



## Arboricultural Impact Assessment Report. (Rev. 01)

Prepared for; Richard Crookes Constructions I Site Address; Alex Avenue Public School, Cnr. of Farmland Drive and future realignment of Pelican Road, Schofields NSW 2762 I Date; 12<sup>th</sup> of February 2019.



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# Arboricultural Impact Assessment Report.

## Overview:

Paul Shearer Consulting (PSC) was engaged by Richard Crookes Constructions (the client) to produce this Arboricultural Impact Assessment Report (AIA) for the Proposed Alex Avenue Public School. The client has been engaged by Schools Infrastructure NSW (SINSW) (the applicant). This report accompanies an Environmental Impact Statement (EIS) in support of State Significant Development Application (SSD 18\_9368) for the new Alex Avenue Public School. The subject site is located at the corner of Farmland Drive and the future realignment of Pelican Road, Schofields NSW. The new school will cater for approximately 1,000 students and 70 full-time staff upon completion. The proposal seeks consent for; construction of a two storey library, administration and staff building (Block A) comprising school administrative spaces including reception, library with reading nooks, makers space and research pods, staff rooms and offices, special programs rooms, amenities, canteen, interview rooms and presentation spaces. Construction of four two storey class room buildings (Block B) containing 40 home bases comprising; collaborative learning spaces, learning studios, covered outdoor learning spaces (COLA’s), practical activity areas and amenities. Construction of a single storey assembly hall (Block C) with performance stage and integrated COLA. The assembly hall will have OOSH facilities, store room areas and amenities. Associated site landscaping and open space including fences throughout the games courts. Pedestrian access points along both Farmland Drive and the future Pelican Road. Substation on the north east corner of the site and school signage at the front entrance. All proposed school buildings will be connected by a covered walkway providing integrated COLA’s. School staff will use the Council carpark for the adjacent sports field pursuant to a Joint User agreement. The proposed school pick-up and drop-off zone will also be contained within the future shared carpark and will be accessed via Farmland Drive.

This report (Revision 01) has been revised to provide additional sensitive construction recommendations for the construction of timber decking around the tree T12, no other revisions have been made. A Preliminary Tree Assessment Report (PTA) was produced on the site for Hayball Architecture by PSC on the 14.12.2018, the PTA report should be read in conjunction with this AIA report. The purpose of this AIA is to identify and assess any impacts associated with fifteen (15) trees identified in the PTA Report. This report will identify potential impacts from proposed works and make recommendations for the management of trees in accordance with The Australian Standard AS4970-2009 Protection of Trees on Development Sites.

## Legislation, Policy & Standards (List not fully inclusive):

Where relevant this report has been produced with reference to:

- ✓ Blacktown LEP & DCP (2015).
- ✓ Council’s Register of Significant Trees (where applicable).
- ✓ AS4970-2009 Protection of Trees on Development Sites & AS4373-2007 Pruning of Amenity Trees.
- ✓ The Biodiversity Conservation Act (2016).
- ✓ The Environment Protection and Biodiversity Conservation Act (1999).
- ✓ State Environmental Planning Policy (SEPP) Vegetation in Non-Rural Areas (2017).
- ✓ State Environmental Planning Policy (SEPP) Educational Establishments & Childcare Facilities (2017).
- ✓ State Environmental Planning Policy Sydney Region Growth Centres (2006).
- ✓ State Environmental Planning Policy (SEPP) Infrastructure (2007).
- ✓ State Environmental Planning Policy (SEPP) 19 Bushland in Urban Areas.
- ✓ SREP No. 20 Hawkesbury - Nepean River (No. 2-1997) and; others as detailed within the SEAR’s.



DISCLAIMER.

Limits of Scope Statement:

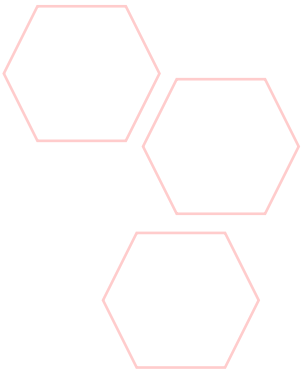
“I am not a solicitor,” There is no substitute for current professional litigation consulting agri-horticultural matters and legal advice. This publication is not intended as, and does not represent legal advice and should not be relied upon to take the place of such advice. Although every effort has 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 Richard Crookes Constructions (the client) to produce this Arboricultural Impact Assessment Report (AIA). The subject site is located at the corner of Farmland Drive and future realignment of Pelican Road, Schofields NSW. The legal description of the site is proposed Lots 1 and 2, being part of existing Lot 4 in DP1208329 and Lot 121 in DP1203646. The site is located within the LGA of Blacktown. Historically the site was used for grazing and as pastoral land.

A Preliminary Tree Assessment Report (PTA) was produced for Hayball Architecture on behalf of SINSW by PSC on the 14.12.2018, the PTA should be read in conjunction with this AIA report. Reports from other consultants were not available at the time that the PTA was produced. The client is a construction company which has been engaged by Schools Infrastructure NSW (SINSW). SINSW proposes construction of Alex Avenue Public School at the subject site. The project is classified as a State Significant Development; application number (SSD 18\_9368). The development is a greenfield project.

The purpose of this AIA is to identify and assess any impacts associated with fifteen (15) trees identified in the PTA Report. This report will identify potential impacts from proposed works and make recommendations for the management of trees in accordance with The Australian Standard AS4970-2009 Protection of Trees on Development Sites. The Australian Standard AS4970 (2009) has been used as a benchmark in the preparation of this report. I am an Australian Qualification Framework (AQF) Level 5 Consulting Arborist and am qualified to produce Arborist Reports within the LGA of Blacktown.

The Landscape Plan referenced for the purpose of producing this report was lacking in detail and did not provide a planting schedule. I have not referenced site plans indicating proposed civil works, soft landscaping, elevations or sections.

The northern end of the site is partially located within a designated 10/50 Bushfire Prone Area (Vegetation Buffer Zone). The Blacktown LEP (2015) does not identify any archaeological items on the site. However a draft report; Statement of Heritage Impact and Historical Archaeological Assessment indicates that there is possibly one archaeological item located on the subject site and additional archaeological items located within the vicinity of the site. The Statement of Heritage Impact and Historical Archaeological Assessment report concludes that any historical items on the site hold no heritage significance and that proposed works will not impact on any identified items of heritage significance.

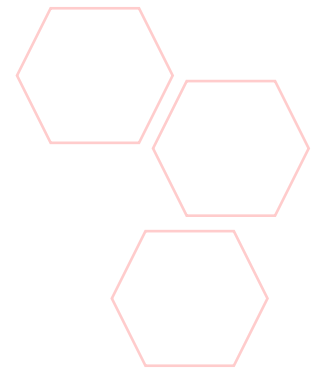
Fifteen trees protected under Section 4.3 of Blacktown Council's DCP (2015) were surveyed for the purpose of producing this report. The NSW National Parks & Wildlife 1:25000 Vegetation Map indicates that the naturally occurring vegetation community on site is Cumberland Plain Woodland (Shale Plains Woodland). The Cumberland Plain Woodland and its sub-groups have been listed as Critically Endangered under the *Biodiversity Conservation Act (2016)* and the *Environment Protection and Biodiversity Conservation Act (1999)*. All fifteen of the subject trees are endemic to the Cumberland Plain Woodland (Shale Plains Woodland). The subject trees are not listed on a Council Register of Significant Trees. The eight trees; T1, T2, T3, T4, T5, T6, T7 and T12 are located on the subject site. The seven trees; T8, T9, T10, T11, T13, T14 and T15 are located adjacent to the southern boundary of the site. The trees T1-T7 are located in the south east corner of the site. No Health or Condition issues were observed at the time of the site inspection which would require the removal of any of the fifteen subject trees.

The new school will cater for approximately 1,000 primary school students and 70 full time staff. The proposal seeks consent for; construction of a two storey library, administration and staff building (Block A), Construction of 4 two storey classroom buildings containing 40 home bases (Block B), construction of a single storey assembly hall (Block C) with performance stage and integrated outdoor learning area (COLA), landscaping and open space including fencing throughout and games courts. Pedestrian access points along both Farmland Drive and the future

Pelican Road, substation at the north east corner of the site and school signage at the front of the school. All school buildings will be connected with covered walkways providing integrated covered outdoor learning areas (COLA's). School staff will use the council carpark for the adjacent sports fields pursuant to a Joint Use agreement. The proposed school pick up and drop off zone will also be contained within the future shared car park and will be accessed via Farmland Drive.

I have completed an impact assessment based on site plans provided and have concluded that; proposed works will result in a Major TPZ incursion on the tree T1 and a Major TPZ/SRZ incursion on the tree T12. This tree exhibits reduced vigour and proposed works within the TPZ of this tree is not ideal. The incursion on the tree T1 is from a proposed batter and the incursion on the tree T12 is from a proposed batter and hard landscaping. I have concluded that construction of the site's southern boundary fence will occur through the TPZ of the trees; T6, T7, T8, T10 and T11. A Minor TPZ incursion is anticipated on the tree T2 from a proposed batter. I have concluded that pruning of the subject trees should not be required to accommodate proposed works.

I have recommended that the proposed batter to the south of the basketball courts and the building Block B4 be reconfigured to negate incursions within the TPZ of the two trees; T1 and T12. Whilst the installation of hard landscaping within the TPZ of the tree T12 is not ideal, I have provided a sensitive construction methodology for hard landscaping within the TPZ of this tree. I have also provided a sensitive construction methodology for construction of the site's southern boundary fence through the TPZ of the trees T6, T7, T8, T10 and T11. I have concluded that all fifteen of the subject trees may be retained if recommendations made in this report are strictly adhered to. I have provided a tree protection plan in accordance with AS4970-2009 and recommended that a Project Arborist be engaged to oversee the implementation of the tree protection plan. I have made recommendations for landscaping in lieu of a detailed landscape plan.





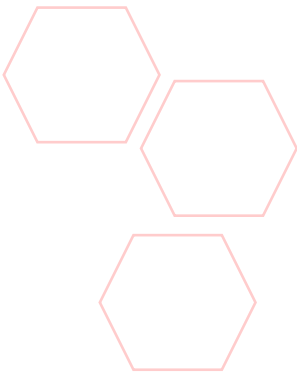


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1.0 Observations.

1.1 The Site.

The subject site is located at the corner of Farmland Drive and future realignment of Pelican Road, Schofields NSW. (Figure 1) The legal description of the site is proposed Lots 1 and 2, being part of existing Lot 4 in DP1208329 and Lot 121 in DP1203646. The site is located within the LGA of Blacktown. Historically the site was used for grazing and as pastoral land, the site is currently undeveloped and a subdivision is proposed. Schofields Road is located some 236m to the south east and it is likely that visibility of the site from Schofields Road is limited. (Google Earth 2018) The site is bounded by new residential development to the north, pastoral land to the south, a proposed new park with sports field to the east and a combination of pastoral land and industrial/commercial properties to the west. An unnamed creek is located downslope and to the south of the site. Figure 2 (following page) is provided to assist with the local site context.

Figure 1. Indicative Site Location Map Proposed Alex Avenue Primary School, Farmland Drive and future realignment of Pelican Road, Schofields NSW. (Image Source; Google Maps 2019).



Legend:

Indicative Site Location: 

1.1.1 10/50 Bushfire Mapping.

The site is located within a designated 10/50 Bushfire Prone Area. (RFS 2019) A Bushfire Assessment by Peterson Bushfire Consultants dated (13.12.2018) states that a 100m vegetation buffer zone extends onto the subject site from a woodland remnant located > 60m to the North West of the site. (Peterson D. 2018) The vegetation buffer zone extends across the northern site boundary and no trees located on the site are located within the vegetation buffer zone. The ‘Code’ cannot be used for the clearing of existing trees on the site.

1.1.2 Physical Site Description.

- † The site is currently undeveloped pastoral land.
- † Site area; the site covers an area of 2.000ha. (LTS Lockley 2017)
- † Topography; the site topography slopes gently to the south, south west.
- † Aspect; the site aspect is south west.
- † Elevation; the site elevation is 40m. (Google Earth 2018)
- † Drainage; the site drains to the south, south west.

1.1.3 Relevant Site Planning Information. (Blacktown LEP 2015 & Biosis 2018)

- † The site is located on Sheet 012 of the Blacktown LEP (2015) Planning Maps.
- † The site is zoned SP2 Infrastructure – Educational Establishment.
- † The site is not located within a designated Heritage Conservation Area.
- † The LEP Maps indicate that there are no Heritage Items located on or adjacent to the site. The draft report; Statement of Heritage Impact and Historical Archaeological Assessment on the site by Biosis (18.12.2018) concludes that there may be one unlisted archaeological historical item on site but any historical items on the site hold no heritage significance and that proposed works will not impact on any identified items of heritage significance. (Vella A. Allen C & Butcher M)
- † The site is not located within a designated Terrestrial Biodiversity Area.

1.1.4 Relevant State Environmental Protection Policy (SEPP) Site Information. (NSW Planning Hub 2018) This list is not fully inclusive.

The site is listed as 34-38 Schofields Road, Schofields on the NSW Planning Hub website.

- † SEPP Sydney Region Growth Centres (2006) Appendix 4 Clause 1.3.
- † SEPP Infrastructure (2007).
- † SEPP 19 Bushland in Urban Areas.
- † SEPP Vegetation in Non-rural Areas (2017).
- † SREP No. 20 Hawkesbury - Nepean River (No. 2-1997).

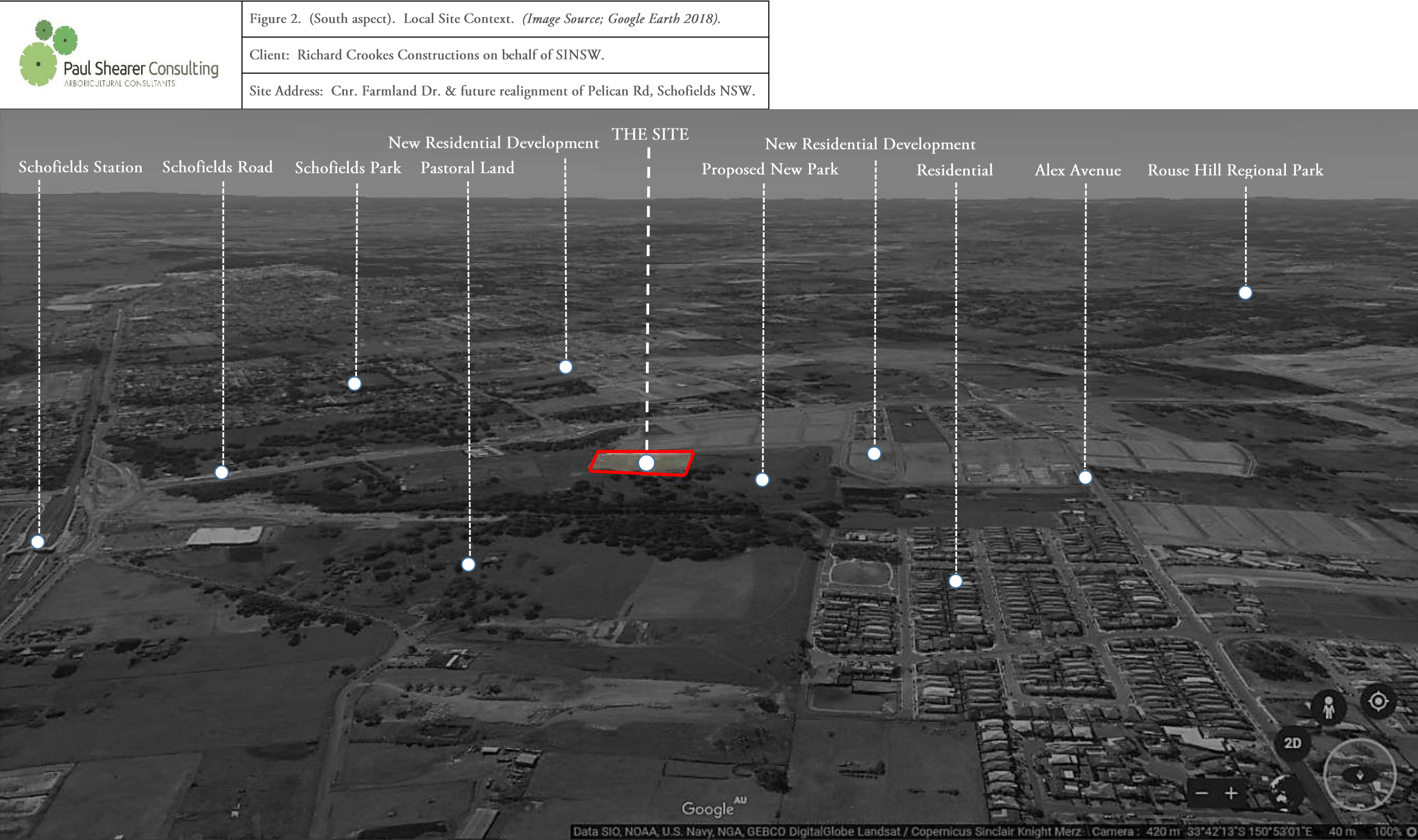
A summary of relevant legislative planning instruments is provided in Appendix 6.

1.1.5 Table 1. Response to SEAR’s.

This AIA Report is required by the Secretary’s Environmental Assessment Requirements (SEAR’s) for SSD 18\_9368. Table 1 provides details of input required from a consulting arborist as specified within the SEAR’s and where it is addressed in this report.

SEAR’s Item.	Report Reference.
The EIS must include all relevant plans, architectural drawings, diagrams and relevant documentation required under Schedule 1 of the Environmental Planning and Assessment Regulation 2000. Provide these as part of the EIS rather than as separate documents. In addition the EIS must contain the following: <ul style="list-style-type: none"><li>Arborist Report.</li></ul>	This report in its entirety.





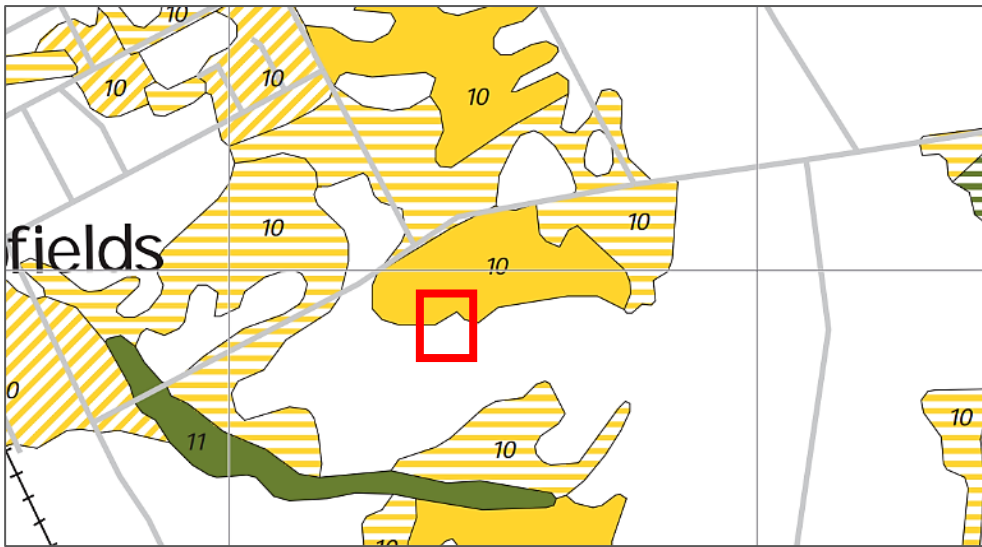
Site Local Context Aerial.

1.2 Flora.

1.2.1 Vegetation Communities. (NPWS 2002)

The NSW National Parks & Wildlife 1:25000 Vegetation Map (12 of 16) indicates that the naturally occurring vegetation community on site is Cumberland Plain Woodland (Shale Plains Woodland). (Figure 3)

Figure 3. Cumberland Plain Vegetation Community Map. (NPWS 2002)



Legend:

Indicative Site Location:		
Shale Plains Woodland:		Canopy Cover > 10% (Unless Remnant > 5ha).
Shale Plains Woodland:		Canopy Cover < 10%.

A Biodiversity

1.2.2 The Trees.

Fifteen trees protected under Section 4.3 of Blacktown Council’s DCP (2015) were surveyed for the purpose of producing this report. The eight trees; T1, T2, T3, T4, T5, T6, T7 and T12 are located on the subject site. The seven trees; T8, T9, T10, T11, T13, T14 and T15 are located adjacent to the southern boundary of the site. The trees T1-T7 are located in the south east corner of the site. The trees T8-T15 are located adjacent to the site’s southern boundary. The ground cover is a combination of endemic and introduced grass. (Tree locations are provided in Figure 4).

1.2.3 Tree Geographical Point of Origin.

All fifteen of the subject trees have been identified as Narrow-leaved Ironbark (*Eucalyptus crebra*) specimens. This species is endemic to the site and the Cumberland Plain Woodland (Shale Plains Woodland) vegetation community.

1.2.4 Tree Hazard Ratings.

The two trees; T3 and T10 have been awarded a Hazard Rating of 5 out of 12. The thirteen trees; T1, T2, T4, T5, T6, T7, T8, T9, T11, T12, T13, T14 and T15 have been awarded a Hazard Rating of 3 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 Appendix 5).

1.2.5 Tree Significance Ratings.

The four trees; T1, T3, T4 and T12 were awarded a Significance Rating of 11 out of 12. The eleven trees; T2, T5, T6, T7, T8, T9, T10, T11, T13, T14 and T15 have been awarded a Significance Rating of 10 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).

(Tree Significance Rating definitions and calculations are provided in Appendix 5).

1.2.6 Tree Retention Values AZ. (After; Barrell 2010).

Tree AZ has been used as the Retention Value methodology for this report. This methodology must be considered with all other relevant values and factors when prioritizing tree retention and removal. Category A refers to trees which are suitable for retention for more than 10 years which are worthy of being a material constraint. Category Z refers to trees which are not worthy of being a material constraint. The nine trees; T1, T2, T3, T7, T8, T9, T11, T14 and T15 have been awarded a Retention Value of A1. The five trees; T4, T5, T6, T12 and T13 have been awarded a Retention Value of A2. The tree; T10 has been awarded a Retention Value of A3.

- † A1 refers to trees with no significant defects which could be retained with minimal remedial care.
- † A2 refers to trees with minor defects that could be addressed by remedial care and/or work to adjacent trees.
- † A3 refers to trees with special significance that would warrant extraordinary efforts to retain for more than 10 years.

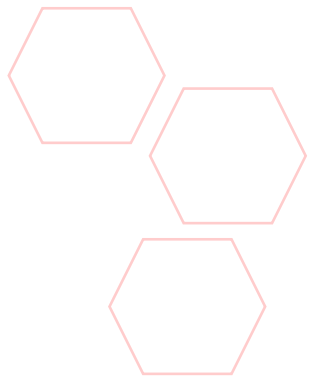
Whilst the TreeAZ methodology categorizes trees with an A rating as being ‘worthy of being a material constraint’ it is important to keep this in context. AS4970-2009 is the overriding planning instrument for the protection of trees on development sites in Australia and has been used as a benchmark in the preparation of this report. (Tree Retention Value definitions and calculations are provided in Appendix 5).

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

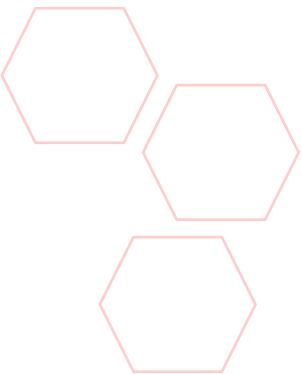
The fourteen trees T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T14 and T15 have been awarded a Medium ULE Rating of 15 - 40 years. The tree T13 has been awarded a Short ULE Rating of 5 - 15 years. (ULE Rating definitions are provided in Appendix 3).

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

The subject trees have not been declared under the *Biodiversity Conservation Act (2016)*. The NSW National Parks & Wildlife 1:25000 Vegetation Map (12 of 16) indicates that the naturally occurring vegetation







community on site is Cumberland Plain Woodland (Shale Plains Woodland). All of the trees surveyed are Narrow-leaved Ironbark (*Eucalyptus crebra*) specimens, this is a representative species of the Cumberland Plain Woodland (Shale Plains Woodland) vegetation community.

The Cumberland Plain Woodland and its sub-groups have been listed as Critically Endangered under the *Biodiversity Conservation Act (2016)* and the *Environment Protection and Biodiversity Conservation Act (1999)*. The subject trees are not listed on a Council Register of Significant Trees. All fifteen of the subject trees are considered significant within the context of the site due to their natural heritage significance and scale. A Flora and Fauna Impact Assessment Report by Alphitonia Ecological Consultants concludes that the subject trees are remnants of the Cumberland Plain Woodland (Shale Plains Woodland). (*Pratt B 2019*)

The Flora and Fauna Impact Assessment Report states that; “*The grazing history on the site has modified the vegetation to such an extent that the community is degraded. While the community still meets the criteria to be considered part of the Biodiversity Conservation Act listed entity, the cover of native species has been reduced such that the community does not meet the 30% cover threshold to be considered part of the EPBC Act listed community.*” (1) (Photographs of the trees and site are provided in Attachment 1. Detailed tree information is provided for individual trees in Attachment 3. A scaled drawing illustrating tree root zones, canopy projections and anticipated construction incursions is provided in Attachment 4).

1.2.8 Weeds.

A number of Priority Weeds as listed under *the Biosecurity Act (2015)* were observed on site including the following listed under the Blacktown Biodiversity Strategy (2011-2020); African Boxthorn (*Lycium ferocissimum*) (Declared as a Weed of National Significance-Class 4) and Prickly Pear (*Opuntia spp.*) (Declared as a Weed of National Significance-Class 4). Class 4 weeds pose a potentially serious threat to primary production, the environment or human health, are widely distributed in an area in which the order applies and are likely to spread in the area or to another area. Class 4 weeds must be controlled as specified within Council’s weed management plan.

1.3 The Soil. (*eSpade 2019*).

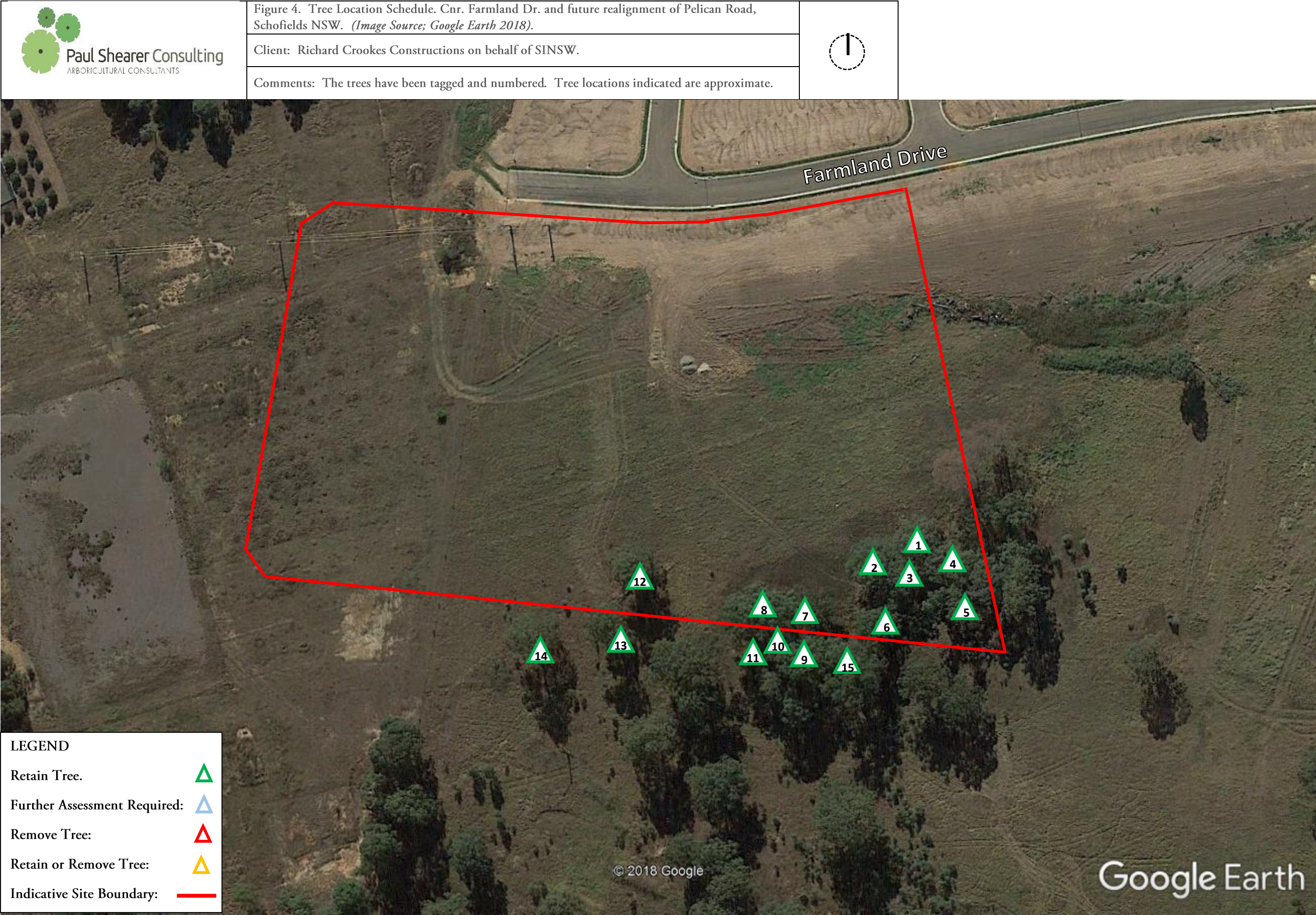
The naturally occurring soil landscape on site is Blacktown (bt) Residual. Geology of the Blacktown soil landscape includes; Wianamatta group - Ashfield Shale, Bringelly Shale and Minchinbury Sandstone. Limitations of the Blacktown soil landscape includes:

- † Localised seasonal waterlogging.
- † Localised water erosion hazard.
- † Moderately reactive highly plastic subsoil.
- † Localised surface movement potential.

I did not carry out field soil profile, texture or compaction assessments.

A Detailed Site Investigation Report by Greencap has concluded that surface soil quality on site satisfied the land use standards for its intended use as a Primary School and did not identify any unacceptable human health or ecological risk associated with the surface soil quality. (*Boukarim N 2019*)







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. 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)

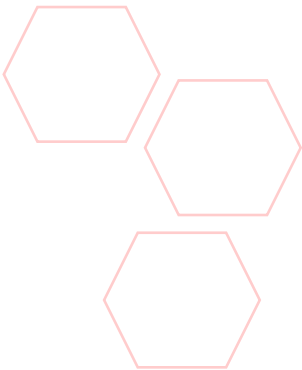
Evaluating the impacts of construction works on trees requires an understanding of the changes that will occur on the site and the trees’ ability to tolerate resulting impacts. The following factors have been considered:

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.



“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. 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 x 50)<sup>0.42</sup> x 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.

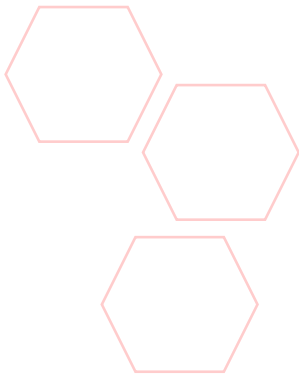
This report will, where reasonably practical, recommend the retention and protection of trees. This report will consider all potential tree impacts and where it is viewed that medium to long term tree retention is viable then a tree will be recommended for retention and protection. Where a significant 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.

The proposal seeks consent for; construction of a two storey library, administration and staff building (Block A) comprising;

- School administrative spaces including reception.
- Library with reading nooks, makers' space and research pods.
- Staff rooms and offices.
- Special programs rooms.
- Amenities.
- Canteen.



- Interview rooms.
- Presentation spaces.

Construction of four two storey class room buildings (Block B) containing 40 home bases comprising;

- Collaborative learning spaces.
- Learning studios.
- Covered outdoor learning spaces (COLA's).
- Practical activity areas and amenities.

Construction of a single storey assembly hall (Block C) with performance stage and integrated COLA. The assembly hall will have OOSH facilities, store room areas and amenities. Associated site landscaping and open space including fences throughout the games courts. Pedestrian access points along bot Farmland Drive and the future Pelican Road. Substation on the north east corner of the site and school signage at the front entrance. All proposed school buildings will connected by a covered walkway providing integrated COLA's. School staff will use the Council carpark for the adjacent sports field pursuant to a Joint User agreement. The proposed school pick-up and drop-off zone will also be contained within the future shared carpark and will be accessed via Farmland Drive.

2.6.2 Impact Assessment.

I have completed an impact assessment based on site plans provided and concluded the following:

*The Tree T1.*

- † Construction of the batter on the southern side of the basketball courts will result in a Major TPZ incursion (14.9%) within the TPZ of the tree T1. No SRZ incursions are anticipated. (Attachment 4)

*The Tree T2.*

- † Construction of the batter on the southern side of the basketball courts will result in a Minor TPZ incursion (0.3%) within the TPZ of the tree T1. No SRZ incursions are anticipated. (Attachment 4)

*The Tree T6.*

- † Construction of the southern boundary fence will occur through the TPZ/SRZ of the tree T6. (Attachment 4) Fencing detail has not been referenced.

*The Tree T7.*

- † Construction of the southern boundary fence will occur through the TPZ/SRZ of the tree T7. (Attachment 4)

*The Tree T8.*

- † Construction of the southern boundary fence will occur through the TPZ/SRZ of the tree T8. The fence appears to be hard up against. Or within close proximity of this tree. (Attachment 4) Fencing detail has not been referenced.

*The Tree T10.*

- † Construction of the southern boundary fence will occur through the TPZ/SRZ of the tree T10. (Attachment 4)

*The Tree T11.*

- † Construction of the southern boundary fence will occur through the TPZ of the tree T11. (Attachment 4)

*The Tree T12.*

- † Site plans indicate that hard landscaping and construction of a batter on the southern side of Block B4 will result in a Major TPZ incursion (82.5%) within the TPZ/SRZ of the tree T10. (Attachment 4)

2.7 Consideration for Minimizing Tree Impacts.

*The Tree T1.*

I have concluded that long term negative impacts on the tree T1 may be resolved by configuring the batter on the southern side of the basketball courts to negate an incursion within the TPZ of the tree T1.

*The Tree T2.*

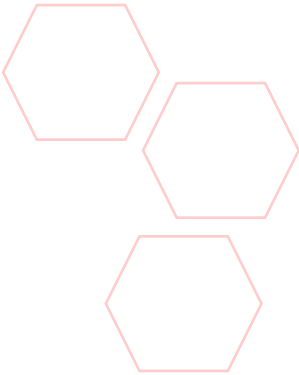
The proposed batter on the southern side of the basketball courts will result in a Minor TPZ incursion and is considered tolerable under AS4970-2009.

*The Trees T6, T7, T8, T10 & T11.*

I have concluded that long term negative impacts on the five trees; T6, T7, T8, T10 and T11 by construction of the southern boundary fence may be resolved by using sensitive construction methods. I have also concluded that locating or configuring the fence at a reasonable distance (200mm) from the stem of the tree T8 will negate the possibility of mechanical damage to this tree.

*The Tree T12.*

The tree T12 exhibits reduced vigour, this tree is likely a remnant and old trees do not adapt as readily to changes within their immediate environment as their younger counterparts. Construction of hard landscaping around this tree, whilst not ideal, may be achievable without affecting the Health or Condition of the tree if sensitive construction methods are utilized. As the landscape plan is lacking detail I have calculated the total area of hard landscaping and batter as an incursion, however it is likely that hard landscaping will involve pier footings rather than significant excavation or surface sealing. Reconfiguring the batter to negate the TPZ incursion will also assist in reducing long term negative impacts on this tree. A sensitive construction methodology is provided as Section 3.12.7.





3.0 Recommendations.

3.1 Trees to be Retained & Protected. (The trees T1-T15).

The trees T1-T15 should be retained and protected throughout the site development process. (Tree protection measures and generic specifications are provided in Attachment 4).

3.2 Trees to be Removed or Retained & Protected.

Not applicable.

3.3 Trees to be Removed.

Not applicable.

3.4 Stump Removals.

Not applicable.

3.5 Pruning.

Based on site plans provided it does not appear that the pruning of trees will be required to accommodate proposed works.

3.6 Selecting a Professional Tree Contractor.

The contractor selected to carry out tree removals, pruning or grinding works should be a member of, or be eligible for, membership with The Tree Contractors Association or Arboriculture Australia. (Recommended tree works must only be carried out by a minimum Cert III qualified Arborist to AS 4373-2007, The Work Health and Safety Act (2017) and the Workcover Amenity Tree Industry Code of Practice (1998).

3.7 Further Tree Assessments.

A risk assessment of the subject trees should be completed by a DEC Pre-qualified Consulting Arborist panel member in accordance with the DEC Tree Management Guidelines (2015) prior to the opening of the school, at 12 moth intervals and after storm events as specified by the DEC.

3.8 Design Changes to Minimize Tree Impacts.

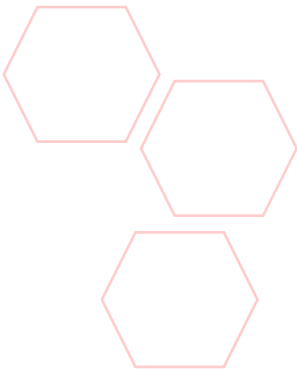
The client may wish to revise the proposed batter on the southern side of the basketball courts and Block B4 to negate incursions within the TPZ of the two trees; T1 and T12. If hard landscaping is to occur within the SRZ/TPZ of the tree T12; construction must be carried out as specified within Section 3.12.

3.9 Generic Pruning Specification.

If any part of a tree needs pruning for construction site access the following generic guidelines must be followed: pruning must not alter the height or shape of a tree and no more than 10% of the overall tree canopy should be removed unless approved by Council. Pruning must be carried out by a Cert III minimum level Arborist in accordance with AS4373-2007 Pruning of Amenity Trees. (A Council permit is required to prune these trees).

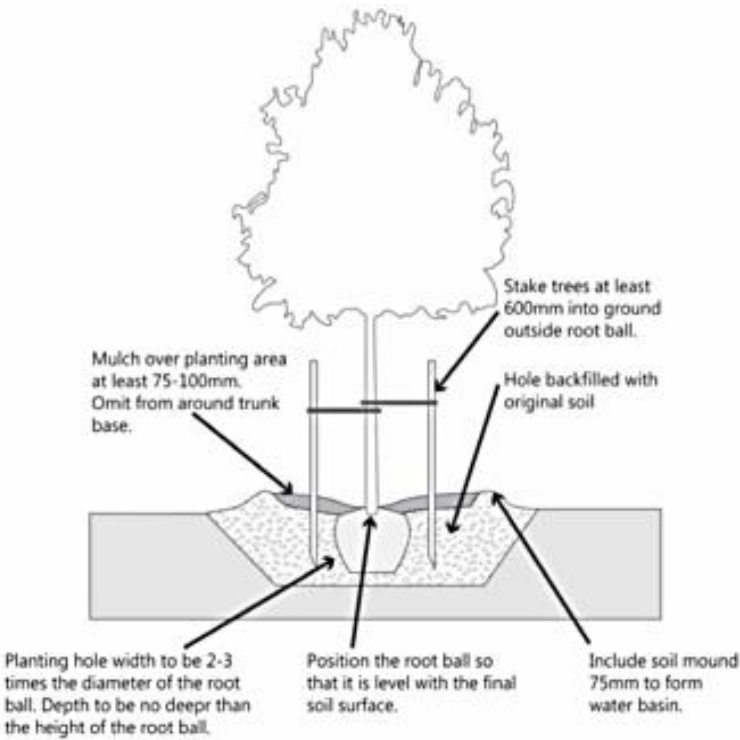
3.10 Tree Replenishment & Landscaping.

The landscape plan referenced for the purpose of producing this report was limited in detail and did not include a planting schedule. Landscaping should comply with the principles listed within Appendix 5 of ‘Planning for Bushfire Protection (2006)’ (PBP). Where practical, the planting of species endemic to the Cumberland Plain Woodland (Shale Plains Woodland) vegetation community should be utilised for tree replenishment if required and landscaping and should include the planting of a suitable number of canopy trees. The use of provenance stock on



this site is preferred. The landscape plan must clearly illustrate the location, number and species of trees. The landscape plan should be produced by a suitably qualified landscape architect and must comply with Council’s guidelines for landscaping and biodiversity. A planting specification is provided as Figure 5.

Figure 5. Tree Planting Guide. (Image Source; NUFA).



3.11 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 3.

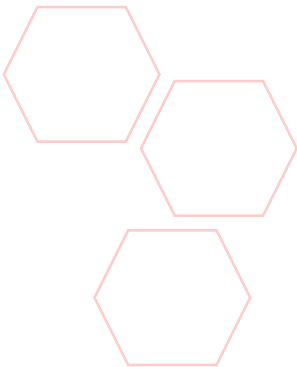
Table 3. Project Arborist Contact Information. Please insert Project Arborist information.

Project Arborist	Contact Information

3.11.1 Tree Protection. (The trees; T1, T2, T3, T4, T5, T6, T7, T8, T10, T11 & T12)

Protection for the eleven trees; T1, T2, T3, T4, T5, T6, T10, T11 and T12 shall consist of protective fencing, silt fencing and ground protection. Protection is not required for the four trees; T9, T13, T14 and T15.





3.11.2 Tree Protection Specifications.

Stem Protection.

Not applicable.

Protective Fencing.

Protective fencing shall consist of 1.8m high chainwire mesh fencing on above ground concrete supports. (The location of protective fencing is provided in Attachment 4).

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 details must be attached to protective fencing. Access to the TPZ fenced area is forbidden without approval by the Project Arborist.

Sediment/Silt Fencing.

Sediment fencing must be installed in accordance with Council specifications. The location of sediment fencing is provided in Attachment 4. The Sediment and Erosion Control Plan should reflect the location of the silt fencing as specified in this report.

Hydraulics and Services.

If installed; stormwater detention tanks should be relocated and constructed outside of the TPZ of retained trees. 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 should be 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.

3.11.3 Maintaining the TPZ’s.

Watering & Feeding.

If work is to occur within the TPZ of T12 then the TPZ should be treated with a root hormone formula such as 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 such as Roundup. All weeds on site should be removed in accordance with Council’s weed management plan and the NSW Biosecurity Act (2015).

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

- † Lighting of fires.

- † Dumping of waste.
- † 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.

3.12 Sensitive Construction Methodology.

3.12.1 Temporary Construction Utilities.

Site sheds and site stockpile areas should be located outside of the TPZ of trees. 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.

3.12.2 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. (To be supervised by the Project Arborist).

3.12.3 Paving.

Paving within the TPZ of trees 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 must be kept to a minimum. (It is allowable for soil levels to be raised by no more than 100mm within the TPZ of trees however soil levels must not be lowered). (To be supervised by the Project Arborist).

3.12.4 Fencing.

The southern boundary fence should allow for a minimum 200mm space from the stem of the tree T8 to allow for radial stem growth and avoid mechanical damage. Fencing within the TPZ of trees must be carefully installed to avoid damage to trees and tree roots. Excavation within the TPZ of trees must be carried out by hand to a depth of 500mm. Excavation beyond 500mm may be carried out by 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 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. (To be supervised by the Project Arborist).

3.12.5 Irrigation.

The installation of irrigation within the TPZ of trees should be carried out to avoid damaging exposed roots. Roots with a stem Ø > 30mm must not be severed when installing irrigation. (To be supervised by the Project Arborist).

3.12.6 Turf.

The installation of turf within the TPZ of trees should be carried out to avoid damaging exposed roots. If required to install turf, soil levels may be raised to a height of no greater than 100mm within the TPZ of trees. 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 new plantings to reduce the impact of completion and enhance vigour in new plantings.

3.12.7 Installation of Decking within the TPZ of T12.

Prior to construction of the timber decking around T12; the entire TPZ should be treated with a root hormone formula such as Seasol or similar in accordance with the manufacturer’s guidelines. Any deadwood with a stem Ø > 30mm should be removed from the tree by a minimum Cert III qualified Arborist in accordance with AS4373-2007. The Project Arborist should be advised of any tree defects encountered during the tree pruning process. The tree should also be watered twice a week (to be adjusted in line with rain events) from the commencement of site works until the cessation of site works. If possible pier footings for the deck should be located outside of the SRZ. Excavation for deck pier footings 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 holes 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. A minimum void of 60mm should be maintained between the timber deck and tree stem. Surface sealing and grade changes are not to occur within the TPZ. The Project Arborist is to be advised of any changes in the Health of the tree during the construction process. (Any work within the TPZ of T12 is to be supervised by the Project Arborist).

3.13 Monitoring Construction Work.

The Project Arborist must supervise any works within TPZs, including retaining walls, irrigation and works 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 4) Critical stages typically include installation of services, footings and slabs, scaffolding, works within the TPZ and at completion of building works. (Table 5)

Table 4. Project Arborist Site Inspection Record.

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

3.14 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.

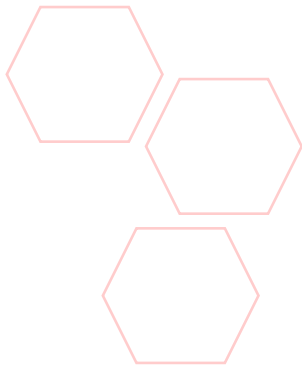
Table 5. Indicative Arboricultural Audit Report Time Line.

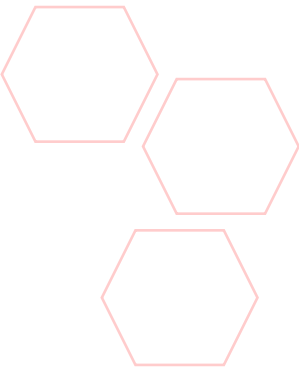
Procedure	Inspection Timing	Compliance Certificate Received Y/N
Tree protection measures	Upon completion of installation	
Supervise site works	As required within TPZ's	
Final certification	Post construction	

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) Pratt B. (2019), *Flora & Fauna Impact Assessment For State Significant Development Application (SSD 18\_9368) for the Proposed Alex Avenue Public School, corner of Farmland Drive and future realignment of Pelican Road, Schofields.* (Page 9)
- (2) Matheny N. & Clark R., (1998), *Trees & Development.* ISA PO Box 3129 Champaign Illinois USA. (Page 93)

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Vella A. Allen C & Butcher M. (2018), *Statement of Heritage Impact & Historical Archaeological Assessment.* Biosis 14/17-27 Power Ave, Alexandria NSW 2015.

Pratt B. (2019), *Flora & Fauna Impact Assessment for State Significant Development Application (SSD 18\_9368) for the Proposed Alex Avenue Public School, corner of Farmland Drive and future realignment of Pelican Road, Schofields.*

Boukarim N (2019), *Detailed Site Investigation, Proposed Alex Avenue Public School.* Greencap Level 2 / 11 Khartoum Road North Ryde NSW 2113 Australia.

## Appendices.

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- 1 Methodology.
- 2 Generic Glossary.
- 3 Tree Useful Life Expectancy.
- 4 TreeAZ Categories
- 5 Tree Hazard & Significance Ratings.
- 6 Legislative Overview,
- 7 Assumptions & Limitations.



Appendix 01. Methodology.

- † A site inspection for the purpose of gathering field notes was conducted on Tuesday the 4<sup>th</sup> of December 2018. Approximately 2 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 (Attachment 2) is an accurate account of notes gathered whilst in the field.
- † The ULE Rating, Hazard Rating, Significance Rating and Retention Value awarded the subject trees was calculated off-site by utilising field notes and photographic evidence. The useful life expectancy (ULE) Rating has been calculated using the methodology from Barrell (2001). (Appendix 3) Tree Retention Values have been calculated using the Tree AZ methodology by Barrell (2010). (Appendix 4) The Hazard Rating has been adopted from (Harris Clarke & Matheny 2004.) (Appendix 5) As there is currently no industry standard for assessing tree Significance Ratings the methodology used to assess tree significance value has been produced by Paul Shearer Consulting® 2017. (Appendix 5)
- † The subject tree/s were assessed using VTA (Visual Tree Assessment) at ground level. VTA methodology was applied as per the model produced by Mattheck and Breloer (1994).
- † Site documents were referenced for the purpose of producing this report. (Table 6) (The base drawings referenced is provided as Attachment 3). I did not reference plans illustrating; sections, levels or subgrade services. Consultant reports referenced are listed in Table 7.

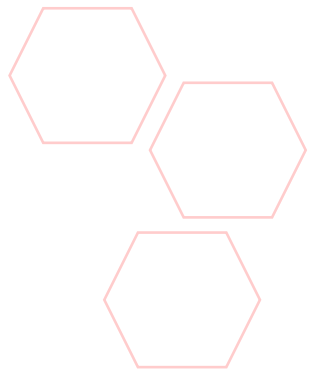
Table 6. Site Documents Referenced.

Drawing Name	Drawing No.	Scale	Produced By	Date Produced
Landscape Plan (For Coordination)	Not indicated	1:500 @ A3	Group GSA	21.01.2019
Plan of Details & Levels	Ref. No. 43778DT	1:400 @ A1	LTS Lockley	09.06.2017

Table 7. Consultants Reports Referenced.

Report	Produced By	Date Produced
Bushfire Assessment	Peterson Bushfire Consultants	13.12.2018
Statement of Heritage Impact & Historical Archaeological Assessment (Draft)	Biosis	18.12.2018
Flora & Fauna Impact Assessment	Aphitonia with contribution by Ecoplanning	15.01.2019
Detailed Site Investigation	Greencap	19.01.2019

- † 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 the Queensland 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;  $TPZ = DBH \times 12$ . 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 tree/s has been determined by measuring the trunk/s Diameter above the Buttress (DAB) and applying the following formula;  $SRZ (r) = D \times 50)^{0.42} \times 0.64$  (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:  
  
 $(T6) (DAB = 760mm \times 50) = 38^{0.42} \times 0.64 = 2.94m$   
 $(T7) (DAB = 640mm \times 50) = 32^{0.42} \times 0.64 = 2.74m$   
 $(T8) (DAB = 660mm \times 50) = 33^{0.42} \times 0.64 = 2.77m$   
 $(T10) (DAB = 660mm \times 50) = 33^{0.42} \times 0.64 = 2.77m$   
 $(T12) (DAB = 800mm \times 50) = 40^{0.42} \times 0.64 = 3.01m$
- † Drawings detailing tree SRZ's/TPZ's, and incursions have been produced to scale using ArborCAD® software. Root zones and incursions have been calculated by the ArborCAD® software program. (Attachment 4)
- † Where relevant the canopy projection of trees located within the proximity of construction works 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.



Appendix 02. Generic Glossary.

Age Classes;

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

**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, and the degree of dieback. 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 or weak trunk/branch junctions. 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);** Tree stem diameter measured at 1.4 metres above ground level.

**DAB (Diameter at Buttress);** Tree stem diameter measured at commencement of basal flare.

**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.

**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.

**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;  $(D \times 50)^{0.42} \times 0.64$ . 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 tree roots. AS4970-2009 only requires SRZ calculations when a major encroachment into the TPZ (>10%) or inside the SRZ is proposed.

**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.

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

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

**Stem;** Refers to a major supporting branch or limb.

**Endemic;** Refers to locally indigenous species.

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

**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 in tree health.

**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 3 would rate as a very low Hazard Rating. (After; Harris Clarke & Matheny 2004.)

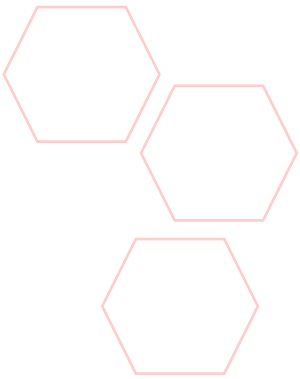
**Tree Significance Ratings;** Refers to four separate categories; Origin, Streetscape Significance, Landscape Significance and Heritage Significance. A tree is given a score of 1 to 3 in each individual category. A score of 12 would rate a tree as being of high significance and a score of 3 would rate 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).

**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. (Tree AZ categories are provided as Appendix 3).

**Tree Retention Values;** Refers to the value of a tree for the purpose of retention. The A-Z methodology (2010) by Jeremy Barrell provides a practical and technical approach based on issues which may justify tree removal. Tree Retention Values are to be considered with other relevant factors including; Hazard Rating, Significance Rating and ULE Rating when prioritizing trees for retention or removal. (Tree AZ categories are provided as Appendix 4).

**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.



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. TreeAZ Categories.

TreeAZ Categories. (Version 10.04 - ANZ) (Barrell. J. 2010)

**CAUTION:** TreeAZ assessments must be carried out by a competent person qualified and experienced in arboriculture. The following category descriptions are designed to be a brief field reference and are not intended to be self-explanatory. They must be read in conjunction with the most current explanations published at [www.TreeAZ.com](http://www.TreeAZ.com).

Category Z: Unimportant trees not worthy of being a material constraint	
<b>Local policy exemptions:</b> Trees that are unsuitable for legal protection for local policy reasons including size, proximity and species	
Z1	Young or insignificant small trees, i.e. below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e. exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc
<b>High risk of death or failure:</b> Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure	
Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e. poor anchorage, increased exposure, etc
<b>Excessive nuisance:</b> Trees that are likely to be removed within 10 years because of unacceptable impact on people	
Z7	Excessive, severe and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. dominance, debris, interference, etc
Z8	Excessive, severe and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e. severe structural damage to surfacing and buildings, etc
<b>Good management:</b> Trees that are likely to be removed within 10 years through responsible management of the tree population	
Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e. cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc
Z10	Poor condition or location with a low potential for recovery or improvement, i.e. dominated by adjacent trees or buildings, poor architectural framework, etc
Z11	Removal would benefit better adjacent trees, i.e. relieve physical interference, suppression, etc
Z12	Unacceptably expensive to retain, i.e. severe defects requiring excessive levels of maintenance, etc

**NOTE:** Z trees with a high risk of death/failure (Z4, Z5 & Z6) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as ZZ. ZZ trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although Z trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint	
A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

**NOTE:** Category A1 trees that are already large and exceptional, or have the potential to become so with minimal maintenance, can be designated as AA at the discretion of the assessor. Although all A and AA trees are sufficiently important to be material constraints, AA trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy ([www.barrelltreecare.co.uk](http://www.barrelltreecare.co.uk)) and is reproduced with their permission





Appendix 05. Tree Hazard & Significance Ratings.

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, 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©)

TABLE 8. Hazard Assessment, Significance Rating & Retention Value Calculations.

Information Category	Tree No.														
Hazard Rating (1-12)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Failure Potential 1, 2, 3, 4.	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1
Size of Defective Part 1, 2, 3, 4.	1	1	2	1	1	1	1	1	1	2	1	1	1	1	1
Target Rating 1, 2, 3, 4.	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Total	3	3	5	3	3	3	3	3	3	5	3	3	3	3	3
Significance Rating (1-12)															
Provenance (Origin) 1, 2, 3.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Landscape Significance 1, 2, 3.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Streetscape Significance 1, 2, 3.	2	1	2	2	1	1	1	1	1	1	1	2	1	1	1
Cultural Significance 1, 2, 3.	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
Total	11	10	11	11	10	10	10	10	10	10	10	11	10	10	10

**(Origin)** – Refers to whether the tree was likely to be naturally occurring, planted or introduced to the site by other means.

- 1. Low - Refers to a tree which is most-likely to have been introduced by ‘other means’ (such as via birds etc.)
- 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.

**(Streetscape Significance)** - Refers to the size, scale and prominence of a tree in the streetscape, generally when viewed from street level.

- 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, have a significant influence on the landscape character or create a ‘sense of place.’

**(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.

**(Heritage/Cultural/Natural Heritage Significance)** - Details the heritage, cultural or natural heritage significance of a tree either formally recognized or in the view of the author.

- 1. Low - Refers to trees that have no Heritage/Cultural/Natural Heritage Significance.
- 2. Moderate - Refers to species which are representative of a cultural planting period or have Heritage/Cultural/Natural Heritage Significance.
- 3. High - Refers to trees of state or national cultural or historical significance or trees with Heritage/Cultural/Natural Heritage Significance.

**(Significance Rating = Origin + Streetscape Significance + Landscape Significance + Heritage Significance. Add each of these four categories together for a score out of 12.)**

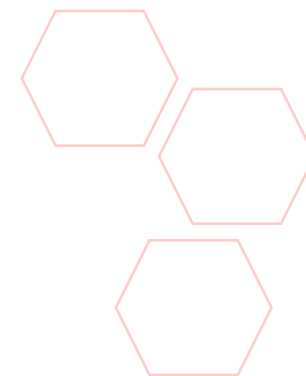
## Appendix 06. Legislative Overview.

Table 9. 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 <i>Biodiversity Conservation Act (2016)</i> (BC Act) and amendments to the <i>Local Land Services Amendment Act (2016)</i> (LLS Act) repeal the <i>Threatened Species Conservation Act 1995</i> , the <i>Nature Conservation Trust Act (2001)</i> and parts of the <i>National Parks and Wildlife Act (1974)</i> . The LLS Act repeals the <i>Native Vegetation Act (2003)</i> . 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 <i>Environmental Planning and Assessment Act 1979</i> 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	<i>The Environment Protection and Biodiversity Conservation Act (1999)</i> 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 <i>Biodiversity Conservation Act (2016)</i> and the <i>Local Land Services Amendment Act (2016)</i> 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.
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.
State Environmental Planning Policy Sydney Region Growth Centres (2006)	State	The SEPP for Sydney Region Growth Centres aims to co-ordinate the release of land for residential, employment and other urban development in the North West Growth Centre, the South West Growth Centre and the Wilton Growth Area, to enable the Minister from time to time to designate land in growth centres as ready for release for development, to provide for comprehensive planning for growth centres, to provide controls for the sustainability of land in growth centres that has conservation value, to provide for the orderly and economic provision of infrastructure in growth centres, to provide development controls in order to protect the health of waterways in growth centres, to protect and enhance land with natural and cultural heritage value and to provide land use and development controls that will contribute to the conservation of biodiversity.
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 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.
SREP No. 20 Hawkesbury - Nepean River (No. 2-1997).	State	Sydney Regional Environment Plan No 20 applies to certain land in the Greater Sydney Metropolitan Region that is within the LGA of Baulkham Hills, Blacktown, Blue Mountains, Camden, Campbelltown, Fairfield, Gosford, Hawkesbury, Hornsby, Ku-ring-gai, Liverpool, Penrith, Pittwater, Warringah and Wollondilly. The aim of the plan is to protect the environment of the Hawkesbury-Nepean River system by ensuring that the impacts of future land uses are considered in a regional context.

## Appendix 07. Assumptions & Limitations of This Report.

- † 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.





## Attachments.

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- 1      Photographs.
- 2      Summary of Tree Observations Table.
- 3      Base Drawing Referenced.
- 4      Drawing Illustrating Root Zones & Incursions.
- 4      Drawing Illustrating Tree Protection Measures.
- 4      Illustrating Tree Protection Measure Specifications.



**Attachment 01.      Photographs.**

Photograph 1. (North aspect). This photograph illustrates the subject site as viewed from directly opposite at the intersection of Farmland Drive and Hyde Street. The subject trees are highlighted in red.



Photograph 2. (West aspect). This photograph illustrates the streetscape of the subject site as viewed heading east along Farmland Drive. There are distant views of several of the trees from this aspect.



Photograph 3. (East aspect). This photograph illustrates the subject site as viewed heading west along Farmland Drive. A distant view of the tree T12 is visible from this aspect.





Photograph 4. (North aspect). The subject trees are located adjacent to the site's southern boundary. The subject trees are considered significant within the context of the site due to their natural heritage significance and scale.





Photograph 5. (North West aspect). This photograph provides a closer perspective of the trees T1-T6.





Photograph 6. (North east aspect). This photograph provides a closer perspective of the trees T7-T11 and T15.






Photograph 7. (East aspect). This photograph provides a closer perspective of the trees T12-T14.





Attachment 02. Summary of Tree Observations Table.

 <b>Paul Shearer Consulting</b> ARBORICULTURAL CONSULTANTS	Table 10. Summary of Tree Observations.
	Client: Richard Crookes Constructions on behalf of SINSW.
	Site: Cnr. Farmland Drive & future realignment of Pelican Rd, Schofields NSW.
	Date Field Notes Recorded: Tuesday the 4 <sup>th</sup> of December 2018.

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 (Tree AZ)	ULE Rating	Comments	Development Impact Summary
1	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	20	4x8	400/550	4.80	-	39.06	G	G	3	11	A1	2A	One first tier branch failure, lowest branches at 2, 2.5 and 4m in northern canopy quadrant.	Major TPZ incursion from batter.
2	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	19	4x10	450/700	5.40	-	38.83	G	G	3	10	A1	2A	Lowest branch in northern canopy quadrant at 2.5m.	Minor TPZ incursion from batter.
3	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	17	4x8	380/480	4.56	-	38.93	G	F	5	11	A1	2A	Deviation in stem at 5m, lowest branch in northern canopy quadrant at 3m.	No construction impacts anticipated with TPZ.
4	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	19	4x10	500/750	6.00	-	39.51	F	F	3	11	A2	2D	One first tier branch failure, dieback of branches, reduced foliage density.	No construction impacts anticipated with TPZ.
5	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	20	4x8	490/700	5.88	-	39.62	F	F	3	10	A2	2D	One first tier branch failure, dieback of branches, reduced foliage density.	No construction impacts anticipated with TPZ.
6	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	20	4x8	540/760	6.48	2.94	38.47	G	G	3	10	A2	2A	Slight dieback of branchlets.	Fencing through SRZ/TPZ. No other construction impacts anticipated.
7	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	18	4x9	460/640	5.52	2.74	38.08	G	G	3	10	A1	2A	Lowest branch in northern canopy quadrant at 2.5m.	Fencing through SRZ/TPZ. No other construction impacts anticipated.
8	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	20	4x9	470/660	5.64	2.77	38.13	G	G	3	10	A1	2A	Lowest branch in northern canopy quadrant at 4m.	Fencing through SRZ/TPZ. No other construction impacts anticipated.
9	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	17	N1/S8/E 7/W5	350/400	4.20	-	37.71	G	G	3	10	A1	2A	Canopy slightly asymmetrical to west.	No construction impacts anticipated with TPZ.
10	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	18	N10/S9/E8/W2	460/660	5.52	2.77	37.92	G	F	5	10	A3	2A	Included codominant stems with seam, no doubt mechanically codependent with T11, lowest branch in northern canopy quadrant at 3m.	Fencing through SRZ/TPZ. No other construction impacts anticipated.
11	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	20	N10/S9/E2/W10	490/600	5.88	-	38.07	G	F	3	10	A1	2A	No doubt mechanically codependent with T10, lowest branch in northern canopy quadrant at 2.5m.	No construction impacts anticipated with TPZ.
12	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	16	4x7	560/800	6.72	3.01	39.17	F	G	3	11	A2	2D	Foliage density approximately 50%, stunted foliage and deadwood,	Major SRZ/TPZ incursion from batter and landscaping.
13	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	19	4x8	400/600	4.80	-	38.25	F	F	3	10	A2	3A	Foliage density/size slightly reduced, one stem snapped out.	No construction impacts anticipated with TPZ.
14	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	20	4x8	550/780	6.60	-	38.64	F	G	3	10	A1	2A	Lowest branch in northern canopy quadrant at 4m.	No construction impacts anticipated with TPZ.
15	Narrow-leaved Ironbark ( <i>Eucalyptus crebra</i> )	M	19	N10/S9/E10/W4	440/590	5.28	-	37.59	G	G	3	10	A1	2A	Slight lean to north.	No construction impacts anticipated with TPZ.

(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).

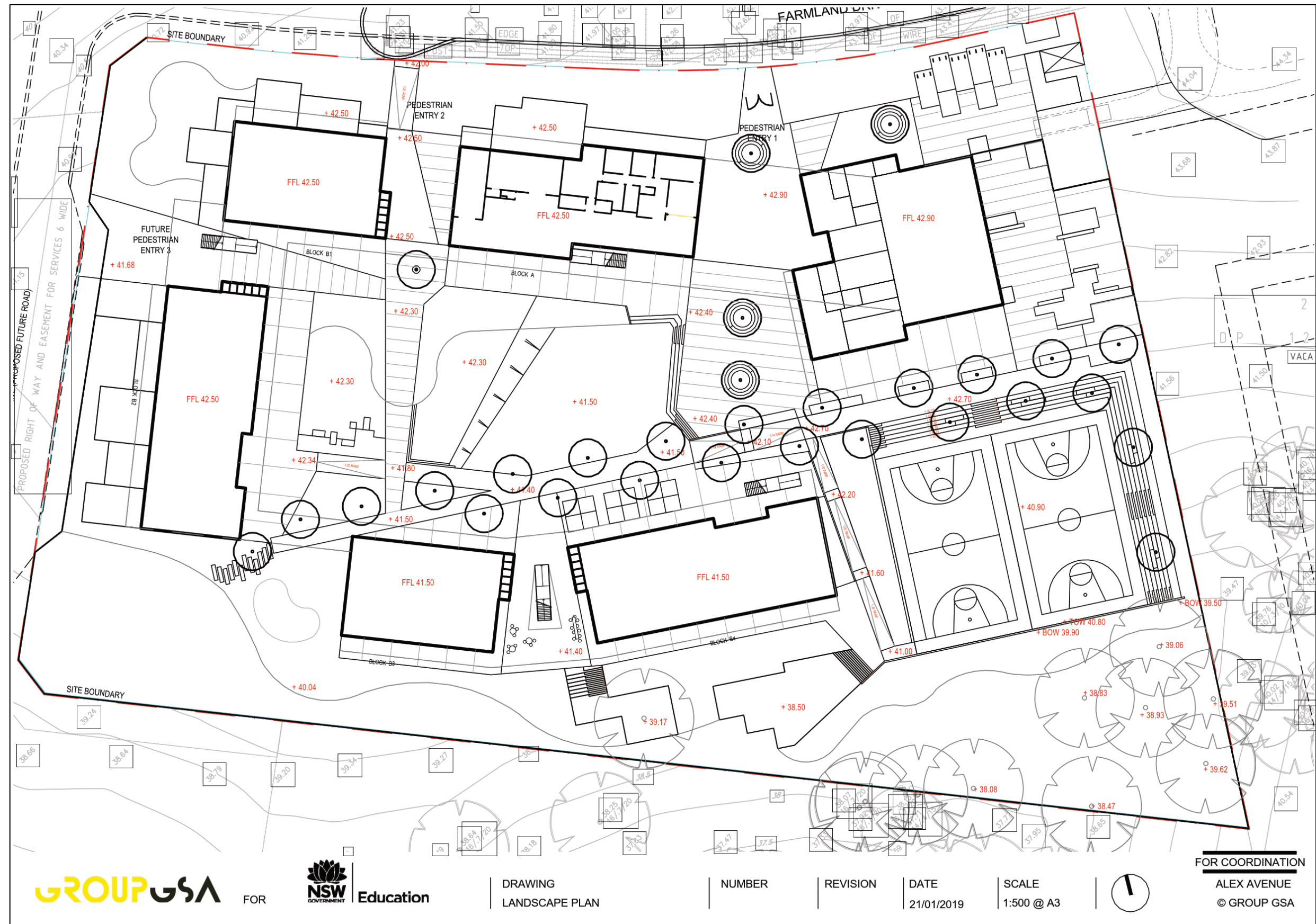
Relevant tree information has been provided, any tree information not provided should be considered irrelevant, typical or within normal range for the species.

\* Indicates dimension estimated.

† Indicates rounded up to minimum TPZ.

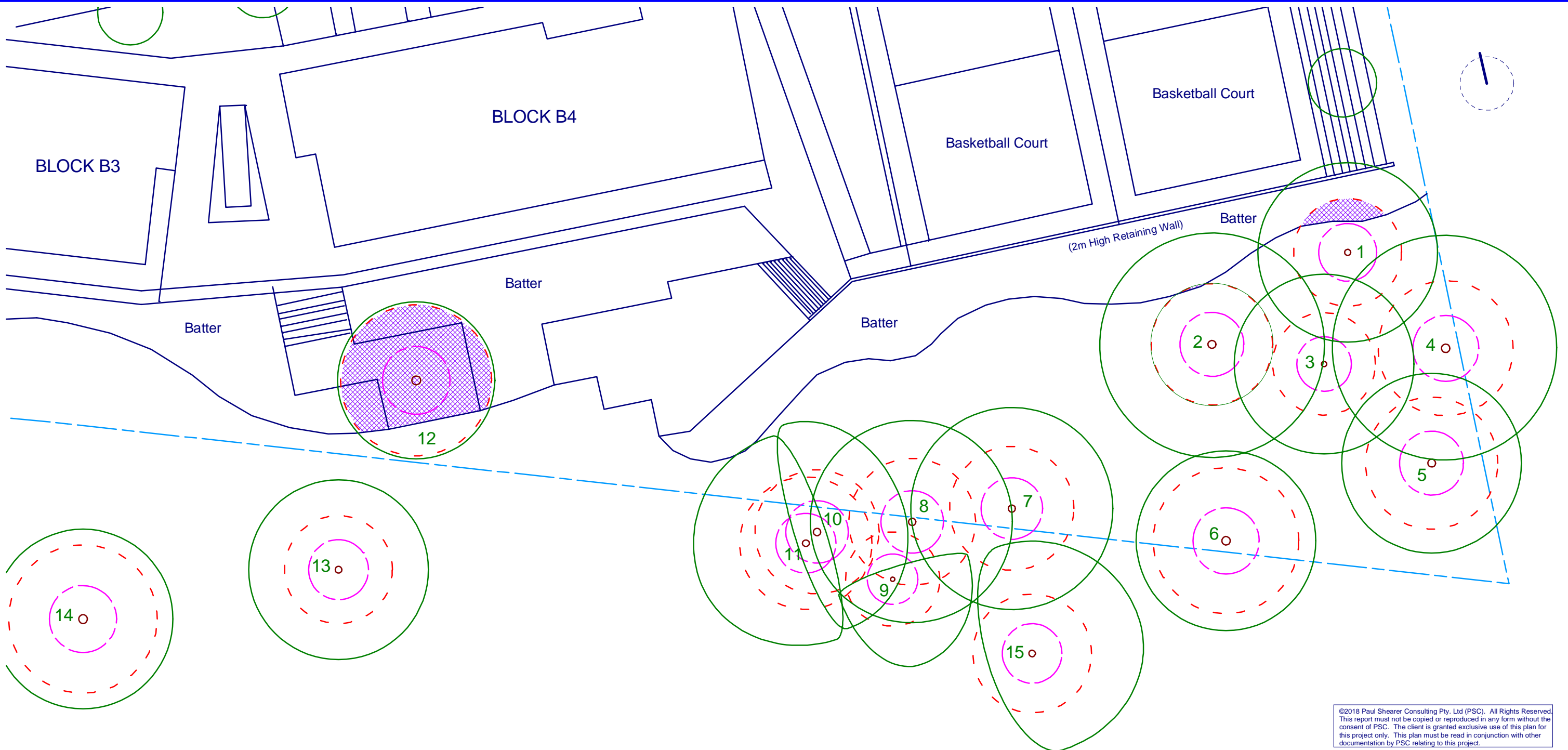
**Attachment 03. Base Drawings Referenced.**

Figure 6. Landscape Plan. (Base plan used for drawings). NTS. (*Group GSA 2019*).



**Attachment 04. Drawings Illustrating Tree Root Zones, Incursions & Canopy Projections, Tree Protection Measures & Specifications.**





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LEGEND

- |                            |  |                   |   |
|----------------------------|--|-------------------|---|
| Tree Protection Zone (TPZ) |  | Retention Value A | 1 |
| Structural Root Zone (SRZ) |  | Retention Value Z | 1 |
| Canopy Projection          |  | TPZ Incursion     |   |
| Site Boundary              |  |                   |   |

NOTES: TPZ incursion information is provided within Section 2.62 of this report. Tree Retention Values have been considered in conjunction with Tree Hazard Ratings, Significance Ratings and ULE Ratings when prioritizing trees for removal or retention. Tree Retention Values (TREE AZ) categories are provided in Appendix 4 of this report. It is sometimes necessary to remove significant trees or trees which are deemed worthy of retention due to construction impacts or associated factors. Tree canopy spreads have been estimated.



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SHEET 1 OF 3

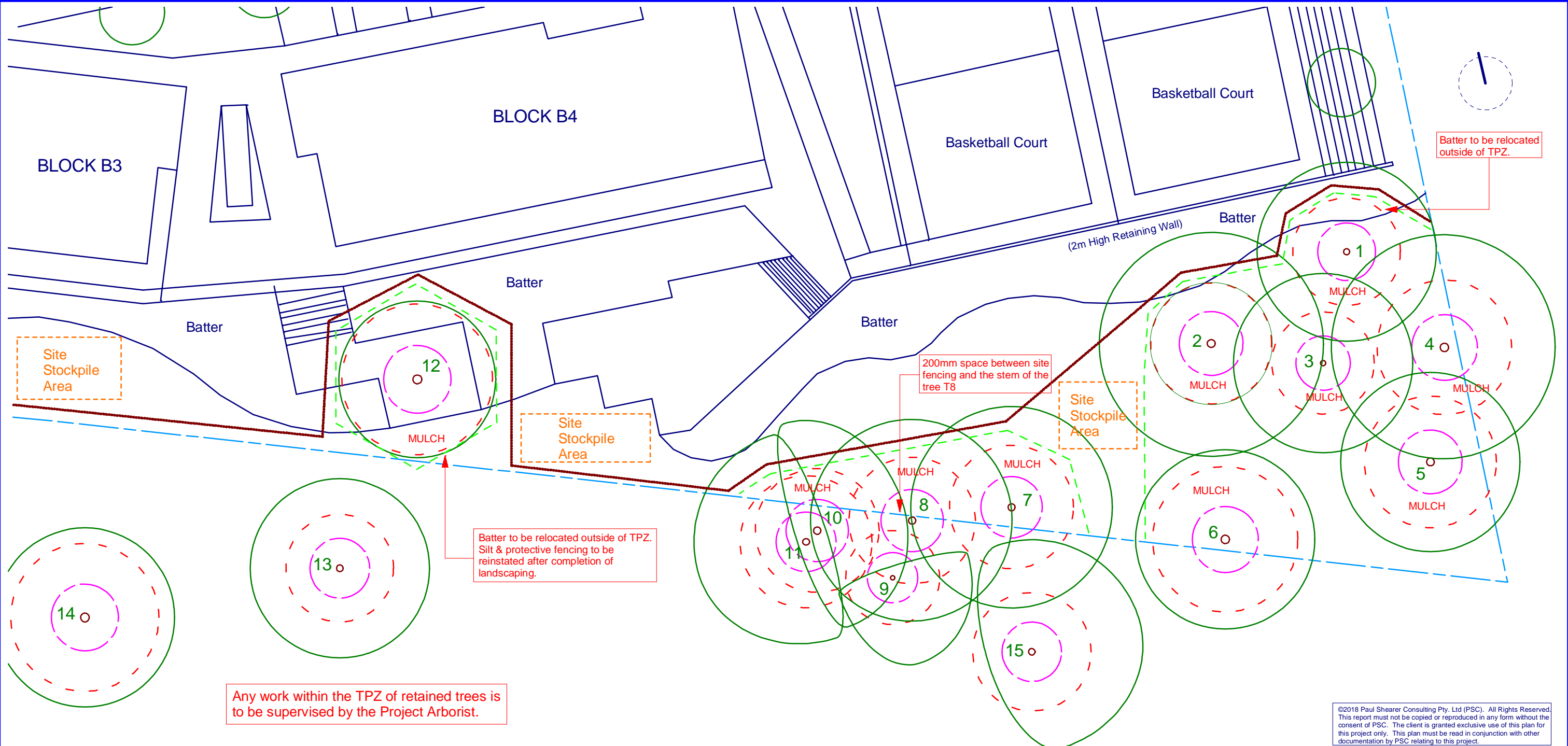
REVISION 0

BASED ON THE DRAWING: LANDSCAPE  
PLAN BY GROUP GSA DATED 21.01.2019

DRAWN	PAUL S
DATE	25.01.2019
SCALE	1:350 @ A3








DRAWING ILLUSTRATING TREE ROOT ZONES, CANOPY PROJECTIONS & INCURSIONS. (Proposed Alex Avenue Public School Schofields NSW for Richard Crookes Constructions on behalf of SINSW).

A3



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LEGEND

- Tree Protection Zone (TPZ)  Protective Fencing 
- Structural Root Zone (SRZ)  Silt Fencing 
- Canopy Projection  Site Stockpile 
- Site Boundary 

TREE PROTECTION NOTES.

- Tree protection is to be installed as specified within the Tree Protection Plan prior to the commencement of site works. A Project Arborist is to be engaged to oversee implementation of the Tree Protection Plan and tree protection as specified within the Tree Protection Plan.
- Arboricultural Audit Reports are required from the Project Arborist at critical stages of the development process. Critical stages Typically include:
1. Upon installation of tree protection measures.
  2. Supervision of works within the TPZ of trees.
  3. Upon completion of site works.

Arboricultural Audit Reports go towards final sign off by the Project Arborist.

The Site Stockpile Area indicated is a preferred location. The location, size and shape of the Site Stockpile Area may be configured in any way so long as an incursion < 10% of a TPZ is to occur.



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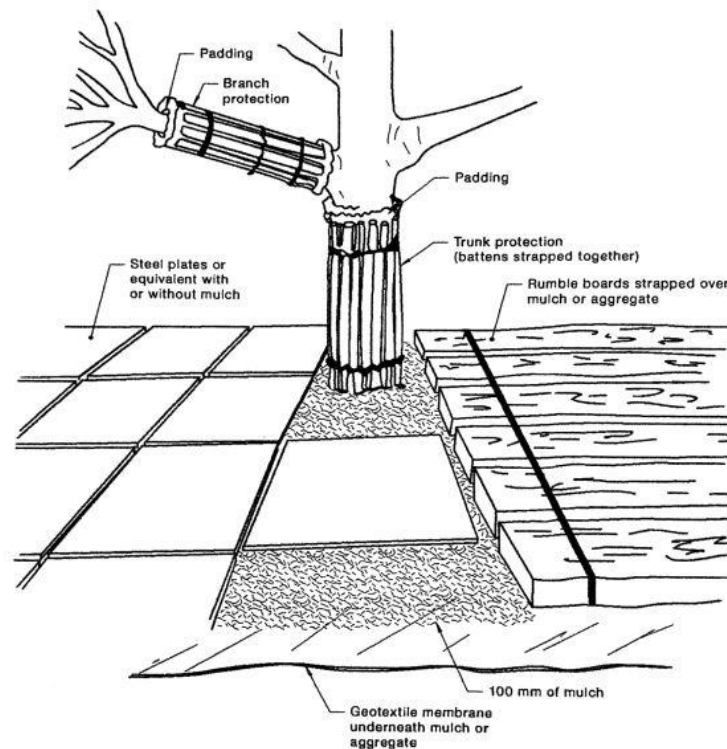
SHEET 2 OF 3      REVISION 0

BASED ON THE DRAWING: LANDSCAPE  
PLAN BY GROUP GSA DATED 21.01.2019

DRAWN PAUL S  
DATE 25.01.2019  
SCALE 1:350 @ A3

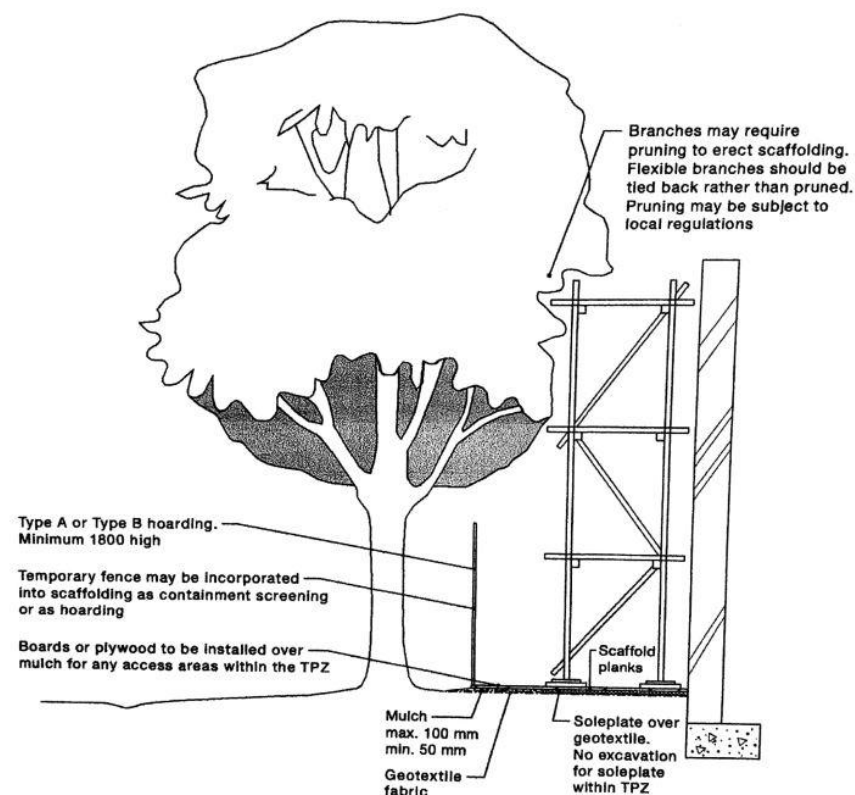
DRAWING ILLUSTRATING TREE PROTECTION MEASURES.  
(Proposed Alex Avenue Public School Schofields NSW for  
Richard Crookes Constructions on behalf of SINSW).





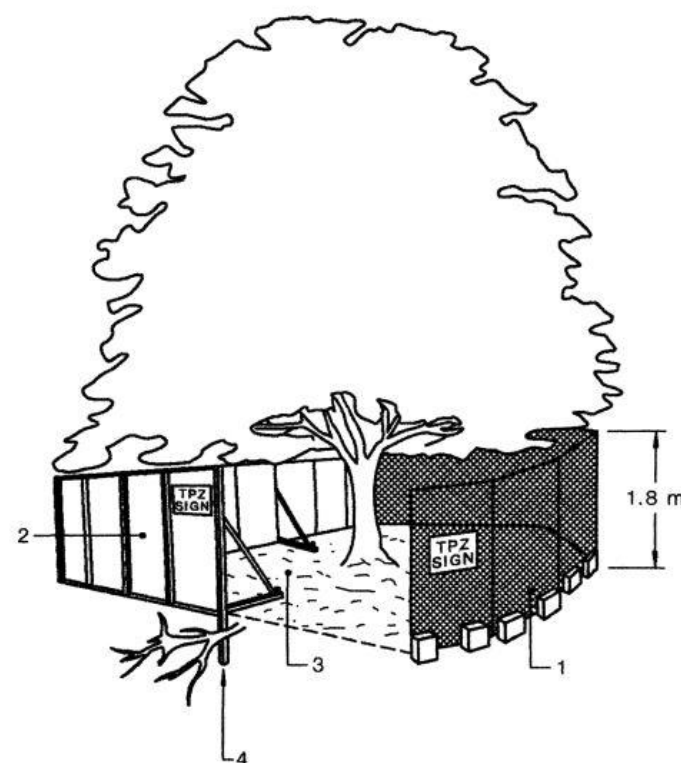
A

Branch, Trunk & Ground Protection.



B

Scaffolding within the TPZ.



C

Protective Fencing & Signage Locations.



D

Signage Example.

#### NOTES.

Tree protection measures A, B & C have been sourced from AS4970-2009 Protection of Trees on Development Sites. Figure D has been adapted from AS4970-2009. These figures are provided to assist with the installation of tree protection as specified within the Tree Protection Plan. The Project Arborist must confirm that tree protection has been installed in accordance with AS4970-2009 and make recommendations for the improvement of tree protection where necessary.

#### A. Branch, Trunk & Ground Protection.

Branch and stem protection is to consist of timber batons over padding (carpet underlay, geotextile fabric or similar). Padding should have a minimum depth of 20mm when pushed flat. Stem batons should have a minimum length of 2m. Batons must be fastened in place with wire and nothing is to be screwed or nailed into trees. Ground protection within the TPZ is to consist of a 75mm deep layer of mulch or woodchip over geotextile fabric. Rumble boards strapped together over aggregate and geotextile fabric is preferred where vehicular traffic is anticipated within the TPZ.

#### B. Scaffolding within the TPZ.

No excavation should be carried out to install scaffolding. The soleplate should be installed at existing ground level over a 75mm deep layer of mulch and geotextile fabric. Branches may be pruned in accordance with AS4373-2007 and Council guidelines to install scaffolding, however branches should be tied back, rather than pruned where possible. Any pruning work must be carried out by a Cert III qualified arborist. A Council permit may be required for pruning works not specified within the DA Conditions of Consent.

#### C. Protective Fencing & Signage.

Wherever possible; protective fencing is to consist of 1.8m high chainwire link fencing on aboveground concrete supports. Protective fencing must be installed prior to the commencement of site works including demolition. A sign identifying the tree protection area should be installed on protective fencing or scaffolding.

#### D. Signage.

Tree protection area signage should provide clear and readily accessible information that a TPZ has been established. The contact details of the Project Arborist should be included on the sign in case access to tree protection areas is required.

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