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ST. IVES HIGH SCHOOL

ARBORICULTURAL IMPACT ASSESSMENT

PREPARED FOR:

JDH ARCHITECTS

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19/11/18	Issued Development Application	DP	AM
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27/11/18	Issued Development Application	DP	DP

Executive Summary

This report was commissioned by JDH Architects to accompany their Development Application, within the Ku Ring Gai Council area at 88 Yarrabung Road, St Ives. The aim of this report is to provide an assessment of the impacts of the proposed development on seventy-eight trees in accordance with *AS4970 – 2009 Protection of trees on development sites* ('the standard').

This report collates and presents information collected by David Prieto on the 18/10/18. The data collected is located at 7. **Tree Survey Table** also see **8. Tree Survey Table Notes** (page 22) for notes relating to tree survey table.

Generally the site's vegetation was observed to have a majority native tree canopy, with a native shrub midstorey and an exotic turf groundcover layer. The existing surveyed trees are shown at **9. Tree Location Plan** (page 27).

The proposed development will involve the construction of a Sport Complex adjacent to the paved carpark on Horace Street with sitting/terrace on the embankment to the north of the existing soccer field. There are associated turf, paths, paving, retaining walls, services and landscape works. This will involve the demolition of Building B, sport courts and adjacent pathway and stairs. The existing waste containers and rainwater tanks are proposed to be relocated. The extent of site works is also illustrated at **9. Tree Location Plan** (page 27).

The matrix below gives a brief overview summary of tree significance and level of encroachment from the proposed development of numbered trees.

	ENCROACHMENT WITHIN TPZ Numbering of trees as shown on Tree Location Plan				
TREE LANDSCAPE SIGNIFICANCE		**No Impact**	**Minor Encroachment** (<10% of TPZ)	**Major Encroachment** (>10% of TPZ)	**Within Development Footprint**
	High	2, 29, 187	-	-	24
	Medium	28, 30, 32, 33, 35, 38, 41, 42, 43(M-H), 44, 46, 194, 195, 200A, 207, 214, 217 & 293	40	-	3, 4, 8, 10, 11, 12, 14, 15, 17, 20 & 21
	Low	1, 24A, 26, 27(L-M), 31, 34, 36(L-M), 37, 39, 45, 47, 188, 189, 190, 191, 192, 197, 200, 203, 204, 205, 206, 208, 209, 210, 211, 212, 213, 215, 216, 218, 314 & 322	-	25(L-M)	5, 6, 7, 9, 13, 16, 18, 19, 22 & 23,
	Total Number of trees	**54**	**1**	**1**	**22**

In consideration of the data collected recommendations are provided for the removal or retention of trees including specific tree protection measures required to reduce the anticipated impacts from the proposed construction on those trees proposed to be retained. This report specifically recommends:

- The removal of Tree No.'s 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 & 25, if the development is approved as there is an unavoidable major encroachment into the tree protection zone.
- The replacement planting of a number of locally native or canopy trees shall be installed in 25L pot size to offset the loss of trees on site to offset the loss of trees on site.
- The retention of Tree No. 1, 2, 24A, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 47, 187, 188, 189, 190, 191, 192, 194, 195, 197, 200,

200A, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 293, 314 & 322. The construction will not impact these trees.

- The retention of all other trees within the embankment area and not shown on the **9. Tree Location Plan** (page 27).
- The retention of all other trees located outside of the assessed area.
- The retention of Tree No. 40. The OSD will provide a minor encroachment into the tree protection zone
- Final design plans for services such as water, electricity, gas and sewer should be prepared to locate all trenching outside TPZs where possible of retained trees prior to installation and assessed by the project arborist. The findings should be reported in an amendment of, or addendum to this report.
- Any proposed services requiring excavation should be hand dug within the TPZ of tree to be retained. It should be carried out by first excavating a narrow trench to the depth required by hand (depth to be determined on site by project arborist), along the closest line of cut to tree. This will allow the location of woody structural roots greater than 40mm which can then be retained intact as necessary or pruned cleanly by an AQF Level 3 Arborist or Horticulturist.
- The stockpile and material storage areas are to be installed within existing paved areas or outside of the TPZ of all trees to be retained.
- Tree sensitive construction measures must be implemented if works are to proceed within the TPZ as prescribed by the Australian Standard AS4970-2009 Protection of trees on development sites. Specifically the final cut of roots should result in a clean cut, using appropriate tools. Severing roots by earthmoving equipment is unacceptable.
- Pruning of branches should comply with Australian Standard No *4373 -2007 - Pruning of Amenity Trees*. Branch reduction should be made to internal lateral branches or stems which are at least 1/3rd of the diameter of the branch being cut – or – removed at the branch collar, consistent with AS *4373 -2007; Sections 6.4 a) & b) and 7.3.* Deadwooding should be carried out concurrently.
- A tree management plan should be prepared by the project arborist to guide construction methodology, barrier installation and supervision of works as necessary to protect all retained trees during construction works. The plan should be consistent with Sections 4 & 5, AS4970 (2007). Services layout should be incorporated within this plan.
- Tree Protection Fencing (TPF) shall be located to enclose as much of the TPZ as possible. Where approved excavation and construction encroaches into the TPZ, the TPF layout shall be determined with advice from the project arborist.
- Further defects such as cambial damage, decay or hollows may be present which are not visible from the ground. Whilst work is being carried out by climbing arborists (AQF Level 3) aerial inspection of stems, branches and their attachments should be made when work is being carried out. If minor additional works are needed to remove or correct defects it should be done at that time. If significant defects are found requiring heavy pruning or whole tree removal, photos should be taken and an AQF Level 5 Arborist be consulted prior to work being done.
- This arboricultural assessment should be reviewed upon the preparation of detail services plans, revised stormwater, landscape or revised architectural plans.
- Hand excavation is required for all works located within the TPZ of all retained trees. These works shall be supervised by the project arborist.

- A minimum AQF Level 5 Project Arborist shall be engaged to certify the tree protection works in accordance with the hold points provided at **6.3. Hold Points** (page14).
- For additional tree protection notes see **10. General Tree Protection Notes** (page 29).

Table of Contents

Executive Summary 2

Table of Contents 6

1. Introduction 7

2. Methodology 7

3. Observations 9

4. Discussion 11

5. Recommendations 13

6. Tree Management 14

7. Tree Survey Table 16

8. Tree Survey Table Notes 22

9. Tree Location Plan 27

10. General Tree Protection Notes 29

11. References 32

1. Introduction

This report was commissioned by JDH Architects to accompany their Development Application, within the Ku Ring Gai Council area at 88 Yarrabung Road, St Ives. The aim of this report is to provide an assessment of the impacts of the proposed development on seventy-eight trees in accordance with *AS4970 – 2009 Protection of trees on development sites* ('the standard').

This report collates and presents information collected by David Prieto on the 18/10/18. The data collected is located at 7. **Tree Survey Table** also see **8. Tree Survey Table Notes** (page 22) for notes relating to tree survey table.

2. Methodology

2.1. Limitations

Care has been taken to obtain all information from reliable sources. All data has been verified as far as possible. However David Prieto - Consulting Arborist can neither guarantee nor be responsible for the accuracy of information provided by others. Unless stated otherwise:

- Information contained in this report covers only the tree/s examined and reflects the health and structure of the tree at the time of inspection. The documented, observations, results, recommendations and conclusions given may vary after the site visit due to environmental conditions. Liability will not be accepted for damage to person or property as a result of natural processes, unforeseeable actions or occurrences.
- Observations recorded for trees located within adjacent properties have been made without entering that property. Deciduous trees inspected during winter and all trees obscured by other vegetation are not able to be properly assessed. As a result measurements for these trees are estimated. Similarly these trees were not subject to a complete visual inspection and defects or abnormalities may be present but not recorded.
- The inspection was limited to visual examination from the base of the subject tree without dissection, excavation, probing or coring (unless specifically noted otherwise).
- There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject tree may not arise in the future.

No structural foundation design have been supplied.

No landscape plans have been supplied.

2.2. Site Inspection

A visual inspection of the tree/s was performed from ground level, data collected includes:

- Genus, Species, Common Name;
- Height, Width, DBH (Diameter at Breast Height), DRB (Diameter above Root Buttress);
- Age, Health & Vigour;

- Significance, Amenity and Ecological Value;
- Form and Structural Condition;
- Visible Defects or Evidence of Wounding.

2.3. Measurement

- Tree locations are supplied by client on the survey plan or triangulated using a measuring tape.
- Diameter at breast height (DBH) and Diameter above Root Buttress (DRB) are measured using a diameter tape.
- Height is measured using a clinometer or Nikon *Forestry Pro*.
- Canopy width is estimated using a measured stride paced out on site.
- Structural Root Zone (SRZ) and Tree Protection Zone (TPZ) radii are calculated (in accordance with *AS 4970-2009*).
- Development impact/setback is measured from the nearest face of the trunk to the face of the structure in Auto CAD using the perpendicular distance function.

2.4. Recording Data

Data collected is collated in the tree survey table located at **Tree Survey Table**. .The tree survey table contains abbreviations for terms describing the tree's characteristics; explanatory notes pertaining to these are located at **8. Tree Survey Table Notes** (page 22).

The physical data for tree locations, crown width and DRB is schematically described in **9. Tree Location Plan** (page 27).

2.5. Reference Documents

The report was written in coordination with:

- Survey Plan prepared by RPS Australia East Pty Ltd Revision B, dated 12/09/18.
- Architectural Site Plan prepared by JDH Architects Revision C, dated 18/11/18.
- 50% detail design Drainage Plan prepared by John Nicholson Consulting Engineers, dated 23/11/18.
- The Australian Standard for the Protection of Trees on Development Sites (AS 4970 – 2009).

2.6. Council Tree Preservation Order

The Ku-ring-gai Council Tree Preservation controls define a tree as "A perennial plant with at least one self supporting woody, fibrous stem, whether native or exotic, which is 5 metres or more in height or has a trunk diameter of 150mm or more measured at ground level."

The Tree Preservation Order applies to "the whole of the local government area of Ku-ring-gai with the exception of those lands dedicated as National Park."

Exemptions from this Tree Preservation Order apply to dead trees and branches, a list of exempt species is provided within the TPO and "trees within 3.0m of an approved,

existing residential building" measured from the centre of the trunk at ground level to the external wall of the building in question are also exempt from protection.

2.7. Determining a tree's significance

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. When determining a tree's significance within the landscape context, the following questions are asked of each tree. Significance may be expressed in increments of High, Medium or Low. For a High rating the majority (≥4) of the answers will be yes; For a Medium-High rating 3.5 of the answers will be yes; for a Medium rating half (=3) of the answers will be yes; for a Low-Medium rating 2.5 of the answers will be yes; and for the Low rating the minority of answers will be yes (≤2).

1. Is the tree a locally native remnant; an endangered species; a part of an endangered ecological community; or does the tree provide critical habitat for an endangered species?

2. Is the tree of botanical interest; Is it included in a significant tree register or listed as a heritage item under the Federal State or Local Regulations?

3. Is the tree visually prominent in the locality?

4. Is the tree well structured?

5. Is the tree in good health and/or does it display signs of good vigour?

6. Is the tree typically formed for the species?

7. Is the tree currently located in a position that will accommodate future growth?

3. Observations

3.1. Site Description

The site is a School located at 88 Yarrabung St, St Ives North. It contains a number of buildings, driveways, carparks, paved areas, paths turf areas, sport fields and gardens. There was no evidence of recent earthworks on the site or adjoining sites. The site has a general southerly aspect.

3.2. Soil Landscape Map

The soils in this area are from the erosional Glenorie soil landscape group [3]. They are characteristically shallow to moderately deep <100 cm red podzolic soils on ridge crests; moderately deep 70-150 cm red and brown podzolic soils on the upper slopes; deep >200 cm yellow podzolic soils and gleyed podzolic soils along drainage lines.

Generally the landscape is characterised by undulating to rolling low hills on Wianamatta shales. There is local relief between 50m and 80 m with slope gradients of 5-20% on narrow ridges, hillcrests and valleys [3].

These soils are limited by their high soil erosion hazard, localised impermeable and highly plastic soil, and moderately reactive clays. The critical soil characteristics of this soil type for trees growing on this site include poor drainage. [3]

3.3. Native Vegetation Map

Trees within the assessed area are part of the Urban Exotic Native vegetation as identified on the Flora and Fauna report by SRL. They have been mostly planted and they are mostly not indigenous to the area.

The Sydney Turpentine Ironbark Forest (STIF) endangered ecological community[13, 14] has been identified along the eastern boundary of the property outside of the area of tree assessment. It is dominated by *Syncarpia glomulifera* with *E. paniculata* and *E. eugeniodes* occurring less frequently. In areas of higher rainfall (1050 – 1080 mm per annum), *E. saligna* is dominant. *Eucalyptus punctata* occurs occasionally in areas where the shale soils are relatively shallow. [13, 14]

A stratum of small trees is usually present and is composed of a mixture of species including *Syncarpia glomulifera, Pittosporum undulatum, Trema aspera* and *Acacia parramattensis subsp parramattensis*. The shrub stratum is usually sparse, and contains predominantly mesic species such as *Pittosporum revolutum, Breynia oblongifolia, Maytenus sylvestris, Polyscias sambucifolia, Notelaea longifolia* and *Ozothamnus diosmifolius*[13, 14].

The ground stratum consists of a dense mixture of herb and grass species dominated by *Oplismenus aemulus, Pseuderanthemum variabile* and *Echinopogon ovatus*. Other frequently recorded species include *Entolasia marginata, Pratia purpurascens, Dianella longifolia, Arthropdium milleflorum* and *Rubus parvifolia*[13, 14]. There appears to be species representative of this vegetation community located on this site.

Turpentine Ironbark Forest has been almost entirely cleared and has been listed as an endangered ecological community under the NSW Threatened Species Act (1995). Summary of site inspection data. There appears to be species representative of this vegetation community located on this site.

3.4. Summary of site inspection data

Generally the site's vegetation was observed to have a majority native tree canopy, with a native shrub midstorey and an exotic turf groundcover layer. The existing surveyed trees are shown at **9. Tree Location Plan** (page 27).

3.5. Summary of Proposed Development

The proposed development will involve the construction of a Sport Complex adjacent to the paved carpark on Horace Street with sitting/terrace on the embankment to the north of the existing soccer field. There are associated turf, paths, paving, retaining walls, services and landscape works. This will involve the demolition of Building B, sport courts and adjacent pathway and stairs. The existing waste containers and rainwater tanks are proposed to be relocated. The extent of site works is also illustrated at **9. Tree Location Plan** (page 27).

3.6. Tree significance and encroachment matrix

The matrix below gives a brief overview summary of tree significance and level of encroachment from the proposed development of numbered trees.

	ENCROACHMENT WITHIN TPZ Numbering of trees as shown on Tree Location Plan				
TREE LANDSCAPE SIGNIFICANCE		**No Impact**	**Minor Encroachment** (<10% of TPZ)	**Major Encroachment** (>10% of TPZ)	**Within Development Footprint**
	High	2, 29, 187	-	-	24
	Medium	28, 30, 32, 33, 35, 38, 41, 42, 43(M-H), 44, 46, 194, 195, 200A, 207, 214, 217 & 293	40	-	3, 4, 8, 10, 11, 12, 14, 15, 17, 20 & 21
	Low	1, 24A, 26, 27(L-M), 31, 34, 36(L-M), 37, 39, 45, 47, 188, 189, 190, 191, 192, 197, 200, 203, 204, 205, 206, 208, 209, 210, 211, 212, 213, 215, 216, 218, 314 & 322	-	25(L-M)	5, 6, 7, 9, 13, 16, 18, 19, 22 & 23,
	Total Number of trees	**54**	**1**	**1**	**22**

4. Discussion

There is a large number of trees within the property not included in the report. They can be found on the Survey Plan prepared by RPS Australia East Pty Ltd Revision B, dated 12/09/18 and shown at **9. Tree Location Plan** (page 27). Final services design should be prepared in liaison with the project arborist to minimise the impact to the trees within the assessed and outside of the assessed areas, especially trees with highest retention value shown with a green hatch.

4.1. Trees with a Minor TPZ Encroachment

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

- Tree 40 is located 4.91m from proposed OSD, providing a 4.6% cut encroachment within the TPZ. This tree is considered to be of medium significance and is suitable for retention.

  This encroachment is considered to be a low impact and sustainable by the tree provided the excavation will impact distal low diameter roots. The tree is proposed to be retained.

4.2. Trees with a Major TPZ Encroachment

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

- Tree 25 is located 0.39m from the proposed side path, providing a major encroachments within the TPZ and encroachment within the SRZ. This tree is considered to be of low to medium significance and should not be considered a constraint on the development.

  This encroachment is considered to be an unsustainable impact to the tree and should be removed if the development is approved.

4.3. Trees within the development footprint

- Trees 4, 8, 10, 12, 14, 15, 17, 20, 21 & 24 are located within the proposed development footprint. These is are considered to be of medium significance (Tree 24 is Med-High significance) and are suitable for retention. Extensive redesign of the proposed pathway, stormwater and driveway layout would be required to retain these trees. It they cannot be retained if the development is approved in its current form.

- Trees 3, 5, 6, 7, 9, 11, 13, 16, 18, 19, 22, 23 are located within the proposed development footprint. These trees are considered to be of low significance and should not be considered a constraint on the development.

4.4. Other Tree Comments

- Trees 1, 2, 24A, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 47, 187, 188, 189, 190, 191, 192, 194, 195, 197, 200, 200A, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 293, 314 & 322are located in positions that will allow their retention without impact from the proposed development.

- Other trees more than 5m in height were found within the embankment to the south-western side of the assessed area. No number has been assigned but can be found on the survey plan. They are considered to be of low significance, have forest form with sparse crowns, are in fair health and should not be considered a constraint for the development. They are not impacted by the proposed development.

5. Recommendations

In consideration of the data collected recommendations are provided for the removal or retention of trees including specific tree protection measures required to reduce the anticipated impacts from the proposed construction on those trees proposed to be retained. This report specifically recommends:

- The removal of Tree No.'s 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 & 25, if the development is approved as there is an unavoidable major encroachment into the tree protection zone.
- The replacement planting of a number of locally native or canopy trees shall be installed in 25L pot size to offset the loss of trees on site to offset the loss of trees on site.
- The retention of Tree No. 1, 2, 24A, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 41, 42, 43, 44, 45, 46, 47, 187, 188, 189, 190, 191, 192, 194, 195, 197, 200, 200A, 203, 204, 205, 206, 207, 208, 209, 210, 211, 212, 213, 214, 215, 216, 217, 218, 293, 314 & 322. The construction will not impact these trees.
- The retention of all other trees within the embankment area and not shown on the **9. Tree Location Plan** (page 27).
- The retention of all other trees located outside of the assessed area.
- The retention of Tree No. 40. The OSD will provide a minor encroachment into the tree protection zone
- Final design plans for services such as water, electricity, gas and sewer should be prepared to locate all trenching outside TPZs where possible of retained trees prior to installation and assessed by the project arborist. The findings should be reported in an amendment of, or addendum to this report.
- Any proposed services requiring excavation should be hand dug within the TPZ of tree to be retained. It should be carried out by first excavating a narrow trench to the depth required by hand (depth to be determined on site by project arborist), along the closest line of cut to tree. This will allow the location of woody structural roots greater than 40mm which can then be retained intact as necessary or pruned cleanly by an AQF Level 3 Arborist or Horticulturist.
- The stockpile and material storage areas are to be installed within existing paved areas or outside of the TPZ of all trees to be retained.
- Tree sensitive construction measures must be implemented if works are to proceed within the TPZ as prescribed by the Australian Standard AS4970-2009 Protection of trees on development sites. Specifically the final cut of roots should result in a clean cut, using appropriate tools. Severing roots by earthmoving equipment is unacceptable.
- Pruning of branches should comply with Australian Standard No *4373 -2007 - Pruning of Amenity Trees*. Branch reduction should be made to internal lateral branches or stems which are at least 1/3rd of the diameter of the branch being cut – or – removed at the branch collar, consistent with AS *4373 -2007; Sections 6.4 a) & b) and 7.3.* Deadwooding should be carried out concurrently.
- A tree management plan should be prepared by the project arborist to guide construction methodology, barrier installation and supervision of works as necessary to protect all retained trees during construction works. The plan should be consistent with Sections 4 & 5, AS4970 (2007). Services layout should be incorporated within this plan.
- Tree Protection Fencing (TPF) shall be located to enclose as much of the TPZ as possible. Where approved excavation and construction encroaches into

the TPZ, the TPF layout shall be determined with advice from the project arborist.

- Further defects such as cambial damage, decay or hollows may be present which are not visible from the ground. Whilst work is being carried out by climbing arborists (AQF Level 3) aerial inspection of stems, branches and their attachments should be made when work is being carried out. If minor additional works are needed to remove or correct defects it should be done at that time. If significant defects are found requiring heavy pruning or whole tree removal, photos should be taken and an AQF Level 5 Arborist be consulted prior to work being done.
- This arboricultural assessment should be reviewed upon the preparation of detail services plans, revised stormwater, landscape or revised architectural plans.
- Hand excavation is required for all works located within the TPZ of all retained trees. These works shall be supervised by the project arborist.
- A minimum AQF Level 5 Project Arborist shall be engaged to certify the tree protection works in accordance with the hold points provided at **6.3. Hold Points** (page14).
- For additional tree protection notes see **10. General Tree Protection Notes** (page 29).

6. Tree Management

6.1. Tree Management Objectives

The general tree management objectives include:

- Appointment of a Project Arborist who has a minimum Level 5 AQF Arboriculture qualification and experience in managing trees on construction sites.
- Installation of additional root, trunk and branch protection as required to protect retained trees where minor encroachments within the TPZ are anticipated.
- The installation of a Tree Protection Fence to enclose and protect the TPZ.
- Monitoring, inspection and certification of tree protection as per the below hold points.

6.2. Management Objective Priorities

The prioritisation of the above objectives is integral for the successful management of site trees:

1. Protection of the TPZ of retained trees;
2. Protection of the trunk and branches of retained trees;
3. Reduction of stress related to construction impacts;
4. The ongoing viability of retained trees after practical completion.

6.3. Hold Points, Inspection and Certification

To ensure this plan is implemented hold points (**HP**) have been specified in the schedule of works (below). Once each stage is reached the work will be inspected and certified by the Project Arborist and the next stage may commence.

Alterations to this schedule may be required due to necessity however this shall be through consultation with the Project Arborist only.

6.4. Schedule of Works and Responsibilities

Hold Point	Task	Responsibility	Certification	Timing of Inspection
1	Assessment of Services plans by Project Arborist following completion of services plans	Principal Contractor	Project Arborist	After completion of services design plans
2	Indicate clearly (with spray paint on trunks) trees approved for removal only	Principal Contractor	Project Arborist	Prior to demolition and site establishment.
3	Install TPF and additional root, trunk and/or branch protection	Principal Contractor	Project Arborist	Prior to demolition and site establishment.
4	Supervise all excavation works proposed within the TPZ	Principal Contractor	Project Arborist	As required prior to the works proceeding adjacent to tree
5	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Quarterly during construction period
6	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Following the removal of tree protection measures from HP 3
7	Final Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Prior to issue of occupation certificate.

7. Tree Survey Table

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ST IVES HIGH SCHOOL TREE SURVEY DATA

DATE OF SURVEY:18/10/18

No impact	Minor encroachment	Major encroachment - Sustainable	Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments	Recom-mendations
1	*Polyspora*	*axillaris*	Gordonia	5	5	180	110	100	90	251	490	2453	3012	M	F	F	L	L	L	D, M	No impact	20% deadwood up to 40mm in diameter mostly on upper crown	-
2	*Eucalyptus*	*sideroxylon*	Mugga Ironbark	13	10	1000				1000	1080	3418	12000	M	G	G	H	H	M	D	No impact	Several bulges on trunk at 1m to north with associated altered bark. Somewhat sparse crown. Tree recently pruned	-
3	*Syncarpia*	*glomulifera*	Turpentine	6.5	5	260	270			375	530	2535	4500	SM	G	Av	L	M	H	CD, M	Within development footprint	-	-
4	*Angophora*	*costata*	Smooth-barked Apple	11	5	350	320			475	500	2474	5700	SM	G	Av	M	M	H	D	Within development footprint	Multi-trunked at 0.5	-
5	*Allocasuarina*	*littoralis*	Black She Oak	5	3	40	40	40		70	360	2155	2000	SM	Av	F	L	L	M	CD, CS	Within development footprint	Multi-trunked at 0.5m. Somewhat sparse crown skewed to south	-
6	*Syncarpia*	*glomulifera*	Turpentine	7	3.5	210	230	170		355	480	2431	4260	J	G	Av	L	L	H	D, M	Within development footprint	-	-
7	*Callistemon*	*viminalis*	Weeping Bottlebrush	5.5	3.5	100	100	100	100	200	350	2129	2400	M	Av	F	L	L	M	CD, M, CS	Within development footprint	Very sparse crown skewed to north	-
8	*Eucalyptus*	*scoparia*	Wallangarra White Gum	10	5	420				420	530	2535	5040	M	G	G	M	M	M	D	Within development footprint	300x100 exposed hardwood on 120mm branch to southwest	Branch to be pruned
9	*Syncarpia*	*glomulifera*	Turpentine	6	2.5	170	100	40		202	310	2024	2424	J	G	Av	L	L	H	CD, Su	Within development footprint	-	-
10	*Syncarpia*	*glomulifera*	Turpentine	8	4	150	150	150		260	450	2366	3120	SM	G	Av	M	M	H	D, M	Within development footprint	-	-
11	*Callistemon*	*salignus*	Willow Bottlebrush	7	4	310				310	450	2366	3720	M	G	Av	L	M	M	D	Within development footprint	Exposed heartwood to west at 1.5m for 0.5m	-
12	*Pyrus*	*calleryana var.*	Callery Pear var.	8	10	570				570	570	2613	6840	M	G	G	M	M	L	D, B	Within development footprint	2x150mm former pruning cuts at 1.5m to west and south for crown raising with moderate reaction wood	-
13	*Fraxinus*	*sp.*	Ash Tree	5	6	100	100	100	100	200	490	2453	2400	M	Av	F	L	L	L	CD, M, CS	Within development footprint	Crown skewed to southwest. Growth consistent with basal suckers from rootstock	-
14	*Carya*	*illinoinensis*	Pecan Nut Tree	13	4	500				500	600	2670	6000	M	G	G	M	M	L	D, B	Within development footprint	Minor distal dieback	-
15	*Eucalyptus*	*robusta*	Swamp mahogany	10	7	420				420	510	2494	5040	M	G	G	M	M	M	D	Within development footprint	Crown skewed to west	-

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ST IVES HIGH SCHOOL TREE SURVEY DATA

DATE OF SURVEY:18/10/18

No impact	Minor encroachment	Major encroachment - Sustainable	Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments	Recom-mendations
16	*Eucalyptus*	*robusta*	Swamp mahogany	11	7	430				430	520	2515	5160	M	F	F	L	L	M	CD, CS	Within development footprint	very sparse modified crown skewed to north & south	-
17	*Eucalyptus*	*robusta*	Swamp mahogany	10	7	420				420	510	2494	5040	M	Av	Av	M	M	M	CD	Within development footprint	Crown skewed to east	-
18	*Eucalyptus*	*tereticornis*	Forest Red Gum	6	3	100	150			181	200	1683	2172	J	Av	Av	L	L	M	D	Within development footprint	-	-
19	*Eucalyptus*	*robusta*	Swamp mahogany	2	2	150				150	210	1718	2000	SM	P	P	L	L	M	D	Within development footprint	Crown heavily damaged, trunk topped at 2m with only some adventitious branches. On Council verge	-
20	*Eucalyptus*	*robusta*	Swamp mahogany	10	7	310				310	420	2299	3720	M	Av	Av	M	M	M	D	Within development footprint	Somewhat sparse crown. Former pruning cuts with associated good reaction wood. Exposed roots to south for 1.5m	-
21	*Eucalyptus*	*robusta*	Swamp mahogany	9.5	7	360				360	480	2431	4320	M	Av	Av	M	M	M	D	Within development footprint	Crown skewed to north. Former pruning cuts with associated good reaction wood. Exposed roots to south for 1.5m	-
22	*Eucalyptus*	*tereticornis*	Forest Red Gum	5	4	100	40	40		115	130	1500	2000	SM	Av	Av	L	L	M	D	Within development footprint	Crown slightly skewed to south	-
23	*Eucalyptus*	*tereticornis*	Forest Red Gum	7	4	110				110	130	1500	2000	SM	Av	Av	L	L	M	D	Within development footprint	-	-
24	*Eucalyptus*	*paniculata*	Grey Ironbark	12	8	430				430	490	2453	5160	M	G	G	M-H	M-H	H	D	Within development footprint	-	-
24A	*Syncarpia*	*glomulifera*	Turpentine	5	3	120				120	150	1500	2000	J	G	G	L	L	H	D	No impact	Good future tree	-
25	*Eucalyptus*	*robusta*	Swamp mahogany	10	7	355				355	505	2484	4260	M	Av	Av	L-M	M	M	D	Located 0.39m from proposed side path , providing a major (40.4%) cut encroachment within the TPZ and within the SRZ	Exposed roots to NW & SE for 2m	-
26	*Eucalyptus*	*robusta*	Swamp mahogany	9	6	250				250	300	1996	3000	M	Av	F	L	L	M	CD	No impact	Exposed roots to NW & SE for 2m	-
27	*Eucalyptus*	*robusta*	Swamp mahogany	10	7	380				380	440	2344	4560	M	Av	Av	L-M	M	M	CD	No impact	Exposed roots to NW & SE for 2m	-
28	*Angophora*	*floribunda*	Rough-barked Apple	9.5	4	300				300	350	2129	3600	M	G	Av	M	M	M	CD, CS	No impact	Crown skewed to west. Somewhat sparse on lower 50% of the crown	-
29	*Eucalyptus*	*pilularis*	Blackbutt	17	7	590				590	400	2252	7080	M	G	G	H	H	H	D, M	No impact	-	-

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ST IVES HIGH SCHOOL TREE SURVEY DATA

DATE OF SURVEY:18/10/18

No impact	Minor encroachment	Major encroachment - Sustainable	Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments	Recom-mendations
30	*Pinus*	*radiata*	Monterey Pine	19	9	1160				1160	1130	3484	13920	M	F	Av	M	L	L	D	No impact	Very sparse crown. Several former 200-300mm in diameter pruning cuts to east. Exposed root flare for 4m to north & 3m to south	
31	*Eucalyptus*	*pilularis*	Blackbutt	6	6	200	300			361	400	2252	4332	M	F	F	L	L	H	CD, CS	No impact	Very sparse crown, 50% deadwood up to 300mm.	-
32	*Eucalyptus*	*pilularis*	Blackbutt	11	5	620				620	620	2707	7440	M	G	Av	M	M	H	CD	No impact	Loss of former leader at 1m	-
33	*Eucalyptus*	*microcorys*	Tallowwood	11	5	630				630	690	2832	7560	M	G	G	M	M	M	D	No impact	-	-
34	*Eucalyptus*	*resinifera*	Red Mahogany	10	7	220				220	240	1817	2640	M	G	F	L	L	H	CD, CS	No impact	Heavily modified crown skewed to south. Recently pruned	-
35	*Eucalyptus*	*microcorys*	Tallowwood	15	6	510				510	630	2726	6120	M	G	G	M	M	M	D	No impact	Recently pruned	-
36	*Pinus*	*radiata*	Monterey Pine	10	8	440				440	510	2494	5280	M	Av	F	L-M	L	L	CD	No impact	Sparse upper crown skewed to west	-
37	*Eucalyptus*	*pilularis*	Blackbutt	10	8	440				440	510	2494	5280	M	G	F	L	M	H	CD	No impact	Modified crown skewed to northeast	-
38	*Eucalyptus*	*pilularis*	Blackbutt	13	6	450				450	520	2515	5400	M	G	Av	M	M	H	CD	No impact	Somewhat sparse crown. On council verge	-
39	*Eucalyptus*	*pilularis*	Blackbutt	8	5	340	150			372	390	2228	4464	M	G	Av	L	M	H	CD, CS	No impact	Crown skewed to north. Multi-trunked at 0.5m. On council verge	-
40	*Pinus*	*radiata*	Monterey Pine	11	4	690				690	800	3013	8280	M	F	Av	M	M	L	D	Located 4.91m from proposed OSD, providing a minor (4.6%) cut encroachment within the TPZ	350mm in diameter stem formerly pruned at 1.5m	-
41	*Lophostemon*	*confertus*	Brush Box	11.5	6	680				680	760	2949	8160	M	G	Av	M	M	M	CD	No impact	Crown partially modified to southeast	-
42	*Lophostemon*	*confertus*	Brush Box	10	5	460				460	510	2494	5520	M	G	F	M	M	M	CD, CS	No impact	Crown heavily skewed to southeast	-
43	*Pinus*	*patula*	Mexican weeping pine	14	9	800	400	400	400	1059	1120	3471	12708	M	G	G	M-H	H	L	D, M	No impact	-	-
44	*Eucalyptus*	*pilularis*	Blackbutt	14	7	450				450	500	2474	5400	M	G	G	M	M	H	D	No impact	On council verge	-
45	*Lophostemon*	*confertus*	Brush Box	6	7	330	110			348	420	2299	4176	M	Av	F	L	L	M	CD	No impact	Crown skewed to west. Adjacent to fence	-

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ST IVES HIGH SCHOOL TREE SURVEY DATA

DATE OF SURVEY:18/10/18

No impact	Minor encroachment	Major encroachment - Sustainable	Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments	Recom-mendations
46	*Eucalyptus*	*pilularis*	Blackbutt	9	9	550				550	600	2670	6600	M	G	F	M	M	H	CD, CS	No impact	On council verge. Trunk heavily leaning and crown skewed to southwest over the road	-
47	*Eucalyptus*	*pilularis*	Blackbutt	15	8	650				650	690	2832	7800	M	F	F	L	L	H	D	No impact	On council verge. 40% deadwood up to 130mm in diameter. Very sparse crown. Large number of Fungal Fruiting Bodies to southeast at base. Exposed heartwood with possible internal decay	Council should inspect this tree
187	*Eucalyptus*	*grandis*	Rose Gum	22	9	970				970	1020	3337	11640	M	G	G	H	M	M	D	No impact	Altered bark for 0.4x1m to north at trunk base	-
188	*Melaleuca*	*quinquenervia*	Broad-leaved Paperbark		3	250				250	320	2051	3000	M	Av	F	L	L	M	CD, CD	No impact	Group of trees	-
189	*Melaleuca*	*quinquenervia*	Broad-leaved Paperbark		3	250				250	320	2051	3000	M	Av	F	L	L	M	CD, CD	No impact	Group of trees	-
190	*Melaleuca*	*quinquenervia*	Broad-leaved Paperbark		3	250				250	320	2051	3000	M	Av	F	L	L	M	CD, CD	No impact	Group of trees	-
191	*Melaleuca*	*quinquenervia*	Broad-leaved Paperbark		3	250				250	320	2051	3000	M	Av	F	L	L	M	CD, CD	No impact	Group of trees	-
192	*Melaleuca*	*quinquenervia*	Broad-leaved Paperbark		3	250				250	320	2051	3000	M	Av	F	L	L	M	CD, CD	No impact	Group of trees	-
194	*Casuarina*	*cunninghamia*	River Sheoak	16	7	420				420	480	2431	5040	M	G	Av	M	M	M	CD	No impact	Forest form. Buttressed at base	
195	*Casuarina*	*cunninghamia*	River Sheoak	16	7	400				400	450	2366	4800	M	G	Av	M	M	M	D	No impact	Ivy growing at base	-
197	*Corymbia*	*maculata*	Spotted Gum	12.5	3	200				200	290	1968	2400	M	F	F	L	L	M	CD	No impact	Forest form. Privet growing at 1m to southeast	-
200	*Lophostemon*	*confertus*	Brush Box	6	6	350	150	100		394	480	2431	4728	M	Av	F	L	L	M	CD, CS	No impact	Crown heavily skewed to west	-
200A	*Casuarina*	*cunninghamia*	River Sheoak	15	6	650				650	800	3013	7800	M	G	G	M	M	M	D	No impact	Buttressed at base. Not on survey, approximate location	-
203	*Corymbia*	*maculata*	Spotted Gum	12.5	7	480				480	550	2575	5760	M	F	F	L	L	M	CD	No impact	Very sparse crown skewed to northeast	-
204	*Corymbia*	*maculata*	Spotted Gum	12	3.5	400				400	470	2410	4800	M	G	F	L	L	M	CD, CS	No impact	Crown skewed to north	-

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ST IVES HIGH SCHOOL TREE SURVEY DATA

DATE OF SURVEY:18/10/18

No impact	Minor encroachment	Major encroachment - Sustainable	Within development footprint

NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	Trunk Dia 4	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi-cance	Am	Eco	Form	Development Setback and Encroachment	Comments	Recom-mendations
205	*Corymbia*	*maculata*	Spotted Gum	9	5	460				460	520	2515	5520	M	G	F	L	M	M	CD, CS	No impact	Crown heavily skewed to east. 200mm in diameter pruning cut at 1.5m	-
206	*Corymbia*	*maculata*	Spotted Gum	13	6	460				460	500	2474	5520	M	G	F	L	L	M	CD	No impact	Forest form	-
207	*Corymbia*	*maculata*	Spotted Gum	12	4	510				510	590	2652	6120	M	G	Av	M	M	M	CD	No impact	Somewhat sparse crown, forest form. 50mm in diameter bark recently damaged at 1.2m to east	-
208	*Casuarina*	*cunninghamiai*	River Sheoak	10	3	200				200	230	1785	2400	M	Av	F	L	L	M	CD, CS	No impact	Forest form	-
209	*Casuarina*	*cunninghamiai*	River Sheoak	10	3	200				200	240	1817	2400	M	Av	F	L	L	M	CD	No impact	Forest form	-
210	*Casuarina*	*cunninghamiai*	River Sheoak	6	2	100	100	100		174	200	1683	2088	SM	Av	F	L	L	M	CD, M	No impact	Crown skewed to east	-
211	*Corymbia*	*maculata*	Spotted Gum	12	2.5	200				200	230	1785	2400	SM	F	F	L	L	M	CD	No impact	Forest form	-
212	*Casuarina*	*cunninghamiai*	River Sheoak	15	6	480				480	560	2594	5760	M	Av	F	L	L	M	CD	No impact	Forest form	-
213	*Melaleuca*	*quinquenervia*	Broad-leaved Paperbark	7	6	250	100	100		288	350	2129	3456	SM	Av	F	L	L	M	CD, CS	No impact	-	-
214	*Corymbia*	*maculata*	Spotted Gum	13	7	460				460	560	2594	5520	M	G	Av	M	M	M	CD, CS	No impact	Crown skewed to northwest. One single crown with T215	-
215	*Corymbia*	*maculata*	Spotted Gum	12	5	400				400	420	2299	4800	M	Av	Av	L	M	M	CD	No impact	One single crown with T214	-
216	*Melaleuca*	*styphelioides*	Prickly-leaved Paperbark	7	5	400	190			443	450	2366	5316	M	F	F	L	L	M	CD	No impact	Crown skewed to north	-
217	*Eucalyptus*	*grandis*	Rose Gum	19	5	550				550	680	2814	6600	M	G	F	M	M	M	CD, CS	No impact	Self-corrected crown skewed to west	-
218	*Corymbia*	*maculata*	Spotted Gum	9	5	210				210	270	1910	2520	M	G	F	L	L	M	CD, CS	No impact	Crown heavily skewed to northeast	-
293	*Eucalyptus*	*elata*	River Peppermint	15	8	700				700	950	3239	8400	M	Av	Av	M	M	M	CD, CS	No impact	Crown skewed and trunk leaning to south. Buttressed	-
314	*Eucalyptus*	*grandis*	Rose Gum	13	8	490				490	550	2575	5880	M	G	F	L	L	M	CD	No impact	Previously removed 150mm in diameter stem at 1.5m. Sparse crown. Altered bark on base of trunk for 2m to south for 50% of trunk circumference. Possible internal decay	Monitoring
322	*Eucalyptus*	*grandis*	Rose Gum	5.5	3	110				110	200	1683	1320	SM	P	P	L	L	M	CD. Su	No impact	Crown skewed to south.	-

8. Tree Survey Table Notes

8.1. Genus, Species and Common Name

The botanical and common name of each tree is identified and recorded. Occasionally the exact species name is unknown; *sp.* is recorded to indicate this.

8.2. Height, Spread, Trunk Dia, DBH and DRB

- The tree's height and spread is recorded in metres.
- The tree **DBH** is recorded in millimetres. DBH is an abbreviation of Diameter (of the trunk) measured at Breast Height (or 1.2m from the base of the trunk). If more than one trunk is present the DBH is calculated in accordance with AS4970-2009 Protection of Trees on Development Sites.
- If the tree has multiple trunks multiple trunks each trunk DBH (**Trunk Dia**) will be recorded individually.
- The tree **DRB** is recorded in millimetres. DRB is an abbreviation of Diameter (of the trunk) measured above the Root Buttress. It is required to calculate the SRZ in accordance with AS4970-2009 Protection of Trees on Development Sites when there is major encroachment within the TPZ, ie. greater than 10% is encroached upon or if there is an encroachment within the SRZ.

8.3. Age

The age class of each tree is estimated as either:

- **J** – Juvenile, a young sapling, easily replaced from nursery stock.
- **SM** - Semi Mature, a tree that has not grown to mature size.
- **M** - Mature, a tree that has reached mature size and will slowly increase in size over time.
- **OM** - Over Mature, a tree that has been mature for a long period and is beginning to display signs of decline, e.g. large dead branches.
- **S** - Senescent, an over mature tree that is now in decline.

8.4. Health and Vigour

The trees health and vigour is recorded as a measurement of:

- **G** - Good the tree does not appear stressed with no excessive dieback, insect infestation, decay, dead wood or epicormic shoots.
- **Avg** - Average Health the tree appears stressed and have some crown dieback, and/or a few epicormic shoots, and/or some dead wood in the crown and some new growth at branch tips. These trees may benefit from remediation of the growing environment to reduce stress and return it to good health.
- **F** - Fair the tree may have areas of crown dieback, and/or epicormic shoots, and/or areas of decay, and/or reduced new growth at branch tips. These trees have been stressed for a short period of time, remediation of the growing environment may improve the trees health.

- **P** - Poor the tree may have large areas of crown dieback, and/or many epicormic shoots, and/or reduced new growth at branch tips. These trees have been stressed for a long time, remediation of the growing environment would not return the tree to good health.
- **D** – Dead the tree is dead

8.5. Crown Condition

The crown condition of each tree is assessed and recorded as either:

- **G** - Good Condition: the tree appears to have no visible indication of inherent structural defects.
- **Avg** - Average Condition: the tree has minor structural defects which may be corrected with remedial works or pruning, allowing the tree to return to Good Condition.
- **F** - Fair Condition: the tree has visible structural defects such as (but not limited to) dead branches, and/or an unbalanced crown, and/or leaning trunk and/or areas of decay. These trees do not demonstrate the typical form of their species, or have been damaged or have begun to deteriorate. Remedial works or pruning may return the tree to Average Condition.
- **P** - Poor Condition: the tree has significant structural defects such as (but not limited to) very large dead branches, and/or extremely unbalanced crown, and/or subsiding trunk and/or large areas of decay. These trees do not demonstrate the typical form of their species, or have been severely damaged or have deteriorated significantly. Remedial pruning would not return the tree to Fair Condition.

8.6. Significance

Measured as High, Medium or Low, see **0. The Ku-ring-gai Council Tree** Preservation controls define a tree as "A perennial plant with at least one self supporting woody, fibrous stem, whether native or exotic, which is 5 metres or more in height or has a trunk diameter of 150mm or more measured at ground level."

The Tree Preservation Order applies to "the whole of the local government area of Ku-ring-gai with the exception of those lands dedicated as National Park."

Exemptions from this Tree Preservation Order apply to dead trees and branches, a list of exempt species is provided within the TPO and "trees within 3.0m of an approved, existing residential building" measured from the centre of the trunk at ground level to the external wall of the building in question are also exempt from protection.

Determining a tree's significance (page 8). Significance may be expressed in increments of High, Medium or Low. For a High rating the majority (≥4) of the answers will be yes; For a Medium-High rating 3.5 of the answers will be yes; for a Medium rating half (=3) of the answers will be yes; for a Low-Medium rating 2.5 of the answers will be yes; and for the Low rating the minority of answers will be yes (≤2).

8.7. Amenity Value

Amenity value is a subjective measurement based on the tree's contribution to the landscape, it may be based on the tree's visual form, however it also includes non visual attributes such as provision of shade for a seat, screening of poor views or for privacy, or if it has historical significance. The amenity value is recorded as:

- **H** - High, the trees form is an excellent example of its species and it makes a great specimen and/or it has other attributes such screening, or is historical significance. These trees are visually prominent and valuable to the community or public domain.
- **M** - Medium, the tree may have an altered form and/or it has attributes that provides amenity to local residents only.
- **L** – Low, the tree is not a good specimen and it does not provide substantial benefit to local residents or the community.

8.8. Ecological Value

Ecological value is a measurement of the trees contribution to the environment. It is determined by the trees area of origin, its potential to provide habitat to native fauna and its potential to become an environmental pest. The ecological value is recorded as:

- **H** - High, the tree is locally native or remnant and/or it has habitat value for native fauna.
- **M** - Medium the tree is native but not locally native.
- **L** - Low, the tree is not native and/or it may be a listed nuisance or weed species.
- **Ha** – Habitat, is the tree valued by fauna for food (ie. foliage fruit or sap) or shelter (ie. nesting, roosting, dray or hollow).

8.9. Form

The form, structure or shape of each tree is assessed and recorded as either one or a combination of several of the below terms; (**U**) Upright, (**B**) Broad, (**C**) Conical, (**Sh**) Shrub, (**CS**) Crown Shy (also referenced is the adjacent dominant tree canopy ie. **T4**), (**V**) Vase, (**D**) Dome, (**P**) Palm, (**S**) Spreading, (**L**) Leaning or (**BM**) Basal Multi Trunked.

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

8.10. Defects

The presence of one or a combination of several defects is recorded (**W**) Wound, (**D**) Decay, (**F**) Fungus, (**B**) Bulge, (**FB**) Fibre Buckling, (**C**) Cracks, (**S**) Split, (**H**) Hollow, (**DB**) Die Back, (**E**) Epicormic shoots, (**DW**) Dead Wood, (**I**) Inclusion, (**CA**) Cavities, (**PF**) Previous Failure, (**R**) Root Damage, (**P**) Pruning wound, (**PD**) Pests and diseases, (**ST**) Storm Damage.

8.11. SRZ (Structural Root Zone)

The SRZ is a radial area extending outwards from the centre of the trunk. This area contains the majority of the structural woody roots. This area is responsible primarily for stability. Root damage or root loss within this zone greatly increases the opportunity for decay fungi to ingress into the heartwood, causing internal decay in addition to destabilising the tree's structural integrity. The SRZ is calculated as follows (This

calculation is derived from the Australian Standard 4970 – 2009 Protection of Trees on Development Sites):

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

8.12. TPZ (Tree Protection Zone)

The TPZ is a circular area with a radius measured by multiplying the DBH by twelve (12), or a circular area the size of the tree's drip line whichever is greater. This area contains the majority of the essential structural and feeder roots responsible for stability, gaseous exchange and water and nutrient uptake. Excavation, back filling, compaction or other disturbance should not occur in this area.

The TPZ is used to identify the minimum area required for the safe retention of a given tree. This calculation is derived from the Australian Standard 4970 – 2009 Protection of Trees on Development Sites. An incursion to 10% within the TPZ is potentially acceptable if no other option is available. A major encroachment (in excess of 10%) is required to be clearly justified by the project Arborist and compensated for elsewhere. Justification methodology may vary depending on site or the individual tree's health, vigour and ability to withstand disturbance and may require root investigation.

8.13. Development Setback / Impact

The successful retention of trees on construction sites is dependent on the adequate allocation and management of the space above, below and around trees to be retained.

The trunk and canopy of trees to be retained must be protected to ensure the trunk and branches are not damaged during construction. The removal of bark and / or branches allows the potential ingress of micro organisms which may cause decay. Similarly the removal of bark restricts the tree's ability to distribute water, mineral ions and glucose.

It is essential to prevent the disturbance of the soil beneath the drip line of each tree, because this is the area where oxygen, water and mineral ions are absorbed by tree roots. Oxygen, water and mineral ions are essential for healthy plant growth. If soil becomes compacted, the ability of roots to function correctly is greatly reduced. Similarly the removal or damage of roots will reduce the ability of roots to function correctly. Woody roots provide stability for the tree and they also transport nutrients to the leaves.

The potential implications of removing or damaging roots are threefold:

1. The risk of whole tree failure is increased, as tree roots anchor and stabilise the tree. Woody roots are developed to assist in the support of the tree in prevailing wind, with these roots removed wind throw may occur, which would result in the mass failure of the tree.
2. The ability of the tree to absorb and transfer the essential nutrients, oxygen and water from the soil to the leaves is greatly affected. This will place the tree under stress and reduce the tree's ability to photosynthesise, and in turn cause the tree to use up stored energy reserves. These energy reserves are used to fight infection and insect attack, for new growth, maintenance of existing tissues and also for healing wounds. Once energy reserves become depleted a tree is much more susceptible to drought, disease and pest attack.

3. Open wounds are sites by which decay-causing pathogens can enter the tree. The severance or damage of woody roots creates sites where pathogens may gain ingress. Whilst the effect of decay may not be immediately apparent, the long term health and structure of the tree will be compromised.

8.14. Comments

Comments generally relate to the suitability for retention. The comments allow for a brief notation of other factors relevant to the assessment of the tree.

9. Tree Location Plan

LEGEND

+101.45	Existing levels
+ RL 101.55	Proposed levels
+ TOW 101.55	Proposed Top Of Wall levels
—·—·—	Boundary
- - - - - - -	To be removed / demolished

———	Building
- - - - - - -	Building over
———	Retaining walls
- - - - - - -	Hydraulic lines SW

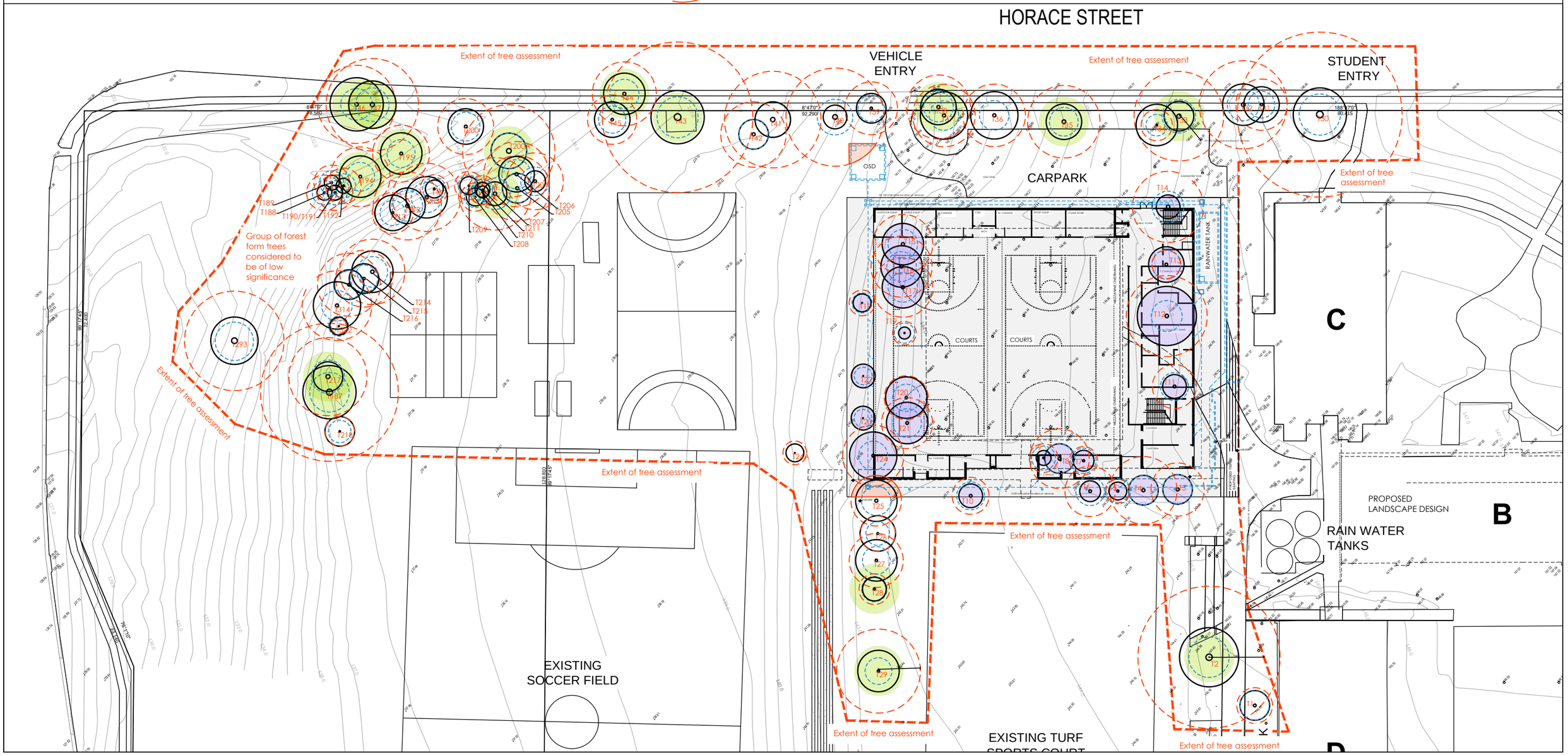
Indicative crown spread
Existing tree
Trunk diameter

Tree Protection Zone
Structural Root Zone

Assessed tree within development footprint

Cut - encroachment into Tree Protection Zone

Tree with highest retention value (Selected Medium and High significance)



REVISION	DESCRIPTION	DRAWN	CHECK	DATE
A	SUBMITTED TO CLIENT FOR COMMENT	DP	AM	26-10-18
B	SUBMITTED TO CLIENT FOR DA	DP	AM	19-11-18
C	SUBMITTED TO CLIENT FOR DA - Revised services	DP	AM	27-11-18

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PROYECT
ST IVES HIGH SCHOOL

CLIENT
JDH ARCHITECTS

PROJECT
NEW SPORTS COMPLEX

DRAWING
TREE LOCATION PLAN - DETAIL

SCALE	ISSUE	SHEET
N.T.S. @ A3	DA	T - 01

DRAWN	CHECK	DATE	REVISION
DP	AM	27-11-18	C

10. General Tree Protection Notes

10.1. Structural Root Zone (SRZ)

The SRZ is a radial area extending outwards from the centre of the trunk calculated as follows:

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

10.2. Tree Protection Zone (TPZ)

The TPZ is a radial area extending outwards from the centre of the trunk equal to the DBH x 12. This area shall be protected by a TPF (*see below*). For all trees to be retained a TPZ is to be created and maintained.

The TPZ function is primarily to protect the root zone by restricting access however the canopy of the tree shall also be protected from damage or injury. The Project Arborist shall approve the extent of the TPZ.

The TPZ shall be mulched to a depth of 75mm with an approved organic mulch. Supplementary watering shall be provided in dry periods to reduce water or construction stress, particularly to those trees which may have incurred root disturbance.

An area equivalent to the encroachment is required to be provided (additional to and contiguous with the remaining TPZ) to offset against the encroachment. This additional area is to be protected during construction.

In the TPZ the following activities shall be excluded:

- Excavation, compaction or disturbance of the existing soil.
- The movement or storage of materials, waste or fill.
- Movement or storage of plant, machinery, equipment or vehicles.
- Any activity likely to damage the trunk, crown or root system.
- Scaffolding.

10.3. Tree Protection Fencing (TPF)

Prior to site establishment, tree protection fencing shall be installed to establish the TPZ for trees to be retained. Tree protection fencing shall be maintained entire for the duration of the construction program.

Tree protection fencing shall be:

- To enclose as much of the TPZ as can reasonably be enclosed, allowing for pedestrian access and 1m offset around construction footprint and scaffolding.
- Cyclone chain link wire fence or similar, with lockable access gates.
- Certified and Inspected by the Project Arborist
- Installed prior to the commencement of the works.
- Prominently signposted with 300mm x 450mm boards stating "**NO ACCESS TO THIS AREA - TREE PROTECTION ZONE CONTACT PROJECT ARBORIST 0407 006 852**".

10.4. Trunk and Root Zone Protection

Other measures may be required in addition to tree protection fencing. These specific protection measures will be installed as directed by the Project Arborist to protect the canopy, trunk or branches from the risk of damage.

The Project Arborist shall be consulted if there is risk of damage to a retained tree. The Project Arborist may require:

- A 75mm layer of approved mulch to be installed to the TPZ.
- A temporary drip irrigation system to be installed to the TPZ.
- Additional root protection to be installed.
- Additional trunk and branch protection to be installed.

10.5. Tree Damage

In the event of damage to a tree or the TPZ of a tree to be retained the Project Arborist shall be engaged to inspect and provide advice on remedial action. This should be implemented as soon as practicable and certified by the Project Arborist.

10.6. Excavation within the TPZ

Excavation within the TPZ shall be avoided. All care shall be undertaken to preserve tree root systems. Excavation within the canopy drip line or TPZ shall subject to the approval and supervision of the Project Arborist. Excavation shall be executed by hand to avoid damage to roots.

If excavation within the TPZ is required other than that anticipated in this report the Project Arborist shall be notified. A root mapping exercise may be required and should be certified by the Project Arborist. Root mapping shall be undertaken by either ground penetrating radar (GPR), air spade, water laser or by hand excavation. The purpose shall be to locate woody structural roots greater than 50mm in diameter.

Where roots 50mm dia. or greater are encountered, alternative construction method shall be considered to ensure roots are not severed. Adequate allowance must also be made for future radial root growth. In paved areas, consideration should be given to raising the proposed pavement level and using a porous fill material in preference to excavation.

If there is no avoiding placing services through the TPZ excavate outside the TPZ and underbore below the root ball of the tree as directed by the Arborist.

10.7. Fill

All fill material to be placed within the TPZ should be approved by Arborist and equal to 5-7mm Round River Pea Gravel to provide aeration and percolation to the root zone. Otherwise no fill should be placed within the TPZ of trees to be retained.

10.8. Pavements

Proposed paved areas within the TPZ should be placed on or above grade to minimise excavation, and avoid root severance and/or damage. Pavements should be permeable or avoided otherwise.

10.9. Pruning

All pruning work required (including root pruning) should be in accordance with Australian Standard No *4373 -2007 - Pruning of Amenity Trees*.

If required, roots should be severed with clean sharp implement flush with the face of the excavation and maintained in a moist condition. Root pruning shall be performed under the supervision of the Project Arborist.

10.10. Tree Removal

Tree removal work shall be carried out by an experienced Level 3 Arborist in accordance with the NSW Work Cover Code of Practice for the Amenity Tree Industry (1998).

Care shall be taken to avoid damage to trees during the felling operation. Stumps shall be grubbed-out using a mechanical stump grinder to a minimum depth of 300mm without damage to other retained root systems.

10.11. Post Construction Maintenance

In the event of any tree deteriorating in health after the construction period, the Project Arborist shall be engaged to provide advice on any remedial action. Remedial action shall be implemented as soon as practicable and certified by the Project Arborist.

Tree protection fencing with additional trunk and root protection shall be removed following completion of construction. The mulch layer in the TPZ shall be retained and replenished where required to maintain a 75mm thickness.

11. References

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