



ST. IVES INDOOR SPORTS COMPLEX

ARBORICULTURAL IMPACT ASSESSMENT

PREPARED FOR:

JDH ARCHITECTS

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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 forty-five trees in accordance with AS4970 – 2009, *Protection of trees on development sites*. Five of these trees have not been assigned numbers.

This report collates and presents information collected by David Prieto on the 18/10/18 & 22/07/2020. The data collected is located at **7. Tree Survey Table** (page 19) also see **8. Tree Survey Table Notes** (page 25) 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. The existing surveyed trees are shown at **9. Tree Location Plan** (page 29).

The proposed development will involve the construction of a Sport Complex with carparking levels adjacent to an existing under construction sport complex building with associated retaining walls to the south and a driveway and pedestrian access to the west on Horace Street. There are associated paths, paving, retaining walls and services. The extent of site works is also illustrated. The extent of site works is also illustrated at **9. Tree Location Plan** (page 29).

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	-	187	-	-
	Medium	44, 46, 194, 195, 217 & 293	-	43(M-H), 207 & 214	41
	Low	45, 47, 188, 189, 190, 191, 192, 197, 200, 209, 210, 211, 213, 216, 218, 314 & 322	200A, 208, 212, 215,	26, 39(L-M), 203, 204, 205, 206	40(L-M), 42(L-M)
	Total Number of trees	23	5	9	3

There are an additional 5 trees not assigned numbers within the development. They are very likely to be of Low Significance.

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 39, 40, 41, 42, 203 & 207 if the development is approved as there is an unsustainable major encroachment into the tree protection zone.
- The removal of 5 juvenile trees located within the building footprint if the development is approved as there is an unsustainable major encroachment into the tree protection zone.
- The replacement planting of a number of locally native canopy trees shall be installed in 25L pot size to offset the loss of trees on site. Trees species as *Syncarpia glomulifera*, *Eucalyptus pilularis* and *Eucalyptus paniculata* should be considered as they are indigenous to the local vegetation or as recommended by the Ecologists. Final tree replacement number and locations to be determined by Council in liaison with the School and Bushfire Consultants to comply with APZ requirements.
- The retention of Tree No.'s 44, 45, 46, 47, 188, 189, 190, 191, 192, 194, 195, 197, 200, 209, 211, 213, 216, 217, 218, 293, 314 & 322. The construction will not impact these trees.
- The retention of all other trees located outside of the assessed area.
- The retention of Tree No.'s 187 & 215. The construction will provide a minor encroachment into the tree protection zone.
- The retention of Tree No.'s 208, 210 & 212. The following should be implemented:
 1. TPF and Ground Protection will be required to minimise soil compaction and root damage from machinery used for excavation for retaining wall footing.
 2. Scaffolding width should be minimised to avoid excessive crown pruning to achieve clearance.
 3. Minor pruning will be required to accommodate construction operations and built structure.
- The retention of Tree No. 200A: The construction will provide a minor encroachment into the tree protection zone. The underbored Stormwater discharge pipe is to be installed at a minimum of 700mm under existing ground levels in the TPZ and outside the SRZ and 1000mm under existing ground levels within the SRZ.
- The retention of Tree No. 26. Foot path construction should be entirely at grade, requiring no excavation and only consolidation of sub-base, especially within the TPZ.
- The retention of Tree No's 43 & 214. The following should be implemented to minimise impact to the trees.
 1. Earthworks drawings should be modified to show only existing levels outside of the driveway and crossover footprint.
 2. The area of cut/fill near proposed footpath should be deleted.
 3. Foot path construction should be entirely at grade, requiring no excavation except where unavoidable to achieve transition to the car parks, constructed of asphalt requiring consolidation of sub-base, not compaction, especially within the TPZ.
 4. No other design elements or services requiring trenching is to be located within the TPZ. The current levels and soil permeability are to be maintained and soil compaction avoided during construction.
 5. A Construction Management Plan should be prepared that shows construction operations should be restricted to the driveway and building footprints.
 6. Where this is unavoidable, no construction operations, materials/waste storage, movement of pedestrians, vehicles or machinery should take place outside a 1.0m offset from proposed driveway, path or building footprint for construction.
 7. Tree Protection Fencing (TPF) should be installed to protect the maximum achievable TPZ area plus an additional offset area to the south as per AS4970-2009 to create a Tree Protection Exclusion Zone.

8. An 75mm organic coarse woody mulch, to maximise the gas and water exchange and promote soil and tree health should be installed throughout the fenced TPF Exclusion Zone as specified by Council's approval conditions. This is the single most efficient practice to enhance the biological health, structure, texture and nutrient availability of soil to promote root re-growth and establishment and long-term tree viability. The mulch should not be placed against the tree trunk.
 9. The final cut of roots should result in a clean cut, using appropriate tools, under the project arborist. Severing roots by earthmoving equipment is unacceptable as this results in tearing damage to roots, putting the tree at greater risk of root decay and/or structural instability.
- The retention of Tree No. 208. The construction will provide a major but sustainable impact into the tree protection zone.
 - The retention of Tree No. 204. Earthwork and construction elements are addressed as outlined above in Trees 43 & 214, points 1-4; the underbored Stormwater discharge pipe is to be installed at a minimum of 700mm under existing ground levels in the TPZ and outside the SRZ and 1000mm under existing ground levels within the SRZ.
 - The retention of Tree No.'s 205 & 206. The path, earthwork and construction elements are addressed as outlined above in Tree 43, points 1-6; and the underbored Stormwater discharge pipe is to be installed at a minimum of 700mm under existing ground levels in the TPZ and outside the SRZ and 1000mm under existing ground levels within the SRZ.
 - All excavation required to install the path within the SRZ of Trees 204 & 205 must be carried out by hand and under project arborist supervision. If major woody roots are found, the path levels should be modified to accommodate them without damage.
 - Revised bulk earthworks plans should be prepared consistent with the recommendations in this report and the impact to trees included in the revised AIA.
 - Generally, no additional elements requiring fill or cut are to be installed within the TPZ of any retained tree. The current levels and soil permeability are to be maintained and soil compaction avoided. Any additional or alternative built form, landscape element or service installation design within the TPZ of all retained trees should be carried out in liaison with the project arborist.
 - This arboricultural impact assessment (AIA) should be revised upon the preparation of stormwater, landscape, revised architectural plans.
 - Following approval of final plans, a Tree Protection Plan prepared by a minimum AQF Level Arborist should include the following: i) construction final design and methodology ii) Tree Protection barrier installation and iii) Project Arborist supervision/direction as necessary to protect the trees during construction works (including excavation/construction/fill within TPZ of retained trees providing a major encroachment). The plan should be prepared following provision of a CMP (Construction Management Plan) and/or TMP (Traffic Management Plan), in liaison with Construction plans and consistent with any conditions of consent and AS4970 (2009), sections 4 & 5.
 - Any earthworks within the TPZ of retained trees should be carried out under project arborist supervision by first excavating a narrow trench to the depth required by hand or equivalent. Severing roots by earthmoving equipment is unacceptable.
 - Additional ground/root, trunk and branch protection may be required where tree protection fencing is impractical.
 - For additional tree protection information see **6. Tree management Plan** (page 15) and **10. General Tree Protection Notes** (page 33).

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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 forty-five trees in accordance with AS4970 – 2009, *Protection of trees on development sites*. Five of these trees have not been assigned numbers.

This report collates and presents information collected by David Prieto on the 18/10/18 & 22/07/2020. The data collected is located at **7. Tree Survey Table** (page 19) also see **8. Tree Survey Table Notes** (page 25) 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 Andrew Morrison - 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.
- Defects such as cambial damage, cracks, decay or hollows may be present which are not visible from the ground. This report does not include an aerial survey of the crown.
- Defects such as root damage, cracks or decay may be present under the ground. This report does not include any subterranean survey of the root plate.
- 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.

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 **7. Tree Survey Table** (page 19). 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 25).

The physical data for tree locations, crown width and DRB is schematically described in **9. Tree Location Plan** (page 29).

2.5. Reference Documents

The report was written in coordination with:

- Survey Plan prepared by CMS Surveyors Pty Ltd Revision 2, dated 03/07/2020.
- Architectural Site Plan, Basement, Lower Ground Floor, Ground Floor, Elevations prepared by JGH Architects Revision A, dated 08/04/21, 13/04/21.
- Bulk Earthworks Plan DA3.01, Siteworks and Stormwater Management Plan DA4.01 by Northrop Revision 1, dated 27/04/21.
- Landscape Plan by Space Landscape Designs, Revision F, dated 09/04/21.
- Flora and Fauna Assessment Report by SLR Consulting Australia Pty Ltd.
- Bush Fire Assessment Report by Building Code & Bushfire Hazard Solutions Pty Ltd.
- The Australian Standard for the Protection of Trees on Development Sites (AS 4970 – 2009).

2.6. Council Tree Preservation Regulatory Controls

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 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 of botanical interest; Is it included in a significant tree register or listed as a heritage item under the Federal State or Local Regulations?
2. Is the tree visually prominent in the locality?
3. Is the tree well structured?
4. Is the tree in good health and/or does it display signs of good vigour?
5. Is the tree typically formed for the species?
6. 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, car parks, paved areas, paths turf areas, sport fields and gardens. A sport complex building is under construction to the north. There was no evidence of recent earthworks outside of the construction site fenced area to the north. The site has a general southerly aspect.

3.2. Soil Landscape Map

The soils in this area are from the erosional Glenorie soil landscape group³. 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 valleys³.

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

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. eugenioides* 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 variable* and *Echinopogon ovatus*. Other frequently recorded species include *Entolasia marginata*, *Pratia purpurascens*, *Dianella longifolia*, *Arthropodium 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. The existing surveyed trees are shown at **9. Tree Location Plan** (page 29).

3.5. Summary of Proposed Development

The proposed development will involve the construction of a Sport Complex with carparking levels adjacent to an existing recently constructed St Ives High School Hall with associated retaining walls to the south and a driveway and pedestrian access to the west on Horace Street. There are associated paths, paving, retaining walls and services. The extent of site works is also illustrated. The extent of site works is also illustrated at **9. Tree Location Plan** (page 29).

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.

TREE LANDSCAPE SIGNIFICANCE	ENCROACHMENT WITHIN TPZ				
	Numbering of trees as shown on Tree Location Plan				
		No Impact	Minor Encroachment (<10% of TPZ)	Major Encroachment (>10% of TPZ)	Within Development Footprint
	High	-	187	-	-
	Medium	44, 46, 194, 195, 217 & 293	-	43(M-H), 207 & 214	41
	Low	45, 47, 188, 189, 190, 191, 192, 197, 200, 209, 210, 211, 213, 216, 218, 314 & 322	200A, 208, 212, 215,	26, 39(L-M), 203, 204, 205, 206	40(L-M), 42(L-M)
	Total Number of trees	23	5	9	3

There are an additional 5 trees not assigned numbers within the development. They are very likely to be of Low Significance.

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 CMS Surveyors Pty Ltd Revision 2, dated 03/07/2020. 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.

Proposed Development

We understand footings for retaining walls for the carpark and driveway will have returns within the retained footprint. Therefore, no offset to accommodate the toe of footings has been assumed in this assessment.

We understand the top of the underboring borehole for 225mm discharge pipes is proposed to be a minimum of 700mm below existing surfaces. This should be deepened to 1000mm under SRZ of retained trees.

The proposed building is located immediately adjacent and to the north and east of a dense vegetated area. No construction management plan has been provided, however it is anticipated that an additional areas directly adjacent to the building and/or within the school grounds will be required to allow i) installation of scaffolding for the construction building and roof, ii) installation of storage, waste and site office/shed buildings and iii) movement of materials, machinery and workers. A construction

approach should be implemented similar to the one used for the construction of high-rise buildings occupying the entire layout footprint of the construction site where access is limited to one side of the building; i.e. construction works near trees should be solely carried out from within the building/carpark footprint layout.

4.1. Trees with a Minor TPZ Encroachment

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

- Tree 187 is located 9.52m from proposed carpark retaining wall, providing a minor (3.0%) cut encroachment into the TPZ. This high significance tree should be retained and protected.

This is considered to be a low level of impact and sustainable by the tree.

It is proposed to be retained.

- Tree 200A will be underbored 225mm dia discharge pipe at greater than 700mm depth under SRZ and TPZ. This medium significance tree is suitable for retention.

Detailed drawings should indicate a minimum depth of 1000mm within the SRZ and where possible elsewhere within the TPZ. If this depth is ensured, it is considered to be a negligible level of impact and sustainable by the tree.

It is proposed to be retained.

- Tree 208 is located 1.89m from the proposed column footing and building providing a minor (4.4%) cut encroachment into the TPZ. This low significant tree is in good health. Pruning of lower crown is anticipated to allow construction works. This tree is of low significance, however it is proposed to be retained.

This is considered to be a low level of impact and sustainable by the tree.

If it is retained, the following should be implemented:

1. TPF and Ground Protection will be required to minimise soil compaction and root damage from machinery used for excavation for retaining wall footing.
2. Scaffolding width should be minimised to avoid excessive crown pruning to achieve clearance.

- Tree 212 is located 1.15m proposed carpark retaining wall providing a minor (9.7%) cut encroachment into the TPZ. Pruning of lower crown is anticipated to allow construction works. This tree is of low significance, however it is proposed to be retained.

If it is retained, the following should be implemented:

1. TPF and Ground Protection will be required to minimise soil compaction and root damage from machinery used for excavation for retaining wall footing.
2. Scaffolding width should be minimised to avoid excessive crown pruning to achieve clearance.

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 26 is located 1.45m from proposed path providing 17.9% major encroachment within TPZ and encroachment within the SRZ. This tree is considered to be of low significance, however it is proposed to be retained.

To retain and protect this tree, foot path construction should be entirely at grade, requiring no excavation and only consolidation of sub-base, especially within the TPZ.

It is proposed to be retained.

- Tree 39 is located 0.19m from the proposed entry pedestrian access and associated retaining walls, providing a major encroachment (44.5%) within the TPZ and encroachment within SRZ. Likely to be within public path connection opposite the pedestrian entrance. This tree is considered to be of low to medium significance and should not be a constraint to development. It cannot be retained if the plans are approved in their current form.

It is proposed to be removed.

- Tree 43 is located 6.36m from the proposed carpark and 7.94m from the proposed driveway/crossover, providing a major (25.9%) cut encroachment into the TPZ. It is 7.59m from proposed cut area shown on bulk earthworks drawing, providing 2.2% encroachment. Total of 27.2%. This tree is in good health, good structure, is considered to be of medium to high significance and should be retained and protected. This species is considered to be moderately tolerant of construction impacts.

It appears that 0.5-1.0m of fill has previously been placed around 40% of the TPZ to produce a levelled grassed playground surface. It is unknown to what extent functional absorption and connecting roots from this tree have proliferated in that area, since then.

When considered in isolation, the encroachment of the **drive and crossover** would provide a moderate to high impact and is considered sustainable as the tree showed good vigour at the time of the inspection. This would be considered the maximum impact tolerable by this tree. Construction methodology to protect the tree and tree care is recommended to optimise the tree's recovery from root loss.

The **asphalt pathway design levels** were developed in liaison with Arboreport to minimise excavation impact to this tree and Tree 204. It provides a low impact when considered in isolation.

The **excavation for earthworks** provides a low impact when considered in isolation.

However, the **cumulative impact** is considered to be a high and unsustainable impact.

The following should be implemented to retain and protect the tree in accordance with the Australian Standard AS4970-2009 *Protection of trees on development sites*:

1. Earthworks drawings should be modified to show only existing levels outside of the driveway and crossover footprint; ie, The area of cut/fill near proposed footpath should be deleted.
2. Foot path construction should be entirely at grade, requiring no excavation except where necessary to achieve transition at each end to the front and main car parks, respectively. An asphalt construction will allow for a flexible design to accommodate structural tree roots if found within SRZ of T204 and T205 and only consolidation of sub-base, especially within the TPZ.
3. No other design elements or services requiring trenching is to be located within the TPZ. The current levels and soil permeability are to be maintained and soil compaction avoided during construction.
4. No construction operations, materials storage, movement of pedestrians, vehicles or machinery should take place outside a 1.0m offset from proposed driveway, path or building footprint. This offset area is likely to be required for construction. The ground in this area should be protected by appropriate covering to protect the soil from compaction prior to commencement of works on site.
5. Tree Protection Fencing (TPF) should be installed to protect the maximum achievable TPZ area plus an additional offset area to the south as per AS4970-2009 to create a Tree Protection Exclusion Zone.
6. An 75mm organic coarse woody mulch, to maximise the gas and water exchange and promote soil and tree health should be installed throughout the fenced TPF Exclusion Zone as specified by Council's approval conditions. This is the single most efficient practice to enhance the biological health, structure, texture and nutrient availability of soil to promote root re-growth and establishment and long-term tree viability. The mulch should not be placed against the tree trunk.
7. The final cut of roots should result in a clean cut, using appropriate tools, under the project arborist. Severing roots by earthmoving equipment is unacceptable as this results in tearing damage to roots, putting the tree at greater risk of root decay and/or structural instability.

This tree is proposed to be retained.

- Tree 203 is located 1.65m from excavation for proposed carpark retaining wall providing a major 19.9% cut encroachment into the TPZ and encroachment within SRZ. This tree is considered to be of low significance and should not be considered a constraint on the development.

It is proposed to be removed.

- Tree 204 is located 4.2m from excavation for proposed carpark/ basement providing a minor (0.7%) cut encroachment into the TPZ. Major 0-500mm fill encroachment 34% indicated in bulk earthwork drawing. A proposed path encroaches within the TPZ. A proposed underbored 225mm dia discharge pipe at >700mm depth under TPZ. This tree is considered to be of low significance and should not be considered a constraint on the development, however it is proposed to retain this tree.

All excavation required to install the path within the SRZ of this tree and Tree 205, must be under project arborist supervision.

It can be retained if the path, earthwork and construction elements are addressed as outlined above in Tree 43, points 1-4; and the underbored Stormwater discharge pipe

is installed at a minimum of 700mm under existing ground levels in the TPZ and outside the SRZ and 1000mm under existing ground levels within the SRZ.

- Trees 205 & 206 are located 3.19m and 5.5m from the proposed carpark (and stairs) to southwest, providing a 13.3% and 2.5% cut encroachment into the TPZ respectively. Major 0-500mm 24% and 15% respectively fill encroachment indicated in bulk earthwork drawing. Underbored 225mm dia discharge pipe at >700mm depth under SRZ and TPZ. These trees are considered to be of low significance, however they are proposed to be retained.

They can be retained if the path, earthwork and construction elements are addressed as outlined above in Tree 43, points 1-6; and the underbored Stormwater discharge pipe is installed at a minimum of 700mm under existing ground levels in the TPZ and outside the SRZ and 1000mm under existing ground levels within the SRZ.

All excavation required to install the path within the SRZ of Tree 205, must be under project arborist supervision.

These low significance trees are proposed to be retained.

- Tree 207 is located 2.22m from the proposed stair well and car park retaining wall providing a major (24.3%) cut encroachment into the TPZ, and encroachment into the SRZ. Major 0-500mm (10%) fill encroachment indicated in bulk earthwork drawing. Underbored 225mm dia discharge pipe at >700mm depth under SRZ and TPZ. This tree is considered to be of medium significance. This tree has a bark wound and somewhat sparse crown.

The encroachment from the car park retaining wall footing impact will provide a high and unsustainable impact. If this tree was to be retained, extensive redesign of the proposed carpark and building layout would be required.

It is proposed to be removed and replaced.

- Tree 214 is located 2.62m from proposed carpark retaining wall, providing major (19.1%) cut encroachment into the TPZ. Crown overhangs the proposed carpark. This tree is considered to be of medium significance, it is in good health and average structure and is suitable for retention.

While this is a major encroachment, this would provide a moderate level of impact which is sustainable by the tree, if undertaken in a manner that minimises impact to the tree. In accordance with the Australian Standard AS4970-2009 *Protection of trees on development sites* the following should be provided. Specifically;

That the construction elements are addressed as outlined above in Tree 43, points 4-8.

This tree is proposed to be retained.

4.3. Trees within the development footprint

- Trees 40, & 42 are located within the proposed pedestrian connecting path and driveway/crossover. These trees are considered to be of low-medium significance. Consideration has been given by the client to modify the driveway and path location and retain these trees, however, locating it further south would increase the impact to Tree No. 43 to an unsustainable level. We understand a driveway installed south of Tree 43 TPZ would be unfeasible due to steep grades.

Extensive redesign of the proposed driveway layout would be required to retain these trees. They cannot be retained if the development is approved in its current form.

They are proposed to be removed and replaced.

- Tree 41 is located within the proposed driveway/crossover. This tree is considered to be of medium significance and are suitable for retention. Consideration has been given by the client to modify the driveway and path location and retain this tree, however, locating it further south would increase the impact to Tree No. 43 to an unsustainable level. We understand a driveway installed south of Tree 43 TPZ would be unfeasible due to steep grades.

Extensive redesign of the proposed driveway layout would be required to retain these trees. They cannot be retained if the development is approved in its current form.

It is proposed to be removed and replaced.

- 5 additional trees are indicated on the demolition plan for removal. They are located within the proposed building footprint (not assigned numbers). Arboreport has not assessed these trees. We understand these have been planted within the last 24 months as part of an adjacent school development. These juvenile/newly planted trees will be of low significance and will need to be removed if the current plans are approved.

4.4. Other Tree Comments

- Trees 44, 45, 46, 47, 188, 189, 190, 191, 192, 194, 195, 197, 200, 209, 210, 211, 213, 216, 217, 218, 293, 314 & 322 are located in positions that will allow their retention without impact from the proposed development. We note Tree 210 may have impacts from construction operations (soil compaction from construction workers and machinery access and operation).
- 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 39, 40, 41, 42, 203 & 207 if the development is approved as there is an unsustainable major encroachment into the tree protection zone.
- The removal of 5 juvenile trees located within the building footprint if the development is approved as there is an unsustainable major encroachment into the tree protection zone.
- The replacement planting of a number of locally native canopy trees shall be installed in 25L pot size to offset the loss of trees on site. Trees species as *Syncarpia glomulifera*, *Eucalyptus pilularis* and *Eucalyptus paniculata* should be considered as they are indigenous to the local vegetation or as recommended by the Ecologists. Final tree

replacement number and locations to be determined by Council in liaison with the School and Bushfire Consultants to comply with APZ requirements.

- The retention of Tree No.'s 44, 45, 46, 47, 188, 189, 190, 191, 192, 194, 195, 197, 200, 209, 211, 213, 216, 217, 218, 293, 314 & 322. The construction will not impact these trees.
- The retention of all other trees located outside of the assessed area.
- The retention of Tree No.'s 187 & 215. The construction will provide a minor encroachment into the tree protection zone.
- The retention of Tree No.'s 208, 210 & 212. The following should be implemented:
 4. TPF and Ground Protection will be required to minimise soil compaction and root damage from machinery used for excavation for retaining wall footing.
 5. Scaffolding width should be minimised to avoid excessive crown pruning to achieve clearance.
 6. Minor pruning will be required to accommodate construction operations and built structure.
- The retention of Tree No. 200A: The construction will provide a minor encroachment into the tree protection zone. The underbored Stormwater discharge pipe is to be installed at a minimum of 700mm under existing ground levels in the TPZ and outside the SRZ and 1000mm under existing ground levels within the SRZ.
- The retention of Tree No. 26. Foot path construction should be entirely at grade, requiring no excavation and only consolidation of sub-base, especially within the TPZ.
- The retention of Tree No's 43 & 214. The following should be implemented to minimise impact to the trees.
 10. Earthworks drawings should be modified to show only existing levels outside of the driveway and crossover footprint.
 11. The area of cut/fill near proposed footpath should be deleted.
 12. Foot path construction should be entirely at grade, requiring no excavation except where unavoidable to achieve transition to the car parks, constructed of asphalt requiring consolidation of sub-base, not compaction, especially within the TPZ.
 13. No other design elements or services requiring trenching is to be located within the TPZ. The current levels and soil permeability are to be maintained and soil compaction avoided during construction.
 14. A Construction Management Plan should be prepared that shows construction operations should be restricted to the driveway and building footprints.
 15. Where this is unavoidable, no construction operations, materials/waste storage, movement of pedestrians, vehicles or machinery should take place outside a 1.0m offset from proposed driveway, path or building footprint for construction.
 16. Tree Protection Fencing (TPF) should be installed to protect the maximum achievable TPZ area plus an additional offset area to the south as per AS4970-2009 to create a Tree Protection Exclusion Zone.
 17. An 75mm organic coarse woody mulch, to maximise the gas and water exchange and promote soil and tree health should be installed throughout the fenced TPF Exclusion Zone as specified by Council's approval conditions. This is the single most efficient practice to enhance the biological health, structure, texture and nutrient availability of soil to promote root re-growth and establishment and long-term tree viability. The mulch should not be placed against the tree trunk.
 18. The final cut of roots should result in a clean cut, using appropriate tools, under the project arborist. Severing roots by earthmoving equipment is unacceptable as this results in tearing damage to roots, putting the tree at greater risk of root decay and/or structural instability.
- The retention of Tree No. 208. The construction will provide a major but sustainable impact into the tree protection zone.

- The retention of Tree No. 204. Earthwork and construction elements are addressed as outlined above in Trees 43 & 214, points 1-4; the underbored Stormwater discharge pipe is to be installed at a minimum of 700mm under existing ground levels in the TPZ and outside the SRZ and 1000mm under existing ground levels within the SRZ.
- The retention of Tree No.'s 205 & 206. The path, earthwork and construction elements are addressed as outlined above in Tree 43, points 1-6; and the underbored Stormwater discharge pipe is to be installed at a minimum of 700mm under existing ground levels in the TPZ and outside the SRZ and 1000mm under existing ground levels within the SRZ.
- All excavation required to install the path within the SRZ of Trees 204 & 205 must be carried out by hand and under project arborist supervision. If major woody roots are found, the path levels should be modified to accommodate them without damage.
- Revised bulk earthworks plans should be prepared consistent with the recommendations in this report and the impact to trees included in the revised AIA.
- Generally, no additional elements requiring fill or cut are to be installed within the TPZ of any retained tree. The current levels and soil permeability are to be maintained and soil compaction avoided. Any additional or alternative built form, landscape element or service installation design within the TPZ of all retained trees should be carried out in liaison with the project arborist.
- This arboricultural impact assessment (AIA) should be revised upon the preparation of stormwater, landscape, revised architectural plans.
- Following approval of final plans, a Tree Protection Plan prepared by a minimum AQF Level Arborist should include the following: i) construction final design and methodology ii) Tree Protection barrier installation and iii) Project Arborist supervision/direction as necessary to protect the trees during construction works (including excavation/construction/fill within TPZ of retained trees providing a major encroachment). The plan should be prepared following provision of a CMP (Construction Management Plan) and/or TMP (Traffic Management Plan), in liaison with Construction plans and consistent with any conditions of consent and AS4970 (2009), sections 4 & 5.
- Any earthworks within the TPZ of retained trees should be carried out under project arborist supervision by first excavating a narrow trench to the depth required by hand or equivalent. Severing roots by earthmoving equipment is unacceptable.
- Additional ground/root, trunk and branch protection may be required where tree protection fencing is impractical.
- For additional tree protection information see **6. Tree management Plan** (page 15) and **10. General Tree Protection Notes** (page 33).

6. Tree Management Plan

6.1. Management Objectives:

The prioritisation of the following 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 on retained trees from construction;
4. To ensure the viability of retained trees after practical completion.

6.2. Tree Management Actions:

The above general tree management objectives are achieved by:

- Appointment of a Level 5 AQF Project Arborist experienced in managing trees on construction sites to prepare and certify a Tree Management Plan.
- The installation of a Tree Protection Fence to enclose and protect the TPZ.
- Installation of additional root, trunk and branch protection as required to protect retained trees where minor encroachments within the TPZ are anticipated.
- Supervision, monitoring, inspections and certification of tree protection as outlined in the Tree Management Plan.

6.3. Schedule of Hold Points, Inspections 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.

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

7. Tree Survey Table

No impact	Minor encroachment	Major encroachment - Sustainable	Within development footprint
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NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi- cance	Am	Eco	Form	Development Setback and Encroachment	Comments
26	<i>Eucalyptus</i>	<i>robusta</i>	Swamp mahogany	9	6	250			250	300	1996	3000	M	Av	F	L	L	M	CD	Located 1.45m from proposed path providing 17.9% major encroachment within TPZ and encroachment within the SRZ.	Exposed roots to NW & SE for 2m
39	<i>Eucalyptus</i>	<i>pilularis</i>	Blackbutt	8	5	340	150		372	390	2228	4464	M	G	Av	L-M	M	H	CD, CS	Located 0.19m from the proposed entry pedestrian access and associated retaining walls, providing a major encroachment (44.5%) within the TPZ and encroachment within SRZ. Likely to be within public path opposite entrance.	Crown skewed to north. Multi-trunked at 0.5m. On council verge
40	<i>Pinus</i>	<i>radiata</i>	Monterey Pine	11	6	650			650	700	2849	7800	M	P-F	AV	L-M	L-M	L	U	Within vehicular access footprint layout	Upper crown and lower crown sparse. Previous snap off of trunk at 9m. DW to 90mm. Stump of previously removed tree located 4m to south of base of trunk.
41	<i>Lophostemon</i>	<i>confertus</i>	Brush Box	11.5	6	680			680	760	2949	8160	M	G	Av	M	M	M	CD	Within vehicular access footprint layout	Crown partially modified to southeast
42	<i>Lophostemon</i>	<i>confertus</i>	Brush Box	10	5	460			460	510	2494	5520	M	G	F	L-M	M	M	CD, CS	Within vehicular access footprint layout	Crown heavily skewed to southeast
43	<i>Pinus</i>	<i>patula</i>	Mexican weeping pine	14	9	800	400	400	1059	1120	3471	12708	M	G	G	M-H	H	L	D, M	Located 6.36m from the proposed carpark and 7.94m from the proposed driveway/crossover, providing a major (25.9%) cut encroachment into the TPZ. 7.59 m from proposed cut area shown on bulk earthworks drawing, 1.3%. Total 27.2%.	-
44	<i>Eucalyptus</i>	<i>pilularis</i>	Blackbutt	14	7	450			450	500	2474	5400	M	G	G	M	M	H	D	No impact	On council verge
45	<i>Lophostemon</i>	<i>confertus</i>	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

No impact	Minor encroachment	Major encroachment - Sustainable	Within development footprint
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NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Significance	Am	Eco	Form	Development Setback and Encroachment	Comments
46	<i>Eucalyptus</i>	<i>pilularis</i>	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	<i>Eucalyptus</i>	<i>pilularis</i>	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
187	<i>Eucalyptus</i>	<i>grandis</i>	Rose Gum	22	9	970			970	1020	3337	11640	M	G	G	H	M	M	D	Located 9.52m from proposed carpark retaining wall, providing a minor (3.0%) cut encroachment into the TPZ	Altered bark for 0.4x1m to north at trunk base
188	<i>Melaleuca</i>	<i>quinquenervia</i>	Broad-leaved Paperbark		3	250			250	320	2051	3000	M	Av	F	L	L	M	CD	No impact	Group of trees
189	<i>Melaleuca</i>	<i>quinquenervia</i>	Broad-leaved Paperbark		3	250			250	320	2051	3000	M	Av	F	L	L	M	CD	No impact	Group of trees
190	<i>Melaleuca</i>	<i>quinquenervia</i>	Broad-leaved Paperbark		3	250			250	320	2051	3000	M	Av	F	L	L	M	CD	No impact	Group of trees
191	<i>Melaleuca</i>	<i>quinquenervia</i>	Broad-leaved Paperbark		3	250			250	320	2051	3000	M	Av	F	L	L	M	CD	No impact	Group of trees
192	<i>Melaleuca</i>	<i>quinquenervia</i>	Broad-leaved Paperbark		3	250			250	320	2051	3000	M	Av	F	L	L	M	CD	No impact	Group of trees
194	<i>Casuarina</i>	<i>cunninghamiana</i>	River Sheoak	16	7	420			420	480	2431	5040	M	G	Av	M	M	M	CD	No impact	Forest form. Buttressed at base
195	<i>Casuarina</i>	<i>cunninghamiana</i>	River Sheoak	16	7	400			400	450	2366	4800	M	G	Av	M	M	M	D	No impact	Ivy growing at base
197	<i>Corymbia</i>	<i>maculata</i>	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	<i>Lophostemon</i>	<i>confertus</i>	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

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	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi- cance	Am	Eco	Form	Development Setback and Encroachment	Comments
200A	Casuarina	cunninghamiana	River Sheoak	15	6	650			650	800	3013	7800	M	G	G	M	M	M	D	Underbored 225mm dia discharge pipe at >700mm depth under SRZ and TPZ.	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	Located 1.65m from excavation for proposed carpark retaining wall providing a major 19.9% cut encroachment into the TPZ and encroachment within SRZ.	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	Located 4.2m from excavation for proposed carpark/ basement providing a minor (0.7%) cut encroachment into the TPZ. Major 0-500mm fill encroachment 34% indicated in bulk earthwork drawing. Underbored 225mm dia discharge pipe at >700mm depth under TPZ.	Crown skewed to north
205	Corymbia	maculata	Spotted Gum	9	5	460			460	520	2515	5520	M	G	F	L	M	M	CD, CS	Located 3.19m from the proposed carpark to southwest, providing a major (13.3%) cut encroachment into the TPZ . Major 0-500mm (24%) fill encroachment indicated in bulk earthwork drawing. Underbored 225mm dia discharge pipe at >700mm depth under SRZ and TPZ.	Crown heavily skewed to east. 200mm in diameter pruning cut at 1.5m

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	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi- cance	Am	Eco	Form	Development Setback and Encroachment	Comments
206	Corymbia	maculata	Spotted Gum	13	6	460			460	500	2474	5520	M	G	F	L	L	M	CD	Located 5.5m from the proposed stairs & carpark to southwest, providing a minor (2.5%) cut encroachment into the TPZ. Major 0-500mm (15%) fill encroachment indicated in bulk earthwork drawing. Underbored 225mm dia discharge pipe at >700mm depth under SRZ and TPZ.	Forest form
207	Corymbia	maculata	Spotted Gum	12	4	510			510	590	2652	6120	M	G	Av	M	M	M	CD	Located 2.22m from the proposed stair well and car park retaining wall providing a major (24.3%) cut encroachment into the TPZ, and encroachment into the SRZ. Major 0-500mm (10%) fill encroachment indicated in bulk earthwork drawing. Underbored 225mm dia discharge pipe at >700mm depth under SRZ and TPZ.	Somewhat sparse crown, forest form. 50mm in diameter bark recently damaged at 1.2m to east
208	Casuarina	cunninghamiana	River Sheoak	10	3	200			200	230	1785	2400	M	Av	F	L	L	M	CD, CS	Located 1.89m from the proposed column footing and building providing a minor (4.4%) cut encroachment into the TPZ.	Forest form
209	Casuarina	cunninghamiana	River Sheoak	10	3	200			200	240	1817	2400	M	Av	F	L	L	M	CD	No impact	Forest form
210	Casuarina	cunninghamiana	River Sheoak	6	2	100	100	100	174	200	1683	2088	SM	Av	F	L	L	M	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

No impact	Minor encroachment	Major encroachment - Sustainable	Within development footprint
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NO#	Genus	Species	Common Name	Height	Spread	Trunk Dia	Trunk Dia 2	Trunk Dia 3	DBH	DRB	SRZ	TPZ	Age	Health	Crown	Signifi- cance	Am	Eco	Form	Development Setback and Encroachment	Comments
212	Casuarina	cunninghamiana	River Sheoak	15	6	480			480	560	2594	5760	M	Av	F	L	L	M	CD	Located 1.15m proposed carpark retaining wall providing a minor (9.7%) cut encroachment into the TPZ.	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	Located 2.62m from proposed carpark retaining wall, providing major (19.1%) cut encroachment into the TPZ. Crown overhang of development.	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	Located 3.97 from excavation for proposed carpark retaining wall, providing minor (6.5%) cut encroachment into the TPZ	One single crown with T214
216	Melaleuca	styhelioides	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	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
322	Eucalyptus	grandis	Rose Gum	5.5	3	110			110	200	1683	1320	SM	P	P	L	L	M	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 (m), Spread (m), Trunk Dia, DBH and DRB (mm)

- The tree's height and spread (diameter) 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. Structural Condition (Crown)

The structural 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 **2.7 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 tree's contribution to the environment. It is determined by the tree's 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, **(BC)** Bias Crown **(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) – Radius (mm)

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):

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

8.12. TPZ (Tree Protection Zone) – Radius (mm)

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

Tree Protection Zone

Indicative crown spread

Existing tree

Structural Root Zone

Trunk diameter

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

Assessed tree within development footprint

Cut - encroachment into Tree Protection Zone

Fill - encroachment into Tree Protection Zone

Tree recommended for removal in AIA report

The main site plan illustrates the proposed development for the St Ives Indoor Sports Complex. It features a large building footprint with internal room divisions and structural columns. Surrounding the building are various trees, each represented by a circle indicating its trunk diameter and a larger dashed circle for its tree protection zone. Some trees are marked with a green dot, signifying a high retention value. The plan also shows existing infrastructure, including Horace Street to the north, an existing carpark to the east, and an existing building to the southeast. Key features like a vehicle entry, driveway, and various tanks (rainwater, R/W) are labeled. The 'Extent of tree assessment' is outlined in red dashed lines. Annotations include 'Group of forest form trees considered to be of low significance' and 'Extent of tree assessment' in multiple locations.

REVISION	DESCRIPTION	DRAWN	CHECK	DATE
A	SUBMITTED TO CLIENT FOR COMMENT	DP	AM	25-07-20
B	SUBMITTED TO CLIENT FOR DA	AM	AS	29-04-21
C	SUBMITTED TO CLIENT FOR DA	AM	AS	29-04-21

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7. All work to be performed by a suitably qualified tradesperson

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PROJECT

ST IVES INDOOR SPORTS COMPLEX

CLIENT

JDH ARCHITECTS

PROJECT

ST IVES INDOOR SPORTS COMPLEX

DRAWING

TREE LOCATION PLAN - DETAIL

SCALE

N.T.S. @ A3

ISSUE

DA

SHEET

T - 01

DRAWN

AM

CHECK

AS

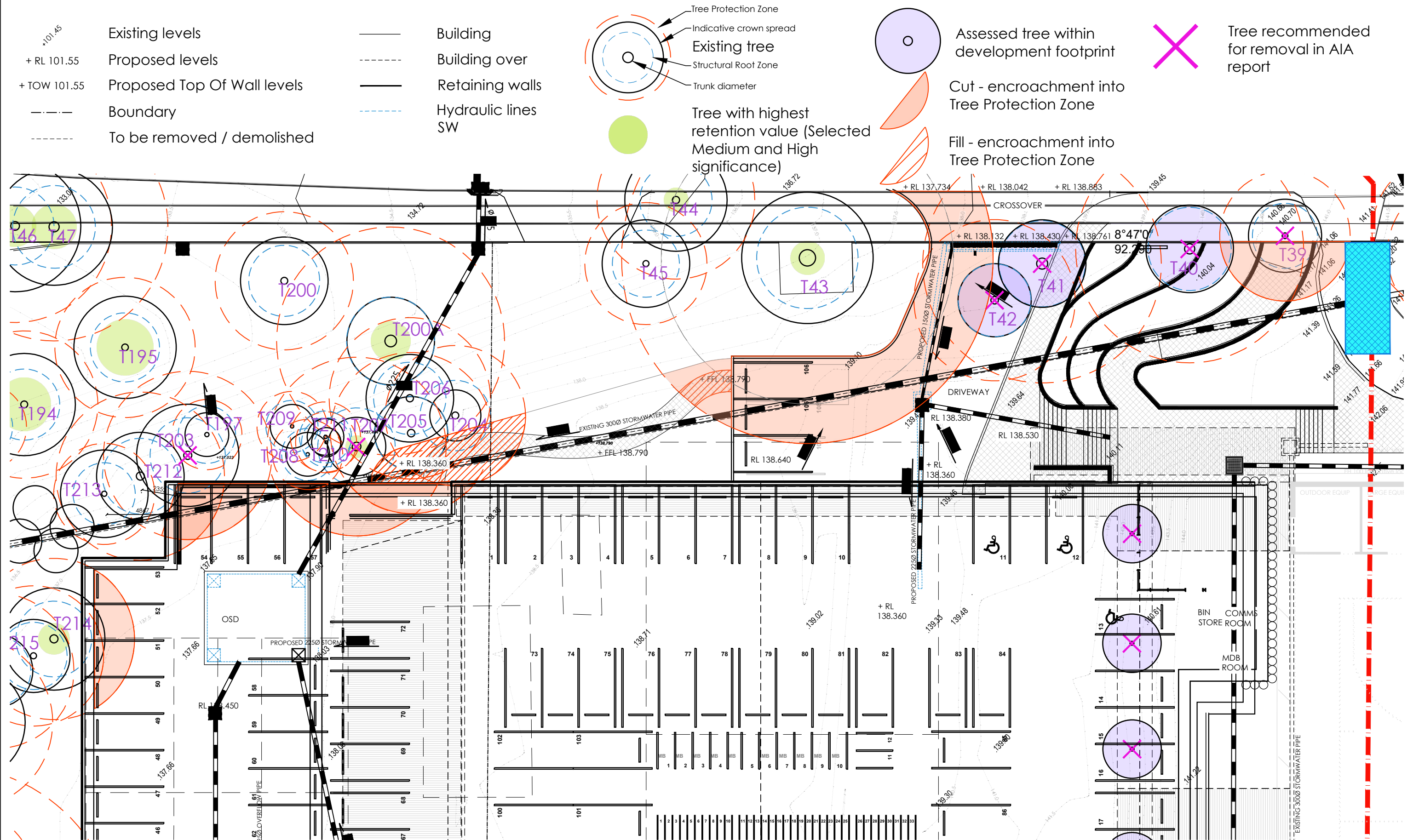
DATE

29-04-21

REVISION

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LEGEND



REVISION	DESCRIPTION	DRAWN	CHECK	DATE
A	SUBMITTED TO CLIENT FOR COMMENT	DP	AM	25-07-20
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PROJECT	ST IVES INDOOR SPORTS COMPLEX
CLIENT	JDH ARCHITECTS

PROJECT		ST IVES INDOOR SPORTS COMPLEX					
DRAWING		TREE LOCATION PLAN - DETAIL					
SCALE	N.T.S. @ A3	ISSUE	DA T - 02				
DRAWN	AM	CHECK	AS	DATE	29-04-21	REVISION	C

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

Tree Protection Zone

Indicative crown spread

Existing tree

Structural Root Zone

Trunk diameter

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

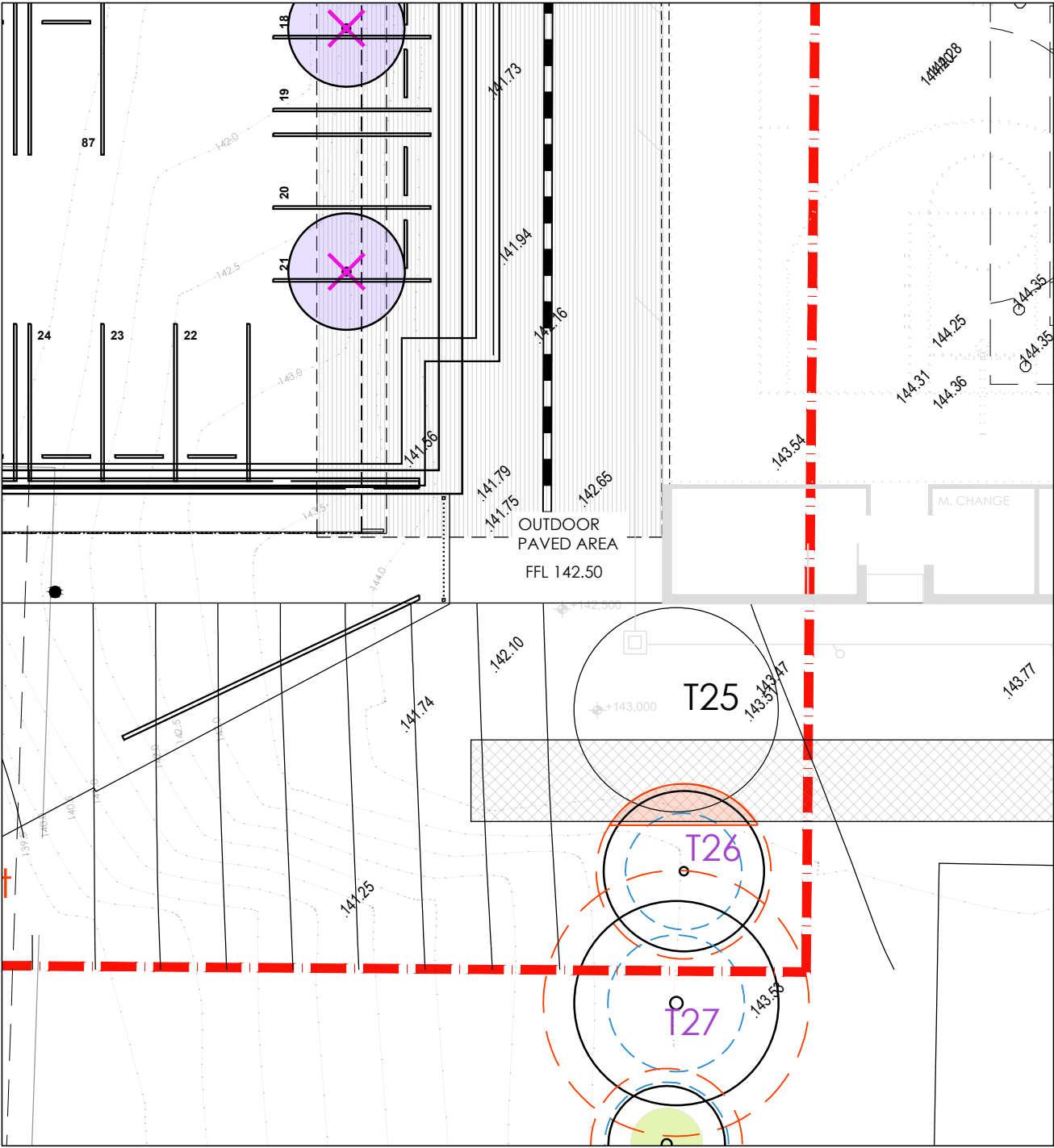
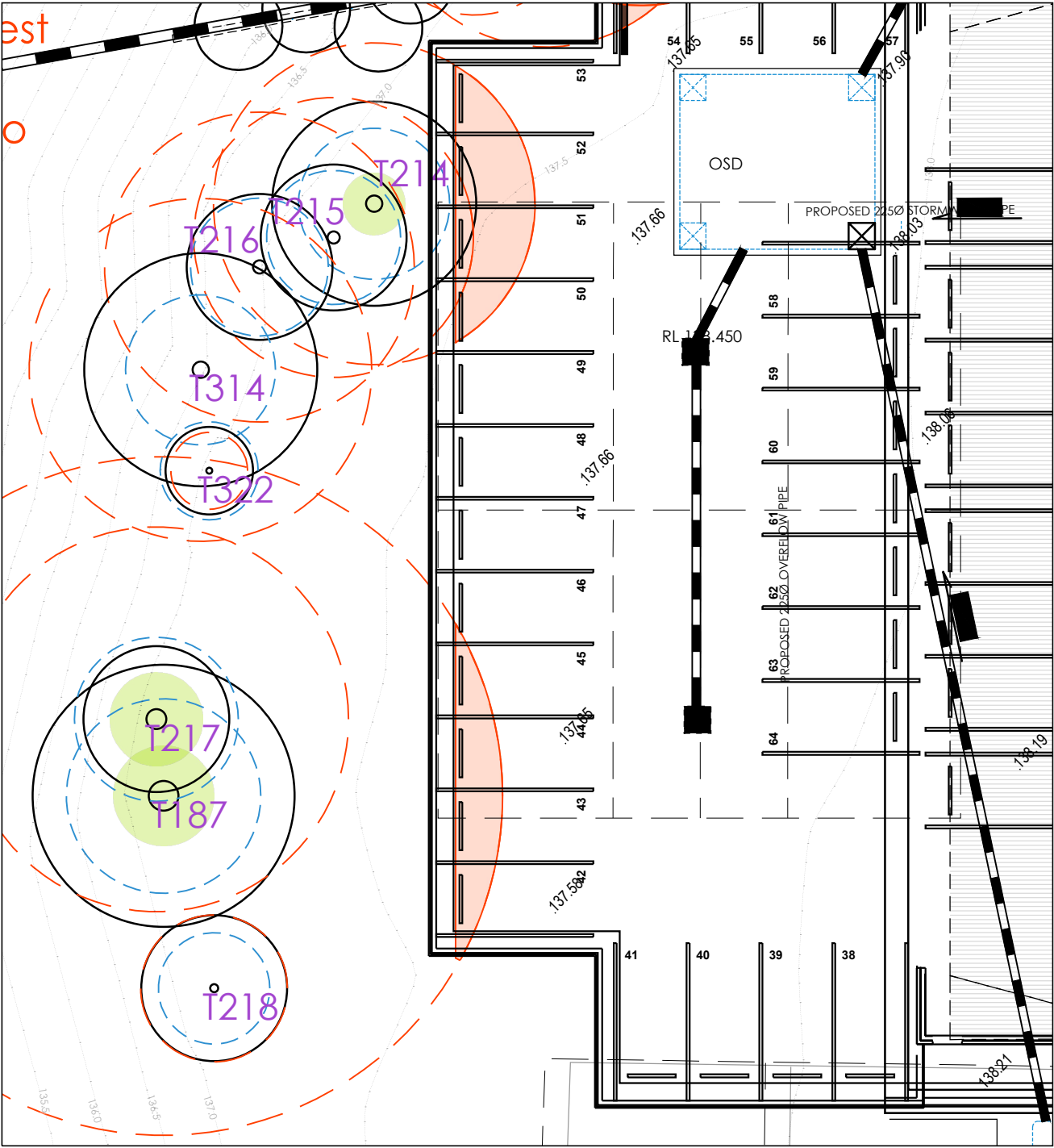
Assessed tree within development footprint

Cut - encroachment into Tree Protection Zone

Fill - encroachment into Tree Protection Zone

X

Tree recommended for removal in AIA report



REVISION	DESCRIPTION	DRAWN	CHECK	DATE
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PROJECT

ST IVES INDOOR SPORTS COMPLEX

CLIENT

JDH ARCHITECTS

PROJECT

ST IVES INDOOR SPORTS COMPLEX

DRAWING

TREE LOCATION PLAN - DETAIL

SCALE

N.T.S. @ A3

ISSUE

DA

SHEET

T - 03

DRAWN

AM

CHECK

AS

DATE

29-04-21

REVISION

B

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:

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

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, Lower Branches 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.

Trunk and lower branch protection may be required to alleviate mechanical damage to a height of 3m. The minimum trunk protection shall consist of an initial padding layer beneath and battens consistent with *The Australian Standard for the Protection of Trees on Development Sites (AS 4970 – 2009), Section 4 and paragraph 4.5.2 and Figure 4*. The battens shall consist of lengths of 100 x 50mm (or varied to accommodate risk and tree structure) timber boards secured side by side, spaced 50mm apart with galvanised steel banding for the full circumference of the trunk without driving nails or screws into the trunk or branches. Trunk protection should be installed prior to any site works, maintained throughout the construction program and removed post construction.

Root protection may be required if site access and construction activities will not be able to be excluded from the entire TPZ as the installation of the tree protection fence is not reasonably practicable. Installation of root protection prior to the commencement of works to prevent the damage to roots such as i) Rumble boards as per section 4.5.3 - Ground protection and Figure 4 of AS4970 Protection of trees on development sites; or ii) construction of the above ground driveway.

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.

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 TPZ shall subject to the approval and supervision of the Project Arborist.

Excavation shall be executed by hand to avoid damage to roots by first excavating a narrow trench to the depth required. This will allow the location of woody structural roots greater than 40mm which can then be retained intact as necessary or pruned cleanly by and AQF level 3 Arborist or Horticulturalist. Final cut of roots should result in a clean cut, using appropriate tools as prescribed by the Australian Standard AS4970-2009 *Protection of trees on development sites*.

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 40mm in diameter.

Where roots 40mm 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*. A Pruning Specification Report may be required if pruning works are proposed.

Roots should be severed with clean sharp implement flush with the face of the excavation and maintained in a moist condition. Severing roots by earthmoving equipment is unacceptable as this results in tearing damage to roots, putting the tree at greater risk of root decay and/or structural instability. Root pruning shall be performed under the supervision of the Project Arborist.

If required, 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 as required.

Whilst work is being carried out by climbing arborists (AQF Level 3) an aerial inspection of stems, branches and their attachments should be made. 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.

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.

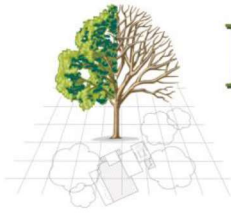
10.11. Post Construction Maintenance

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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22 November 2021

JDH Architects
44 Little Oxford Street
Darlinghurst NSW 2010

TREE MANAGEMENT STATEMENT:
St Ives High School, 88 Yarrabung Rd, St Ives, NSW

This letter has been commissioned by JDH Architects to discuss the tree protection during the proposed building works and service installation associated with the new Indoor Sports Complex. An arborist site visit or tree inspection was undertaken on the 1 November 2021 prior to the commencement of the building works.

The subject trees had been included within an earlier Arboricultural Impact Assessment (Report) - DA Issue, compiled by Arboreport dated 6 May 2021. This letter is to be read in conjunction with this earlier report, which provides preliminary information on dimensions and protection of the subject trees.

Following my site inspection and a review of the proposed electrical diagrams it appears that the services for the new building will be connected though the newly built School Hall. If this is the case, I can confirm that no trees other than those in the original report will be impacted by this proposed development. Trees 33, 34, 35, 36, 37 and 38 are all positioned far enough away from the proposed works and have a new asphalt car park between them.

If, however, the proposed new building requires new service conduits to be installed, and routed back to Building A as per the Electrical Services Spatial Site Plan by Northrop (Drawing No ESK01 – Rev 7) dated 29 April 2021, then a Arboricultural Assessment and Impact Statement will need to be prepared to address any proposed excavation within Tree Protection Zones.

For further information regarding the subject trees, please contact Naturally Trees.

Yours sincerely

Andrew Scales
Dip. Horticulture
Dip. Arboriculture AQF5

