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ST MARY ST JOSEPH CATHOLIC SCHOOL, MAROUBRA

ARBORICULTURAL IMPACT ASSESSMENT

PREPARED FOR:

Sydney Catholic Schools
C/o JDH Architects

PREPARED BY:

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date	*revision*	*prepared*	*checked*
19/05/2020	Issued Development Application	DP	AM

Executive Summary

This report was commissioned by Sydney Catholic Schools C/o JDH Architects to accompany their Primary School Development Application within the Randwick City Council area at 280 Fitzgerald Avenue, Maroubra. The aim of this report is to provide an assessment of the impacts of the proposed development on twenty-nine trees in accordance with AS4970 - 2009.

This report collates and presents information collected by David Prieto on the 20/08/2020. The data collected is located at **7. Tree Survey Table** (page 24) also see **8. Tree Survey Table Notes** (page 29) for notes relating to tree survey table.

Generally, the site's vegetation was observed to have a majority native tree canopy, with an exotic shrub midstorey and an exotic turf groundcover layer. The existing surveyed trees are shown at **9. Tree Location Plan** (page 34).

The proposed development will involve the construction of a two-storey multifunctional staff, admin & GLA building to the northwest, COLA, sport court to south, softfall rubber playground to northeast, internal alteration to Blocks D & E with associated gardens, driveway, footpaths, paving and retaining walls. This will involve the partial demolition of existing structures and regrading site levels through excavation, cutting and filling of soil on site. The extent of site works is also illustrated at **9. Tree Location Plan** (page 34).

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	-	-	20	-
	Medium	22	-	2, 3, 7, 8, 12, 19(M-H) & 23	-
	Low	5, 9, 10, 21, 25, 27 & 28	4	1, 6, 11(L-M), 13 (L-M), 14, 15(L-M), 16(L-M), 17, 18, 24(L-M), 26 & 29(L-M)	-
	Total Number of trees	**8**	**1**	**20**	**0**

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 2, 3, 14, 18 & 29, if the development is approved as there are unsustainable major encroachments into the tree protection zones.

- The removal of Tee No.'s 27 & 28. These trees are not impacted by the proposed works, however they are proposed to be removed and replaced as per the Landscape Plan.
- The replacement planting of a number of canopy and medium size trees shall be installed in 25L pot size to offset the loss of trees on site.
- The retention of Tree No.'s 5, 9, 10, 21, 22 & 25. The construction will not impact these trees.
- The retention of Tree No. 4. The construction will provide a minor encroachment into the tree protection zone.
- The retention of Tree No.'s 1, 6, 7, 8, 11, 12, 13, 15, 16 & 26. There are a major and sustainable impacts into the TPZ.
- The retention of Tree No. 17. The following should be implemented to retain and protect this tree;
  - Any works requiring excavation within the TPZ should be done under direct arborist supervision.
  - Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.
- The retention of Tree No. 19. The following should be implemented to retain and protect high significance tree;
  - No heavy machinery should be used or locate within the TPZ of this tree.
  - Excavation works to remove and install the existing stormwater pipes must be done by hand and under direct arborist supervision.
  - No roots should be pruned without the approval and direct supervision of the project arborist.
  - Any roots exposed during excavation must be retained and protected until the project arborist determines whether they should be retained and protected or pruned.
  - Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.
- The retention of Tree No. 20. The following should be implemented to retain and protect this high significance tree;
  - No heavy machinery should be used or locate within the TPZ of this tree.
  - Pipe must be installed as close as possible to the building.
  - Backfill of trench should be of appropriate non contaminated sandy soil. Care should be taken no to include any sandy soil with elevated levels of phosphorus or lime.
  - Any alternative design within the TPZ of the tree should be completed in liaison with the project arborist.
- The retention of Tree No. 23. The following should be implemented to retain and protect this medium significance tree;
  - No heavy machinery should be used or locate within the TPZ of this tree.
  - Excavation works for the removal and installation of the existing and proposed footpath must be done under direct arborist supervision. Final location and depth of the footpath slab within the SRZ should be adjusted in liaison with the project arborist if roots are expose.
  - Works to install the new pipes must be done by hand and under direct arborist supervision.

  - Existing discharge line from the pit to the kerb line should be decommissioned and left in situ to minimise root disturbance.
  - No roots should be pruned without the approval and under direct supervision of the project arborist.
  - Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.
- The retention of Tree No. 24. The following should be implemented to retain and protect this low to medium significance tree;
  - The VRF Condenser plan slab should be installed above existing levels or, it should be relocated 4m to the east.
  - Excavation works for the flood protection wall within the TPZ should be done under direct arborist supervision.
- A Tree Protection Plan should be prepared to guide construction methodology and barrier installation as necessary to protect the trees during construction works. 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.
- For additional tree protection information see **6. Tree Management Plan** (page 22) and **10. General Tree Protection Notes** (page 36).
- This arboricultural assessment should be reviewed upon the preparation of revised stormwater, landscape, architectural plans or others.
- Layouts of all proposed mains water, gas, electricity and sewer have not been prepared. Plans of all such proposed services must be reviewed, assessed and approved by the project arborist prior to approval or implementation.

Table of Contents

1. Introduction

This report was commissioned by Sydney Catholic Schools C/o JDH Architects to accompany their Primary School Development Application within the Randwick City Council area at 280 Fitzgerald Avenue, Maroubra. The aim of this report is to provide an assessment of the impacts of the proposed development on twenty-nine trees in accordance with AS4970 - 2009.

This report collates and presents information collected by David Prieto on the 20/08/2020. The data collected is located at **7. Tree Survey Table** (page 24) also see **8. Tree Survey Table Notes** (page 29) 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.
- 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 a 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 24). 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 29).

The physical data for tree locations, crown width and DRB is schematically described in **9. Tree Location Plan** (page 34).

2.5. Reference Documents

The report was written in coordination with:

- Survey Plan prepared by CMS Surveyors Pty Ltd Revision 3, dated 25/09/19.
- Architectural Site Plan prepared by JDH Architects Revision A, dated 18/05/2020.
- Flood Risk Management Plan by Cohort Engineering, dated 30/04/2019.
- Stormwater Management Plan prepared by Cohort Engineering Revision A, dated 15/05/2020.
- Landscape Plan prepared by Context Revision A, dated 19/05/20.
- The Australian Standard for the Protection of Trees on Development Sites (AS 4970 – 2009).

2.6. Council Tree Preservation Regulatory Controls

Randwick City Council Tree Preservation controls define a tree as being:

a) any palm tree, cycad or tree fern;
b) any tree in bushland
c) any tree on public land; and
d) any other tree with:

i. a height equal to or exceeding 6 metres; or
ii. a canopy width equal to or exceeding 4 metres; or
iii. for a single trunk tree species, a trunk circumference equal to or exceeding one (1) metre at a height of one (1) metre above ground level; or
iv. for a multi-trunk tree species, a combined trunk circumference (measured around the outer girth of the group of trunks) equal to or exceeding one (1) metre at a height of one (1) metre above ground level.

Dead, dying or dangerous trees, trees growing within 2 metres of a building, noxious weeds, and listed nuisance species, are excluded from this order.

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 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 Primary School located at 280 Fitzgerald Avenue, Maroubra. It contains Buildings A, B, C, D, E & F, a demountable building, a basketball court and soccer field with associated water tanks, footpaths, paving and softfall playground. There was no evidence of recent earthwork on site or adjoining sites. The site has a general south-easterly aspect.

3.2. Soil Landscape Map

This site is located on a soil transition area with Tuggerah soils to the west near Malabar Road and Lambert soils to the east.

The soils to the west near Malabar Road are from the Tuggerah soil landscape group [3]. They are characterised by deep >200 cm Podzols on dunes to Podzols / Humus Podzol intergrades on swales.

Generally the landscape is characterised by gently undulating to rolling coastal dune fields. There is local relief to 20 m, and slope gradients between 1 and 10%, but occasionally up to 35%. Dunes are generally north - south oriented; with convex, narrow crests; moderately inclined slopes; and broad, gently inclined concave swales [3].

These soils are limited by their extreme wind erosion hazard, non-cohesive, highly permeable soil, very low soil fertility, localised flooding and permanently high watertables. The critical soil characteristics of this soil type for trees growing on this site include poor water retention and low fertility [3].

The soils to the east are from the Lambert soil landscape group [3]. They are generally shallow <50 cm discontinuous earthy sands and yellow earths on the crests and the insides of benches; shallow <20 cm siliceous sands/lithosols on leading edges; shallow to moderately deep <150 cm leached sands, grey earths and gleyed podzolic soils in poorly drained areas; localised yellow podzolic soils associated with shale lenses.

Generally the landscape is characterised by undulating to rolling rises and low hills on Hawkesbury Sandstone. There is local relief from 20m to 120 m with slope gradients of 20% and rock outcrops >50%. Additionally there are broad ridges, gently to moderately inclined slopes, wide rock benches with low broken scarps, small hanging valleys and areas of poor drainage[3].

These soils are limited by their very high soil erosion hazard, rock outcrops, seasonally perched watertables, shallow, highly permeable soil with, very low soil fertility [2]. The critical soil characteristics of this soil type for trees growing on this site include shallow soil depth. [3]

3.3. Native Vegetation Map

This area is mapped as *cleared and modified lands*. These areas are mostly suburban development. Small remnants of vegetation too small to map may occur here.

However, the tree species found during inspection possibly belong to the Coastal Sand Swamp Forest. It is dominated by *Callistemon salignus (*sweet willow bottlebrush*), Eucalyptus robusta (*swamp mahogany*), Melaleuca quinquenervia (*broad-leaved paperbark*), and occasionally Casuarina glauca (*swamp oak*)*.

The open shrub stratum may be dominated by *Banksia oblongifolia*, *Callistemon linearis* (narrow-leaved bottlebrush), *Leptospermum juniperinum* (prickly teatree), *Melaleuca nodosa*, M. sieberi, *Xanthorrhoea fulva*.

3.4. Summary of site inspection data

Generally, the site's vegetation was observed to have a majority native tree canopy, with an exotic shrub midstorey and an exotic turf groundcover layer. The existing surveyed trees are shown at **9. Tree Location Plan** (page 34).

3.5. Summary of Proposed Development

The proposed development will involve the construction of a two-storey multifunctional staff, admin & GLA building to the northwest, COLA, sport court to south, softfall rubber playground to northeast, internal alteration to Blocks D & E with associated gardens, driveway, footpaths, paving and retaining walls. This will involve the partial demolition of existing structures and regrading site levels through excavation, cutting and filling of soil on site. The extent of site works is also illustrated at **9. Tree Location Plan** (page 34).

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	-	-	20	-
	Medium	22	-	2, 3, 7, 8, 12, 19(M-H) & 23	-
	Low	5, 9, 10, 21, 25, 27 & 28	4	1, 6, 11(L-M), 13 (L-M), 14, 15(L-M), 16(L-M), 17, 18, 24(L-M), 26 & 29(L-M)	-
	Total Number of trees	**8**	**1**	**20**	**0**

4. Discussion

4.1. Trees with a Minor TPZ Encroachment

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

- Tree 4 is located 1.85m from the proposed flood protection wall, providing a 5.1% encroachment into the TPZ. This low significance tree is suitable for retention.

  It 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 1 is located 1.62m from the proposed sports court, providing a 26.8% cut encroachment into the TPZ. There is not encroachment into the SRZ. This low significance tree is suitable for retention.

  The entire are of encroachment is located within the existing building and associated footpath footprint. This encroachment is considered to provide a low to moderate level of impact and is sustainable by the tree as less than average root growth is anticipated in this area.

  This low significance tree is proposed to be retained.

- Trees 2 & 3 are located 2.11m & 2.33m from the proposed flood protection wall, providing 21.9% & 22.4% cut encroachment into the TPZ and encroachment into the SRZ. These trees are considered to be of medium significance and are suitable for retention.

  Consideration has been to modify the hydraulic plans to minimise the level of root disturbance, however the flood protection wall has to be installed in this area to reduce the flood risk within the School grounds. Discontinuous footings and other alternative wall design were found not acceptable by the hydraulic engineer as it would reduce the level of protection. Any other alternative location would provide a larger encroachment into the TPZ.

  These encroachments are considered to be a high level of impact and unsustainable by the trees as woody structural roots are anticipated to be damaged during the construction of the wall, and in our opinion, this tree species is generally not able to cope with large root disturbance.

  These trees are proposed to be removed and replaced.

- Tree 6 is located 0.95m from the proposed new flood protection wall providing a 18.2% cut encroachment into the TPZ and encroachment into the SRZ. There is an additional 13% encroachment and negligible impact by the section of the flood wall located above the existing retaining wall. No crown encroachment is anticipated. This juvenile tree is in good health and vigour and is suitable for retention.

  The total combined level of encroachment is 31.2%. While this is a major encroachment, it is considered to be a moderate level if impact and sustainable by the tree as it is a juvenile specimen and this species is known to be tolerant to root disturbance.

  This low significance tree is proposed to be retained.

- Tree 7 is located 7.21m from the proposed new flood protection wall providing a 4% encroachment into the TPZ. There is an additional 29% encroachment and negligible impact by the section of the flood protection wall installed over the existing retaining wall. There is no encroachment into the SRZ and no crown encroachment is anticipated. This tree is considered to be of high significance, it is in good health and crown condition and should be retained and protected.

  The total combined encroachment is 33.4%. While this is a major encroachment, it is considered to be a low level of impact and sustainable by the tree as it is good vigour and no roots are expected to be found during the excavation for the southern section of the new wall.

This high significance tree is proposed to be retained.

- Tree 8 is located 3.07m from the proposed flood protection wall to be installed over the existing retaining wall, providing a 22.7% cut encroachment into the TPZ. There is no encroachment into the SRZ and no crown encroachment is anticipated. This tree is considered to be of high significance, it is in good health and crown condition and should be retained and protected.

  No roots are anticipated to be found to the east of the 2m in height retaining wall. This encroachment is considered to be a negligible impact and sustainable by the tree.

  This high significance tree is proposed to be retained.

- Tree 11 is located 3.06m from the proposed flood protection wall to be installed over the existing retaining wall, providing a 14% cut encroachment into the TPZ. There is no encroachment into the SRZ and no crown encroachment is anticipated. This tree is considered to be of low to medium significance, has a heavily modified crown skewed to east and is suitable for retention.

  No roots are anticipated to be found to the east of the 2.7m high retaining wall. This encroachment is considered to be a negligible impact and sustainable by the tree.

  This tree is proposed to be retained.

- Tree 12 is located 2.47m from the proposed flood protection wall to be installed over the existing retaining wall, providing a 16.8% cut encroachment into the TPZ. There is no encroachment into the SRZ and no crown encroachment is anticipated. This tree is considered to be of medium significance and is suitable for retention.

  No roots are anticipated to be found to the south of the 3m high retaining wall. This encroachment is considered to be a negligible impact and sustainable by the tree.

  This tree is proposed to be retained.

- Tree 13 is located 4.8m from the proposed pedestrian access footpath, providing a 4.4% cut encroachment into the TPZ. There is an additional 25.7% encroachment and negligible impact by the section of the flood wall installed over the existing retaining wall. No crown encroachment is anticipated. This early mature tree is in good health and vigour and is suitable for retention.

  The total combined encroachment is 30%. While this is a major encroachment, it is considered to be a low level of impact and sustainable by the tree.

  It is proposed to be retained.

- Tree 14 is located 0.61m from the proposed pedestrian access footpath, providing a 35.1% cut encroachment into the TPZ and encroachment into the SRZ. There is an additional 11.5% encroachment by the flood wall located

over the existing retaining wall. This juvenile tree is considered to be of low significance and should not be considered a constraint on the development.

The total combined level of encroachment is 55.8%. Crown encroachment is anticipated. This encroachment is considered to be a significant level of impact and unsustainable by the tree. It cannot be retained if the pedestrian access is located in this position.

It is proposed to be removed and replaced.

- Tree 15 is located 2.28m from the proposed pedestrian access footpath, providing a 9.6% cut encroachment into the. There is no encroachment into the SRZ by the footpath. There is an additional 29.3% encroachment and negligible impact by the flood wall installed over the existing retaining wall. No crown encroachment is anticipated. This semi-mature specimen is considered to be of low to medium significance, it is in good health and vigour and is suitable for retention.

  The total combined encroachment is 38.9%. While this is a major encroachment, it is considered to be a low level of impact and sustainable by the tree provided it is a semimature specimen in good health and vigour and this species is known to be tolerant to root disturbance.

  This tree is proposed to be retained.

- Tree 16 is located 1.23m from the proposed flood protection wall to be installed over the existing retaining wall, providing a 33.7% encroachment into the TPZ and encroachment into the SRZ.

  A ramp and footpath is proposed within the TPZ of the tree south of the retaining wall with anticipated RL 8.72 to the east and proposed RL9.58 to the west of the ramp. The entire profile of the ramp and footpath is therefore anticipated to be installed above existing levels requiring no excavation.

  A stormwater line and pit (Pit 7) are proposed to be located 2.2m from the tree and south of the retaining wall within the area already encroached by the above described elements. Considering existing and proposed levels, only superficial excavation less than 150mm in depth is anticipated to be required.

  A sport court with artificial turf is located south of the existing 0.7m wall. They sport court was renovated and the artificial turf installed before December 2018 as per Google Street View. Impacts on the tree are unknown, however no signs of tree damage or health decline were observed during the inspection. Root growth in this aera is anticipated to be less due to deflection from the retaining wall and soil compaction.

  This tree is considered to be of low to medium significance, it is in good health and vigour and is suitable for retention. No crown encroachment is anticipated. This encroachment is considered to be a moderate level of impact and sustainable by the tree as roots have been likely deflected as described before. In accordance with the Australian Standard AS4970-2009 *Protection of trees on development sites* the following should be provided. Specifically;

- Any works requiring excavation within the TPZ should be done under direct arborist supervision.

- Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.

- If roots are found, final cut of roots should result in a clean cut, using appropriate tools. 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 17 is located 1.47m & 3.47m from the proposed flood protection wall to be installed over the existing retaining wall and stormwater line respectively, providing a combined 28.8% encroachment into the TPZ and encroachment into the SRZ.

  A footpath is proposed within the TPZ of the tree south of the retaining wall with anticipated RL 8.72. The entire footpath profile is anticipated to be installed above existing levels requiring no excavation.

  A stormwater line and pit (Pit 7) are proposed to be located 3.47m from the tree and south of the retaining wall within the area already encroached by the above described elements. Considering existing and proposed levels, only superficial excavation less than 150mm in depth is anticipated to be required.

  A sport court with artificial turf is located south of the existing 0.5m wall. They sport court was renovated and the artificial turf installed before December 2018 as per Google Street View. Impacts on the tree are unknown, however no signs of tree damage or health decline were observed during the inspection. Root growth in this aera is anticipated to be less due to soil compaction.

  This tree has a sparse crown and pruning cuts from former scaffolds removed from base. It is considered to be of low significance and should not be considered a constraint on the development, however it is proposed to be retained as per the landscape plan. This encroachment is considered to be a moderate level of impact and sustainable by the tree as roots have been likely deflected as described before. In accordance with the Australian Standard AS4970-2009 *Protection of trees on development sites* the following should be provided. Specifically;

  - Any works requiring excavation within the TPZ should be done under direct arborist supervision.

  - Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.

  - If roots are found, final cut of roots should result in a clean cut, using appropriate tools. 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 low significance tree is proposed to be retained.

- Tree 18 is located 1.36m from the proposed footpath and driveway, providing a 25.1% cut encroachment into the TPZ and encroachment into the SRZ. This over mature tree has a very sparse crown has a sparse crown, is in fair health and fair to poor crown condition unlikely to improve. This tree is considered to be of low significance, provides low amenity value and should not be considered a constraint on the development.

  This encroachment is considered to be a significant and unsustainable impact to the tree.

  It is proposed to be removed and replaced.

- Tree 19 is impacted by several elements.

  It is located 4.48m from the proposed softfall rubber playground area, providing an 8.6% anticipated fill encroachment into the TPZ. The Landscape Architect has confirmed that the base and subbase will have a total profile of approximately 130mm. Therefore, the entire rubber paving within the TPZ will be able to be installed over the existing levels or requiring scraping of the topsoil. This will be impermeable covering of the existing surface. When considering in isolation, this encroachment is considered to be a low level of impact and sustainable by the tree.

  It is located 1.21m from an existing pit and existing discharge lines. The hydraulic engineer has confirmed that both discharge lines between the OSD and the Pit and between the Pit and the kerb will have to be removed and then replaced by 3 pipes 150x75. This will provide a 35.1% cut encroachment into the TPZ and encroachment into the SRZ. When considering in isolation, this encroachment is considered to be a potential high level of impact and unsustainable by the tree if woody structural roots are damaged during the excavation works.

  This tree is considered to be of medium to high significance, it is in good health and vigour and should be retained and protected. This tree is located on a deep sandy soil area and root growth is anticipated at depth. This tree species is known for being tolerant of root disturbance. Consideration has been given to modify the stormwater plan, however a discharge is required in this location. No crown pruning is anticipated to be required.

  While this is a combined major encroachment, this would provide a sustainable level of impact by the tree if the pipes can be carefully installed whilst adequately protecting woody structural roots during works. In accordance with the Australian Standard AS4970-2009 *Protection of trees on development sites* the following should be provided. Specifically;

  - Engage a minimum AQF Level 5 project arborist to supervise and direct works.
  - No heavy machinery should be used or locate within the TPZ of this tree.
  - Excavation works to remove the existing stormwater pipes must be done by hand and under direct arborist supervision.
  - Any roots exposed during excavation must be retained and protected until the project arborist determines whether they should be retained and protected or pruned.

- Works to install the new pipes must be carried out carefully by hand and under direct arborist supervision.
- No roots should be pruned without the approval and direct supervision of the project arborist.
- If roots are found, they should be retained and protected and pipes installed between (above or below) the exposed roots. The project arborist should determine if any small diameter roots may be pruned to allow works or not and the location of the pipe modified.
- Final cut of roots should result in a clean cut, using appropriate tools. 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.
- Any alternative design within the TPZ of the tree should be completed in liaison with the project arborist.

This tree can be retained if the above is fully implemented.

This tree is proposed to be retained

- Tree 20 is located 6.6m from the proposed rainwater/stormwater line, providing a 23.3% cut encroachment into the TPZ. There is no encroachment into the SRZ and no crown pruning is anticipated. This tree is considered to be of high significance, it is in good health and vigour and should be retained and protected.

  We note that Block F building was constructed before June 2013 as per Google Street View. The impact from that construction to the tree remains unknown, however the tree appeared to be in good health and crown condition at the time of the inspection. Existing roots were most likely removed within the building footprint during earthworks extending to an offset around the existing slab footprint. Therefore, it is anticipated that small diameter, young roots will be affected by the excavation associated with the installation of the proposed stormwater. The hydraulic engineer has confirmed that the pipe will be installed as close as possible to the existing building and associated footpath.

  While this is a major encroachment, this is considered to be a low to moderate level of impact and sustainable by the tree as no woody roots are expected to be found during the excavation works. In accordance with the Australian Standard AS4970-2009 *Protection of trees on development sites* the following should be provided. Specifically;

  - Engage a minimum AQF Level 5 project arborist to supervise and direct works.
  - No heavy machinery should be used or locate within the TPZ of this tree.
  - Pipe installed as close as possible to the building and works to be done in liaison with the project arborist.
  - Final cut of roots should result in a clean cut, using appropriate tools. 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.

- Backfill of trench should be of appropriate non contaminated sandy soil. Care should be taken no to include any sandy soil with elevated levels of phosphorus or lime.
- Any alternative design within the TPZ of the tree should be completed in liaison with the project arborist.

This tree is proposed to be retained

- Tree 23 is located 1.28m from the proposed footpath and 4.08m from the proposed stormwater discharge line, providing a combined 33.9% cut encroachment into the TPZ and encroachment into the SRZ. No crown encroachment is anticipated.

  There is an existing footpath in this area. Consideration has been given by the client to retain or replace the existing path for other at the same location and RLs, however this was found unacceptable. The proposed footpath and paved area are located adjacent to the existing fence line, approximately 0.75m closer to the tree trunk than existing footpath. No proposed RLs are shown in the plan in this area, however it is anticipated that the proposed path will be installed to match existing street footpath levels. This will require the excavation of the top 150mm of soil west of the fence and within the SRZ. No paving cracks or paving heave were observed, however roots may be found in this area within the depth of required excavation.

  There is a stormwater pit approximately 4m northwest of the tree trunk. There is an existing discharge line running northeast to southwest into the kerb line (not shown in the plan), however the hydraulic engineer has confirmed that it is hydraulically flawed as it points in the direction of gutter flows and grades back towards the site pit, which will result in flows not being discharged from the Site and road waters flowing back into the pit. Therefore a new discharge line had to be proposed as shown in the plan.

  This tree is considered to be of medium significance, is in good health and crown condition and is suitable for retention. This tree is located on a deep sandy soil area and root growth is anticipated at depth. This tree species is known for being moderately tolerant of root disturbance. No crown pruning is anticipated to be required. This tree has a self-corrected crown and trunk leaning to west, therefore woody tension roots are anticipated to be found mainly to the east of the trunk and outside of the area of proposed works.

  While this is a combined major encroachment, this would provide a level of impact and sustainable by the tree as the pipes will be installed at shallow depth and if no woody roots are damaged during the excavation works. In accordance with the Australian Standard AS4970-2009 *Protection of trees on development sites* the following should be provided. Specifically;

  - Engage a minimum AQF Level 5 project arborist to supervise and direct works.
  - No heavy machinery should be used or locate within the TPZ of this tree.
  - Excavation works for the removal and installation of the existing and proposed footpath must be done under direct arborist supervision.

The final location and depth of the footpath slab within the SRZ must be modified in liaison with the project arborist pending on number and diameter of roots exposed in this area.

- Works to install the new pipes must be done by hand and under direct arborist supervision.
- Existing discharge line from the pit to the kerb line should be decommissioned and left in situ to minimise root disturbance.
- No roots should be pruned without the approval and under direct supervision of the project arborist.
- If roots are found, they should be retained and protected and pipes installed between (above or below) the exposed roots. The AQF level 5 project arborist should determine if any small diameter roots may be pruned to allow works or not and the location of the pipe modified.
- Final cut of roots should result in a clean cut, using appropriate tools. 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.
- Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.

This tree can be retained if the above is fully implemented.

This tree is proposed to be retained

- Tree 24 is impacted by several elements.

  It is located 2.67m from the proposed flood protection wall to south along the boundary, providing a 17.7% cut encroachment into the TPZ. When considering in isolation this is a low to moderate level of impact and sustainable by the tree as no woody roots are expected to be found.

  It is located 3.18m from the proposed VRF condenser plan and stormwater lines, providing a 11.5% cut encroachment into the TPZ. When considering in isolation this is a low level of impact as no woody roots are expected to be found.

This tree is considered to be of low to medium significance, it is in good health and vigour and is suitable for retention. There is no encroachment into the SRZ and no crown pruning is anticipated to be required. It has a codominant crown protected from dominant winds. This tree species is known for being tolerant of root disturbance.

The total combined encroachment is 29.2%. While this is a major encroachment, it is considered to be a moderate level of impact and sustainable by the tree as it is in good health and vigour and no woody roots are expected to be found during the works. In accordance with the Australian Standard AS4970-2009 *Protection of trees on development sites* the following should be provided. Specifically;

- The VRF Condenser plan slab should be installed above existing levels or, it should be relocated 4m to the east to reduce the encroachment into the TPZ north of the tree.

- Excavation works for the flood protection wall within the TPZ should be done under direct arborist supervision.

- If roots are found, final cut of roots should result in a clean cut, using appropriate tools. 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 26 is located 2.41m from the proposed flood protection wall, providing a 11.9% cut encroachment into the TPZ. There is no encroachment into the TPZ and no crown pruning is anticipated. This tree is considered to be of low significance and should not be considered a constraint on the development, however it is proposed to be retained.

  This encroachment is considered to be a low level of impact and sustainable by the tree as it is in good health and vigour and no woody roots are expected to be damaged.

  If roots are found, final cut of roots should result in a clean cut, using appropriate tools. 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.

  It is proposed to be retained.

- Tree 29 is located 0.8m and 4.94m from the proposed new flood protection wall to south and booster to southwest, providing a combined 41% cut encroachment into the TPZ and encroachment into the SRZ. This tree is considered to be of low to medium significance and is suitable for retention.

  Consideration has been to modify the hydraulic plans to minimise the level of root disturbance, however a protection wall has to be installed in this area to reduce the flood risk within the School grounds. Discontinuous footings and other alternative wall design was found not acceptable as it would reduce the level of protection.

  This combined encroachment is considered to be a significant level of impact and unsustainable by the trees as woody structural roots are anticipated to be damaged during the construction of the wall.

  This tree is proposed to be removed and replaced.

4.3. Other Tree Comments

- Tree 5, 9, 10, 21, 22 & 25 are located in positions that will allow their retention without impact from the proposed development.

- Trees 27 & 28 are not impacted by the proposed development. These trees are considered to be of low significance. Tree 27 ha a very sparse crown and

provides low amenity value. The landscape architect has indicated his preference for these trees to be removed and replaced. They are proposed to be removed as shown on the Landscape Plan.

- A number of trees not assigned numbers were found on site (some have been annotated on the tree location plan). They are exempt from protection under the Randwick City Council Tree Preservation regulatory controls. They may be considered for removal irrespective of the proposed development application.

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 2, 3, 14, 18 & 29, if the development is approved as there are unsustainable major encroachments into the tree protection zones.
- The removal of Tee No.'s 27 & 28. These trees are not impacted by the proposed works, however they are proposed to be removed and replaced as per the Landscape Plan.
- The replacement planting of a number of canopy and medium size trees shall be installed in 25L pot size to offset the loss of trees on site.
- The retention of Tree No.'s 5, 9, 10, 21, 22 & 25. The construction will not impact these trees.
- The retention of Tree No. 4. The construction will provide a minor encroachment into the tree protection zone.
- The retention of Tree No.'s 1, 6, 7, 8, 11, 12, 13, 15, 16 & 26. There are a major and sustainable impacts into the TPZ.
- The retention of Tree No. 17. The following should be implemented to retain and protect this tree;
  - Any works requiring excavation within the TPZ should be done under direct arborist supervision.
  - Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.
- The retention of Tree No. 19. The following should be implemented to retain and protect high significance tree;
  - No heavy machinery should be used or locate within the TPZ of this tree.
  - Excavation works to remove and install the existing stormwater pipes must be done by hand and under direct arborist supervision.
  - No roots should be pruned without the approval and direct supervision of the project arborist.
  - Any roots exposed during excavation must be retained and protected until the project arborist determines whether they should be retained and protected or pruned.
  - Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.
- The retention of Tree No. 20. The following should be implemented to retain and protect this high significance tree;

- No heavy machinery should be used or locate within the TPZ of this tree.
- Pipe must be installed as close as possible to the building.
- Backfill of trench should be of appropriate non contaminated sandy soil. Care should be taken no to include any sandy soil with elevated levels of phosphorus or lime.
- Any alternative design within the TPZ of the tree should be completed in liaison with the project arborist.

- The retention of Tree No. 23. The following should be implemented to retain and protect this medium significance tree;
  - No heavy machinery should be used or locate within the TPZ of this tree.
  - Excavation works for the removal and installation of the existing and proposed footpath must be done under direct arborist supervision. Final location and depth of the footpath slab within the SRZ should be adjusted in liaison with the project arborist if roots are expose.
  - Works to install the new pipes must be done by hand and under direct arborist supervision.
  - Existing discharge line from the pit to the kerb line should be decommissioned and left in situ to minimise root disturbance.
  - No roots should be pruned without the approval and under direct supervision of the project arborist.
  - Any alternative design within the TPZ of the tree should be done in liaison with the project arborist.
- The retention of Tree No. 24. The following should be implemented to retain and protect this low to medium significance tree;
  - The VRF Condenser plan slab should be installed above existing levels or, it should be relocated 4m to the east.
  - Excavation works for the flood protection wall within the TPZ should be done under direct arborist supervision.
- A Tree Protection Plan should be prepared to guide construction methodology and barrier installation as necessary to protect the trees during construction works. 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.
- For additional tree protection information see **6. Tree Management Plan** (page 22) and **10. General Tree Protection Notes** (page 36).
- This arboricultural assessment should be reviewed upon the preparation of revised stormwater, landscape, architectural plans or others.
- Layouts of all proposed mains water, gas, electricity and sewer have not been prepared. Plans of all such proposed services must be reviewed, assessed and approved by the project arborist prior to approval or implementation.

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	Installation of footpath within the SRZ of Tree 23 to be determined and works done under direct arborist supervision	Principal Contractor	Project Arborist	As required prior to the works proceeding adjacent to tree

4	Excavation works and installation of SW pipes within the TPZ of Trees 19 & 23 must be done under direct arborist supervision	Principal Contractor	Project Arborist	As required prior to the works proceeding adjacent to tree
5	Supervise all excavation works proposed within the TPZ	Principal Contractor	Project Arborist	As required prior to the works proceeding adjacent to tree
6	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Quarterly during construction period
7	Inspection of trees by Project Arborist	Principal Contractor	Project Arborist	Following the removal of tree protection measures from HP 2
8	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 MARY ST JOSEPTH CATHOLIC PRIMARY SCHOOL, MAROUBRA TREE SURVEY DATA

DATE OF SURVEY: 20/08/19

No impact	Minor encroachment	Major encroachment - Sustainable	Major encroachment - Unsustainable	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	Ret/ Rem	Development Setback and Encroachment	Comments
1	*Banksia*	*integrifolia*	Coast Banksia	5.5	6	190	230	230	100	390	610	2689	4680	M	G	G	L	M	H	CD, M	Ret	Located 1.62m from the proposed sport court, providing a major (26.8%) cut encroachment into the TPZ	Asymmetric crown at and above front façade line with 0.5m offset. Previously identified and tagged as Tree 45
2	*Banksia*	*integrifolia*	Coast Banksia	7	4.5	400	70			407	520	2515	4884	M	G	G	M	M	H	D	Rem	Located 2.11m from the proposed flood protection wall, providing a major (21.9%) cut encroachment into the TPZ and encroachment into the SRZ	Asymmetric crown . Previously identified and tagged as Tree 46
3	*Banksia*	*integrifolia*	Coast Banksia	7	6	440	90			450	475	2421	5400	M	G	G	M	M	H	D	Rem	Located 2.33m from the proposed flood protection wall, providing a major (22.4%) cut encroachment into the TPZ and encroachment into the SRZ	Crown skewed to east. Previously identified and tagged ass Tree 47
4	*Banksia*	*integrifolia*	Coast Banksia	7	3	190				190	240	1817	2280	SM	G	Av	L	L	H	CD,CS	Ret	Located 1.85m from the proposed flood protection wall, providing a minor (5.1%) cut encroachment into the TPZ	Sparse crown skewed to North. Previously identified and tagged as tree 48
5	*Casuarina*	*glauca*	Swamp Oak	7.5	2	170				170	230	1785	2040	J	G	Av	L	L	M	D	Ret	No encroachment (1% or less)	Self corrected trunk leaning in several directions
6	*Casuarina*	*glauca*	Swamp Oak	7	1.5	100				100	130	1500	2000	J	G	G	L	L	M	D	Ret	Located 0.95m & 0.88m from the proposed new flood portection wall and existing wall respectively, providign a combined major (31.2%) cut encroachment (18.2% cut by new wall and negligeble 13% by flood protection over existing wall) into the TPZ and encroachmetn into the SRZ	-
7	*Banksia*	*integrifolia*	Coast Banksia	8	9	700	200	550	200	935	1000	3309	11220	M	G	G	H	H	H	D	Ret	Located 3.07m from the proposed flood protection over the existing wall and 7.21m from the proosed flood protection wall, providing a combined major (33%) encroachment (4% cut by new wall to southeast and negligeble 29% by flood wall over exixting) into the TPZ	-

No impact	Minor encroachment	Major encroachment - Sustainable	Major encroachment - Unsustainable	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	Ret/ Rem	Development Setback and Encroachment	Comments
8	*Banksia*	*integrifolia*	Coast Banksia	7	7	450	450	130		650	780	2981	7800	M	G	G	H	H	H	D	Ret	Located 3.07m from the proposed flood protection wall over the existing wall providing a major (22.7%) negibleble encroachment into the TPZ	Aerial services along the street to the west of the crown
9	*Cupaniopsis*	*anacardioides*	Tuckeroo	5.5	4.5	190				190	240	1817	2280	SM	G	Av	L	M	M	CD	Ret	No encroachment	-
10	*Cupaniopsis*	*anacardioides*	Tuckeroo	5	4	140	120			185	210	1718	2220	SM	G	F	L	M	M	CD,CS	Ret	No encroachment	-
11	*Casuarina*	*glauca*	Swamp Oak	7.5	6	450				450	520	2515	5400	M	G	F	L-M	M	M	D	Ret	Located 3.06m from the proposed flood protection wall over existing wall, providing a major (14%) negligeble encroachment into the TPZ	Heavily modified crown skewed to east. Aerial services along the street to the west of the crown
12	*Banksia*	*integrifolia*	Coast Banksia	5.5	6	450	350			571	730	2900	6852	M	G	Av	M	M	H	D	Ret	Located 2.47m from the proposed flood protection wall over existing wall, providing a major (16.8%) negligeble encroachment into the TPZ	-
13	*Melaleuca*	*quinquenervia*	Broad-leaved Paperbark	6	4	550				550	550	2575	6600	M	G	Av	L-M	M	H	D	Ret	Located 4.8m from the proposed pedestrian access footpath and 2.12m from the proposed flood protection above existing wall, providing a combined major (30%) encroachment (4.4% by the foopath & 25.7% by flood wall) into the TPZ and encroachmetn into the SRZ	
14	*Ficus*	*rubiginosa*	Port Jackson Fig	5	5	300	100	150		350	420	2299	4200	J	G	F	L	L-M	M	CD	Rem	Located 0.61m & 1.27m from the proposed pedestrian access footpath and flood wall respectively, providing a combined major (55.8%) encroachment (35.1% cut by the footpath & 20.8% negligible by the wall) into the TPZ and encroachment into the SRZ. Crown encroachment is anticipated	Crown skewed to west

No impact | Minor encroachment | Major encroachment - Sustainable | Major encroachment - Unsustainable | 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	Ret/ Rem	Development Setback and Encroachment	Comments
15	*Melaleuca*	*quinquenervia*	Broad-leaved Paperbark	7	5	300	250			391	390	2228	4692	SM	G	Av	L-M	M	M	CD	Ret	Located 2.28m from the proposed pedestrian access footpath and 1.34m from the proposed flood protection over existing wall, providing a combined major (38.9%) encroachment (9.6% cut by the footpath & 29.3% negligible by flood wall) into the TPZ and encroachment into the SRZ	-
16	*Hibiscus*	*tiliaceus*	Coastal hibiscus	6	8	470				470	520	2515	5640	M	G	G	L-M	M	M	D	Ret	Located 1.23m from the proposed flood protection wall over existing wall, ramp and stormwater pit/line, providing a combined major (33.7%) encroachment into the TPZ and encroachment into the SRZ. Minor crown pruning is anticipated	-
17	*Leptospermum*	*laevigatum*	Coast tea tree	5	3	250	250	250	100	445	670	2797	5340	M	G	F	L	L	H	D, M	Ret	Located 1.47m & 3.47m from the proposed ramp and stormwater line providing a combined (28.8%) encroachment into the TPZ and encroachment into the SRZ. There is an additional negligible encroachment by the flood wall above existing wall	Very sparse crown with a former scaffold removed at base
18	*Leptospermum*	*laevigatum*	Coast tea tree	4	3	260				260	380	2204	3120	OM	F	F-P	L	L	H	D	Rem	Located 1.36m from the proposed footpath, providing a major (25.1%) cut encroachment into the TPZ and encroachment into the SRZ	Codominant scaffold removed at base. Very sparse crown skewed to northeast
19	*Casuarina*	*glauca*	Swamp Oak	11	11	730				730	840	3076	8760	M	G	Av-G	M-H	H	M	D	Ret	Located 1.21m & 4.48m from the existing stormwater lines proposed to be relayed and from the softfall rubber paving, providing a combined major (43.7%) encroachment (8.6% fill & 35.1% shallow cut) into the TPZ and encroachment into the SRZ	-
20	*Banksia*	*integrifolia*	Coast Banksia	7	10	1450				1450	1450	3868	15000	M	G	G	H	H	H	D	Ret	Located 6.6m from the proposed rainwater/stormwater lines, providing a major (23.3%) cut encroachment into the TPZ	Within adjacent reserve

No impact	Minor encroachment	Major encroachment - Sustainable	Major encroachment - Unsustainable	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	Ret/ Rem	Development Setback and Encroachment	Comments
21	*Araucaria*	*heterophylla*	Norfolk Island pine	7	3	170				170	190	1647	2040	J	G	G	L	L	L	D	Ret	No encroachment	-
22	*Grevillea*	*robusta*	Silky Oak	11	8	450				450	530	2535	5400	M	G	G	M	M	M	D	Ret	No encroachment	Within adjacent property
23	*Eucalyptus*	*nicholii*	Narrow-leaved Black Peppermint	6.5	8	600	230			643	680	2814	7716	M	G	G	M	M	M	D,B	Ret	Located 1.28m & 4.08m from the proposed footpath and stormwater discharge lines, providing a major (33.9%) cut encroachment into the TPZ and encroachment into the SRZ	Northwest side of the crown at 1m to the existing building. Minor dieback
24	*Hibiscus*	*tiliaceus*	Coastal hibiscus	5.5	6	330	300			446	465	2399	5352	M	G	G	L-M	M	M	CD, B	Ret	Located 2.67m from the new flood protection wall to south, 3.18m from the VRF condenser plan and 4.02m from the stormwater line to north, providing a combined major (29.2%) cut encroachment into the TPZ	Previously identified and tagged as tree 33
25	*Hibiscus*	*tiliaceus*	Coastal hibiscus	5.5	6	100	100	140	20	200	270	1910	2400	M	G	F-Av	L	M	M	CD,Su	Ret	No encroachment	Previously identified and tagged ass tree 34
26	*Hibiscus*	*tiliaceus*	Coastal hibiscus	5	5	300	120			324	390	2228	3888	M	G	F-Av	L	M	M	CD,CS	Ret	Located 2.41m from the new flood protection wall to south, providing a major (11.9%) cut encroachment into the TPZ	Crown skewed to west
27	*Metrosideros*	*excelsa*	New Zealand Christmas tree	3	5	100	100	100	100	200	300	1996	2400	M	G	F-P	L	L	L	D	Rem	No encroachment	Very sparse crown
28	*Metrosideros*	*excelsa*	New Zealand Christmas tree	5.5	5	130	130	130	130	260	650	2762	3120	M	G	Av	L	M	L	D,M	Rem	No encroachment	-
29	*Agonis*	*flexuosa*	Western Australian Peppermint Tree	6.5	8	540				540	630	2726	6480	M	G	Av	L-M	M	M	D,M	Rem	Located 0.8m & 4.94m from the new flood protection wall to south and booster to southwest, providing a combined major (41%) cut encroachment into the TPZ and encroachment into the SRZ	-

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. Structural Condition

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 **0. Randwick City Council Tree** Preservation controls define a tree as being:

e) any palm tree, cycad or tree fern;
f) any tree in bushland
g) any tree on public land; and
h) any other tree with:
   i. a height equal to or exceeding 6 metres; or
   ii. a canopy width equal to or exceeding 4 metres; or
   iii. for a single trunk tree species, a trunk circumference equal to or exceeding one (1) metre at a height of one (1) metre above ground level; or
   iv. for a multi-trunk tree species, a combined trunk circumference (measured around the outer girth of the group of trunks) equal to or exceeding one (1) metre at a height of one (1) metre above ground level.

Dead, dying or dangerous trees, trees growing within 2 metres of a building, noxious weeds, and listed nuisance species, are excluded from this order.

Determining a tree's significance (page 7). 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, (**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)

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

Hydraulic lines - SW

Building under

Building

Building over

Retaining walls

Fence

Earthworks

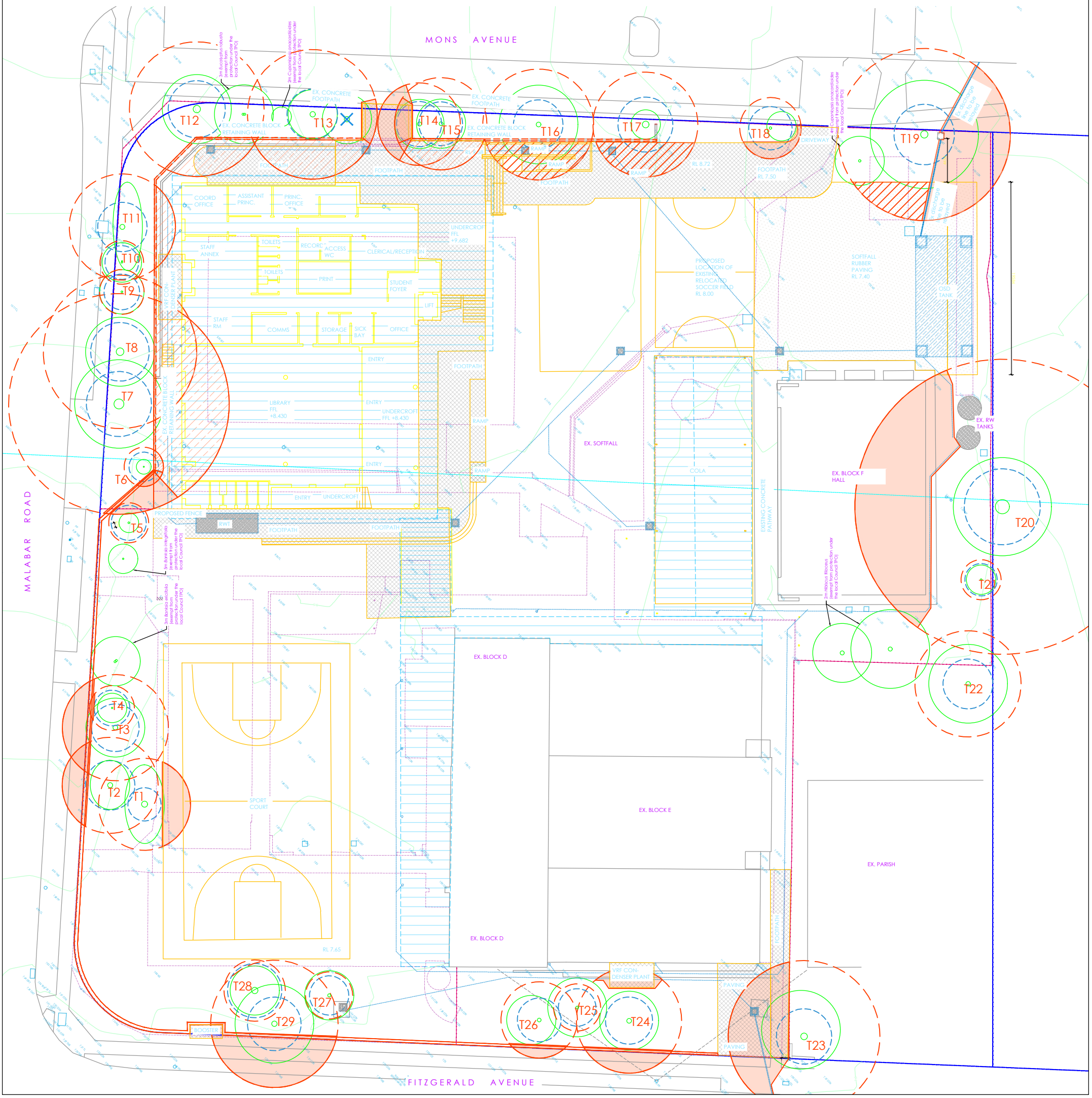
Tree Protection Zone
Indicative crown spread
Existing tree
Structural Root Zone
Trunk diameter

Tree not found

Cut - encroachment into Tree Protection Zone

Fill - encroachment into Tree Protection Zone

Area of reduced root growth east and south of retaining wall within TPZ



REVISION	DESCRIPTION	DRAWN	CHECK	DATE
A	SUBMITTED TO CLIENT FOR COMMENT - Pre-design advice	DP	AM	22-08-19
A	SUBMITTED TO CLIENT FOR COMMENT - Preliminary advice	DP	AM	22-10-19
C	SUBMITTED TO CLIENT FOR COMMENT - SW plan to be amended	DP	AM	14-05-2020
C	SUBMITTED TO CLIENT FOR COMMENT - Landscape plan coordination	DP	AM	18-05-2020
C	SUBMITTED TO CLIENT FOR DA	DP	AM	19-05-2020

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JOB: **ST MARY ST JOSEPH CATHOLIC PRIMARY SCHOOL**

CLIENT: **JDH ARCHITECTS**

PROJECT: ADDITIONS AND ALTERATIONS
DRAWING: TREE LOCATION PLAN
SCALE: N.T.S. @ A3 | ISSUE: DA | SHEET: T - 01
DRAWN: DP | CHECK: AM | DATE: 19-05-2020 | REVISION: 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, 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 it 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.

Further 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.

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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