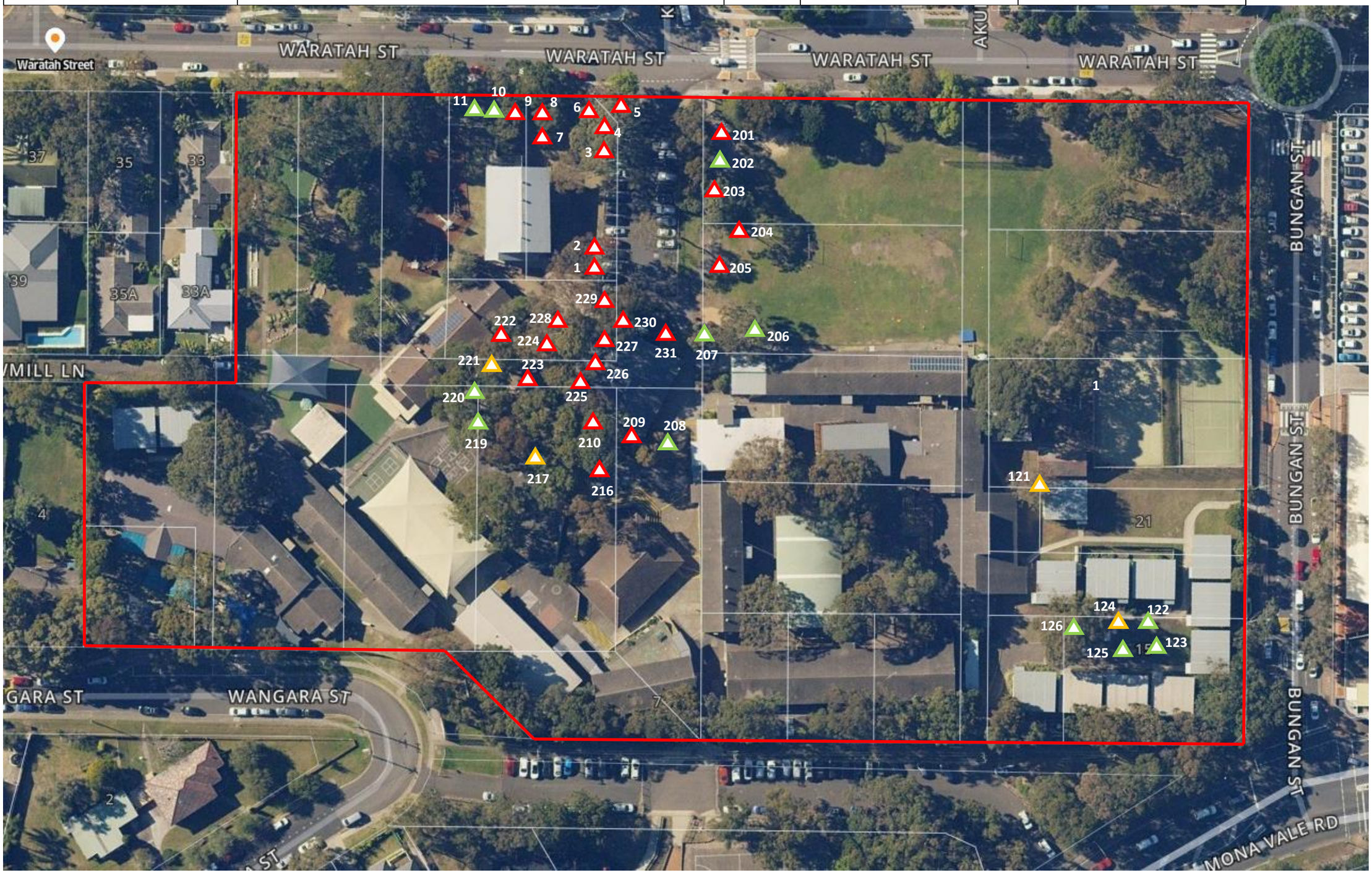
† Very high soil erosion hazard.
† Impermeable plastic low wet-strength subsoil.
† Localised run-on.
† Seasonal waterlogging of foot slopes.

Limitations of the Warriewood soil landscape includes:

† Localised flooding and run-on.
† High water tables.
† Highly permeable soil.

The site is located in a Class 5 Acid Sulphate Soils Area. The northern corner of the site is located within a designated Low Risk Flood Hazard Precinct. Evidence of waterlogging has been identified adjacent to the site's North West and south eastern boundary areas. I did not carry out field soil profile, texture or compaction assessments. As with most school site's it is reasonable to assume that soils in high use areas are moderately to highly compacted due to years of heavy pedestrian traffic.

Paul Shearer Consulting ARBORICULTURAL CONSULTANTS	Figure 8. Tree Location & Management Schedule. *(Image source; Eagleview 2020).*		Legend:	Further Assessment Required; △
	Client: SINSW Mona Vale Public School 2 Waratah Street Mona Vale NSW.		Retain Tree; △	Tree Removal Required; △
	Comments: Tree locations & site boundaries are indicative.		Pruning Required; △	Indicative Site Boundary; —



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2.0 Discussion.

2.1 Tree Survival on Construction Sites. *(After; Matheny & Clarke 1998)*

Sometimes the impacts associated with a development on trees is obvious and sometimes it is not. With the exception of careless construction activity or development design which does not adequately consider impacts to trees, projects which consider tree preservation during the early stages of the design process rarely result in short-term tree death. Trees may take some to die as a result of adjacent construction work. Often these trees decline slowly as a result of indirect impacts that cause stress. If a tree cannot adapt to impacts from construction work, long term or chronic stress may weaken a tree to a point where it is pre-disposed to secondary issues such as disease or insect attack. Disease or insect attack invariably exacerbates the trees' weakened condition and this may result in tree decline.

The following site changes which may cause chronic stress to trees have been considered:

- Changes in hydrology of site.
- Changes in soil quality.
- Changes in soil surface (crusting, hydrophobia, erosion, etc.)
- Restrictions in soil area available for root development.
- Addition of toxic materials to the soil.
- Direct injury to root system.
- Increased exposure to sun and/or wind.
- Excessive reduction in leaf area, such as from heavy pruning.
- Large mechanical wounds, which interrupt sap flow and lead to decay.

The long term survival of trees after site changes involves the interaction of biological, physical and environmental factors, and in many cases appears to be dependent on a trees' ability to tolerate water stress and regenerate new roots. Mechanical damage to trees from construction activities may eventually result in decay and a tree's ability to overcome injury by compartmentalizing decay is also important.

"Tree response to a given impact varies widely depending on the species, age, and condition. That variability makes it difficult to develop quantitative measures for tree survival that are applicable to a wide range of species and site conditions. The consultant must combine knowledge of tree biology, site influences, and construction practice to evaluate impacts on trees. If the impacts are determined to be too severe, the plans must either be redesigned to reduce, injury, or the tree removed." (1)

Table 1 provides information that may affect a tree's ability to tolerate the impacts from construction works.

2.2 Evaluation of Construction Impacts. *(After; Matheny & Clarke 1998)*

Evaluating the impacts of construction works on trees requires an understanding of the changes that will occur on the site and the trees' ability to tolerate resulting impacts. The following factors have been considered:

Direct Injury to the Tree:

- Changes to the crown, primarily from pruning to provide clearance and access.
- The extent of injury to roots caused by creation of a stable building base, excavation, grading, and installation of pavement, utilities, and irrigation systems.

Indirect Injury to the Tree:

- Diversion of runoff.
- Diversion of streams.
- Stream improvements.
- Changes in water table.
- Change in capacity for soil water recharge.
- Removal of adjacent vegetation.
- Damming of underground water flow.

Table 1. Consideration for Construction Impact Tolerances. ***(After; Matheny & Clarke 1998)***

The following factors have been considered with regard to the ability of the tree/s to tolerate construction impacts.

Consideration for Construction Impact Tolerances
Specific Tree: † Age. † Health. † Structure. † Species tolerance. † Previous exposure to wind & sun. † Vigor.
Changes That Will Occur: † Amount of root injury. † Degree of restriction of root area. † Amount of reduction in leaf area. † Degree of change in soil structure, moisture & drainage. † New exposure to sun & wind. † Change in microclimate. † Exposure to toxic chemicals. † Competition with other plants. † Number and depth of mechanical wounds.
Ability to Ameliorate Impacts: † Possibility for irrigation. † Potential for reducing compaction. † Potential for increasing soil aeration. † Potential to protect from stress-related insects & diseases. † Potential for improving drainage.

2.3 Tree Impact Evaluation Checklist. *(After; Matheny & Clarke 1998)*

The following checklist, whilst not exhaustive, details a range of tree characteristics, site development and site disturbance factors that have been considered.

Table 2. Tree Impact Evaluation Checklist.

Tree Impact Evaluation Checklist
Tree Characteristics: † Species tolerance to impacts. † Tree age/longevity. † Tree health & vigor. † Root depth & extent. † Conformation of canopy. † Structural stability.
Site Development: † Disturbance that will occur within root areas. † Distance from trunks and depth of excavations (e.g., grade changes, underground utilities, pavement section, footings & foundations). † Root areas exposed to compaction. † Root area covered by pavement. † Pruning requirements (e.g., building clearance & overhead utilities). † Irrigated landscape (compatibility with trees & trenching for irrigation system). † Removal of adjacent vegetation (root damage, changing microclimate & increased exposure).
Disturbance to the Overall Site that Could Affect Trees: † Diversion of runoff (to or from trees). † Installation of sub-drains or drainage swales (lowering the water table). † Altered drainage patterns that increase erosion. † Altered drainage patterns or vegetation removal that increases siltation. † Walls or foundations damming underground water flow. † Road fill over streams and check dams that alter water flow and sedimentation. † Change in capacity for soil water recharge.

2.4 AS4970 (2009) Protection of Trees on Development Sites. *(After; AS4970 (2009)*

The Australian Standard AS4970 (2009) and its methodology has been used as a benchmark in the preparation of this report. The scope of AS4970 is to provide guidance on the protection of trees throughout the various stages of a development from the initial planning process through to implementation.

The Standard provides information to guide not only the property developer but all relevant stakeholders who are concerned with trees in relation to development. The Standard provides guidance on determining which trees are appropriate for retention and how to protect them throughout the site construction process. The Standard is not in favour of, or against development and it does not argue for the removal or retention of trees.

Section 3 of the Standard describes 2 x root zone areas for the purpose of tree protection. It specifies the Tree Protection Zone (TPZ) as a radial offset of 12 x the stem diameter of a tree measured at 1.4m above ground level or (DBH) measured from the centre of the tree stem. The TPZ is described as; a specified area above and below ground required to maintain the viability and stability of a tree. It specifies the Structural Root Zone (SRZ) as the area measured immediately above the root buttress or (DAB) applied to the following formula; SRZ Radius = $(DAB \times 50)^{0.42} \times 0.64$. The minimum SRZ for trees with a DAB < 0.15m is 1.5m.

The Standard specifies an incursion within the Structural Root Zone (SRZ) or an incursion > 10% of the Tree Protection Zone (TPZ) as a Major incursion. It specifies that where a Major incursion is to occur the Project Arborist must demonstrate the viability of the affected tree or trees. As the methodology used to determine the TPZ and SRZ are generic in nature, and tree root growth may be affected by many factors, demonstrating that a tree would remain viable would generally be carried out by a detailed root-mapping investigation. This type of detailed inspection can determine the actual location and size of tree roots and the extent of root damage that will occur. Of course additional potentially impacting factors must also be considered. The Standard specifies that where an incursion is <10% of the TPZ and outside of the SRZ it is classified as a Minor incursion and is considered tolerable. *(AS4970 2009)*

2.5 The Application of AS4970. *(After; AS4970 (2009))*

Mature trees do not adapt as well as young trees to changes within their immediate environment and the zoning of land for development and reduced allotment sizes has created a situation whereby the retention of significant mature trees may, on occasions, be impossible. Recommending that a proposed development be modified to retain a tree/s only for the tree/s to die soon after as a result of construction impacts is not reasonable or practical and does not provide for the best long term outcome.

This report will, where reasonably practical, recommend the retention and protection of trees. This report will consider all potential tree impacts and where it is viewed that medium to long term tree retention is viable then a tree will be recommended for retention and protection. Where a significant modification of a development is not required trees may also, on occasions, be recommended for short term retention. Trees located within the proposed building footprint of dwellings will generally be recommended for removal. Recommending that a proposed development be modified to retain a tree/s may however be recommended if a tree/s or site have an official cultural, heritage or significance designation.

2.6 Proposed Works & Impact Assessment.

2.6.1 Proposed Works.

Site plans referenced indicate the proposal seeks consent for:

† Demolition works.
† The construction of a combined three storey Administration Building with Teaching and Learning Hub. (T and L building).
† Construction of a single storey Performing Arts Centre (PAC) building with deck.
† Modification of the Waratah Street car park.
† The refurbishment of existing buildings.
† The relocation of demountable classrooms.
† The installation of subgrade services.
† The installation of hard and soft landscaping including extensive timber decking.

Site plans indicate that bulk earthworks will be carried out for construction of the T and L building and the PAC building. Footings for both buildings will be a concrete slab on ground and the deck off the PAC building will be piered. The RL of the T and L building roof is 32.700 and the new administration area is 28.900.
A formal site plan with trees plotted was not referenced for the purpose of producing this report. An overlay of the site survey over the proposed site plan was provided by the architect so that this AIA could be completed. The overlay plan was difficult to interpret and every effort has been made to plot trees in their correct locations.

Site plans indicating proposed landscaping and the location of proposed civil works were not referenced for the purpose of producing this report. The base drawing referenced is provided as Attachment 4.

2.6.2 Impact Assessment.

I have completed an impact assessment based on site plans provided and concluded the following. Please note, where they are to occur multiple incursions have been provided for individual trees:

a) No Direct Construction Impacts.

I have concluded that the eleven subject trees; T10, T11, T122, T123, T125, T126, T206, T207, T208, T219 and T220 will not be directly impacted upon by proposed works.

b) Acceptable Direct Construction Impacts.

I have concluded that acceptable tree impacts, which involve Minor TPZ incursions or minor pruning which may be carried out in accordance with AS4373-2007 and AS4970-2009 will occur on the four trees; T121, T124, T217 and T221.

c) Direct Construction Impacts Requiring Tree Removal.

I have concluded that the twenty six trees; T1, T2, T3, T4, T5, T6, T7, T8, T9, T201, T203, T204, T205, T209, T210, T216, T222, T223, T224, T225, T226, T227, T228, T229, T230 and T231 will suffer direct tree impacts requiring tree removal.

d) Demolition Impacts.

I have concluded that demolition works will occur adjacent to the twenty three trees; T1, T2, T3, T4, T5, T6. T7, T8, T10, T11, T201, T202, T203, T204, T205, T206, T207, T208, T216, T217, T219, T223 and T224. Trees within the proposed building footprint have been excluded.

e) Potential Indirect Construction Impacts.

I have concluded that the fourteen trees; T121, T122, T123, T124, T125, T126, T201, T202, T203, T204, T205, T206, T207 and T208 may suffer indirect construction impacts due to changes to storm water runoff.

f) Construction of the Teaching/Learning Hub & Administration Building.

† The fourteen trees; T1, T2, T3, T4, T205, T209, T210, T225, T226, T227, T228, T229, T230 and T231 are located within the building footprint of the proposed T and L building. (See Attachment 5)

† Major TPZ incursions as specified within AS4970 or pruning contrary to AS4373 will impact upon the five trees; T204, T216, T222, T223 and T224.

g) Construction of the Car Park off Waratah Street.

† The five trees; T5, T6, T7, T8 and T9 are located within the building footprint of the proposed new car park. Major incursions will occur within the TPZ/SRZ of the trees; T201 and T202.

h) Construction of the Performing Arts Centre Building.

† A minor incursion as specified within AS4970 will occur within the TPZ of the tree T121 due to construction of the PAC deck. The deck will also be constructed very close to the tree, whilst this may be suitable in the short term, potential tree and building conflicts could occur in the future. **(An impact assessment summary for individual trees with incursion percentages is provided in Attachment 3).**

2.7 Consideration for Minimizing Tree Impacts.

I have considered that tree impacts may be minimized if the proposed T & L building was relocated to a different location. However it is difficult to see where else the building could be relocated on the site whilst maintaining the client's objective of creating better connection throughout the school. I did consider that relocating the T & L building to the northern corner of the site and retaining the current car park as this may significantly reduce the number of tree removals and other construction impacts. However this would require removal of a playground and may cause concern to neighbours due to the scale of the building. In addition there is no special significance associated with the trees or site which would make a significant redesign of the project equitable.

I have considered that potential future conflicts between the PAC deck and the tree T121 may be averted by reconfiguring or relocating the deck to allow for radial expansion of the stem on the tree.

Table 3. The AS4970-2009 Protection of Trees on Development Sites Process.

Stage in Development.	Tree Management Process.	
	Matters for Consideration.	Actions & Certification.
Planning (Sections 2 & 3 of AS4970).		
Site Acquisition.	Legal constraints.	
Detail Surveys.	Council plans & policies (heritage, threatened species etc.)	Existing trees accurately plotted on survey plan.
Arboricultural Impact Assessment.	Hazards/risks & Tree Retention Value.	Evaluate trees suitable for retention and mark on plan. Provide Arboricultural Impact Assessment Report including tree protection zones (TPZ's) to guide development.
Preliminary Development Design.	Condition of trees, proximity to buildings, location of services and roads, level changes, building operations space and long term management.	Planning selection of trees for retention, design review by proponent and design modifications to minimize impacts on trees.
Development Submission.	Identify trees for retention through comprehensive arboricultural impact assessment of proposed construction. Determine tree protection measures. Landscape design.	Provide Arboricultural Impact Assessment Report including Tree Protection Plan with drawing and specification.
Development Approval.	Development controls & conditions of consent.	Review consent conditions relating to trees.
Pre-construction (Sections 4 & 5 of AS4970).		
Initial Site Preparation.	State based OHS requirements for tree work, approved retention/removal, pruning as required in accordance with AS4373-2007 Pruning of Amenity Trees and specification for tree protection measures.	Compliance with conditions of consent, tree removals/retention/transplanting/pruning, certification of removals/pruning. Establish/delineate TPZ's, install tree protection measures and certify tree protection.
Construction (Sections 4 & 5 of AS4970).		
Site Establishment.	Temporary infrastructure, demolition, bulk earthworks and hydrology.	Locate temporary infrastructure to minimize impacts on retained trees, maintain tree protection measures and certify tree protection measures.
Construction Work.	Liaison with site manager, compliance and any deviation from approved plans.	Maintain or amend tree protection measures as required, supervision and monitoring.
Implement Hard & Soft Landscaping.	Installation of irrigation, control compaction, installation of pavement and retaining walls.	Remove selected tree protection measures as required for access, remedial tree works, supervision and monitoring.
Practical Completion.	Tree vigor (Health) and structure (Condition).	Remove all remaining tree protection measures and certify tree protection.
Post Construction (Section 5 of AS4970)		
Defects liability/Maintenance Period.	Tree Health and Condition.	Maintenance and monitoring, final remedial tree works and final certification of tree Health and Condition.

3.0 Recommendations.

3.1 Trees to be Removed. ***(The Trees; T1, T2, T3, T4, T5, T6, T7, T8, T9, T201, T203, T204, T205, T209, T210, T216, T222, T223, T224, T225, T226, T227, T228, T229, T230 & T231).***

The twenty six subject trees; T1, T2, T3, T4, T5, T6, T7, T8, T9, T201, T203, T204, T205, T209, T210, T216, T222, T223, T224, T225, T226, T227, T228, T229, T230 and T231 are either located within the proposed building footprint or will suffer intolerable construction impacts from proposed works. The client may wish to consider the removal of these trees to accommodate proposed works.

3.2 Stump Removals.

Grind the stump, root-ball and surface root of the trees removed to a maximum depth. The grinding contractor should contact; Dial Before You Dig or obtain the location of underground services from the client to verify the location of underground services on site before commencing grinding works. The industry standard allows for stump grindings to remain on-site unless specified otherwise.

3.3 Selecting a Professional Tree Contractor.

The tree contractor selected for tree removals should be a member of, or be eligible for membership with, The Tree Contractors Association or Arboriculture Australia. (Recommended tree works should be carried out by a minimum Cert 3 qualified Arborist to AS4373-2007 Pruning of Amenity Trees, The Work Health and Safety Act (2012) and The Workcover Code of Practice; Amenity Tree Industry (2012.)

3.4 Further Tree Assessments.

No further more detailed tree assessments are recommended.

3.5 Design Changes to Minimize Tree Impacts. ***(The Tree; T121).***

If practical the client may wish to redesign or relocate the deck off the PAC building to avoid future conflicts with the tree T121. Ideally a minimum void of 300mm should be maintained between the subject tree (outer stem) and the deck to allow for radial stem growth.

3.6 Pruning Specification. ***(The Trees; T121, T124, T217 & T221).***

Where practical branches should be tied back rather than pruned or tied back and pruned once construction is complete to minimise live tissue removal. If this is not practical, the four trees; T121, T124, T217 and T221 will require pruning to accommodate approved works. Where possible, only smaller limbs <100mm in diameter should be removed. Pruning must not alter the height or shape of a tree unless specified within this report. Pruning should involve the removal of dead wood with a stem diameter >30mm, ivy and any parasitic plants such as mistletoe. The climber must advise the Project Arborist of any tree defects encountered during the tree pruning process that were not observed during the ground level VTA assessment. Pruning must be carried out by a minimum Cert III level Arborist to AS4373-2007 Pruning of Amenity Trees. (This specification is to be strictly followed for the pruning of any trees on the site).

Table 4. AS4373-2007 Pruning Classifications.

Tree No.	AS4373 Pruning Code	Description
121	R – Reduction pruning.	Prune southern canopy quadrant to allow adequate clearance of PAC deck.
124	R – Reduction pruning.	Prune north eastern canopy quadrant to allow adequate clearance of T&L building.
217	R – Reduction pruning.	Prune north eastern canopy quadrant to allow adequate clearance of T&L building.
221	R – Reduction pruning.	Prune eastern canopy quadrant to allow adequate clearance of T&L building.

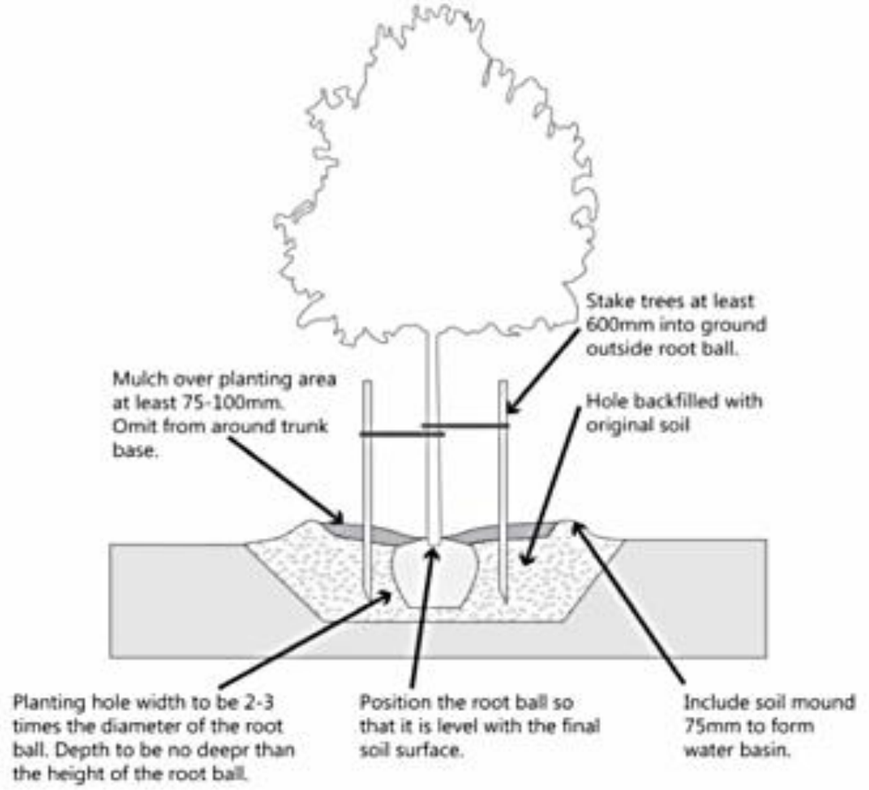
3.7 Tree Replenishment & Landscaping.

Tree replenishment and landscaping must be carried out for trees removed in accordance with Northern Beaches Council's tree replenishment, landscaping and biodiversity guidelines. The removal of trees to accommodate the T&L building and Waratah Street car park will have an impact on the Waratah Street streetscape character. Where practical compensatory planting should be carried out along the school's Waratah Street boundary. Where possible tree replenishment should be carried out with species endemic to the Northern Beaches LGA (Pittwater Ward) which have the same potential physical dimensions of trees removed at maturity. This will also require that tree replenishment be carried out in locations that can accommodate the potential physical dimensions of new trees, both above and below ground level, at maturity.

Trees selected for replenishment and landscaping must be grown to AS2303-2015 Tree Stock for Landscape Use or NATSPEC standards. Planting should be carried out by a minimum Cert. III level horticulturist or landscape gardener. The new trees should be inspected at 12 month intervals, dead trees should be replaced and remedial pruning should be carried out as required by a minimum Cert III qualified landscaper or horticulturist.

The Department of Education Facilities Standards and Guidelines (EFSG) DG90 - Landscape Planning and Design provides guidelines and desired outcomes for landscaping. DG90 provides guidelines for all aspects of landscaping including; ground works, buildings, roadworks, services, drainage, erosion control, surface finishes and planting. It provides guidelines for both soft landscaping (planting etc.) and hard landscaping (the built environment). A planting specification is provided as Figure 9.

Figure 9. Tree Planting Guide. ***(Image Source; NUFA 2017).***



3.8 Tree Protection Plan. *(After; AS4970-2009).*

The Tree Protection Plan should be included as part of the site induction process for construction workers. The Tree Protection Plan is to be kept on site so it may be referenced as required. An AQF level 5 project Arborist is to be engaged to oversee the management of trees throughout the site redevelopment process. The Project Arborist contact information is to be recorded in Table 5.

Table 5. Project Arborist Contact Information. Please insert Project Arborist information.

Project Arborist	Contact Information

3.8.1 Tree Protection.

(The Trees; T10, T11, T121, T122, T123, T124, T125, T126, T202, T206, T207, T208, T217, T219, T220 & T221).

Protection for the sixteen trees; T10, T11, T121, T122, T123, T124, T125, T126, T202, T206, T207, T208, T217, T219, T220 & T221 must be installed prior to the commencement of site works. Protection for the fourteen trees; T10, T11, T122, T123, T124, T125, T126, T202, T206, T208, T217, T219, T220 and T221 shall consist of protective fencing and ground protection. Protection for the two trees; T121 and T207 shall consist of stem protection and ground protection. (Attachment 5).

3.8.2 Tree Protection Specifications. (Tree protection specifications are illustrated in Attachment 5 - Sheet 4).

Stem Protection.

Stem protection should consist of 1.8m long timber batons fastened in place with wire over hessian or carpet underlay with a depth of 20mm when pushed flat. Nothing is to be nailed or screwed into trees.

Protective Fencing.

Protective fencing shall consist of 1.8m high chainwire mesh fencing on above ground concrete supports. (Protective fencing may be removed for demolition or to install landscaping but must be reinstated upon completion of demolition and landscaping works. Any work within TPZ's to be supervised by the Project Arborist).

Ground Protection.

Ground protection within the TPZ is to consist of a 75mm deep layer of mulch over a sheet of geotextile fabric. The mulch should consist of a blend of native, aged, weed and seed free leaf mulch. The mulch must be maintained at a depth of 75mm.

Signage.

Signage with 'Tree Protection Zone No Entry' or similar and the Project Arborist's contact derails must be attached to protective fencing. Access to the TPZ fenced area is forbidden without approval by the Project Arborist.

Sediment/Silt Fencing.

Not applicable.

3.8.3 Maintaining the TPZ's.

Watering & Feeding.

Prior to the commencement of works, the TPZ of retained trees should be treated with Seasol as per the manufacturer's directions. Retained tree/s should be watered twice a week, and altered in accordance with normal rainfall patterns, for the duration of site works. Soil moisture levels should be regularly monitored by the Project Arborist.

Weed Removal.

All weeds within the TPZ's, should be removed by hand without soil disturbance or should be controlled with the appropriate use of a systemic herbicide. All weeds on site should be removed in accordance with Council's weed management plan and the NSW Biosecuritv Act (2015).

Activities generally excluded from TPZ's include but are not limited to;

- † Dumping of waste and the lighting of fires.
- † Machine excavation including trenching.
- † Excavation for silt fencing.
- † Cultivation.
- † Wash down and cleaning of equipment.
- † Refuelling.
- † Preparation of chemicals, including preparation of cement products.
- † Parking of vehicle and plant.
- † Soil level changes.
- † Placement of fill.
- † Temporary or permanent installation of utilities and signs.
- † Physical damage to the tree.

3.9 Sensitive Construction Methodology.

3.9.1 Demolition.

Demolition within the TPZ of trees must be carried out by hand and the access of demolition machinery within the TPZ of trees is to be avoided. Tree roots with a stem Ø >30mm shall not be severed as part of the demolition process. Demolition works within the TPZ of retained trees must be supervised by the Project Arborist. (Tree protection must be installed prior to the commencement of demolition works).

3.9.2 Temporary Construction Utilities.

Site sheds and site stockpile areas should be located in designated Site Stockpile Areas or outside of the TPZ of trees. (Attachment 4) If such items must be located within the TPZ of trees they should ideally be situated on the downhill slope of the tree and located so that an incursion of <10% of the TPZ occurs.

3.9.3 Installation of Subgrade Services.

Civil works plans were not referenced for the purpose of producing this report. If installed; stormwater detention tanks should be relocated and constructed outside of the TPZ of retained trees. With the exclusion of the stormwater line calculated, the installation of hydraulics and services should also be routed outside the TPZ of retained trees. If underground services must be routed within the TPZ of a tree, and result in a Major incursion, they shouldbe installed by directional drilling or manually excavated trenches at a depth of at least 1m. (Directional drilling to be supervised by the Project Arborist.) Entry and exit pits will be positioned outside the designated TPZ of each tree. This requirement should apply unless root sympathetic exploratory investigations have been undertaken and it has been determined that access within the TPZ will not significantly affect the tree.

3.9.4 Grade Changes.

Unless specified in this report soil levels must not be lowered within the TPZ of retained trees. Soil levels may be lowered where a combined incursion < 10% of the TPZ and outside of the SRZ is anticipated. (If not already completed, to be calculated and works supervised by the Project Arborist). If necessary, soils levels may be raised by 100mm within the TPZ of retained trees. Soil levels may be raised in excess of 100mm where a combined incursion < 10% of the TPZ and outside of the SRZ is anticipated. (To be calculated and works supervised by the Project Arborist).

3.9.5 Piering.

If the construction of piers is to occur within the TPZ of trees; excavation must be carried out by hand for the first 500mm. No tree roots >30mm in Ø are to be damaged during the excavation process. If tree roots with a stem Ø > 30mm are encountered then excavation must stop and more suitable location sought. The excavated pier hole should be lined with a heavy gauge plastic prior to the pouring of concrete to minimize the likelihood of lime present in the concrete altering soil pH. Where possible structures should be cantilevered over TPZ's to minimize tree impacts. (To be supervised by the Project Arborist).

3.9.6 Paving.

Paving within the TPZ of trees (including the car park within the TPZ of T202) must be carried out at existing ground level using a permeable product to allow for soil moisture and oxygen infiltration. Compaction of the paving sub-base should be kept to a minimum. (Paving installation within the TPZ of retained trees to be supervised by the Project Arborist).

3.9.7 Garden Beds & Irrigation.

The installation of garden beds and irrigation within the TPZ of trees should be carried out by hand so as to avoid damaging tree roots. Roots with a stem Ø > 30mm must not be severed when installing garden beds and irrigation. It may be allowable for soil levels to be raised by no more than 100mm within the TPZ of trees however soil levels must not be lowered. Protective fencing may be removed to install garden beds and irrigation but must be reinstated upon completion. (The Installation of garden beds and irrigation within the TPZ of retained trees to be supervised by the Project Arborist).

3.9.8 Turf.

The installation of turf within the TPZ of trees should be carried out to avoid damaging exposed roots. Turf should not be installed hard up against the stems of existing trees as this will result in mechanical damage to tree stems by mowing equipment. The area around tree stems should be mulched in lieu of applying turf. Turf should also be kept away from the stems of new plantings as this may cause rot.

3.9.9 Fencing.

Permanent fencing within the TPZ of trees must be carefully installed to avoid damage to trees and tree roots. Excavation within the TPZ of trees for fence posts must be carried out by hand to a depth of 500mm. Excavation beyond 500mm may be carried out be mechanical means if required. Roots with a stem Ø > 30mm must not be severed when carrying out excavation for fence footings or installing fences. If a root with a stem Ø > 30mm is encountered during the hand excavation process then another more suitable location must be sought. In some cases it may be necessary to design fencing in a manner so that exposed tree roots are not disturbed. (The installation of fencing within the TPZ of retained trees is to be supervised by the Project Arborist).

3.9.10 Timber Decking.

The project manager have advised that extensive timber decking is proposed around trees. Decking footings must be installed as specified in Section 3.12.5 Piering. Decking must be installed so that a minimum void of 30mm is maintained from the outer edge of tree stems to the wooden decking. (The installation of timber decking within the TPZ of retained trees is to be supervised by the Project Arborist).

3.9.11 Site Access & Site Stockpiling.

Trucks can damage low hanging branches and vehicular and pedestrian traffic can cause soil compaction and root damage and runoff from site stockpile areas can introduce toxic chemicals to tree root zones. Where practical site access and site stockpile areas should be planned so as to minimize impacts on trees.

3.10 Monitoring Construction Work.

The Project Arborist must supervise any works within TPZs, including; footings, retaining walls, irrigation, lighting installation, top-dressing, planting and paving. The Project Arborist should specify any remedial work above or below ground. Monitoring is to be recorded for inclusion in certification at practical completion. The Project Arborist will monitor the impacts of general construction works on retained trees. Ideally monitoring should be done at monthly intervals. Monitoring is to be recorded for inclusion in practical completion. (Table 6) Critical stages typically include installation of services, footings and slabs, scaffolding, works within the TPZ and at completion of building works. (Table 7)

Table 6. Project Arborist Site Inspection Record.

Site Inspection Date	Purpose of Inspection	Time on Site (Hours)	Arborist Signature

3.11 The Arboricultural Audit Process.

† **Site Establishment Audit Report.**

The construction management plan shall be provided to the Project Arborist. The Project Arborist will ensure that the construction management plan will not impact on protected tree assets. (At the completion of site establishment the Project Arborist will certify that tree protection measures are in place and that completed site establishment works will not impact on tree assets.)

† **Site Works Audit Report/s.**

The Project Arborist will supervise all works within the TPZ of retained trees. The Project Arborist will ensure that the approved works do not impact on protected tree assets. (At the completion of work the Project Arborist will certify that he was present to supervise works and that work was carried out in accordance with approved specifications.)

† **Final Audit Report.**

The Project Arborist will assess the condition of trees and their growing environment, and make recommendations for any necessary remedial actions. Following the final inspection and the completion of any remedial works, the Project Arborist will certify (as appropriate) that the completed works have been carried out in compliance with the approved plans and specifications for tree protection.

Table 7. Indicative Arboricultural Audit Report Time Line.

Procedure	Inspection Timing	Compliance Certificate Received Y/N
Tree protection measures	Upon completion of installation	
Supervise site works	As required within TPZ's	
Final certification	Post construction	

Yours sincerely,

Paul Shearer (Director)
Dip. Hort. (Arb.), Cert. III Hort. (Arb.), ISA Tree Risk Assessment (TRAQ) Cert.
ISA Professional Member No: 229686.

References.

(1) AS4970-2009 Protection of Trees on Development Sites. Licensed to Paul Shearer Consulting. SAI Global Sydney Australia. (Page 9)

(2) AS4970-2009 Protection of Trees on Development Sites. Licensed to Paul Shearer Consulting. SAI Global Sydney Australia. (Page 9)

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Appendices.

Appendix 01. Methodology.

† Site inspections for the purpose of gathering field notes were conducted on Friday the 6th of March and Monday the 18th of May 2020. Approximately 8 hours was spent on-site for the purpose of gathering field notes.

† Field notes were recorded on an Excel spread-sheet with a smart phone and transferred directly to this report. The Summary of Tree Observations is an accurate account of notes gathered whilst in the field.

† The subject trees were assessed using a Level 2 Basic Assessment at ground level as per the ISA TRAQ methodology (2013). Visual Tree Assessment (VTA) methodology was applied as per the model produced by Mattheck and Breloer (1994).

† The Diameter at Breast Height (DBH) of the trees was measured at 1400mm above ground level.

† The Diameter at Buttress (DAB) was measured above the basal flare.

† Tree height and canopy spread has been estimated.

† The site's tree population has been tagged and numbered by Arbor Safe for a Tree Assessment Report produced in 2019. I have maintained tree numbering on line with the report by Arbor Safe.

† Site documents were referenced for the purpose of producing this report. (Table 8) I did not reference site pans illustrating proposed landscaping or civil works. A copy of the base plan used for the purpose of producing this report is provided as Attachment 4.

Table 8. Site Documents Referenced.

Drawing Name	Drawing No.	Scale	Produced By	Date
Detail Survey	Sheet 3 of 12	1:200 @ A1	Craig & Rhodes	06.01.2020
Detail Survey	Sheet 6 of 12	1:200 @ A1	Craig & Rhodes	06.01.2020
Detail Survey	Sheet 7 of 12	1:200 @ A1	Craig & Rhodes	06.01.2020
Survey Overlay for Arborist	Sketch	1:1000 @ A1	Architectus	20.05.2020
T&L Building Sections	SK-600 (C)	1:250 @ A1	Architectus	22.05.2020
PAC Sections	SK-610 (C)	1:250 @ A1	Architectus	22.05.2020

† A digital camera was used at ground level for the purpose of collecting photographic evidence. Photographs displayed in this report may have been digitally enhanced (enlarged) to better illustrate observations. No other alteration of photographic content has been made.

† This report is not a comprehensive tree hazard or risk assessment. I did not; conduct a tree structural assessment, I did not conduct an aerial inspection; I did not send tree tissue or soil for pathology analysis.

† Any radial offsets described have been measured from the centre of the tree stems.

† The subject tree/s have been tagged and numbered with galvanized nails and alloy tags.

† The Diameter above Buttress (DAB) of the trees was measured above the buttress flare.

† The Diameter at Breast Height (DBH) of the trees was measured at 1400mm above ground level. The stems of multiple stemmed specimens was measured and calculated using a downloaded version of the University of Newcastle online TPZ Calculator for a DBH total.

† AS4970 (2009) defines the Tree Protection Zone (TPZ) as area of the root zone and tree canopy (above and below ground) required for a tree to remain viable. The TPZ of the tree/s has been determined by measuring the (DBH) and applying the following formula; *TPZ = DBH x 12.* The DBH of multiple stemmed specimens is calculated by applying the following formula; $\sqrt{(DBH_1)^2 + (DBH_2)^2 + (DBH_3)^2}$ etc. The TPZ of palms, other monocots, cycads or tree ferns has been estimated 1m beyond the crown projection. A minimum TPZ of 2m has been provided for trees with a DBH of <0.17m. TPZ's have been calculated as a radial offset from the centre of the stem base of the tree/s.

† The Australian Standard AS4970 (2009) defines the Structural Root Zone (SRZ) as the area of root zone required for tree stability. The standard specifies that the SRZ must be calculated where an SRZ incursion is anticipated. The SRZ of the formula; *SRZ (r) = D x 50)* $^{\wedge 0.42}$ *x 0.64* (where D = DAB). An SRZ of 1.5m has been provided for trees with a DAB 0.15m or less. SRZ's have been calculated as a radial offset from the centre of the stem base of the tree/s.

† SRZ Calculations:

Structural Root Zones (SRZ's), where incursions are anticipated, have been calculated are as follows:

(T3) (DAB = 800mm x 50) = 40.0$^{\wedge 0.42}$ *x 0.64 = 3.01m*
(T121) (DAB = 590mm x 50) = 29.5$^{\wedge 0.42}$ *x 0.64 = 2.65m*
(T201) (DAB = 350mm x 50) = 17.5$^{\wedge 0.42}$ *x 0.64 = 2.13m*
(T202) (DAB = 700mm x 50) = 35.0$^{\wedge 0.42}$ *x 0.64 = 2.85m*
(T203) (DAB = 640mm x 50) = 32.0$^{\wedge 0.42}$ *x 0.64 = 2.74m*
(T204) (DAB = 680mm x 50) = 34.0$^{\wedge 0.42}$ *x 0.64 = 2.81m*
(T216) (DAB = 700mm x 50) = 35.0$^{\wedge 0.42}$ *x 0.64 = 2.85m*
(T223) (DAB = 380mm x 50) = 19.0$^{\wedge 0.42}$ *x 0.64 = 2.20m*
(T224) (DAB = 400mm x 50) = 20.0$^{\wedge 0.42}$ *x 0.64 = 2.25m*

† Drawings detailing tree SRZ's/TPZ's, and incursions have been produced to scale using ArborCAD® software. Root zones and incursions have been calculated using the ArborCAD® software program.

† Tree canopy projections have been estimated at the four cardinal points. Where necessary the height of lower tree limbs that may be impacted upon by proposed works has been estimated.

† Each tree has been awarded a Hazard Rating, Significance Rating, Retention Value and Useful Life Expectancy (ULE) Rating to assist planning partners in developing the site in a manner which is sympathetic to the retention of trees deemed worthy of retention. The Hazard Rating, Significance Rating, Retention Values and ULE Ratings awarded the subject trees was calculated off-site by utilising field notes and photographic evidence.

† The Hazard Rating has been adopted from *(Harris Clarke & Matheny 2004.)* As there is currently no industry standard for assessing tree Significance Ratings; the methodology used to quantify Tree Significance Ratings has been produced by Paul Shearer Consulting® 2017. As there is currently no industry standard for assessing tree Retention Values the methodology used to quantify Tree Retention Values has been produced by Paul Shearer Consulting® 2017. (Appendix 3) ULE Ratings have been adopted from Barrell (2001). Whilst each tree has been awarded a Hazard Rating, Significance Rating, Retention Value and ULE Rating, these should be considered holistically when prioritizing trees for retention or removal.

† RL's provided have been taken from the base of each tree as specified on the site survey.

Appendix 02. Assumptions & Limitations of This Report.

The comments and recommendations made in this report assume the following:

† Any health or condition issues relating to the subject trees needed to be identified.

† The amenity of adjoining neighbours needed to be considered.

† The retention of the subject trees and preservation of the streetscape and landscape character was desired.

† Removal of trees is considered a last resort option.

† Consideration for potential wildlife habitat and related ecological issues was to be considered.

† Issues of significance associated with the subject site such as, heritage items and relevant environmental protection mechanisms were to be considered.

† Loss of this report or alteration of any part of this report not undertaken by the author invalidates the entire report.

† Possession of this report or a copy thereof does not imply right of publication or use for any purpose by anyone but the client or their directed representatives, without the prior consent of the author.

† This report and any values expressed herein represent the opinion of the author and the consultant's fee is in no way conditional upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.

† Sketches, diagrams, graphs and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural drawings, reports or surveys.

† To the author's knowledge all facts, matter and all assumptions upon which the report proceeds have been stated within the body of the report and all opinion contained within the report have been fully researched and referenced and any such opinion not duly researched is based upon the writers experience and observations.

† There is no warranty or guarantee, expressed or implied by the author that the problems or deficiencies of the plants or site in question may not arise in the future.

† All instructions (verbal or written) that define the scope of the report have been included in the report and all documents and other materials that the author has been instructed to consider or to take into account in preparing this report have been included or listed within the report.

Appendix 03. Useful Life Expectancy. (ULE).

Categories (after Barrell 1996, Updated 07/04/01.) The five categories and their sub-groups are as follows:

1. Long ULE - tree appeared retainable at the time of assessment for over 40 years with an acceptable degree of risk, assuming reasonable maintenance;

A. Structurally sound trees located in positions that can accommodate future growth.
B. Trees which could be made suitable for long term retention by remedial care
C. Trees of special significance which would warrant extraordinary efforts to secure their long term retention.

2. Medium ULE- tree appeared to be retainable at the time of assessment for 15 to 40 years with an acceptable degree of risk, assuming reasonable maintenance;

A. Trees which may only live from 15 to 40 years.
B. Trees which may live for more than 40 years but would be removed for safety or nuisance reasons.
C. Trees which may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.
D. Trees which could be made suitable for retention in the medium term by remedial care.

3. Short ULE - tree appeared to be retainable at the time of assessment for 5 to 15 years with an acceptable degree of risk, assuming reasonable maintenance:

A. Trees which may only live from 5 to 15 years.
B. Trees which may live for more than 15 years but would be removed for safety or nuisance reasons.
C. Trees which may live for more than 15 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.
D. Trees which require substantial remediation and are only suitable for retention in the short term.

4. Removal - trees which should be removed within the next 5 years;

A. Dead, dying, suppressed or declining trees.
B. Dangerous trees through instability or recent loss of adjacent trees.
C. Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
D. Damaged trees that are clearly not safe to retain.
E. Trees which may live for more than 5 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.
F. Trees which are damaging or may cause damage to existing structures within the next 5 years.
G. Trees that will become dangerous after removal of other trees for the reasons given in (a) to (f).
H. Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

5. Small, young or regularly pruned - Trees that can be moved or replaced;

A. Small trees less than 5m in height.
B. Young trees less than 15 years old but over 3m in height.
C. Formal hedges and trees intended for regular pruning to artificially control growth.

Appendix 04. Generic Glossary.

Table 9. Tree Age Categories.

Category.	Description.
Semi-mature (S)	Refers to a tree between immaturity and full size.
Mature (M)	Refers to a full sized tree with some capacity for further growth.
Late-mature (L)	Refers to a tree that is entering decline.
Over-mature (O)	Refers to a tree already in decline.

Table 10. Tree Health Categories. (Describes tree vigour).

Category.	Vigour.	Foliage Density & Size.	Symptoms of Stress or Decline	Pests & Diseases.
Good	Full canopy cover with good extension growth.	Foliage density 80% or greater & foliage typical size.	No significant characteristics observed.	No significant pests or diseases observed.
Fair	Canopy cover slightly reduced with moderate extension growth.	Foliage density 60% or less, foliage typical size for species or slightly reduced.	Minor dieback of branchlets, deadwood < 30mm Ø, minor epicormic growth &/or reduced pruning response.	No significant pests or diseases observed.
Declining	Moderately reduced canopy cover, with little to no extension growth.	Foliage density < 60%, foliage size may be significantly reduced.	Moderate dieback to larger branches, deadwood > 30mm Ø, moderate to high percentage of epicormic growth & little to no pruning response.	Pests or diseases may be present that will have adverse impacts on the Health or Condition of the tree in the moderate term.
Poor	Significantly reduced canopy cover, with no extension growth.	Foliage density < 50%, foliage size significantly reduced.	Significant dieback including larger branches, deadwood > 30mm Ø, high percentage of epicormic growth & no pruning response.	Pests or diseases may be that will have adverse impacts on the Health or Condition of the tree in the short term.

Health; refers to the tree's vigour as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease and insect invasion, degree of dieback and other factors. Classes are Good (G), Fair (F), Declining (D), and Poor (P).

Condition; refers to the tree's form and growth habit, as modified by its environment (aspect, suppression by other trees, soils) and the state of the scaffold (i.e. trunk and major branches), including structural defects such as cavities, branch/trunk taper, crooked trunks, weak trunk/branch junctions or other factors. Condition is not directly connected with Health and it is possible for a tree to exhibit Good Health and Poor Condition. Classes are Good (G), Fair (F), Declining (D), and Poor (P).

DBH (Diameter at Breast Height); refers to the tree stem diameter measured at 1.4 metres above ground level.

DAB (Diameter at Buttress); refers to the tree stem diameter measured at commencement of basal flare.

RL; Refers to Reduced Level. In surveying RL refers to equating elevations of survey points with reference to a common assumed datum. It is a vertical distance between survey point and adopted datum plane.

AS4970; refers to Australian Standard for Protection of Trees on Development Sites. This standard does not advocate for tree retention or removal but provides recommendations for the protection of trees on development sites so that certain trees

AS4373; refers to Australian Standard for Pruning of Amenity Trees. This certification commenced in 1996 (updated 2007) and is a standard for correct arboricultural techniques. The standard takes into account tree biology/health and tree worker safety issues.

Tree Protection Zone (TPZ); as detailed in AS4970 (2009) Protection of Trees on Development Sites, the TPZ includes the SRZ and is the combination of root and canopy area required to maintain tree stability and health/viability. TPZ calculation; twelve (12) times the trunk DBH measured as a radial offset from the centre of the tree stem. The TPZ indicates the location where protective fencing should be installed to create an exclusion zone around a protected tree.

Table 11. Tree Condition Categories. (Describes tree form or structure).

Category.	Root-plate & Buttress.	Stem.	Scaffold.
Good	Root-plate level with existing grade, no exposed roots, no recent incursions within dripline & typical buttress morphology.	Typical stem morphology, good taper, no fluting, reaction wood, disease or decay.	Good architecture, good branch taper, major branches above horizontal, no first or second tier branch failures & no significant genetic defects.
Fair	Root-plate may be slightly elevated, buttress roots may be slightly flared & exposed, root-plate may be impacted upon by the built environment but no recent incursions within dripline.	Typical stem morphology, minor mechanical damage, decay or disease may be present, good architecture, good taper, minor fluting or reaction wood may be present.	Good to fair architecture, good to average taper, major branches may be horizontal, first or second titer branch failures may have occurred but no significant history of branch failure & minor genetic defects may be present.
Declining	Root-plate may be significantly elevated, buttress roots may be flared & exposed, root-plate may be impacted upon by the built environment & recent incursions within dripline.	Typical or atypical stem morphology, major mechanical damage, parasitic decay or disease may be present, may exhibit poor architecture, poor taper or HD ratio, significant fluting may be present.	Fair architecture, fair to average branch taper, genetic defects are present & a history of first or second tier branch failure has been established.
Poor	Root-plate movement detected, root-plate may be significantly impacted upon by the built environment or recent incursions within dripline within close proximity of tree stem	Typical or atypical stem morphology, advanced parasitic decay or disease may be present, cavities, decay or other defects which have reduced the structural integrity of the tree beyond the safe threshold are present.	Poor architecture, poor branch taper, may exhibit extensive history of branch failure & pronounced genetic defects may be present. (Canopy may be suppressed).

Structural Root Zone (SRZ); as detailed in AS4970 (2009) Protection of Trees on Development Sites, refers to the area of root zone measured as a radial offset from the centre of the tree stem required for tree stability. SRZ calculation; (D x 50) ^0.42 x 0.64. D = trunk diameter in metres measured above the root buttress. It is important to note that the SRZ is a calculated as a radial average and biological root growth is affected by many factors. It may therefore be necessary, in certain cases, to undertake root mapping via physical or non-invasive means to determine the exact location of structural

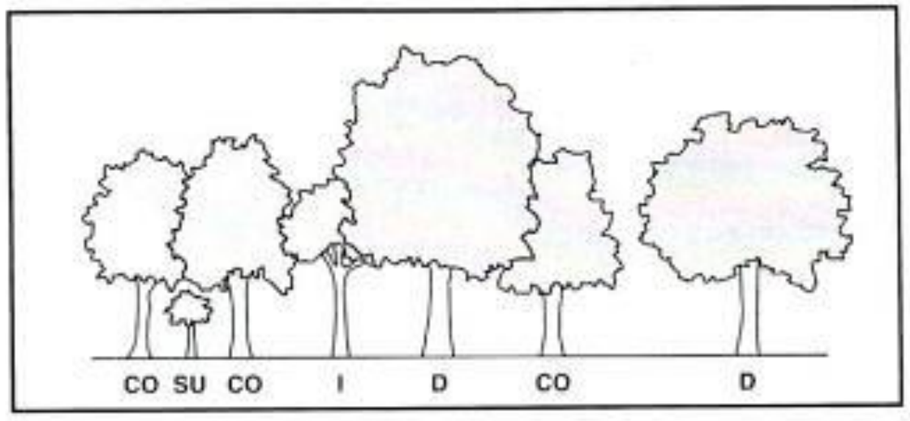
roots. AS4970 (2009) only requires SRZ calculations when a major encroachment into the TPZ (>10%) or inside the SRZ is proposed.

Aerial Inspection; refers to climbing a tree to obtain more accurate information on the tree canopy or scaffold.

Stem; refers to the tree trunk/s.

Crown; refers to the part of the tree consisting of branches and leaves and any part of the trunk from which branches arise.

Figure 10. Crown Classes. ***(After; Matheny & Clark 1994).***



Crown classes are described as; Codominant (CO), Suppressed (SU), Intermediate (I) and Dominant (D). In a planning context priority should be given for retention of trees with Codominant (CO), Intermediate (I) and Dominant (D). Trees with dominant crowns being the best candidates for retention and trees with suppressed crowns being the worst candidates for retention.

Endemic; Refers to locally indigenous species.

Indigenous; Refers to Australian native plants which are not endemic.

Lopped; refers to a tree which has been pruned contrary to AS4373 (2007.) This type of pruning may be harmful to the health or condition of a tree.

Potential Foliage Density; refers to the foliage density exhibited by the tree as a percentage (0-100%) based on the potential foliage density of a healthy specimen with good vigour. Average potential foliage density is described as 70% approximately.

In Decline; refers to a tree which has entered the mortality spiral.

In Full Decline; refers to a tree which is dying with little chance of successful remediation.

Epicormic Shoots; trees have epicormic buds which in times of stress may grow to increase the foliage on a tree. An increase in the photosynthetic production of sugar (energy) may assist in overcoming a trees' stressed condition. The presence of epicormic shoots on a tree is therefore a sign of stress or reduced vigour.

Tree Hazard Ratings; refers to three separate categories; Failure Potential, Size of Defective Part and Target Rating. A tree is given a score of 1 to 4 in each individual category. A score of 12 would rate as an extreme Hazard Rating; a score of 4 would rate as a very low Hazard Rating. *(After; Harris Clarke & Matheny 2004.)*

Tree Significance Ratings; refers to four separate categories; Origin, Streetscape Significance, Landscape Significance and Heritage Significance. A tree is given a score of 1 to 3 in each individual category. A score of 12 would rate a tree as being of High Significance and a score of 4 would rate a tree as being of Low Significance. *(Paul Shearer Consulting 2017©)* The three Significance Rating Categories are as follows:

† High Significance Rating - (11-12).
† Moderate Significance Rating - (9-10).
† Low Significance Rating - (4-8).

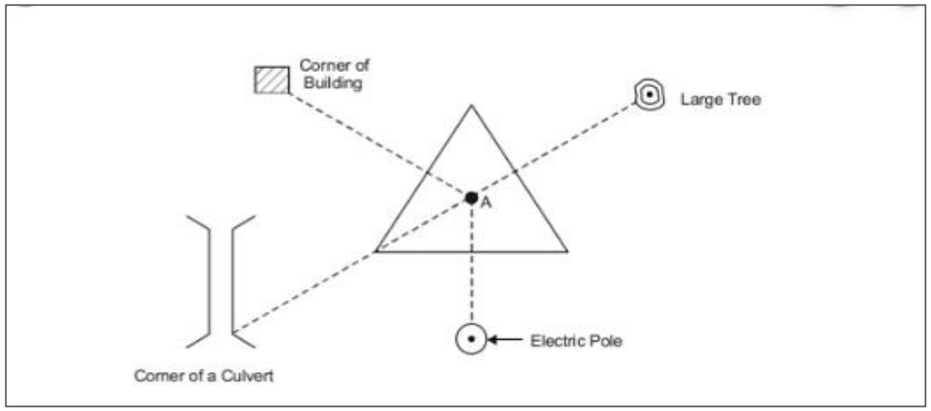
Tree Retention Value; refers to four separate categories; Health (vigour), Condition (form/structure), Situation and Ecology. A tree is given a score of 1 to 3 in each individual category. A score of 12 describes a tree with a High Retention Value and a tree with a score of 4 describes a tree with a Low Retention Value. *(Paul Shearer Consulting 2017©)* The three Significance Rating Categories are as follows:

† High Retention Value - (11-12).
† Moderate Retention Value - (9-10).
† Low Retention Value - (4-8).

Useful Life Expectancy (ULE) Rating; adapted from Barrell 1996 and Updated April 2001. In a planning context, the time a tree can expect to be usefully retained is the most important long-term consideration. The five ULE categories are; (1 Long – Over 40 years), (2 Medium – 15 – 40 years), (3 Short – 5-15 years), (4 Removal – Trees which should be removed) and (5 – Trees that can be moved or replaced). ULE i.e. a system designed to classify trees into a number of categories so that information regarding tree retention can be concisely communicated in a non-technical manner.

Chain Survey; in this context involved plotting a tree by measuring its offset to a fixed structure/s. (Figure 11)

Figure 11. Chain Survey.



Appendix 05. Legislative Overview.

Table 12. Legislative Overview. The following is a list of legislative planning provisions which are applicable to the subject site. (This list is not comprehensive and other instruments are applicable).

Planning Instrument	Hierarchy	Overview
The Biodiversity Conservation Act (2016).	State	The *Biodiversity Conservation Act (2016)* (BC Act) and amendments to the *Local Land Services Amendment Act (2016)* (LLS Act) repeal the *Threatened Species Conservation Act 1995*, the *Nature Conservation Trust Act (2001)* and parts of the *National Parks and Wildlife Act (1974*). The LLS Act repeals the *Native Vegetation Act (2003).* The BC Act establishes a new regulatory framework for assessing and offsetting biodiversity impacts on proposed developments. Where development consent is granted, the authority may impose as a condition of consent an obligation to retire a number and type of biodiversity credits determined under the new Biodiversity Assessment Method (BAM). Under the BC Act consent cannot be granted for non-State significant development under Part 4 of the *Environmental Planning and Assessment Act 1979* if the consent authority is of the opinion it is likely to have serious and irreversible impacts on biodiversity values.
The Environment Protection and Biodiversity Conservation Act (1999).	Commonwealth	*The Environment Protection and Biodiversity Conservation Act (1999)* amended (2013) (the Act) aims to protect matters of national environmental significance for which Australia has made international agreements. The Act streamlines national environmental assessment and the approval processes, and promotes ecologically sustainable development and conservation of biodiversity. It also provides for a cooperative approach to the management of natural, cultural, social and economic aspects of ecosystems, communities and resources. Nationally threatened species and ecological communities are listed as one of nine national environmental significance under the Act.
State Environmental Planning Policy (SEPP) Vegetation in Non-Rural Areas (2017).	State	The Vegetation SEPP Vegetation in Non-Rural Areas (2017) works with the *Biodiversity Conservation Act (2016)* and the *Local Land Services Amendment Act (2016)* to create a framework for the regulation of clearing of native vegetation in NSW. The SEPP requires a Council permit to clear any vegetation below the Biodiversity Offset Scheme threshold, to which Part 3 of the SEPP applies. The SEPP also provides for an appeal to the Land and Environment Court against a Councils refusal to grant such a permit.
SEPP 19 Bushland in Urban Areas.	State	The general aims of SEPP 19 Bushland in Urban Areas is to protect and preserve bushland within the urban areas referred to in Schedule 1 of the SEPP because of its value to the community as natural heritage, its aesthetic value, and its value as a recreational, educational and scientific resource. The SEPP is designed to protect bushland in existing public open space zones and reservations and to ensure that preserving bushland is given a high priority when local environmental plans for urban development are being prepared.
State Environmental Planning Policy (SEPP) Educational Establishments & Childcare Facilities (2017).	State	The goal of the SEPP for Educational Establishments and Childcare Facilities (2017) makes it easier for new and existing child-care providers, schools, TAFEs and universities to build new facilities and improve existing ones by streamlining approval processes. The updated policy includes the following changes to the planning system. It simplifies and streamlines the planning approval process by allowing certain early childhood education and care facilities to be assessed as exempt or complying developments. The SEPP amends Local Environmental Plans to permit centre-based child care in all R2 Low Density Residential areas allowing facilities in more locations closer to homes. The Guideline contains key national requirements and planning and design guidance for child care facilities and will generally prevail over local development control plans. This SEPP allows for the removal of trees located within 3m of approved works where the planning pathway is a Complying Development (CDC), the tree is not listed a Council Register of Significant Trees and the tree has a height <8m.
SEPP Infrastructure (2007).	State	The SEPP Infrastructure (2007) amended (2018) aims to simplify the process for providing infrastructure like hospitals, roads, railways, emergency services, water supply and electricity delivery. Recent changes to the SEPP introduce new provisions for bushfire hazard reduction and other items. Recent amendments aim to make it easier and faster to deliver and maintain infrastructure, while ensuring appropriate levels of environmental assessment and consultation are undertaken.
SEPP Koala Habitat Protection (2019)	State	The SEPP for Koala Protection (2019) replaces SEPP 44 Koala Habitat Protection. This Policy aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

Attachments.

1 Photographs.
2 Hazard, Significance & Retention Definitions & Calculations.
3 Summary of Tree Observations Table.
4 Site Plan Indicating Scope of Works.
5 Drawings Illustrating Root Zones & Canopy Projections.

Attachment 01. Photographs.

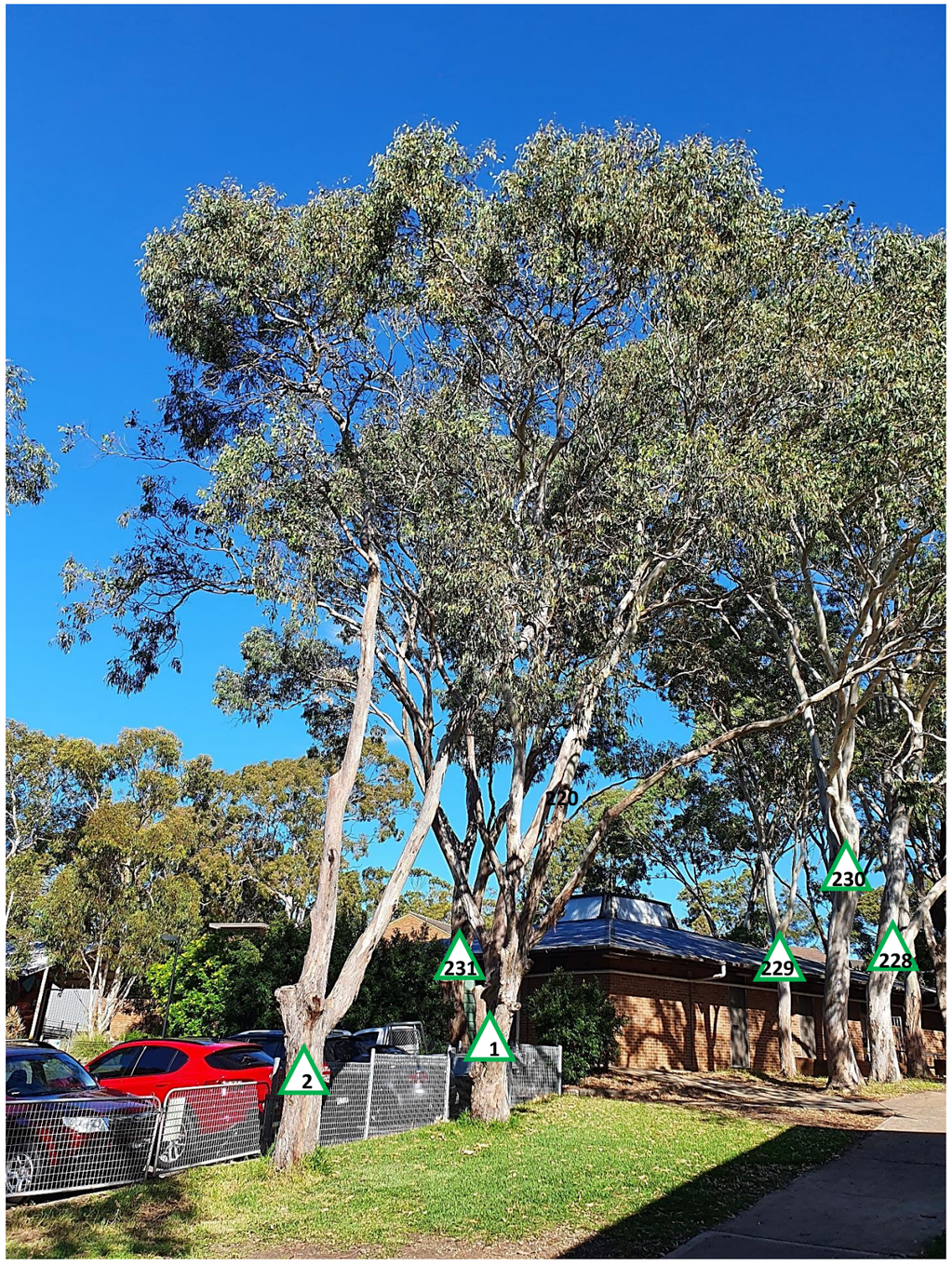
Photograph 1. (North east aspect). This photograph illustrates the streetscape significance of trees located adjacent to the site's Waratah Street boundary as viewed travelling south west along Keenan Street. The trees T2, T3, T4, T5, T6, T7, T201, T203 and T205 would need to be removed to accommodate the proposed T and L building or new car park. I have provided a sensitive construction methodology for the car park so the tree T202 may be retained.

Photograph 2. (North West aspect). **This photograph illustrates the trees T201, T202, T203, T204 and T205 from a different aspect. The trees T201, T203, T204 and T205 would need to be removed to accommodate the proposed T and L building or car park.**

Photograph 3. (North West aspect). The trees T4, T6, T7, T8 and T9 would need to be removed to accommodate the proposed new car park. The trees T10 and T11 would be retained.

Photograph 4. (South west aspect). A different view of the trees T3, T4, T5, T7, T201, T202, T203 and T205. The trees T3, T4, T5, T7, T201, T203 and T205 would need to be removed to accommodate prosed works.

Photograph 5. (North east aspect). The trees T1, T2. T228, T229, T230 and T231 would need to be removed to accommodate the proposed T and L building.



Photograph 6. (South west aspect). The trees T1, T2. T3, T225, T226, T227 and T228 would need to be removed to accommodate the proposed T and L building.

Photograph 7. (South west aspect). This photograph illustrates the trees T206, T208, T209, T210, T216 and T217. The trees T209, T210 and T216 would need to be removed to accommodate the proposed T and L building.

Attachment 02. Hazard Rating & Significance Rating Definitions & Calculations.

TABLE 13. Hazard Rating, Significance Rating & Tree Retention Value Definitions.

Hazard Rating: Refers to three separate categories; Failure Potential, Size of Defective Part and Target Rating. A tree is given a score of 1 to 4 in each individual category. A score of 12 would rate as an extreme Hazard Rating; a score of 3 would rate as a very low Hazard Rating. ***(After; Harris Clarke & Matheny 2004.)***
(Failure Potential) – Identifies the most likely failure and rates the likelihood that the structural defect will result in failure. 1. Low - defects are minor (e.g. Dieback of twigs, small wounds with good wound wood development) 2. Medium – defects are present and obvious (e.g. Cavity encompassing10-25% of stem circumference). 3. High – numerous and or significant defects present (e.g. Cavity encompassing 30-50% of stem circumference or major bark inclusions. 4. Severe – defects are very severe (e.g. heart rots fruiting bodies, cavity encompassing more than 50% stem circumference.
(Size of Defective Part) – Rates the size of the part most likely to fail. The larger the part that may fail, the greater the potential for damage. 1. Most likely failure less than 150mm in diameter. 2. Most likely failure 150mm – 450mm in diameter. 3. Most likely failure 450mm – 750mm in diameter. 4. More than 750mm in diameter.
(Target Rating) – Rates the use and occupancy of the area that would be struck by the defective part. 1. Occasional use (e.g. jogging/cycle track). 2. Intermittent use (e.g. picnic area/day use parking). 3. Frequent use, secondary structure (e.g. seasonal camping area/storage facilities). 4. Constant use, structures (e.g. year-round use for a number of hours each day/residences).
Hazard Rating = Failure Potential + Size of Part + Target Rating. (Add each of these categories for a rating out of 12).

Significance Rating: Refers to four separate categories; Origin, Landscape Significance, Streetscape Significance and Cultural Significance. A tree is given a score of 1 to 3 in each individual category. A score of 12 would rate a tree as being of high significance and a score of 3 would rate a tree as being of low significance. ***(Paul Shearer Consulting 2017©)***
(Origin) – Refers to whether the tree was likely to be planted, naturally occurring or introduced by other means. 1. Low - Refers to a tree which is most-likely to have been introduced by 'other means' (such as via bird droppings et.) 2. Moderate - Refers to a tree which is most-likely to have been planted. 3. High - Refers to a tree which is an endemic species and is most-likely to be naturally occurring.
(Landscape Significance) - Refers to the size, scale and prominence of a tree in the landscape, generally when viewed from a distance. 1. Low - Refers to trees that are inconspicuous in the landscape and have little influence or impact on the landscape character. 2. Moderate - Refers to trees that are moderately significant in the landscape and have a moderate influence on the landscape character. 3. High - Refers to trees that are highly significant in the landscape and have a significant influence on the landscape character.
(Streetscape Significance) - Refers to the size, scale and prominence of a tree in the neighborhood or streetscape, generally when viewed from street level or from within a street. 1. Low - Refers to trees that are inconspicuous in the streetscape and have little influence or impact on the streetscape character. 2. Moderate - Refers to trees that are moderately significant in the streetscape and have a moderate influence on the streetscape character. 3. High - Refers to trees that are highly significant in the streetscape and have a significant influence on the streetscape character.
(Cultural Significance) - Details the cultural or natural heritage status that a tree has attained. 1. Low - Refers to trees that have no cultural or natural heritage significance. 2. Moderate - Refers to species which are representative of a cultural planting period or have natural heritage significance. 3. High - Refers to trees with documented state or national cultural or historical significance or trees with aboriginal significance.
Significance Rating = Tree Species + Landscape Significance + Streetscape Significance + Cultural Significance. (Add each of these four categories together for a score out of 12.)

Retention Value: Refers to three separate categories; Health, Condition and Situation. A tree is given a score of 1 to 4 in each individual category. A score of 12 would rate a tree as having a high retention value and a score of 3 would rate a tree as having a low retention value. ***(Paul Shearer Consulting 2017©)***
(Health) - Refers to the tree's vigor as exhibited by the crown density, leaf color, presence of epicormic shoots, ability to withstand disease invasion, and the degree of dieback. *(After; Matheny & Clarke 1994)* 1. Poor-Declining. 2. Fair. 3. Good.
(Condition) - Refers to the tree's form and growth habit, as modified by its environment (Aspect, suppression by other trees, soils) and the state of the scaffold (i.e. trunk and major branches), including structural defects such as cavities, crooked trunks or weak trunk/branch junctions. These are not directly connected with health as it is possible for a tree to be healthy but in poor condition. *(After; Matheny & Clarke 1994)* 1. Poor-Declining. 2. Fair. 3. Good.
(Situation) - Refers to the physical location of a tree on a site and its potential for future growth taking into account any physical restrictions, (e.g. position of house.) 1. Refers to a tree that is causing damage to property. 2. Refers to a tree that has outgrown its situation and may cause damage to the built environment within the next 5 years. 3. Refers to a tree located in a situation that can accommodate further growth with regular maintenance.
(Ecology) - Refers to the ecological significance or value of a tree. 1. Refers to a tree of exotic climatic origin which that offers little in the way of ecological significance or benefits. 2. Refers to a tree, endemic, indigenous or exotic, which may provide ecological benefits. 3. Refers to a tree which forms part of an endangered vegetation community or provides significant ecological benefits.
Retention Value = Tree Health + Tree Condition + Tree Situation + Ecological. (Add each of these four categories together for a score out of 12.)

TABLE 14. Hazard Assessment, Significance Rating & Retention Value Calculations. Please refer to table 13 for an explanation of values used in this table. Calculations based on observations made at time of inspection.

Information Category	*Tree No.*																																		
Hazard Rating (1-12)	1	2	3	4	5	6	7	8	9	10	11	121	122	123	124	125	126	201	202	203	204	205	206	207	208	209	210	216	217	219	220	221	222	223	224
Failure Potential 1, 2, 3, 4.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
Size of Defective Part 1, 2, 3, 4.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1	1
Target Rating 1, 2, 3, 4.	2	2	2	2	2	2	2	2	2	2	2	4	4	4	4	4	4	2	2	2	2	2	4	4	4	4	4	4	4	4	4	4	4	4	4
Total	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*4*	*6*	*6*	*6*	*6*	*6*	*6*	*4*	*4*	*4*	*4*	*4*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*6*	*8*	*6*	*6*
Significance Rating (1-12)																																			
Provenance (Origin) 1, 2, 3.	2	2	2	2	3	2	3	1	1	2	3	2	3	3	3	3	3	**2**	**2**	3	3	**2**	3	3	2	2	2	3	2	3	**3**	**2**	3	2	2
Landscape Significance 1, 2, 3.	**1**	**2**	**3**	**3**	**1**	**1**	**2**	**1**	**2**	**1**	**2**	2	1	1	2	2	1	**1**	**2**	**2**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**3**	**3**	**2**	**3**	**2**	**2**	**3**
Streetscape Significance 1, 2, 3.	**1**	**1**	**3**	**3**	**1**	**1**	**2**	**1**	**3**	**1**	**2**	1	1	1	1	1	1	2	3	1	1	1	1	1	**1**	**1**	**1**	**1**	**1**	**1**	1	1	1	**1**	**1**
Cultural Significance 1, 2, 3.	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	1	1	1	1	1	1	1	1	1	1	1	1	1	**1**	**1**	**1**	**1**	**1**	**1**	1	1	1	**1**	**1**
Total	*5*	*6*	*9*	*9*	*6*	*5*	*8*	*4*	*7*	*5*	*8*	*6*	*6*	*6*	*7*	*7*	*6*	*6*	*8*	*7*	*7*	*6*	*7*	*7*	*5*	*6*	*6*	*7*	*7*	*8*	*7*	*7*	*7*	*6*	*7*
Retention Value (1-12)																																			
Health 1, 2, 3.	2	3	3	3	3	2	3	3	3	3	3	2	3	3	3	3	3	2	3	3	2	3	3	3	3	3	3	3	3	3	3	3	2	3	2
Condition 1, 2, 3.	2	2	2	3	3	2	3	2	2	1	3	2	1	1	2	2	1	1	2	2	2	2	2	2	3	3	2	2	3	3	2	3	2	2	2
Situation 1, 2, 3.	3	3	3	3	3	3	3	3	3	3	3	2	2	2	2	2	2	3	3	3	3	3	2	2	3	3	3	2	3	3	2	2	2	3	3
Ecology 1, 2, 3.	2	2	2	2	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
Total	*9*	*10*	*10*	*11*	*11*	*9*	*11*	*9*	*9*	*8*	*11*	*8*	*8*	*8*	*9*	*9*	*8*	*8*	*10*	*10*	*9*	*10*	*9*	*9*	*11*	*11*	*10*	*9*	*11*	*11*	*9*	*10*	*8*	*10*	*9*

TABLE 14. Continued.

Information Category	*Tree No.*						
Hazard Rating (1-12)	225	226	227	228	229	230	231
Failure Potential 1, 2, 3, 4.	1	1	1	1	1	1	2
Size of Defective Part 1, 2, 3, 4.	1	1	1	1	1	1	3
Target Rating 1, 2, 3, 4.	4	4	4	4	4	4	3
Total	***6***	***6***	***6***	***6***	***6***	***6***	***8***
Significance Rating (1-12)							
Provenance (Origin) 1, 2, 3.	2	2	2	2	2	2	**2**
Landscape Significance 1, 2, 3.	**2**	**2**	**3**	**3**	**2**	**2**	**3**
Streetscape Significance 1, 2, 3.	**1**	**1**	**1**	**1**	**1**	**1**	1
Cultural Significance 1, 2, 3.	**1**	**1**	**1**	**1**	**1**	**1**	1
Total	***6***	***6***	*7*	*7*	***6***	*7*	*7*
Retention Value (1-12)							
Health 1, 2, 3.	3	3	3	3	3	3	2
Condition 1, 2, 3.	3	2	3	2	2	2	2
Situation 1, 2, 3.	3	3	3	3	3	3	2
Ecology 1, 2, 3.	2	2	2	2	2	2	2
Total	***11***	***10***	***11***	***10***	***10***	***10***	***8***

Attachment 03. Summary of Tree Observations Table.

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Table 15. Summary of Tree Observations.
Client: NSW Department of Education.
Site: Mona Vale Public School 2 Waratah Street Mona Vale NSW.
Date Field Notes Recorded: Friday the 6th of March 2020.

Tree Significance Rating Categories are as follows:

11-12 = High Significance Rating.
9-10 = Moderate Significance Rating.
4-8 = Low Significance Rating.

Tree Retention Value Categories are as follows:

11-12 = High Retention Value.
9-10 = Moderate Retention Value.
4-8 = Low Retention Value.

Retain Tree | Pruning Required | Further Assessment Required | Tree Removal Required

Tree No.	Species	Tree Age	Tree Height* (m)	Canopy Spread* (m)	DBH/DAB (mm)	TPZ (R m)	SRZ (R m)	RL	Tree Health (Vigor)	Tree Condition (Structure)	Hazard Rating (1-12)	Significance Rating (1-12)	Retention Value (1-12)	ULE Rating	Comments	Development Impact Assessment Summary
1	Forest Red Gum *(Eucalyptus tereticornis)*	M	9	N9/S4/E7/W9	550,250/680	7.25	-	22.28	F	F	4	5	9	2A	Three codominant stems at 1.5m, small diameter deadwood, heavily pruned with little to no pruning response & intermediate crown.	Within building footprint of T & L building.
2	Forest Red Gum *(Eucalyptus tereticornis)*	M	10	N2/S4/E5/W4	390/480	4.68	-	22.00	G	F	4	6	10	2A	Two stems removed long ago, two remaining codominant stems at 1.8m, reduced pruning response and codominant crown.	Within building footprint T & L building.
3	Forest Red Gum *(Eucalyptus tereticornis)*	M	18	N9/S14/E15/W15	680/800	8.16		21.13	G	F	4	9	10	2A	One stem removed long ago, minor dieback, habit affected by dominant T4 & codominant crown.	Within building footprint T & L building, TPZ incursion 7.5% by T & L building including major southern canopy impacts.
4	Forest Red Gum *(Eucalyptus tereticornis)*	M	19	N10/ S13/E15/W10	770/1100	9.24	-	20.90	G	G	4	9	11	1A	Dominant crown.	Within building footprint of T & L building.
5	Cheese Tree *(Glochideon ferdinandi)*	M	6	4x4	380,230, 100/480	5.46	-	20.52	G	G	4	6	11	2A	Intermediate crown.	Within building footprint of car park.
6	Wallangarra White Gum *(Eucalyptus scoparia)*	M	7	4x5	430/600	5.16	-	20.57	F-D	F	4	5	9	3A	One stem removed long ago, poor pruning response, foliage density 40%, moderate dieback & intermediate crown.	Within building footprint of car park.
7	Swamp Mahogany *(Eucalyptus robusta)*	M	14	4x5	320/400	3.84	-	21.39	G	G	4	8	11	1A	Dominant crown.	Within building footprint of car park.
8	Camphor Laurel *(Cinnamomum camphora)*	M	9	N3/S6/E6/W4	300,450/600	6.49	-	21.20	G	F	4	4	9	2A	Has not reached potential physical dimensions & asymmetrical codominant crown.	Within building footprint of car park.
9	Camphor Laurel *(Cinnamomum camphora)*	M	15	N12/S5/E7/W6	640/840	7.68	-	21.31	G	F	4	7	9	2A	Has not reached potential physical dimensions & asymmetrical codominant crown.	Within building footprint of car park.
10	White Cedar *(Melia azaderach)*	S	8	4x3	250/290	3.00	-	21.39	G	P	4	5	8	4A	Suppressed crown.	No direct impacts anticipated.
11	Grey Gum *(Eucalyptus punctata)*	M	14	N8/S5/E5/W6	370/430	4.44	-	21.41	G	G	4	8	11	1A	Small diameter deadwood & codominant crown.	No direct impacts anticipated.
121	Forest Red Gum *(Eucalyptus tereticornis)*	M	13	4x8	570/590	6.84		21.07	F	F	6	6	8	2A	Moderate dieback, one stem removed long ago, poor pruning response & dominant crown.	Minor TPZ incursion 6.1% including by deck off PAC building & minor pruning of southern canopy.
122	Sydney Red Gum *(Angophora Costata)*	S	8	N1/S3/E3/W1	200/270	2.40	-	20.75	G	P	6	6	8	3A	Suppressed crown.	No direct impacts anticipated.
123	Sydney Red Gum *(Angophora Costata)*	S	8	4x4	220/260	2.64	-	20.82	G	P	6	6	8	3A	Suppressed crown.	No direct impacts anticipated.
124	Red Bloodwood *(Corymbia gummifera)*	M	13	N10/S5/E8/W5	540/740	6.48	-	20.88	G	F	6	7	9	1A	Dominant canopy & exposed buttress roots.	Minor pruning NE canopy.
125	Sydney Red Gum *(Angophora Costata)*	M	13	N4/S3/E1/W8	400/500	4.80	-	21.20	G	F	6	7	9	1A	Asymmetrical canopy to west.	No direct impacts anticipated.
126	Sydney Red Gum *(Angophora Costata)*	S	8	N3/S1/E1/W5	280/340	3.36	-	21.20	G	P	6	6	8	3A	Suppressed crown.	No direct impacts anticipated.
201	Red Mahogany *(Eucalyptus resinifera)*	M	8	N5/S1/E6/W1	280/350	3.36		19.90	F	P	4	6	8	3A	Suppressed crown.	Major TPZ incursion 23.5% also within SRZ by car park.

Retain Tree	Pruning Required	Further Assessment Required	Tree Removal Required

Tree No.	Species	Tree Age	Tree Height* (m)	Canopy Spread* (m)	DBH/DAB (mm)	TPZ (R m)	SRZ (R m)	RL	Tree Health (Vigor)	Tree Condition (Structure)	Hazard Rating (1-12)	Significance Rating (1-12)	Retention Value (1-12)	ULE Rating	Comments	Development Impact Assessment Summary
202	Red Mahogany *(Eucalyptus resinifera)*	M	13	N7/S2/E 7/W5	410/700	4.92		20.08	G	F	4	8	10	1A	Canopy asymmetrical to NW & codominant crown.	Major TPZ incursion 26.8% also within SRZ by car park. May require minor pruning NW canopy over carpark. Possible impacts from scaffolding.
203	Scribbly Gum *(Eucalyptus haemastoma)*	M	13	N6/S1/E 4/W1	500/640	6.00		20.64	G	F	4	7	10	4A	One stem removed long ago, poor pruning response & suppressed crown.	Major TPZ incursion 26.9% also within SRZ by car park minor pruning western canopy. Possible impacts from scaffolding.
204	Sydney Red Gum *(Angophora Costata)*	M	13	N5/S12/ E4/W7	470/680	5.64		20.67	F	F	4	7	9	2A	Canopy asymmetrical to north & intermediate crown.	Major TPZ incursion 20.5% also within SRZ by T & L building. Major pruning of western canopy for T & L building. Possible impacts from scaffolding.
205	Forest Red Gum *(Eucalyptus tereticornis)*	M	13	N3/S1/E 4/W16	450/640	5.40	-	21.25	G	F	4	6	10	2D	Significant lean to west, small scar at south west stem base & dominant crown.	Within building footprint T & L building.
206	Scribbly Gum *(Eucalyptus haemastoma)*	M	13	4x7	590/790	7.08	-	22.16	G	F	6	7	9	1A	Minor storm damage & dominant crown.	No direct impacts anticipated.
207	Scribbly Gum *(Eucalyptus haemastoma)*	M	13	4x4	330,100,100 ,100/700	3.70	-	22.65	G	F	6	7	9	2A	Tree formed from sucker & intermediate crown.	No direct impacts anticipated, possible impacts from scaffolding.
208	Forest Red Gum *(Eucalyptus tereticornis)*	M	11	4x4	270,280/780	4.67	-	24.36	G	G	6	5	11	1A	Two codominant stems from base, minor canker on western stem & dominant crown.	No direct impacts anticipated.
209	Forest Red Gum *(Eucalyptus tereticornis)*	M	15	N10/S5/ E10/W9	550/660	6.60	-	24.69	G	G	6	6	11	1A	Asymmetrical codominant crown.	Within building footprint T & L building.
210	Forest Red Gum *(Eucalyptus tereticornis)*	M	13	N15/S2/ E8/W2	620/500	7.44	-	24.55	G	F	6	6	10	1A	Asymmetrical canopy to north & intermediate crown.	Within building footprint T & L building.
216	Large-fruited Red Mahogany *(Eucalyptus scias)*	M	15	4x7	600/700	7.44		26.34	G	F	6	7	11	1A	Intermediate crown.	Major TPZ incursion 27.5% by T & L building,
217	Large-fruited Red Mahogany *(Eucalyptus scias)*	M	17	N13/S6/ E8/W7	600/700	7.20	-	25.72	G	G	6	7	11	1A	Minor dieback, minor storm damage & dominant crown.	Minor TPZ incursion 4.0% by T & L building, minor pruning NE canopy.
219	Grey Gum *(Eucalyptus punctata)*	M	16	4x6	260,300,200 /620 c0	5.33	-	25.52	G	G	6	8	11	1A	Three codominant stems at 0.5m & codominant crown.	No direct impacts anticipated.
220	Grey Gum *(Eucalyptus punctata)*	M	13	N12/S1 E/E4/W 5	340/440	4.08	-	25.27	G	F	6	7	9	1A	Moderate lean to west, canopy asymmetrical to north & intermediate crown.	No direct impacts anticipated.
221	Forest Red Gum *(Eucalyptus tereticornis)*	M	18	N12/S1 0/E10/ W7	470/600	5.64	-	24.90	G	G	6	7	10	1A	First branch in northern canopy quadrant at 6m & dominant canopy.	Minor pruning eastern canopy. Possible impacts from scaffolding.
222	Red Bloodwood *(Corymbia gummifera)*	M	13	N12/S1 2/E4/W 2	380/400	4.56	-	24.53	F	F	8	7	8	2A	Canopy heavily bowed to north & intermediate crown.	Major pruning eastern canopy. Possible impacts from scaffolding.
223	Brush Box *(Lophostemon confertus)*	M	14	4x5	310/380	3.72		24.69	G	F	6	6	10	1A	Slight lean to north, slight deviation in stem at 6m & codominant crown.	Major TPZ incursion 24.3% also within SRZ by T & L building. Major pruning of eastern canopy for T & L building. Possible impacts from scaffolding.
224	Forest Red Gum *(Eucalyptus tereticornis)*	M	15	4x5	330/400	3.96		24.43	F	F	6	7	9	2A	Live crown ratio 40 % & intermediate crown.	Major TPZ incursion 37.8% also within SRZ by T & L building. Major pruning of eastern canopy for T & L building. Possible impacts from scaffolding.
225	Forest Red Gum *(Eucalyptus tereticornis)*	M	11	N5/S7/E 8/W5	350/400	4.2	-	23.68	G	G	6	6	11	1A	Minor pruning with little pruning response & codominant crown.	Within building footprint T & L building.
226	Forest Red Gum *(Eucalyptus tereticornis)*	M	11	N7/S9/E 8/W4	420/580	5.04	-	23.59	G	F	6	6	10	1A	Small diameter deadwood & intermediate crown.	Within building footprint T & L building.
227	Forest Red Gum *(Eucalyptus tereticornis)*	M	18	4x7	380/470 d	4.56	-	23.61	G	G	6	7	11	1A	Exposed buttress in southern root-plate quadrant & dominant crown.	Within building footprint T & L building.
228	Forest Red Gum *(Eucalyptus tereticornis)*	M	15	N7/S3/E 5/W9	500/650	6.00	-	23.39	G	F	6	7	10	1A	Asymmetrical codominant crown to west & mechanical damage at stem base with reasonable callus growth.	Within building footprint T & L building.
229	Forest Red Gum *(Eucalyptus tereticornis)*	M	11	N3/S9/E 4/W4	330/370	3.96	-	23.31	G	F	6	6	10	1A	Small diameter deadwood & intermediate crown.	Within building footprint T & L building.

Retain Tree	Pruning Required	Further Assessment Required	Tree Removal Required

230	Forest Red Gum *(Eucalyptus tereticornis)*	M	13	N13/S4/ E7/W6	500/690	6.00	-	23.23	G	F	6	7	10	1A	Asymmetrical codominant crown to north & shallow exposed root in western root-plate quadrant with mechanical damage.	Within building footprint T & L building.
231	Forest Red Gum *(Eucalyptus tereticornis)*	M	18	4x10	620/850	7.44	-	23.29	F	F	8	7	8	2D	Minor fluting in stem, one stem removed, reduced pruning response & dominant crown.	Within building footprint T & L building.

(Please refer to Appendices 3 & 4 for an explanation of terminology used in this table. Please refer to Attachment 2 for Hazard Rating and Significance Rating calculations). Relevant tree information has been provided, any tree information not provided should be considered irrelevant, typical or within normal range for the species.

Major pruning – Refers to pruning contrary to the Australian Standard AS4373-2007 Pruning of Amenity Trees.

* Indicates dimension estimated.
† Indicates rounded up to minimum TPZ.

Attachment 04. Site Plan indicating Proposed Works.

Figure 12. Base plan used to determine the scope of works, tree locations and potential impacts from proposed works. NTS. *(Architectus 2020)*.

Attachment 05. Drawings Illustrating Tree Root Zones & Canopy Projections.

1 Sheet 1 of 6 Legend Illustrating Sheet Locations.
2 Sheet 2 of 6 Illustrating Tree Root Zones, Canopy Projections & Incursions (T&L Building & Car Park).
3 Sheet 3 of 6 Illustrating Tree Root Zones, Canopy Projections & Incursions. (PAC Building).
4 Sheet 4 of 6 Illustrating Tree Protection. (T&L Building & Car Park).
5 Sheet 5 of 6 Illustrating Tree Protection. (PAC Building).
6 Sheet 6 of 6 Illustrating Generic Tree Protection Specifications.