505
28 AVONMORE TCE

506
20A DEANE STREET

PROPOSED BOUNDARY

EXISTING
PROPERTY ACCESS

22.186
22.333
22.369
22.355

TELSTRA PIT

DAMAGED CONCRETE FOOTPATH

EXISTING CONCRETE FOOTPATH

EXISTING METAL WIRE FENCE

EXISTING METAL TRAFFIC BARRIER

EXISTING TREE
EXISTING TREE
EXISTING TREE
EXISTING TREE
EXISTING TREE

21.709
22.278
21.447
FK
22.247
6.0

UNFINISHED GRAVEL BANK

CONCRETE CROSSOVER CONSTRUCTED
IN ACCORDANCE WITH GHD DESIGN

22000
23000
24000
25000
26000
27000

DEANE STREET

Rev No.	Revision Change	Date
03	DRIVEWAY LEVEL RAISED ON AND ANGLED	18/01
02	DRIVEWAY WIDTH CHANGED TO 5.0M	08/05
01	DRAFT FOR COMMENT	24/04

20a Deane Street Cottesloe, WA 6011

EXISTING SITE CONDITIONS

Client: J and N Stewart
Date: 18/01/2021
Scale: 1:100

Rev.03

A1

505
28 AVONMORE TCE

506
20A DEANE STREET

PROPOSED BOUNDARY

EXISTING
PROPERTY ACCESS

FUTURE
PROPERTY ACCESS

22.186
22.333
22.369
23.210
25.382
25.467
25.695
25.680
26.818
26.859
28.214
25.645
26.788
26.824
28.184
25.307
23.135
25.605
22.673
21.709
22.278
21.447
22.247
FK
6.0
3.0
1.4
1.2

22.00
22.50
23.00
23.50
24.00
24.50
25.00
25.50
26.00
26.50
27.00
27.50
28.00

22000
23000
24000
25000
26000
27000

REHABILITATE 21.5m² OF CUT
IN VERGE AT MAX 1:10 GRADE

INSTALL PEDESTRIAN SLOW POINT
REFER MRWA STANDARD DRAWING
9831-5649-1 FOR GRAB RAIL DETAILS

EXISTING OLIVE TREE
POTENTIALLY REMOVED
OR DAMAGED

EXISTING TREE
EXISTING TREE
EXISTING TREE

REHABILITATE 3.8m² OF CUT IN
VERGE AT MAX 1:10 GRADE

REHABILITATE 3.3m² OF FILL
IN VERGE AT MAX 1:2 GRADE

TIE INTO EXISTING
MOUNTABLE KERB

DEANE STREET

Rev No.	Revision Change	Date
03	DRIVEWAY LEVEL RAISED ON AND ANGLED	18/01
02	DRIVEWAY WIDTH CHANGED TO 5.0M	08/05
01	DRAFT FOR COMMENT	24/04

20a Deane Street Cottesloe, WA 6011

GHD APPROVED CROSSOVER

Client: J and N Stewart

Date: 18/01/2021

Scale: 1:100

Rev.03

A2

505
28 AVONMORE TCE

506
20A DEANE STREET

PROPOSED BOUNDARY

5.0
PROPOSED
PROPERTY ACCESS

OWNER PROPOSED CONTOURS IN GREEN
OWNER PROPOSED GRASSED AREA
OWNER PROPOSED
NORFOLK ISLAND PINE TREE

0.000
EXISTING
PROPERTY ACCESS
22.186
22.333
22.369
21.709
21.447
22.278
22.247
FK
6.0
TIE INTO EXISTING
MOUNTABLE KERB
ALREADY CONSTRUCTED GHD
CROSSOVER

0.5
24.390
24.330
24.640
24.580
1.2
2%
24.305
24.555
15.0%
24.005
30%
23.350
15.0%
23.200
10%
23.100
TIE INTO EXISTING
0.5
5.0
0.5
13.5%
24.285
22.5%
23.800
10%
23.700
10%
23.600
BATTERED LIMESTONE RETAINING WALL

27.070
27.110
28.214
27.040
27.076
28.184

EXISTING TREE
EXISTING TREE
EXISTING TREE
EXISTING TREE
EXISTING TREE

22.00
22.50
23.00
23.50
24.00
24.50
25.00
25.50
26.00
26.50
27.00
27.50
28.00
22000
23000
24000
25000
26000
27000

DEANE STREET

REHABILITATE VERGE CUT WITH APPROVED NATIVE PLANTS
ENSURE EXISTING OLIVE TREE'S ARE PROTECTED
BATTERED LIMESTYONE RETAINING

Rev No.	Revision Change	Date
03	DRIVEWAY LEVEL RAISED ON AND ANGLED	18/01
02	DRIVEWAY WIDTH CHANGED TO 5.0M	08/05
01	DRAFT FOR COMMENT	24/04

20a Deane Street Cottesloe, WA 6011

OWNER CROSSOVER PROPOSAL

Client: J and N Stewart
Date: 18/01/2021
Scale: 1:100

Rev.03
A3

24000
25000
26000
27000
28000
21000
22000
23000
24000
25000
26000

21000
22000
23000
24000
26000
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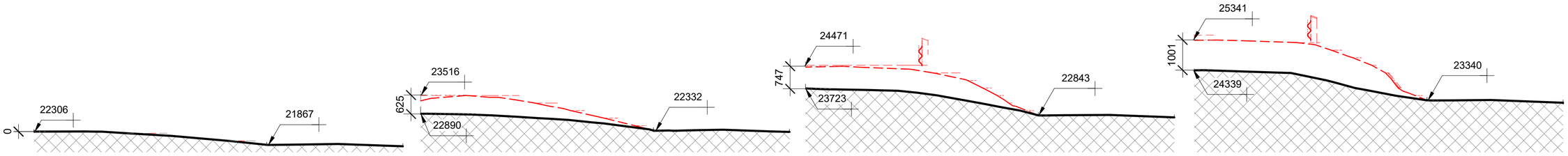
22000
23000
24000
25000
26000

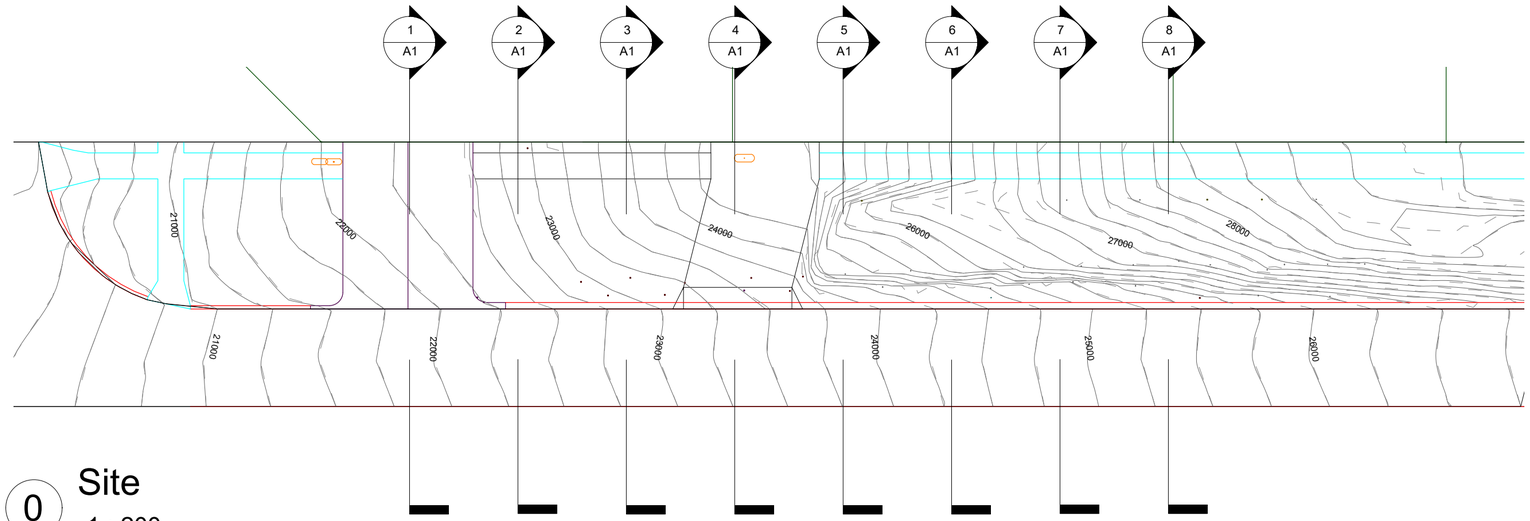


1 Section 1
1 : 100

2 Section 2
1 : 100

3 Section 3
1 : 100

4 Section 4
1 : 100



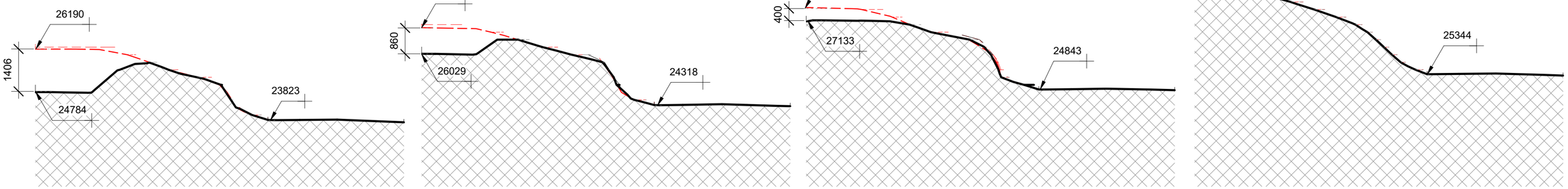
0 Site
1 : 200

5 Section 5
1 : 100

6 Section 6
1 : 100

7 Section 7
1 : 100

8 Section 8
1 : 100



PROJECT
DEANE STREET CROSSOVER PROPOSAL

CLIENTS
J & N STEWART

STATUS
DA

SCALE - As indicated2
DATE - 02/02/2021
REVISION -

DRAWING TITLE
CROSS SECTIONS

SHEET NUMBER
A1

Phillip Matthews
Dip. Horticulture (Arboriculture), B. Min, M.A. (Level 9)
Qualified Tree Health & Structural Integrity Expert
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Arborology WA
Arboricultural Consultants

Planning
Safety Inspections
Structural Integrity
Risk Assessments
Tree Protection
Selection

Arboricultural Report

Tree Survey, Arboricultural Impact Assessment and Tree Protection Plan

To the Australian Standard 4970-2009
"Protection of Trees on Development Sites"

Report Prepared for:	**Mr Russell Stewart** (Property Owner)
Phone:	041 9136 484
Email:	russell.stewart@oceancorp.com.au
Address:	22 Odern Crescent, Swanbourne W.A. 6010

Site Address: **(Lot 506), No. 20A Deane Street, Cottesloe W.A.**

Report Date: **20th January 2021**

Instructions for Report

Phillip Matthews from Arborology WA Arboricultural Consultants has been commissioned by Mr Russell Stewart to undertake an Arboricultural Report of the one (1) Olive tree in accordance with the Australian Standard 4970-2009 "Protection of Trees on Development Sites". Mr Stewart's instructions were; to visit the site, inspect only the one (1) Olive tree located on the council verge in front of (Lot 506), No. 20A Deane Street, Cottesloe, and prepare the findings in this report.

Site Inspection, Reason and Purpose for Report

Phillip Matthews as the Arboricultural Consultant verifies that a site inspection was carried out on 14th January 2021 on the one (1) Olive tree located on the front of the above address, due to the crossover proposal and the new housing construction project and as part of the local government development application.

The Tree Survey Arboricultural Report connected to the Australian Standard AS4970-2009 "Protection of Trees on Development Sites" includes the Arboricultural Impact and the tree protection plan for the proposed crossover development near the one (1) Olive tree located on the council verge in front of (Lot 506), No. 20A Deane Street, Cottesloe. The Olive tree is numbered on the site plan (**See page 3**).

The purpose of this Arboricultural Report is to undertake an "above ground 360° Walkaround" tree inspection and carry out a detailed examination of the one (1) Olive tree. The tree's height, canopy spread, trunk's diameter at base (DAB), trunk's diameter at breast height (DBH), life stage, health and structural condition, Useful Life Expectancy (ULE), Heritage and Cultural Matters (HCM), Ecological and Habitat Matters (EHM), tree problems, recommendations for any tree surgery works prior to construction, tree protection zone (TPZ) and structural root zone (SRZ) measurements are all recorded. This information is to be used to provide a record of the tree prior to construction.

The author's qualifications and experience are included within **Appendix 1,** on **Pages 15-16**.

Report Methodology

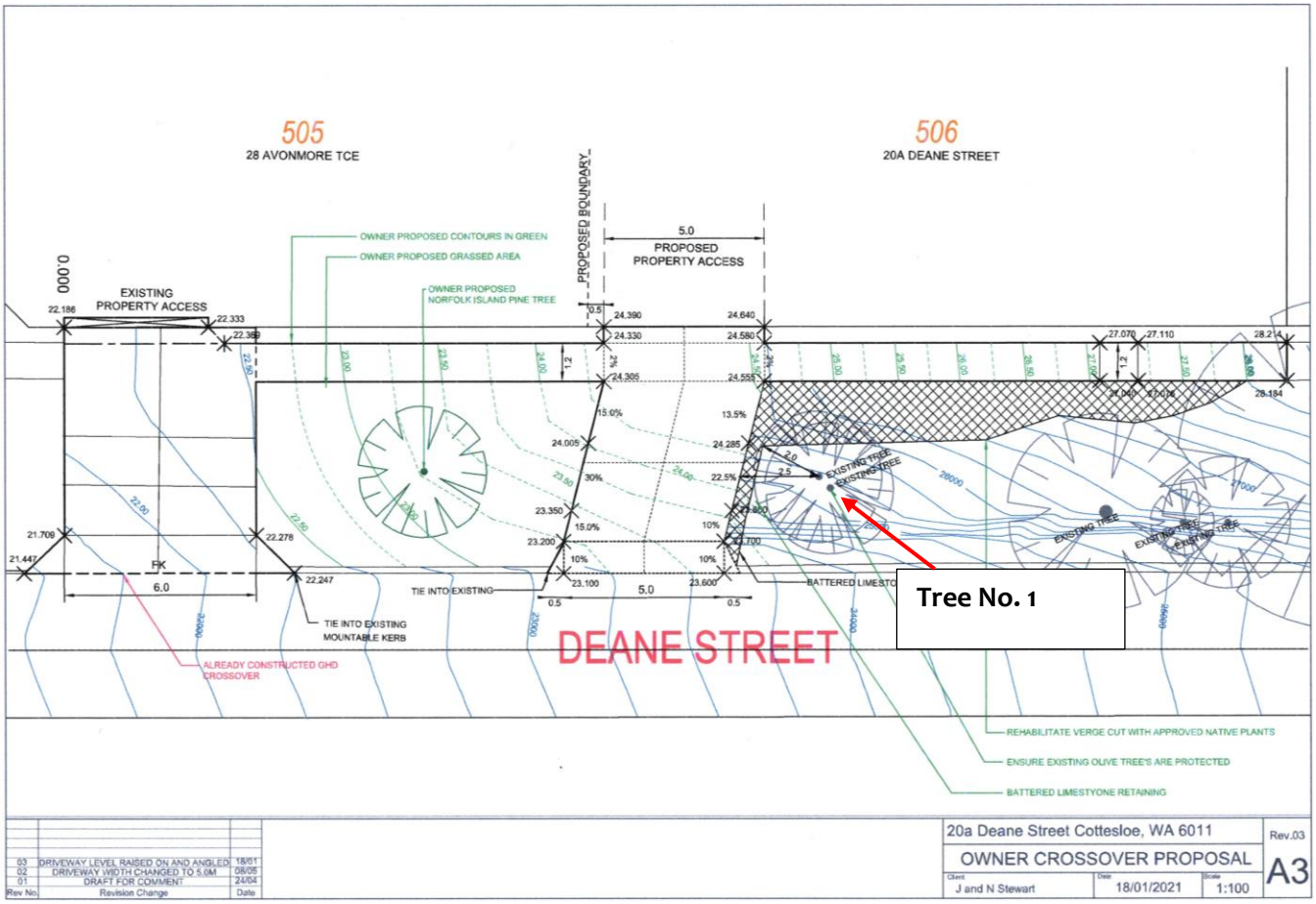
Tree inspections are usually conducted at ground level using the "Visual Tree Assessment" (VTA) method. The VTA is used by Arboricultural Consultants to evaluate the structural integrity of a tree, relying on observation of the tree's biomechanical and physiological features. The VTA method of tree assessment is adapted from Mattheck & Breloer (2007), Scott (2005) and is recognised by Arboriculture Australia and The Institute of Australian Consulting Arboriculturists. As stated above this report is also based upon the Australian Standard AS4970-2009 "Protection of Trees on Development Sites".

Note: No diagnostic devices were used on the subject tree.

Limitations of this Report

This Arboricultural Report refers to the one (1) Olive tree located on the council verge in front of the proposed crossover development at the above address. The report has been prepared on the basis of information supplied by the parties involved in this project. No responsibility is accepted for any errors of fact or omissions which appear in this report which result from incorrect or incomplete information supplied to Phillip Matthews (Arborology W.A. Arboricultural Consultants), by the parties involved. Any alteration to the site or any council policies could change the current circumstances and may invalidate this report and any recommendations made. Due to the changing nature of trees and other site circumstances, the validity of this report and any recommendations made are limited to a 12-month period.

The Site Plans



Site Plans from "Mr R Stewart" 20/1/21.
Modified by P. Matthews 20/1/21.

The Preliminary Tree Assessment

Refer to **Appendix 2:** for the full spreadsheet explanation on **pages 17 to 21**.

Tree Survey Spread Sheets

Tree No	Botanical Name	Tree Height (m)	Canopy Spread N-S (m)	Canopy Spread E-W (m)	Trunk DAB (m)	SRZ (m)	Trunk DBH (m)	TPZ (m)	Tree life stage	Tree Health	Tree Structural Condition	ULE	Tree Retention
1	***Olea europaea***	6.3	4.5	4	0.28	**1.94**	0.22	**2.64**	Semi Mature	**Fair**	**Poor**	20-50 years	**Retain**

Botanical Name

Tree No. 1 was identified as a semi mature specimen, recognized by its botanical name of ***Olea europaea***. Olive trees are a subtropical broad-leaved evergreen trees, native to the Mediterranean regions and its fruit is edible. The olive fruit and its oil are key elements in the cuisine of the Mediterranean and are popular in Australia as well.

Note: There is no other vegetation on the area of the proposed crossover, other than dead grass.

Heritage and/ or Cultural Matters (HCM)

When it comes to heritage and cultural aspects for trees, one might ask, "Does the tree have some historical significance connected to the past. Also was the tree considered by community to represent something special, something related to the chosen identity of that community?"

Tree Number	Heritage and/ or Cultural Matters
1	**Some heritage or cultural significance for this tree:** This tree is well established as a council verge tree, the property of the Town of Cottesloe and is a part of the Urban Tree Forest.

Ecological and Habitat Matters (EHM)

Trees with ecological significance may be located in woodlands or parks surrounded by native vegetation, waterways and other trees. Some trees are considered to be habitat trees, with hollows, cracks and crevices of various sizes, where animals and birds may live, breed or shelter.

Tree Number	Ecological and Habitat Matters
1	**Some ecological and/ or habitat significance for this tree.** This tree is a part of the Urban Tree Forest and provides some benefits, which include habitat, shade, air purification, temperature reduction, wind protection, carbon sequestration, giving off of oxygen, increasing property values, and is recognized as a **monetary dollar value asset.**

Tree Problems

A list of characteristics is provided to assist in gathering information on the tree's current condition, and to give an indication of tree works that may be required. This list of problems identifies issues with the tree's overall structure, any damage or injury and abnormal symptoms such as pests or diseases.

Tree Number	Tree Problems
1	**Bark wound at base:** There was a large wound to the base of the trunk due to previous limb failure on the north/west side. **Poorly Pruned:** The tree has been previously pruned at the base. **Epicormic Growth:** Because of the previous limb failure and pruning, the main trunk has formed three epicormic limbs, one limb to the north and two limbs to the south. The epicormic limb attachments seem to be attached well, at this time. However, these attachments will be weaker than the original limb attachments. **Minor Deadwood:** The deadwood was not heavy enough to signify a possible risk to the targets at this present time. **Containerized Roots:** The roots are restricted within a shallow soil cavity in the limestone rock ledge.

Recommendations for Tree Surgery Works

Tree Surgery Works are only recommended where there is a significant advantage gained from the works or a significant disadvantage if the works are not performed. Works are generally only recommended where the tree represents a risk to people or property. All pruning works should be undertaken prior to the beginning of construction and done by a (minimum AQF level 4) qualified and experienced tree surgeon and must comply with Australian Standards 4373 (2007) "Pruning of Amenity Trees".

Tree Number	Recommendations for Tree Surgery Works
1	No tree surgery works required

Arboricultural Impact Assessment

This Arboricultural Consultant's inspection of the one (1) Olive tree located on the council verge in front of the property known as (Lot 506), No. 20A Deane Street, Cottesloe, due to the crossover proposal and the new housing construction project, found this semi mature tree to be in fair health, poor structural condition and to be worthy of retention.

This Arboricultural Consultant reviewed the architectural site plans for this project. This was enough information, at the time, to provide the tree's impact and protection measurements required for this construction project.

The **Structural Root Zone (SRZ)** and the **Tree Protection Zone (TPZ)** must to be considered during the construction at (Lot 506), No. 20A Deane Street, Cottesloe.

The Arboricultural Impact Assessment and the Tree Protection Plan must be available onsite, prior to the commencement of, and during construction works.

Structural Root Zone (SRZ)

The SRZ is the area required for tree stability. Tree roots could be injured by machinery such as excavators, bobcats, trench diggers etc. causing root damage, therefore a SRZ area of a tree is required for tree stability. Severing of any roots within this zone may cause the tree to become unstable and or decline in health and structural condition. If major encroachment into the SRZ is required the potential for whole tree failure is significantly increased.

The SRZ is the area around the base of a tree is essential for the tree's stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is technically circular with the trunk at its centre and is expressed by its radius in metres. This zone considers a tree's structural stability only, not the root zone required for a tree's vigour and long-term viability, which will usually be a much larger area.

This arboricultural report adopts AS 4970-2009 (Protection of trees on development sites) as the preferred SRZ tree protection method. This method provides a Structural Root Zone (SRZ) distance (radius from trunk centre) by using the diameter of the trunk just above the root buttress, which represents, "D" in the SRZ calculation RSRZ = $(D \times 50)^{0.42} \times 0.64$.

Using the AS 4970-2009 (Protection of trees on development sites), we are able to calculate the structural root zone area of the tree which is required for tree stability. The structural root zone (SRZ) calculation for **tree No. 1** in this construction project, is measured at **1.94m** radius from the tree trunk. Meaning that a **1.94m** radius around the tree is required to be maintained in order to ensure that the tree remains in a structurally stable condition. **Cutting of any roots within this zone may cause the tree to become unstable**, due to the wind movement of the canopy placing an increased loading on the root plate, and/or due to a dramatic decline in the tree's health and vitality.

Note: This Arboricultural Consultant advises the excavation for the proposed crossover must be **outside** the **1.94m** SRZ radius given around this tree. **No roots are to be severed or damaged, inside** the **1.94m** SRZ radius around this tree.

Tree Protection Zone (TPZ)

This arboricultural report adopts AS 4970-2009 (Protection of trees on development sites) as the preferred tree protection method. This method provides a Tree Protection Zone (TPZ) distance (radius from trunk centre) by using the diameter of the trunk at 1.4m, which represents, "DBH" in the TPZ calculation – TPZ = DBH X 12.

Using the AS 4970-2009 (Protection of trees on development sites), we are able to calculate the tree protection zone area of the tree which is the principal means of protection for the tree's canopy, branches, trunk and root system. The Tree Protection Zone (TPZ) calculation for **tree No.1** in this construction project, is measured at **2.64m** radius from the tree trunk. This means that for **tree No.1** a portable barrier fence must to be installed **2.64m** from the tree trunk. In addition, the fence must to be at least **1.8m** high and stay in place during all construction works. The Tree Protection Zone (TPZ) barrier acts as a physical and visual reminder to protect the tree during construction works (See **Diagram 1 and 2** in **Appendix 3: Tree Protection Zone (TPZ)** on **pages 22 and 23**).

Identifying the possible impacts on this tree and the protection required for its stability and longevity in accordance with the Australian Standard 4970-2009 "Protection of Trees on Development Sites", is essential in this construction project.

NOTE: All construction workers need to be notified about the SRZ and the TPZ prior to commencing any excavation near this tree.

During the crossover excavation, all of the exposed roots along the excavation edge must be cleanly pruned to aid the healing process and reduce infection by pathogens.

Tree Protection Plan

By now, there is an understanding that established trees of reasonable health are an asset to any development site. These trees are living organisms that require certain environmental conditions in order to maintain their value as an asset.

All trees consist of three main sections: a canopy or crown, a trunk and a root system. Each one of these sections carries out specific functions necessary for the survival of the tree as all of the parts interact. A tree is in a state of physiological equilibrium between the above ground and below ground sections, so that if one of these sections is damaged, the entire tree will suffer and symptoms may appear in any part of the tree.

Thus, damage to the tree and any soil disturbance must be avoided or minimized during the development process with design and engineering procedures to ensure the protection of the tree being in place at all stages. Therefore, any demolition and construction that occurs around trees must be carried out in such a way as to minimise the impact on the health of the tree.

The Tree Protection Plan must be available onsite prior to the commencement of and during works. **The Tree Protection Plan will identify key stages where monitoring and certification will be required in accordance with the (AS 4970-2009), in section 5 "Monitoring and Certification" 5.2.**

Prior to the construction of the proposed crossover and/ or any machinery or materials being brought onto the site, a Tree Protection Zone (TPZ) fence must be installed. The TPZ calculation for **tree No.1** in this construction project, is measured at **2.64m** radius. This means that for **tree No.1** a portable barrier fence must to be installed **2.64m** from the tree trunk. In addition, the fence must to be at least **1.8m** high and stay in place during all demolition and construction works. The TPZ barrier acts as a physical and visual reminder to protect the tree during construction works (See **Diagram 1 and 2** in **Appendix 3: Tree Protection Zone (TPZ)** on **pages 22 and 23** for more information on the TPZ fence). **This Arboricultural Consultant by prior inspection, must certify that the tree protection measures comply with the tree protection plan, this includes taking photos, in accordance with the (AS 4970-2009), "Section 5.3.2".**

Note: Where the recommended TPZ barrier is not possible due to access to construction works, a TPZ fence section can be temporarily moved up to the canopy line. However, the **2.64m** radius measurement from the tree trunk must be clearly marked out and due care to the tree is still required at all times.

It is this Arboricultural Consultant's opinion that a TPZ of Australian Standards recommendations is not always able to be achieved due to the **2.5m** distance from the tree to the edge of the crossover on the east side, and the **2.4m** distance from the tree to the pedestrian pathway on the north side., However the AS 4970-2009 details the recommended protection zone and must be demonstrated to ensure the tree's survival and its structural stability remain intact. Where the construction of the recommended TPZ barrier is not possible and the impact of encroachment is probable, **this Arboricultural Consultant by prior inspection, must demonstrate that the tree would remain viable. Documenting any encroachment, taking photos and providing a Progress Report, in accordance with the (AS 4970-2009, "Sections 3.3.3 and 5.4.3") is required.**

Major Encroachments - For any excavation encroachments into the TPZ that are greater than 10% of the area of the TPZ and are inside the SRZ, **detailed root investigation is required**. This Arboricultural Consultant by prior inspection, must demonstrate that the tree would remain viable. Therefore, **hand excavation** is the recommended method for construction workers in these encroachments.

Minor Encroachments - For any excavation encroachments into the TPZ that are less than 10% of the area of the TPZ and are outside the SRZ, detailed root investigation is not required. It is this Arboricultural Consultant's opinion that a 10% encroachment into the **2.64m** TPZ radius, which is a measured distance of **2.376m** from the tree trunk's main centre is allowed. This means a **2.376m** TPZ radius to the northern pedestrian pathway and the western edge of the proposed crossover are acceptable minor encroachments that are outside the **1.94m** SRZ. See the diagram on **Appendix 4** on **page 24** for some examples of possible encroachments into the TPZ of up to 10%.

Construction Methodology

All mechanical excavation of the proposed crossover must be at least **2.376m** (10% less than the **2.64m** TPZ radius), away from the base of the trunk with all the exposed roots with a diameter of **less than 25mm** being cleanly severed for good wound occlusion. However, any roots **greater than 25mm** in diameter must not to be cut without authorisation from myself as a qualified Consulting Arborist. **Documenting the situation and/or any root damage, taking photos and providing a Progress Report,**

in accordance with the (AS 4970-2009, "Actions and certification" in TABLE 1, Section 4 and 5 and Section 3.3.3) is required.

During the excavation of the proposed crossover, all of the exposed roots along the excavation edge need to be cleanly pruned to aid the healing process and reduce infection by pathogens.

This Arboricultural Consultant recommends that myself as a qualified Consulting Arborist be present during the excavation of the proposed crossover. **This Arboricultural Consultant by prior inspection, must demonstrate that the tree would remain viable. Documenting any encroachment, taking photos and providing a Progress Report, in accordance with the (AS 4970-2009, "Sections 3.3.3 and 5.4.3") is required.**

Excavated soil must not be stored or built up around the trunk of the tree. Soil levels must not be changed around the trunk base or within the SRZ, either raised or lowered. No chemicals, solvents, fuel, oil, herbicides, cement waste, no machinery or vehicles to be parked or stored within the TPZ.

Any damage to the protected tree, including its canopy, trunk or roots during the construction works must be reported immediately to the site supervisor, who must then immediately report them to myself the qualified Consulting Arborist. **Documentation by myself of the damage, taking photos and providing a Progress Report, in accordance with the (AS 4970-2009), "Actions and Certification" in TABLE 1, Section 4 and 5 and Section 5.4.2 and 5.4.3) is required.**

Conclusion

In the construction of the proposed crossover and pedestrian stairway, it is necessary to consider the benefits provided by trees. These attributes include habitat, shade, air purification, temperature reduction, wind protection, visual amenity, increasing property values, carbon sequestration and giving off of oxygen.

Some account must also be taken of the position in which this tree is growing. **Tree No. 1** in the construction area has a monetary dollar value and is recognized as **asset** to the Town of Cottesloe. The removal of this tree would also be a loss to the urban canopy. Therefore, there is no sound arboricultural reason to remove this tree, at this time.

Tree No. 1 must be retained and not damaged during the construction of this project. The Tree Protection Zone (TPZ) of **2.64m** radius with alterations set out in the Tree Protection Plan minor encroachments on page9. However, the Structural Root Zone (SRZ) of **1.94m** from the trunk must be maintained during the crossover and stairway works.

This information has been provided as a record of the tree prior to construction; to help understand the risks to the tree, their potential future impacts, and the level of risk for future impacts.

Recommendations

- **Prior to the construction of the proposed crossover and the pedestrian stairway and/ or any machinery or materials being brought onto the site.**
  Mr Stewart must install a Tree Protection Fence at a minimum high of **1.8m**, at a distance of **2.64m** radius from the trunk, around tree No. 1, as a visual reminder of the Tree Protection Zone (TPZ) and to protect the tree during demolition and construction works. (See **Appendix 3: Tree Protection Zone (TPZ)** on **pages 22 and 23**).

- **On completion of the Tree Protection fence.**
  A Pre-construction Verification Progress Report on the tree protection measures by myself as the project arborist consultant, must certify that the tree protection measures comply with the tree protection plan on tree No. 1, which includes taking photos, in accordance with the (AS 4970-2009, "Actions" in section 2 and 5.3.1, 5.4.2, 5.4.3 in section 5). This must be submitted to the Town of Cottesloe (TOC).

- **All construction workers and contractors must be inducted or notified prior to commencement on the site** about the Structural Root Zones (SRZ), the Tree Protection Zones (TPZ) and the importance of protecting trees (as per AS 4970-2009, in section 5.2).

- **Print out the SRZ, the TPZ and the Tree Protection Plan** on **pages 7 to 11** of this report. These must be available onsite, prior to the commencement of and during works.

- **The Construction Methodology** must be used at the critical stages of construction around the TPZ.

- **During construction - Re-inspection of tree No.1 must be done during critical stages** including the construction works of the crossover and the stairway. Monitoring and documenting any roots damaged, should be done by myself, taking photos and providing a Progress Report, in accordance with the (AS 4970-2009, "Actions" in section 2 and 5.4.1 in Section 5). This must be submitted to the TOC.

- **Post construction Verification Report on the tree's vigour and structural condition must be done** just after construction has finished, with photos, in accordance with the (AS 4970-2009, "Actions" in section 2 and 5.4.3 in section 5). This must be submitted to the TOC.

- Any amendments to this report and/ or email correspondence and/ or Re-inspections and Verification reports are at an Hourly Tree Inspection Rate of $125.00/hr, including travel.

Phil Matthews - Dip. Hort (Arbor), B. Min, M.A. (AQF Level 9)

Arborology WA Arboricultural Consultants

Qualified Tree Health & Structural Integrity Expert

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Phone: 040 342 3377

Limitation of liability

Tree Surveys and reports remain the property of Phillip Matthews (Arboricultural Consultant) and cannot be shown copied or distributed without his prior or subsequent written permission. The contents of reports such as tree heights, life expectancies and age of trees are approximate. Trees are surveyed from the ground only. The findings of this reports are preliminary in nature. Activities such as taking root samples for laboratory analysis are not taken unless by prior arrangement. A sketch or non-scale drawing, photos and maps are usually provided with the report for illustration purposes only. Structural condition assessments on all trees in any type of survey are usually provided as part of the tree report. All duty of care has been taken to gather this information nevertheless. This report has been prepared on the basis of information supplied by the parties involved in the project, including the requirements of Local Government and site inspections undertaken by Phillip Matthews. No responsibility is accepted for any errors of fact or omissions which appear in this report which result from incorrect or incomplete information supplied to Phillip Matthews by the parties involved in the project. Due to the changing nature of trees and other site circumstances, this report and any recommendations made are limited to a 12-month period. Any alteration to the site and any development proposals could change the current circumstances and may invalidate this report and any recommendations made. No employee of or Phillip Mathews shall be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services. If due to limitations in your instruction any amendments to the report or reinspection's are required to be carry out, travel to and from site and the revisit hours will be invoiced at our hourly rate of $125.00. Phillip Matthews (Arboricultural Consultant), accepts no liability due to the loss of, or damage to, or the failure of, the subject of this advice.

Photographic illustrations

The Olive tree

Shows the bark wound and the base of the three epicormic limbs

Shows the area of the proposed crossover

Appendix 1: Authors Qualifications & Experience

Phillip Matthews is an AQF level 5, Consulting Arborist, Dip Hort (Arbor) with a B.Min, Grad Dip.Min and an AQF Level 9, Master of Arts (See Page 16).

Phil has worked within the arboricultural and horticultural profession for over 27 years in Perth. He has worked closely with Local and State Government Departments, Environmental and Ecological Consultants, Real Estate Consultants, Builders, Developers, Architects and Engineers. He is a well-qualified tree health and structural integrity expert. He has a passion for sustainable urban canopy forest both now and in the future.

His work ranges from individual expert tree inspections to managing trees on major multimillion-dollar housing developments and infrastructure projects. His work often involves trees with preservation orders or tree surveys for development projects. This involves tree inspections, tree risk assessments, planning application arboricultural (tree) reports, arboricultural impact assessments and construction methodology according to the Australian Standard: (AS 4970-2009) "Protection of Trees on Development Sites".

Client List

Elizabeth Quay Project – Perth – Tree Survey, Arboricultural and Horticultural Reports
CPB Contractors PTY LIMITED

Thomas Road, Byford - Solar Cable Project – Tree Survey and Arboricultural Report (**AS 4970-2009**)
Western Power

Dragonfly Boulevard, Mandurah – Urban Re-development Project (**AS 4970-2009**)
Stock Road, Lakelands – Urban Development Project
Jubata Court, Maida Vale – Urban Re-development Project
Buckby Contracting Pty Ltd

Housing Re-development – Planning Application Arboricultural Report (**AS 4970-2009**)
ADCO Construction
BGC Housing Group
Danmar Homes
Danmar Developments
J-Corp Pty Ltd
Now Living
New Imperial Co

Welshpool Road East and Coldwell Road, Wattle Grove – Urban Re-development Project
CARDNO

Bullsbrook Department of Defence – Re-development Project (**AS 4970-2009**)
Schlager Group

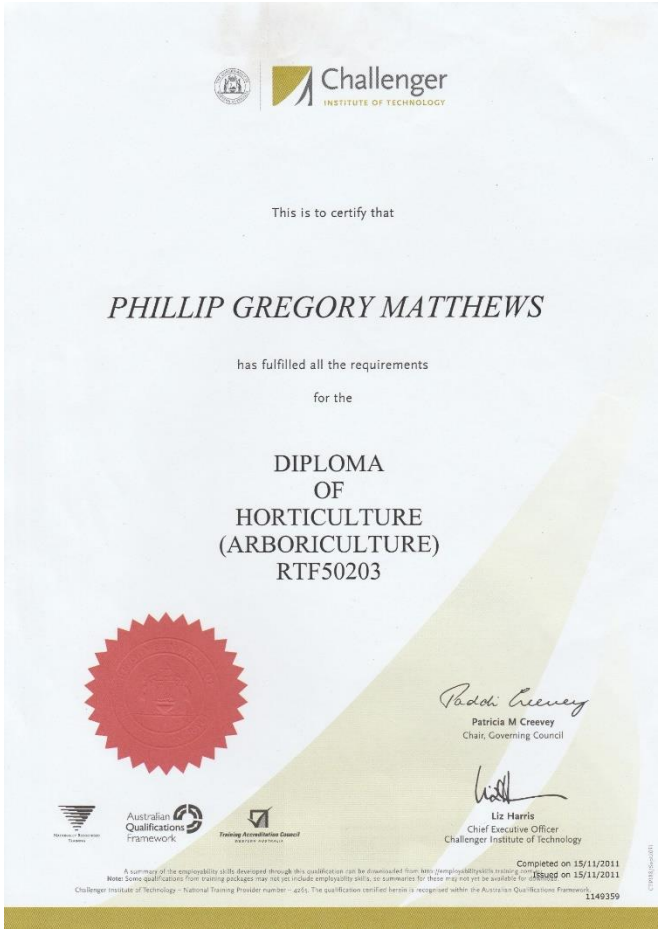
Arbuckle Reserve, Carine – Underground Power Construction Project (**AS 4970-2009**)
Civil Technology

Tree Audit/Survey and Arboricultural Report (**AS 4970-2009**)
Kingsway Christian College
Perth Bible College
Sun City Country Club

Tree Inspections and Arboricultural Report
Education Department
Environmental Industries
Smithwick Strata Services

Asset Tree Valuation Survey
Bethanie on the Park - Retirement village

And 1000's of individual clients


Challenger
INSTITUTE OF TECHNOLOGY

This is to certify that

PHILLIP GREGORY MATTHEWS

has fulfilled all the requirements

for the

DIPLOMA
OF
HORTICULTURE
(ARBORICULTURE)
RTF50203

Patricia M Creevey
Chair, Governing Council

Liz Harris
Chief Executive Officer
Challenger Institute of Technology

Australian Qualifications Framework

Completed on 15/11/2011
Issued on 15/11/2011

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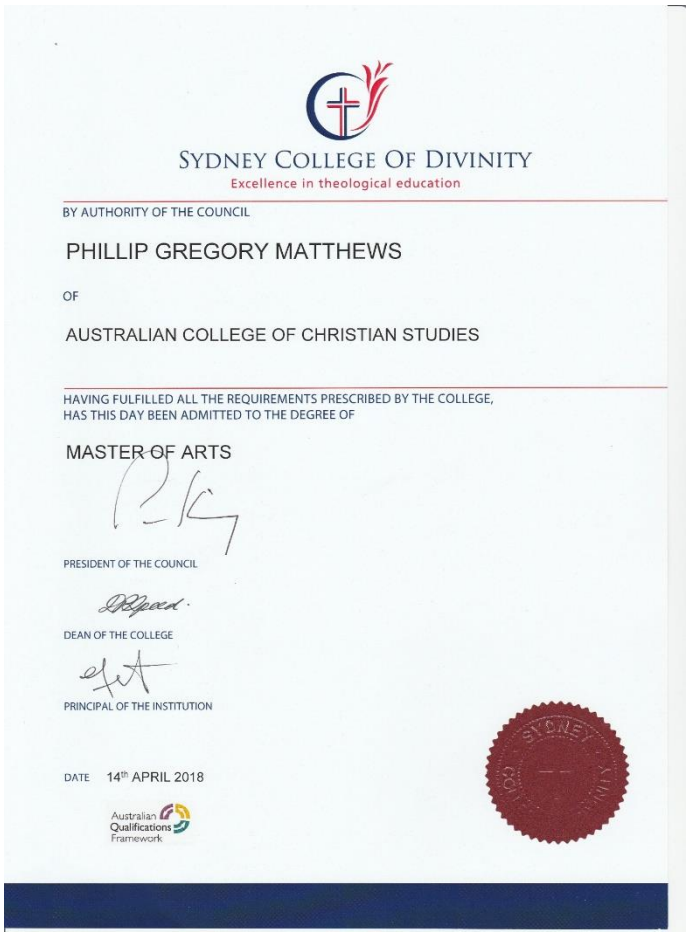
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PHILLIP GREGORY MATTHEWS

OF

AUSTRALIAN COLLEGE OF CHRISTIAN STUDIES

HAVING FULFILLED ALL THE REQUIREMENTS PRESCRIBED BY THE COLLEGE,
HAS THIS DAY BEEN ADMITTED TO THE DEGREE OF

MASTER OF ARTS

PRESIDENT OF THE COUNCIL

DEAN OF THE COLLEGE

PRINCIPAL OF THE INSTITUTION

DATE 14th APRIL 2018

Australian Qualifications Framework

Appendix 2: Spreadsheet Explanation

Tree Number – Provides the schedule numerical character so the tree's location can be clearly identified on the site map/plan.

Botanical Name – Provides the most commonly used botanical name of the tree specimen.

Tree Height – Provides the vertical distance between the base of the tree and the tip of the highest branch on the tree. The height of the tree is measured by a clinometer from ground level. Tree heights are in metres.

Tree Canopy Spread – Provides the canopy spread (width) measurement from north to south and east to west. Tree canopy spreads are in metres. This calculation might be needed for the future tree valuations.

Trunk DAB – Provides the trunk diameter measurement (in metres) immediately above the root buttress of the tree specimen. **DAB** = Trunk diameter above the root buttress.

Trunk DBH – Provides the trunk diameter (in metres, and generally measured at 1.4 metres above ground level) of the tree specimen. **DBH** = Trunk diameter at breast height.

Tree life stage – Provides the tree's age. **Note:** The tree's age does not depend on the tree's health. The tree's age is then placed into one of eight (8) categories.

- **Y** Young or juvenile
- **SM** Semi mature
- **EM** Early mature
- **M** Mature
- **PM** Post mature
- **DS** Declined severely
- **A** Ancient
- **T** Transplanted

Young / Juvenile
A young or juvenile tree is under 2m in height and is easily replaced.

Semi Mature
A semi mature tree would have a single trunk that is greater than 2m in height. Semi mature trees have branched out and may or may not have developed flowers.

Early Mature
Early mature trees are about 2/3 of their expected mature height. The tree has become well developed in the landscape, is normally vigorous and increasing in height. It has increasing landscape significance and may be approaching mature size.

Mature
A mature tree is fully established; the tree is around the middle half of its usual life-expectancy; generally retaining good vigour, vitality, and has branched out and developed flowers. A mature tree has achieved full height and size for the species.

Post Mature
The tree has passed the mature stage of its life and would be considered; (1) very slow in its growth rate and (2) it cannot be disturbed. The tree has insufficient energy reserves to fight decay and pests particularly through pruning cuts or wounds and retains poor vigour and vitality.

Declined Severely
The tree is in its last stage of life, and is starting to lose its capacity to protect itself. It becomes vulnerable to pests and diseases. The tree should be inspected for branch hazards and may need reduction pruning or be entirely removed.

Ancient
The tree is very old, has low vigour, and is liable to decline. It may be an important tree, historically or culturally. The tree should be assessed for hazards and may require reduction pruning or total removal.

Transplanted
The tree has been removed from its original site, transported to another site, for the purpose of creating an established tree. Tree transplanting should always be dated.

Tree Health – Each tree was assessed to determine its health and vitality and then placed into one of six (6) categories.

G Good
F Fair
P Poor
VP Very poor
MDT Moribund Dead tree
DT Dead Tree

Good
The tree shows good or outstanding health and vitality for that tree species. The tree displays an overall full canopy of foliage. The foliage colour, size and density, should be characteristic of a healthy tree and be free of pest and disease problems. The tree has a Normal (N) range of vitality for that species and age. The tree is able to produce sufficient carbohydrate and is able to make structurally adaptive growth.

Fair
The tree shows fair health and vitality and is in a reasonable condition for that tree species. The tree displays a satisfactory or adequate canopy of foliage. The tree may display some chlorotic leaves in the canopy and it may have some minor pest damage or disease problems. The foliage colour, size or density may be different from a healthy specimen of that species and age.

Poor
The tree is not growing to its full capacity. The tree may show minor extension growth in the lateral branch structure. The crown may be light, thin or sparse. There may be huge amounts of chlorotic or dead leaves throughout the canopy. The tree may display lots of pest and disease problems or the tree may be in decline, indicating signs of stress. The tree cannot produce enough carbohydrate to make structurally adaptive growth. There may be some root damage; Reduced (R) or Poor (P) vitality may indicate the presence of issues such as root death that could affect the health of the tree.

Very Poor
The tree is in decline and the canopy may be sparse or very thin. A significant volume of dead wood may be present in the canopy and pest and disease problems may be causing a severe decline in tree health. Poor vitality may indicate the presence of issues such as root death that could affect the stability of the tree.

Moribund Tree
The tree is at the point of death. A significant volume of dead wood will be present which will be of a size and weight to represent a risk to the surrounding targets. The tree should be totally removed.

Dead Tree
The tree has no life and is dead. A significant volume of dead wood will be present which will be of a size and weight to represent a risk to the surrounding targets. The tree should be totally removed.

Tree Structural Condition

–The structural condition of the tree refers to the physiological condition that is observed at the time of inspection.

Each tree was assessed to determine its structural condition and then placed into one of five (5) categories.

G Good
F Fair
P Poor
VP Very poor
F Failed

Good
The tree has a healthy and balanced canopy with no or little physiological damage. The branch unions seem to be strongly attached, with no defects or mechanical degradation in the trunk or in the branch limbs. Main branch limbs are well delineated and are not exposed to any new mechanical loads. The tree would be viewed as a good specimen example for its kind. The tree has a Normal (N) range of vitality for that species and its age. The tree would indicate good stability.

Fair
The tree has some minor complications in the structure of the canopy. The canopy may be somewhat out of balance, and some branches or branch unions may be showing minor structural physiological

damage. The tree has a Reduced (R) vitality from the Normal (N) range for the species and age of a tree. The tree may be on a slight lean or be showing insignificant structural faults.

Poor
The tree has a poorly structure and/or unbalanced canopy and/or displaying large openings. Some branches are not well formed. Branch unions may be structurally poor or physiologically damaged at the attachments. The tree has a Reduced (R) or Poor (P) vitality that may indicate the presence of issues such as root death that could affect the health of the tree.

Very Poor
The tree has a very poorly structure and unbalanced canopy with very large holes. Major branches are not well formed. Minor or major branches may be structurally very poor or physiologically damaged at the attachments. The tree has a Very Poor (VP) vitality that may indicate the presence of issues such as root death that could affect the stability of the tree. A portion of the tree has broken off and/or has failed and/or danger of failure is looming. The tree would be considered physiologically unstable.

Failed and dead
A substantial portion of the tree or the whole tree has failed and the tree is dead.

Useful Life Expectancy (ULE)

The criteria used to calculate the remaining useful life expectancy of the tree is based on numerous factors. The key information required for long term planning is how long each tree can be expected to remain on site with an acceptable degree of safety.

The assessment for each tree is based on the potential of the species in the locality, and the final assessment made gives particular consideration to the following:

- Obvious past influences.
- Health and Vitality – present and future potential for the species on the site.
- Estimated age in relation to the expected life expectancy for the species.
- Structural defects, which may influence the potential life expectancy of the tree or represent a risk factor to the proposed development.

On the basis of the above ULE guidelines, each tree is allocated an expected safe useful life expectancy from 1-100 years.

Trees that appear to be retainable with an acceptable level of risk for 50-100 years.

- Structurally sound trees located in positions that can accommodate future growth.

Trees that appear to be retainable with an acceptable level of risk for 20-50 years

- Trees that may only have between 20-50 years remaining life span.
- Trees that may live for more than 20-50 years but would be removed in that time during the course of management for safety and nuisance reasons.
- Damaged or defective trees that can be made suitable for retention in the medium term by remedial work.

Trees that appear to be retainable with an acceptable level of risk for 10-20 years.

- Trees that may only have 10-20 years of remaining life span.
- Trees that may live for more than 10-20 years but would be removed in that period during the course of management for safety or nuisance reasons.
- Defective trees that require substantial remedial work to be made safe and are only suitable for retention in the short-term.

Trees with a high level of risk that would need removing within the next 1-10 years.

- Dead trees.
- Dying trees, or suppressed and declining trees through disease.
- Dangerous trees through instability.
- Dangerous trees through structural defects including cavities, decay wounds or poor form.
- Damaged trees, which are considered unsafe to retain.

Appendix 3: Tree Protection Zone (TPZ)

Established trees of good to fair vigour represent an asset to any development site. Trees are living organisms that require certain environmental conditions in order to maintain their value as an **asset**. Damage must be avoided or minimized during the development process with procedures to ensure the protection of the tree being in place at all stages.

This arboricultural report implements the AS 4970-2009 "Protection of Trees on Development Sites" as the preferred tree protection method. This method provides a Tree Protection Zone (TPZ), where a tree protection fence is to be installed at a distance (radius from trunk centre) by using the diameter of the trunk at 1.4m above ground, multiplied by 12 (**See Diagram 1**).

The TPZ is a specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown. It provides for the viability and stability of a tree to be retained where it is potentially subject to damage by the development.

Using the AS 4970-2009 "Protection of Trees on Development Sites", we are able to calculate the tree canopy protection zone of the tree. The TPZ calculation for **tree No. 1** is measured at **2.64m** from the tree trunk. This means that a portable barrier fence be installed **2.64m** from the tree trunk and it must be at least **1.8m** high and stay in place during all construction works (**See Diagram 2**).

The TPZ fence acts as a physical and visual reminder to protect the tree during construction works: It reduces the root compaction from any vehicles and material being stored within this zone; It also reduces spillage of toxic materials on the roots and trunk; and physical damage to the tree.

The designated TPZ of each tree is recommended to be clearly marked out and fenced off from the site in accordance with AS 4970-2009 guidelines **prior to any machinery or materials are brought onto the site, and certainly before construction works commencing.**

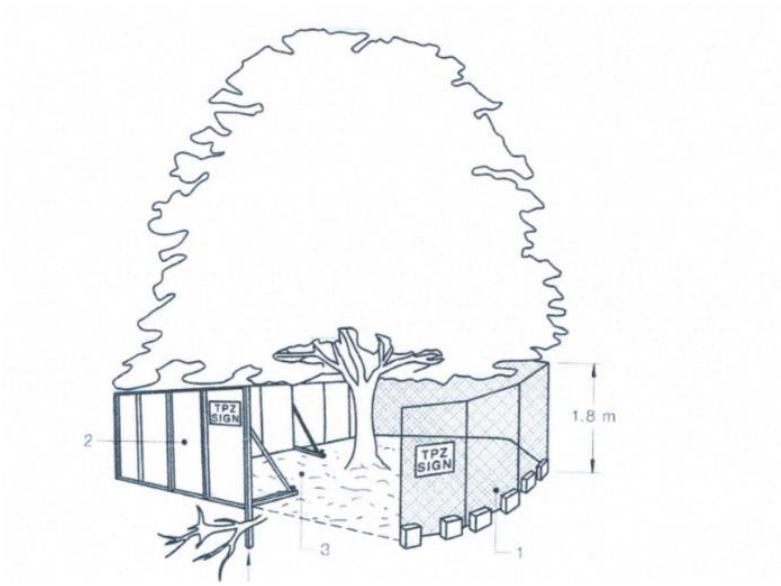

Diagram 1

Diagram from the AS 4970-2009 Guidelines 16/11/21.

This Arboricultural Consultant recommends star pickets with safety yellow caps on top of the star pickets and the orange safety fence, which complies with the AS 4687-2007 "Temporary Fencing and Hoardings".

Diagram 2

Picture from Bunnings website: *www.bunnings.com.au* 16/1/21.

Appendix 4: Encroachments into Tree Protection Zone

Encroachment into TPZ is something unavoidable. This diagram provides examples of TPZ encroachment by area, to assist in reducing the impact of such incursions.

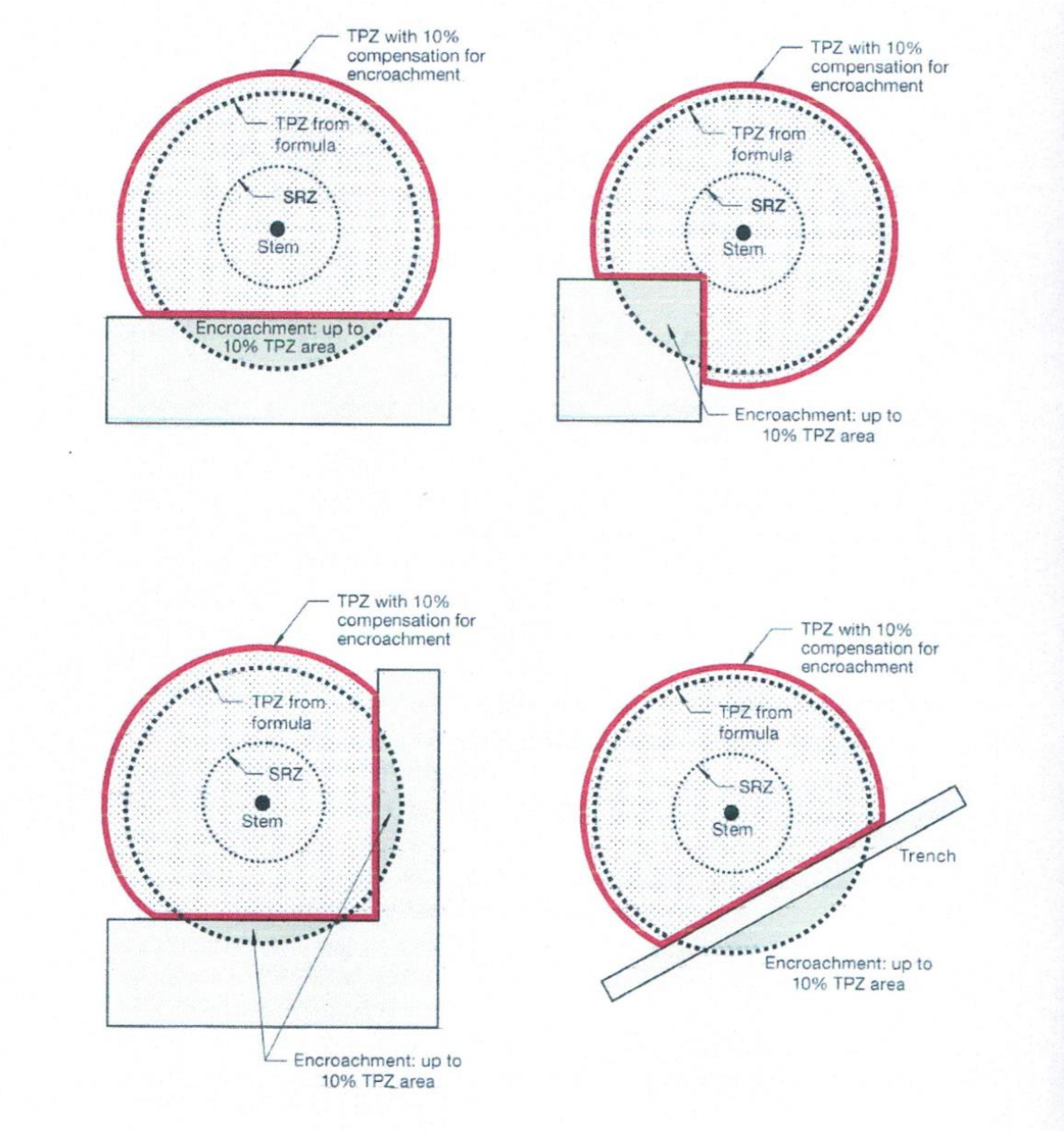

Diagram from AS 4970-2009 Guidelines 18/1/21.

Appendix 5: Technical References

This Arboricultural Report is based on the following primary technical references:

Australian Standards (2009), 4970-2009 - **Protection of Trees on Development Sites.**

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