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SSDA Modification- Arboricultural Impact Assessment

65 Huntingwood Drive
Huntingwood, NSW 2148
Lot 1/-/DP866251

Prepared for: FDC Constructions

Prepared by:

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Version: FINAL

1 EXECUTIVE SUMMARY

Truth About Trees Pty. Ltd. have been engaged by Arnott`s Biscuits Limited C/- FDC Construction, to prepare an Arboricultural Impact Assessment (AIA) report in accordance with the requirements of AS4970-2009: The Protection of Trees on Development Sites and all relevant legislation and planning guidelines.

The purpose of this assessment is to provide a detailed AIA report in relation to a proposed SSDA modification at 65 Huntingwood Drive, Huntingwood located within the Blacktown City Council Local Government area.

The subject site has an existing State Significant Development Application (SSD-17352813) approved for portions of the site detailed within the previous SSDA and the associated Arboricultural Impact Assessment.

Assessment of the trees was undertaken on 21/01/2025 by Tom Hare using the framework of the *Visual Tree Assessment procedure* (VTA) as prescribed by Mattheck & Breloer (Claus Mattheck, 1994).

Trees within the survey area were geo-located and data collected using a TRIMBLE TDC600 data collector, with an external DA2 aerial capable of 30cm accuracy when used in optimal conditions.

Details provided for the trees are as follows:

a) Correct botanical identification and common name
b) Health assessment & rating
c) Basic structural assessment & rating
d) Dimensions: height, crown spread, DBH & DAB
e) TPZ & SRZ calculations
f) Landscape significance assessment & rating
g) Estimated life expectancy
h) Retention value in accordance with the STARS system

Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) were calculated in accordance with Australian Standard *AS4970-2009: Protection of Trees on Development Sites* (Standards Australia, 2009).

Tree Retention Values were determined using the Institute of Australian Consulting Arboriculturists (IACA) 'Significance of a Tree, Assessment Rating System' (STARS) (IACA©, 2010).

The site which is subject to assessment for the purposes of this report is legally identified as Lot 1/-/DP866251, located at 65 Huntingwood Drive, Huntingwood, NSW 2148 and will be further referenced as 'the site'.

The site is detailed within the DPE eSpatial mapping system as zone E4- General Industrial.

The site is not mapped on the NSW Department of Planning & Environment Biodiversity Values Map, as an area of Biodiversity Value and is not located within Bushfire Prone Lands.

The property is not listed as a Heritage item and is not within a heritage conservation area

- A total of two-hundred and forty-six (246) trees were surveyed and assessed in the preparation of this report on 21/01/2025.
- Fifty (53) trees were allocated a medium retention value in accordance with the STARS system of assessment.
- One-hundred and ninety (190) trees were allocated low retention values in accordance with the STARS system of assessment.
- The remaining three (3) trees were allocated very low retention values in accordance with the STARS system of assessment due to being either dead or of hazardous structure.
- Trees 467,468,469,470,471,472,473,474,475,476,477,478,479 are subject to unsustainable impacts from the proposed hardstand extension for the Engineering store and the proposed Engineering shed. Trees 543,544,545,546,547,548,549,550,551,552,553,568,569,570,571 & 572 are subject to unsustainable impacts from the proposed hardstand extension at the rear of the site and the proposed Chocolate manufacturing building. These trees will require removal.
- No further impacts are anticipated upon the remaining trees, and tree protection measures must be installed to isolate the trees from construction activity. Indicative tree protection fencing alignments have been provided in Appendix 3- Tree Protection Drawing.

2 CONTENTS

3 INTRODUCTION & AIM

Truth About Trees Pty. Ltd. have been engaged by Arnott`s Biscuits Limited C/- FDC Construction, to prepare an Arboricultural Impact Assessment (AIA) report in accordance with the requirements of *AS4970-2009: The Protection of Trees on Development Sites* (Standards Australia, 2009) and all relevant legislation and planning guidelines.

The purpose of this assessment is to provide a detailed AIA report in relation to a proposed SSDA modification at 65 Huntingwood Drive, Huntingwood located within the Blacktown City Council catchment area.
The subject site has an existing State Significant Development Application (SSD-17352813) approved for portions of the site detailed within the previous SSDA and the associated Arboricultural Impact Assessment, shown in yellow below. The scope of this report was to inspect and assess trees in the vicinity of new development proposed under the SSDA modification. Only trees that had the potential to be impacted upon by the proposed development were captured, provided they satisfied the definition criteria of a 'tree' in accordance with Councils Development Control Plan (DCP).

This SSDA modification report should be read in conjunction with the previous report dated June 9th, 2021.

An overview of the existing site location and surveyed area is shown in figure 1 below.

Figure 1 – Overview of the site location (red), trees previously assessed as part of the current approved SSDA items (yellow), and the trees surveyed as part of the proposed SSDA modification (blue).

At the request of the client, this report was produced to provide an AIA assessment of the trees related to the proposed development only. Whilst tree defects may be noted within the report, this report does not satisfy the requirements of a detailed Arboricultural risk assessment.

4 METHODOLOGY

Assessment of the trees was undertaken on 21/01/2025 by Tom Hare using the framework of the *Visual Tree Assessment procedure* (VTA) as prescribed by Mattheck & Breloer (Claus Mattheck, 1994).

Trees within the survey area were geo-located and data collected using a TRIMBLE TDC600 data collector, with an external DA2 aerial capable of 30cm accuracy when used in optimal conditions.

Details provided for the trees are as follows:

a) Correct botanical identification and common name
b) Health assessment & rating
c) Basic structural assessment & rating
d) Dimensions: height, crown spread, DBH & DAB
e) TPZ & SRZ calculations
f) Landscape significance assessment & rating
g) Estimated life expectancy
h) Retention value in accordance with the STARS system

Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) were calculated in accordance with Australian Standard *AS4970-2009: Protection of Trees on Development Sites* (Standards Australia, 2009).

Tree Retention Values were determined using the Institute of Australian Consulting Arboriculturists (IACA) *'Significance of a Tree, Assessment Rating System'* (STARS) (IACA©, 2010).

A detailed Arboricultural assessment methodology can be found in Appendix 1 of this report.

Limitations of the report:

- No internal diagnostic testing has been completed.
- No sub surface root testing or soil analysis has been completed.
- All observations were made from ground-level only and where access was reasonably available.
- Tree height, canopy spreads and trunk diameters have been estimated.
- This report has been compiled based only on the information provided by the client as detailed in Table 1 below, and from observations made at the time of the site inspection(s) only.

Only trees located within or directly adjacent to the subject site(s) boundaries that had the potential to be impacted were captured.

Assessment of tree health and condition has been included to guide assessment of tree retention aspects only and is based on a basic visual assessment using elements of the VTA method. Tree structure and defects may be discussed briefly within this report; however, this report is not designed to be, nor does it satisfy the requirements of a detailed Arboricultural Risk Assessment report.

4.1 DOCUMENT SCHEDULE

The documents listed below have been provided to Truth About Trees by the client and have been relied upon to complete the assessment.

Ref. No.	Document / Drawing Title	Author	Date
SEPP_B&C 2021	State Environmental Planning Policy (SEPP) Biodiversity & Conservation – Chapter 2: Vegetation in non-rural areas	NSW DPE	2021
BDCP 2015	Blacktown Development Control Plan (DCP)	BCC	2015
BLEP 2015	Blacktown Local Environmental Plan (LEP)	BCC	2015
AS4970	Australian Standard AS4970-2009 'Protection of trees on development sites'	Standards Australia / SAI Global	2009

Ref. No.	Document / Drawing Title	Author	Date
AS4373	Australian Standard AS4373-2007 'Pruning of amenity trees'	Standards Australia / SAI Global	2007
Documentation provided to Truth About Trees by the client and or representatives:			
200810- AR-A002	Site Plan Stage 1 (Overall)- Rev. E	HLA Architects	04/02/25
200810- AR-A003	Site Plan Stage 2 (Overall)- Rev. B	HLA Architects	04/02/25
200810- AR-A001	Site Plan Proposed Demolition- Rev. A	HLA Architects	04/02/25
200810- AR-A200	Elevations (Overall Site)- Rev. B	HLA Architects	04/02/25

Table 1 – Document Register

5 Site Details

The site which is subject to assessment for the purposes of this report is legally identified as Lot 1/-/DP866251, located at 65 Huntingwood Drive, Huntingwood, NSW 2148 and will be further referenced as 'the site'.

The site is detailed within the DPE eSpatial mapping system as zone E4- General Industrial.

The site is not mapped on the NSW Department of Planning & Environment Biodiversity Values Map, as an area of Biodiversity Value and is not located within Bushfire Prone Lands.

The property is not listed as a Heritage item and is not within a heritage conservation area as shown below.

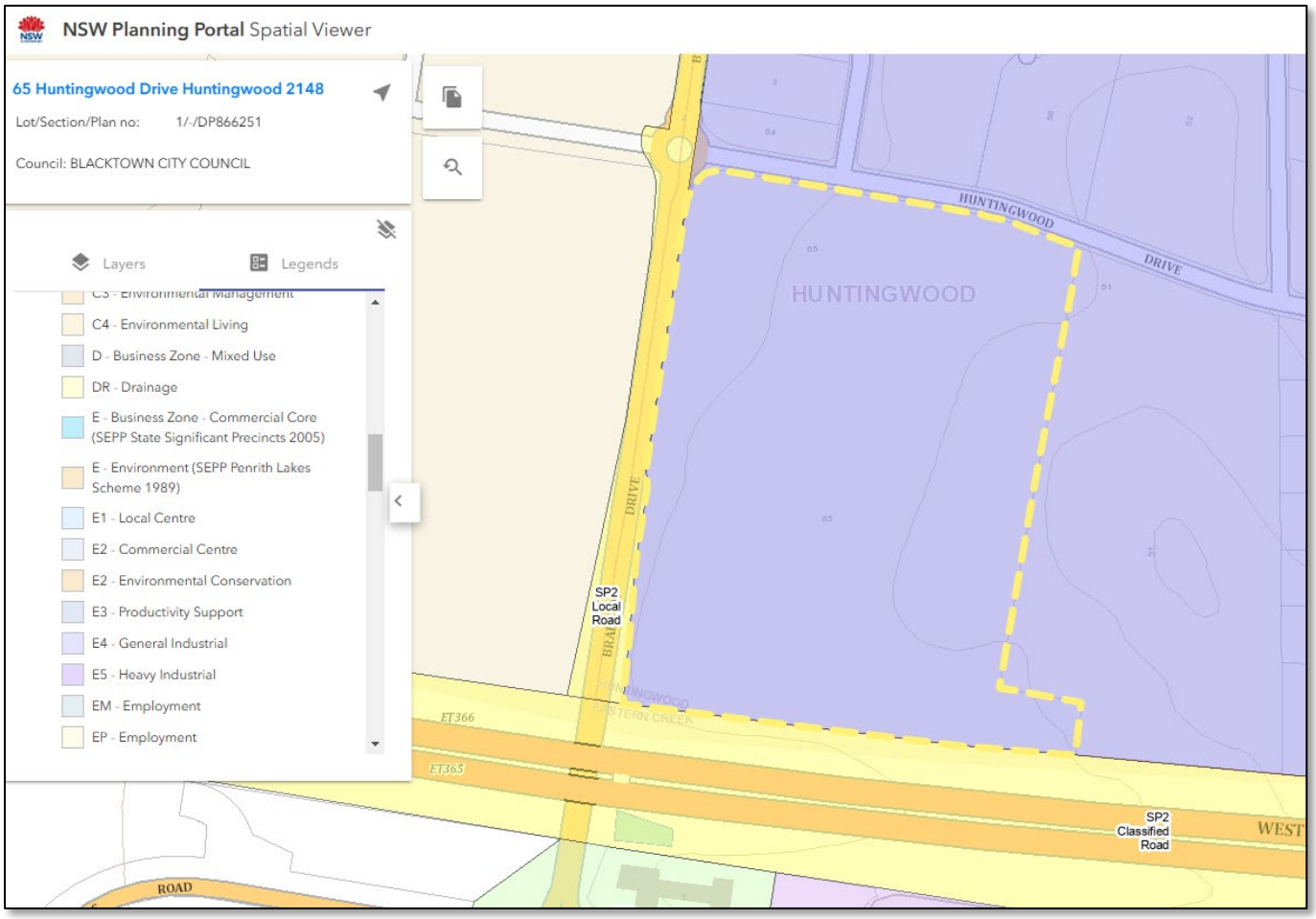

Figure 2– Showing the subject site highlighted by dashed yellow boundary line. Image (Environment, ePlanning Spatial Viewer)

6 THE PROPOSAL

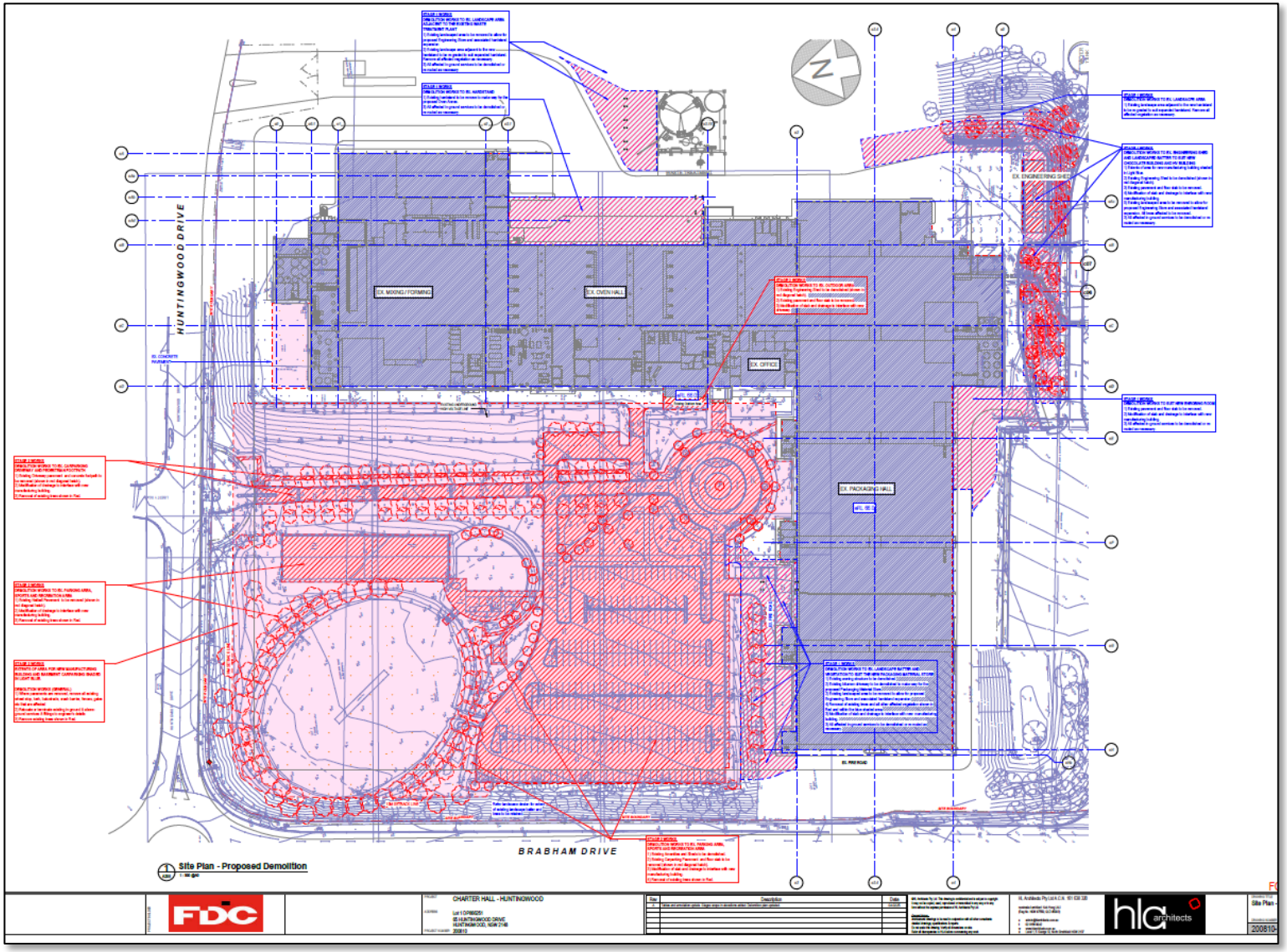

Figure 3- Proposed Demolition Plan. Please refer to official drawing package for clarity.

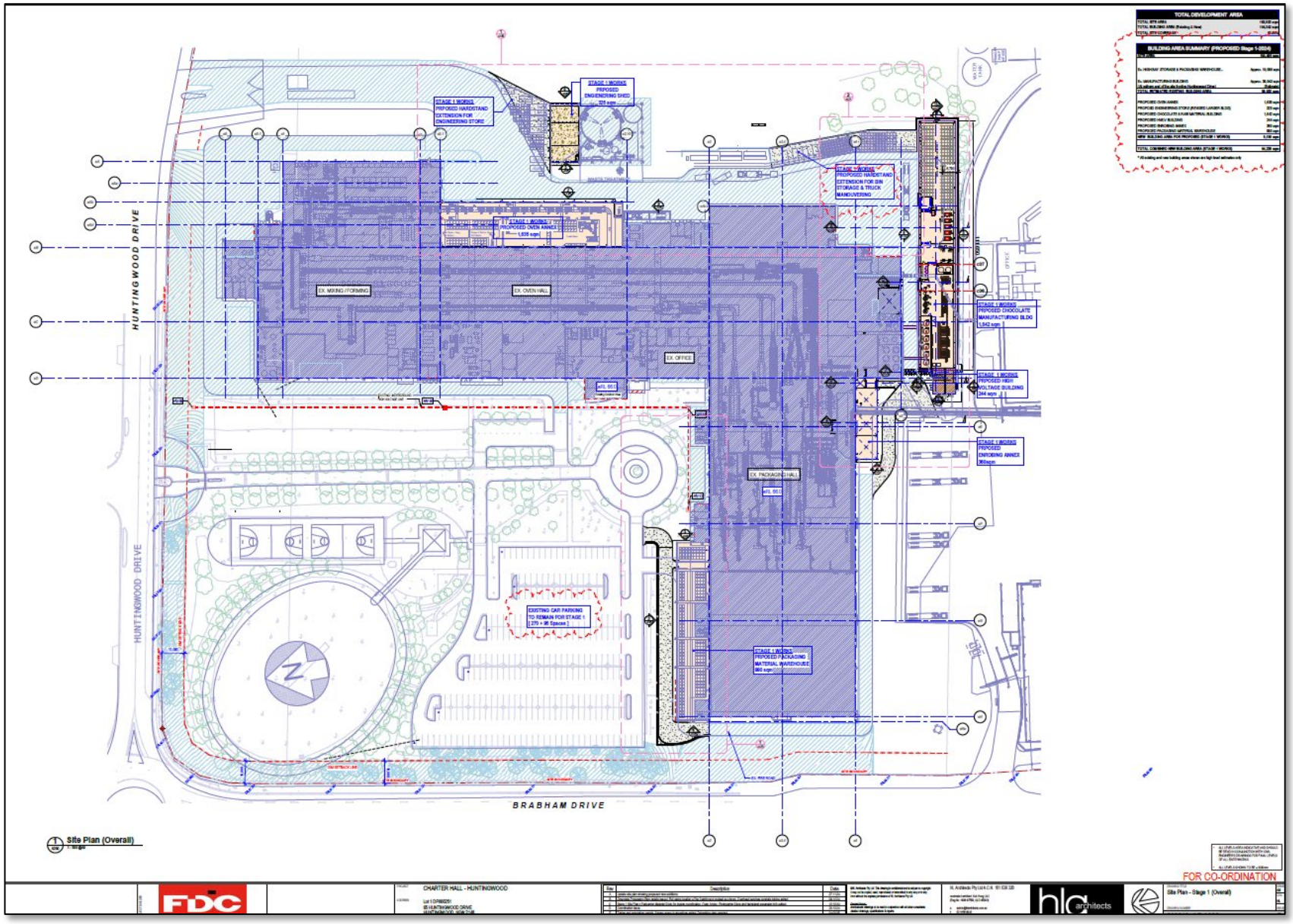

Figure 4- Proposed Stage 1 works. Please refer to official drawing package for clarity.

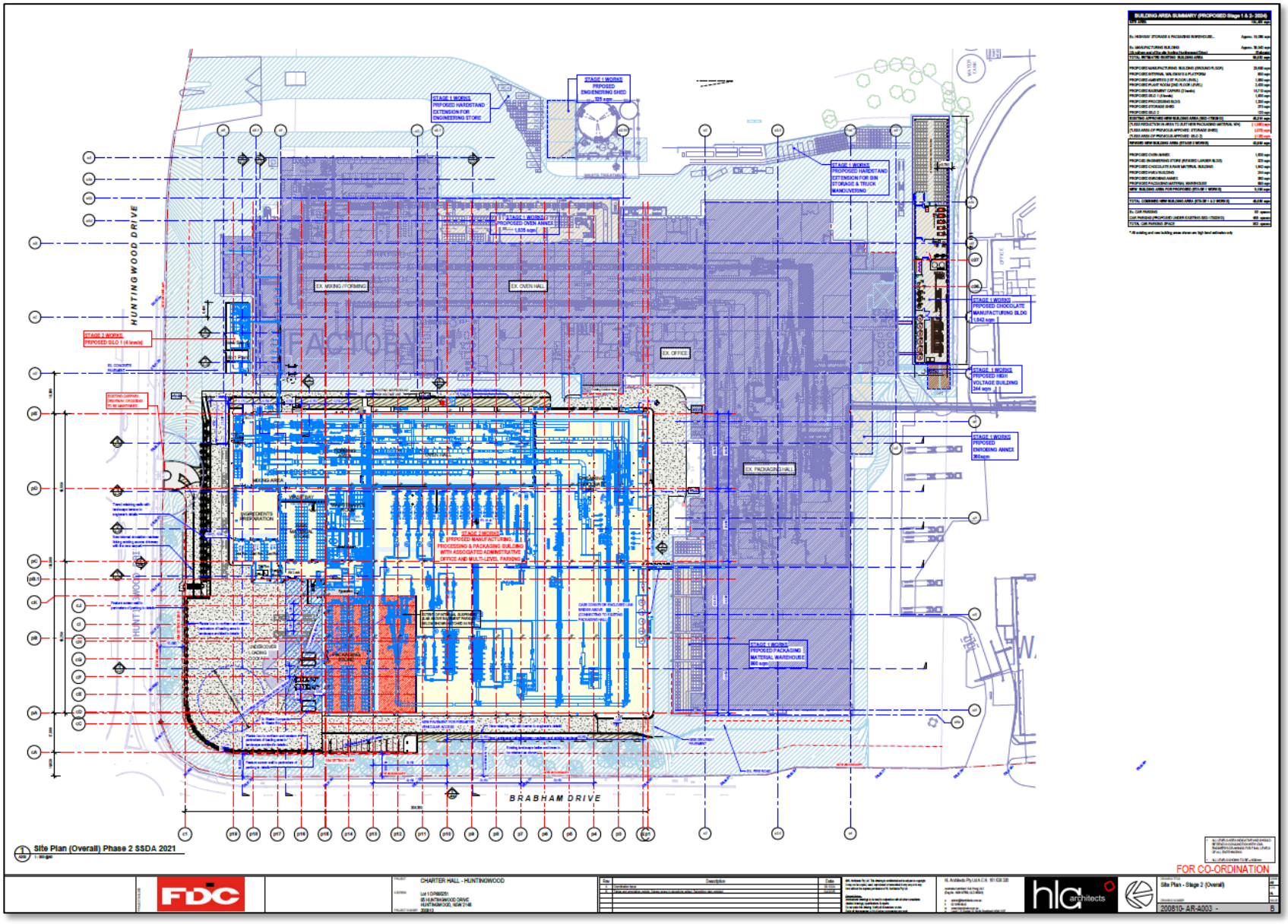

Figure 5- Proposed Stage 2 works. Please refer to official drawing package for clarity.

7 TREE SCHEDULE

SEE APPENDIX 4- TREE SCHEDULE

7.1 TREE RETENTION VALUES

Retention value	Tree numbers	Total
High	N/A	**0**
Medium	346,347,348,349,350,351,352,353,354,389,393,402,410,425,438,456,460,461,470,471,476,478,479,486,487,488,498,502,507,508,509,521,524,525,527,528,538,539, 541,561,562,563,566,567,571,572,574,578,583,584,589,590,591.	**53**
Low	355,356,357,358,359,360,361,362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,390,391,392,394, 395,396,397,398,399,401,403,404,405,406,407,408,409,411,412,413,415,416,417,418,419,420,421,422,423,424,426,427,428,429,430,431,432,433,434,435,436,437, 439,440,441,442,443,444,445,446,447,448,449,450,451,452,453,454,455,457,458,459,462,463,464,465,466,467,468,469,472,473,474,475,477,480,481,482,483,484, 485,489,490,491,492,493,494,495,496,497,499,500,501,503,504,505,506,510,511,512,513,514,515,516,517,518,519,520,522,523,526,529,530,531,532,533,534,535, 536,537,540,542,543,544,545,546,547,548,549,550,551,552,553,554,555,556,557,558,559,560,564,568,569,570,573,575,576,577,579,580,581,582,585,586,587,588.	**190**
Very low	400,414,565.	**3**

Table 2 - Showing tree retention values.

7.2 TREE LOCATIONS

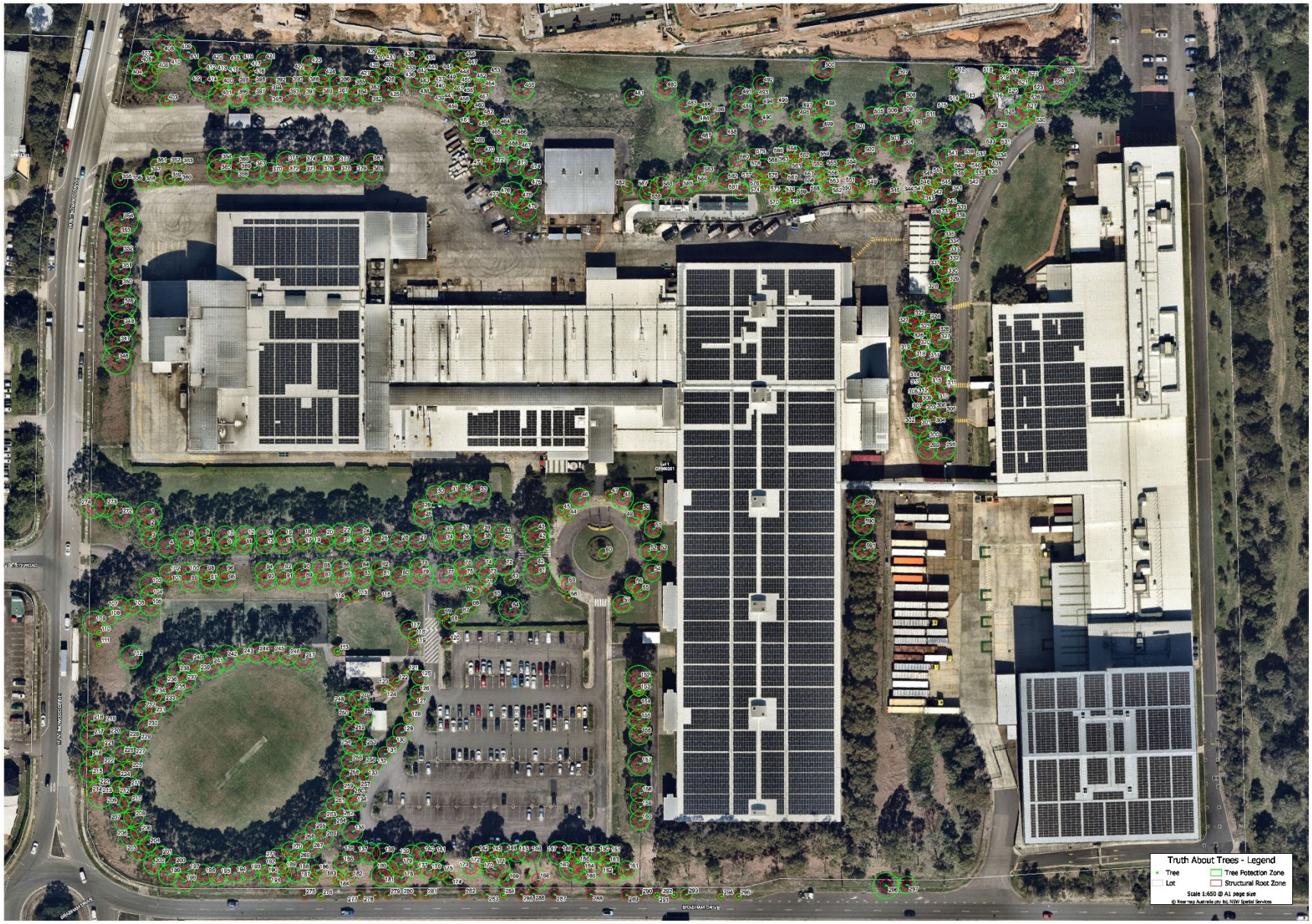

Figure 6 - Tree Locations showing tree numbers, TPZs (Green) and SRZs (red).

8 DISCUSSION

The proposed development has the potential to impact upon the ongoing viability of some of the two-hundred and forty-six (246) trees which were captured as part of this assessment. The impact schedule below lists all of the trees which are potentially impacted upon by aspects of the proposed development. These potential impacts are then assessed in relation to their significance, and mitigation options are provided to reduce the potential impacts where appropriate to do so.

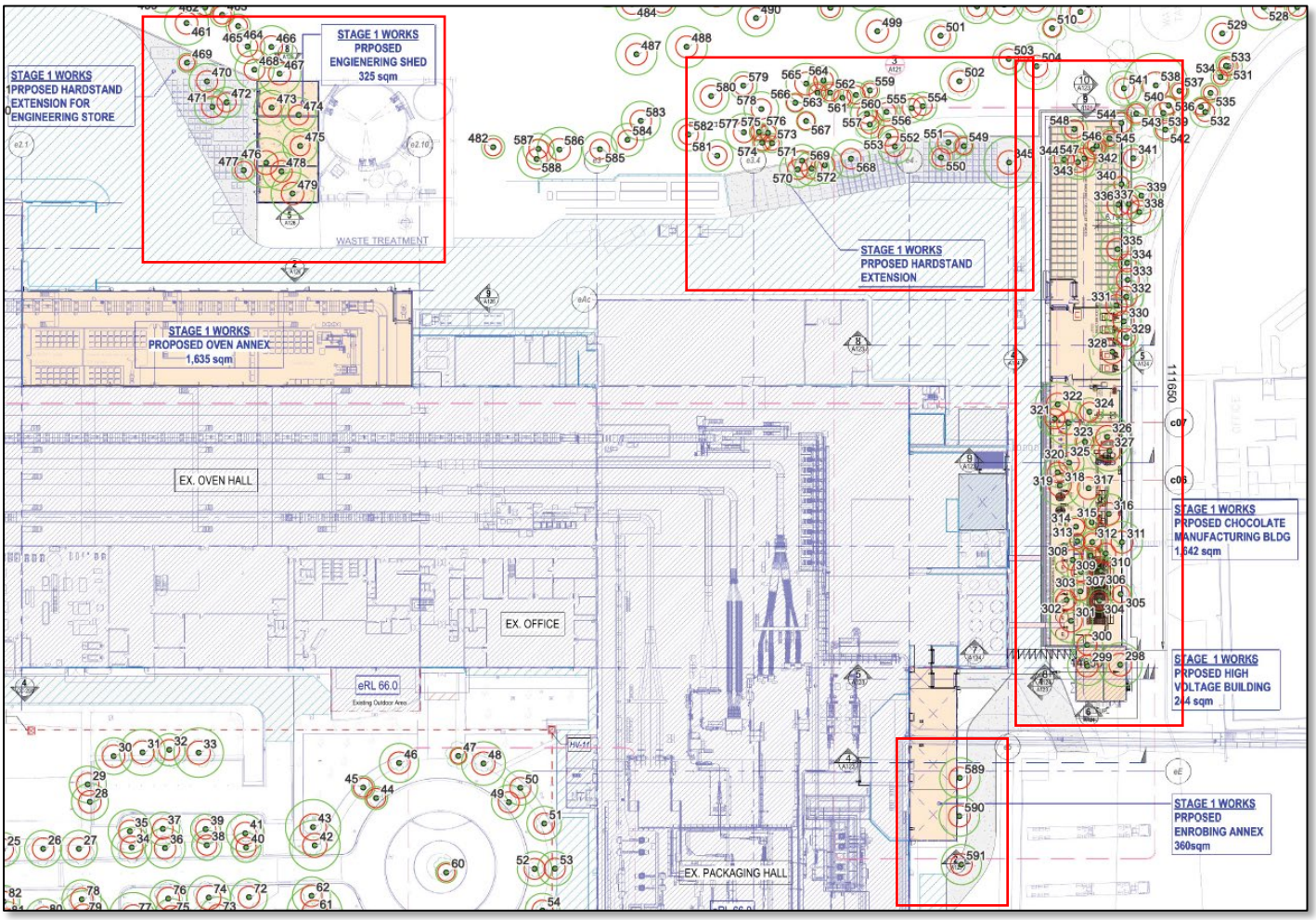

Figure 7- New hardstand & Engineering shed, extension of hardstand & Chocolate building and new roadway for enrobing annex.

8.1 IMPACT ASSESSMENT

IMPACT SCHEDULE				
Tree #	Location	Potentially Impacted by	Potential Mitigation	Practical to retain
467,468,469, 470,471,472, 473,474,475, 476,477,478, 479	Adjacent to existing waste treatment.	Extension of hardstand for Engineering store including retaining wall and grading. Construction of new Engineering shed	Trees 467 & 468 are currently encroached upon by 25-30%, however, the existing topography will increase the level and severity of the encroachments. These two (2) trees will be subject to unsustainable impacts and will require removal., Trees 469,470,471,472,473,474,475,476,477,478 & 479 are within the footprint of the proposed hardstand extension and Engineering Shed. These trees will all require removal.	**NO**

IMPACT SCHEDULE				
Tree #	Location	Potentially Impacted by	Potential Mitigation	Practical to retain
298-345	Rear of site	Proposed Chocolate manufacturing building (previous design)	Trees 298-345 are already approved for removal under the existing SSDA due to conflict with the proposed Chocolate manufacturing building and hardstand.	**NO**
543,544,545, 546,547,548, 549,550,551, 552,553,568, 569,570,571, 572	Rear of site	Proposed Chocolate manufacturing building and hardstand extension	Tree 543 is impacted by the retaining wall adjacent to the proposed Chocolate manufacturing building and will require removal. Trees 544,545,546,547 & 548 are within the footprint of the proposed Chocolate manufacturing building and will require removal. Tree 553 is heavily impacted by the retaining wall for the proposed hardstand, the tree is subject to unsustainable impacts and will require removal. Trees 549,550,551,552,568,569,570,571 & 572 are within the footprint of the proposed hardstand extension and will require removal.	**NO**
589,590,591	Rear of site	Road extension to enable the enrobing annex.	Trees 589,590,591 are within the footprint of the proposed annex and roadway and are subject to unsustainable impacts.	**NO**

Table 3-Impact Schedule

9 CONCLUSION

- A total of two-hundred and forty-six (246) trees were surveyed and assessed in the preparation of this report on 21/01/2025.
- Zero (0) trees are of high retention value in accordance with the STARS system of assessment.
- Fifty-three (53) trees were allocated a medium retention value in accordance with the STARS system of assessment.
- One-hundred and ninety (190) trees were allocated low retention values in accordance with the STARS system of assessment. Trees with a low retention value are generally not considered to be worthy of a material constraint upon design or development, however, may be retained if there is no impact to the trees from the proposed development.
- The remaining three (3) trees were allocated very low retention values in accordance with the STARS system of assessment due to being either dead or of hazardous structure. These trees should be considered for retention regardless of the proposed development.
- Trees 467,468,469,470,471,472,473,474,475,476,477,478,479 are subject to unsustainable impacts from the proposed hardstand extension for the Engineering store and the proposed Engineering shed. These trees will require removal.
- Trees 543,544,545,546,547,548,549,550,551,552,553,568,569,570,571 & 572 are subject to unsustainable impacts from the proposed hardstand extension at the rear of the site and the proposed Chocolate manufacturing building. These trees will require removal.
- Trees 589,590 & 591 are subject to unsustainable impacts from the proposed enrobing annex and associated roadway extension. These trees will require removal.
- No further impacts are anticipated upon the remaining trees, and tree protection measures must be installed to isolate the trees from construction activity. Indicative tree protection fencing alignments have been provided in Appendix 3- Tree Protection Drawing.

Proposed for	Tree number	Total
Trees proposed for removal	467,468,469,470,471,472,473,474,475,476,477,478,479,543,544,545,546,547,548,549,550,551,552,553, 568,569,570,571,572,589,590,591.	32
Trees to be retained	346,347,348,349,350,351,352,353,354,355,356,357,358,359,360,361,362,363,364,365,366,367,368,369, 370,371,372,373,374,375,376,377,378,379,380,381,382,383,384,385,386,387,388,389,390,391,392,393, 394,395,396,397,398,399,400,401,402,403,404,405,406,407,408,409,410,411,412,413,414,415,416,417, 418,419,420,421,422,423,424,425,426,427,428,429,430,431,432,433,434,435,436,437,438,439,440,441, 442,443,444,445,446,447,448,449,450,451,452,453,454,455,456,457,458,459,460,461,462,463,464,465, 466,480,481,482,483,484,485,486,487,488,489,490,491,492,493,494,495,496,497,498,499,500,501,502, 503,504,505,506,507,508,509,510,511,512,513,514,515,516,517,518,519,520,521,522,523,524,525,526, 527,528,529,530,531,532,533,534,535,536,537,538,539,540,541,542,554,555,556,557,558,559,560,561, 562,563,564,565,566,567,573,574,575,576,577,578,579,580,581,582,583,584,585,586,587,588.	214

Table 4-Tree removal & retention

Proposed tree removal totals by retention Value	Total
High	0
Medium	10
Low	22
Very Low	0

Table 5 - Showing proposed tree removal totals by retention value

10 RECOMMENDATIONS

- Thirty-two (32) trees as detailed in Table 4 are proposed for removal to facilitate the development proposed as part of the SSDA modification in its current form.
- Tree pruning and removal works are to be undertaken by a suitably qualified, experienced and insured Arboricultural contractor with a minimum AQF level 3 qualification in Arboriculture.

  Tree removal works should be undertaken in accordance with the following:

  - *(AS4373 – 2007) Pruning of Amenity Trees*
  - *NSW Code of Practice for the Amenity Tree Industry 1998*
  - *NSW Code of Practice for Work Near Overhead Power Lines 2006*
  - *NSW Work Health & Safety Act & Regulations 2011*
  - *Safe Work Guide to managing Risks of Tree Trimming and Removal Work 2016*
- Two-hundred and fourteen (214) trees as detailed in Table 4 are proposed for retention and are to be protected in accordance with Australian Standard AS4970-2009: *Protection of trees on development sites*.
- Trees 400 & 414 are dead and 565 is considered to have potentially hazardous structural condition. These trees should be considered for removal regardless of the proposed development.
- A detailed Tree Protection Specification has been included with Section 15 of this report. This specification provides detailed guidance as to the proper management and protection of trees proposed for retention on site.
- Any trees and tree numbers not specifically listed, recorded and discussed within this report are to be retained in accordance with AS4970-2009.
- Please refer to the previous report dated 9th June 2021 for detail regarding trees 1-345.

11 REFERENCES

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Environment, N. D. (2025, February 13). *ePlanning Spatial Viewer*. Retrieved from NSW Planning Portal: https://www.planningportal.nsw.gov.au/spatialviewer/#/find-a-property/address

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Lonsdale, D. (1999). *Principles of Tree Hazard Assessment and Management* (2007 5th ed.). Norwich: The Stationary Office.

Nelda P Matheny, J. R. (2009). *A Photographic guide to the Evaluation of Hazard Trees in Urban Areas.* Champaign: International Society of Arboriculture.

NSW Rural Fire Service. (2006). *Planning for Bush Fire Protection.* Granville: State of New South Wales.

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12 GLOSSARY OF TERMS & ABBREVIATIONS

Age class – Described as Juvenile, Semi-Mature, Mature, Over-Mature. These definitions are variable subject to species and growing environment.

- **Juvenile** - Trees that are generally a sapling, or a new planting, usually within the first two (2) years of their life.
- **Semi-mature** - Tree aged less than <20% of life expectancy, *in situ*
- **Mature** - Tree aged 20-80% of life expectancy, *in situ*.
- **Senescent/ Over Mature** - Tree aged greater than >80% of life expectancy, *in situ,* or *senescent* with or without reduced *vigour*, and declining gradually or rapidly but irreversibly to death

Arboriculture - The science and culture of the growth, planning, management, care and maintenance of trees primarily for amenity and utility purposes.

Arborist - An individual with competence to cultivate, care and maintain trees for *amenity* or utility purposes.

Australian Standard AS4970-2009 (AS4970) – Australian Standard AS4970-2009: 'Protection of trees on development sites' is the underpinning standard to which development-based Arboricultural works and guidance are based upon within Australia.

Australian Standard AS4373-2007 (AS4373) – Australian Standard AS4373-2007: 'Pruning of amenity trees' is the underpinning standard to which practical Arboricultural works are based upon within Australia.

Batter – The process of grading the land in a slope formation away from an excavation or built structure.

Benching - Relatively level strips of earth or rock in a broad step-like formation breaking the continuity of a slope usually for reasons of safety. Depending on soil and rock type a commonly used ratio for vertical to horizontal cutting is 2:1.

Building envelope - Total surface area of ground that is or will be covered by a building.

Building footprint - *See Building envelope*.

Deep soil - Soil to a depth of 1000 mm or more (Craul 1992, p. 32).

Defect - Any feature of a tree that is likely to make it less safe (in the case of a structural defect) or otherwise to reduce its health, longevity, landscape prominence or conservation value for any other reason.

Diameter at Base (DAB) – The diameter of the tree taken at ground level above the root buttress flare

Diameter at Breast Height (DBH) - Measurement of trunk width calculated at a given distance above ground from the base of the tree often measured at 1.4m.

Easement - Areas of land above or below ground, subject to statutory constraints being either public or private provided for access or the location of utilities.

Estimated Life Expectancy (ELE) - Assessed on trees of particular species in the urban environment, including health and structural conditions which may exist.

Footing - Of a building, the lowest part of a structural wall or *pier* (in any form), that rests upon or into the earth. See also *Foundation*.

Foundation - The point at the earth surface upon which a building *footing* rests. See also *Footing*.

Height over Diameter (H/D) - The height of the tree divided by the Diameter at Base (DAB) used to determine structural integrity of trees in relation to windthrow when trees have developed slender form due to competition.

Significance of a Tree Assessment Rating System (STARS) – A methodology produced by the Institute of Australian Consulting Arborists (IACA) for the use in determining tree retention value(s). (IACA©, 2010)

Structural Root Zone (SRZ) –

Tree Protection Zone (TPZ)

Vigour - Physical strength and health. A tree with good vigour has the ability to sustain life processes and is synonymous with good health.

Visual Tree Inspection (VTA) - Is a detailed visual inspection of a tree and surrounding site (Claus Mattheck, 1994)

13 DISCLAIMER

The information contained within this report is to be used solely for the purposes that were specified at the time of engagement.

All attempts have been made to ensure the legitimacy of any information which has been gathered in the process of compiling this report, however Truth About Trees Pty Ltd cannot be held liable for inaccurate or misguiding information which has been provided by others.

Any tree inspections or assessments which have been carried out for the purposes of this report are valid only at the time of inspection and are based on what could reasonably be seen or diagnosed from a visual inspection carried out from ground level.

All inspections, unless otherwise stated, are based upon Visual Tree Assessment (VTA) techniques, industry best practice and applied knowledge.

No internal diagnostic testing or below ground investigation has been carried out unless otherwise stated.

Trees are a dynamic living organism and as such they have a finite lifespan the end of which cannot always be predicted or understood, even apparently healthy trees can die suddenly or fall without warning. As such there is no warranty or guarantee provided, or implied, regarding the future risks associated with any tree.

Unless specifically stated within the scope and methodology sections of this report, this report does not constitute a detailed Arboricultural Risk Assessment if relating to construction and development related report types.

Assessment of tree health and condition has been included to guide assessment of tree retention aspects only and is based on a basic visual assessment using elements of the VTA method. Tree defects may be discussed briefly within this report; however, this report does not satisfy the requirements of a detailed Arboricultural Risk Assessment report.

It is noted that upon acceptance and completion of any development, that there may be trees that impose a risk of impacting a target that was not previously present prior to the development.

It is up to the client and the tree owner/manager to determine the risk threshold that they are willing to accept and undertake a suitably detailed Arboricultural risk assessment that identifies potential tree risk(s) and provides tree management recommendations in line with this threshold.

Please feel free to contact me either via telephone or email if you have any questions regarding this report.

14 APPENDIX 1: TREE ASSESSMENT METHODOLOGY

14.1 VISUAL TREE ASSESSMENT (VTA)

The VTA system is based on the theory of tree biology and physiology, as well as tree architecture and structure. This method is used by arborists to identify visible signs on trees that indicate good health, or potential problems. Symptoms of decay, growth patterns and defects are identified and assessed as to their potential to cause whole-tree, part-tree and/or branch failure. This system (represented by the image below) is based around methods discussed in `*The Body Language of Trees*'. (Claus Mattheck, 1994)

For the purpose of this report, elements of the VTA system will be used, along with industry standard literature, and other relevant studies that provide an insight into potential hazards in trees. This assessment is a snapshot of what could be reasonably seen or determined from a basic visual inspection. The VTA system is generally used as a means to identify hazardous trees; however, it is important to realize that for a tree to be hazardous there must be a target; a hazard poses no risk if there is no exposure to the hazard.

14.2 HEALTH & VIGOUR ASSESSMENT

The health and vigour of a tree are assessed by looking at the tree canopy and how it is performing. Certain indicators provide information on which to base the assessment. Abnormally small leaves, chlorosis (yellowing), sparse crown, wilting, and die-back can be signs of ill-health or decline but may also be related to a temporary imbalance due to drought or pest infestations. Epicormic growth can be a sign of stress and low energy reserves but can also be related to increased light levels through the removal or pruning of adjacent trees. Extension growth can be a good indicator of vigour, but this can vary greatly between species and under differing climatic conditions. For these reasons, each individual symptom or observation needs to be assessed with objectivity and consideration of all available information.

14.3 STRUCTURAL ASSESSMENT

The structural assessment of trees is carried out using the basic framework of Visual Tree Assessment. Signs and symptoms of defects are assessed to gauge the likelihood of failure, because not every defect constitutes a hazard e.g., *"…co-dominant stems are a structural defect. The severity of the defect is increased by included bark, large crowns and strong wind."* (Nelda P Matheny, 2009)

If trees were removed purely on the basis that there were defects present without assessing the likelihood of failure or whether practical mitigation measures are available, the urban forest would cease to exist. A basic visual tree assessment is undertaken from ground level, if defects are suspected further investigation may be required and recommended.

"*[When using] the Visual Tree Assessment (VTA) procedure for assessing trees, as the suspicion increases that defects are present, the examination becomes more thorough and searching."* (Claus Mattheck, 1994)

"Some defects, especially some forms of decay, do not give rise to external signs and therefore tend to escape detection in a purely visual survey. If there is no reason for suspecting a hidden defect to occur within a particular part of the tree, there is no reasonable basis for carrying out a detailed internal assessment. Although in theory an unsuspected defect might be detectable by the use of specialized diagnostic devices, this would be impracticable in the absence of some external sign to indicate the place which should be probed. Also, internal examination without good reason is undesirable, as it usually causes injury to the tree and is unreasonably time consuming and costly." (Lonsdale, 1999)

14.4 TREE PROTECTION ZONE (TPZ) & STRUCTURAL ROOT (SRZ) ZONE CALCULATIONS

In accordance with Australian Standard *AS4970-2009 Protection of trees on development sites* (Standards Australia, 2009), Tree Protection Zone (TPZ) radius is calculated using the following procedure. Diameter of the trunk is measured at approximately 1.4m above ground level; this measurement is referred to as DBH (Diameter at Breast Height). $R_{TPZ} = DBH \times 12$. For multi-stemmed trees the formula used is $R_{TPZ} = \sqrt{[(DBH1)^2 + (DBH2)^2 + (DBH3)^2]}$. The TPZ is measured radially from the centre of the stem and must be protected on all sides.

The Structural Root Zone (SRZ) radius is calculated by measuring the diameter of the stem close to ground level, just above the basal flare. This measurement is taken as ***D*** and then used in the following formula: $R_{SRZ} = (Dx50)^{0.42} \times 0.64$ and becomes the Structural Root Zone, measured radially from the centre of the stem.

It is important to realize that these calculations provide a notional figure only and tree dynamics, form and site conditions will greatly affect these zones, and it is the job of the arborist to interpret the information correctly.

For palms, cycads, tree ferns, and similar monocots, the TPZ is positioned at least 1m outside the crown projection. SRZs are not applicable to these plant types.

AS4970-2009 states "*a TPZ should not be less than 2m nor greater than 15m (except where crown protection is required*" and the minimum radius for an SRZ is 1.5m.

14.5 REFERENCE DIAGRAMS

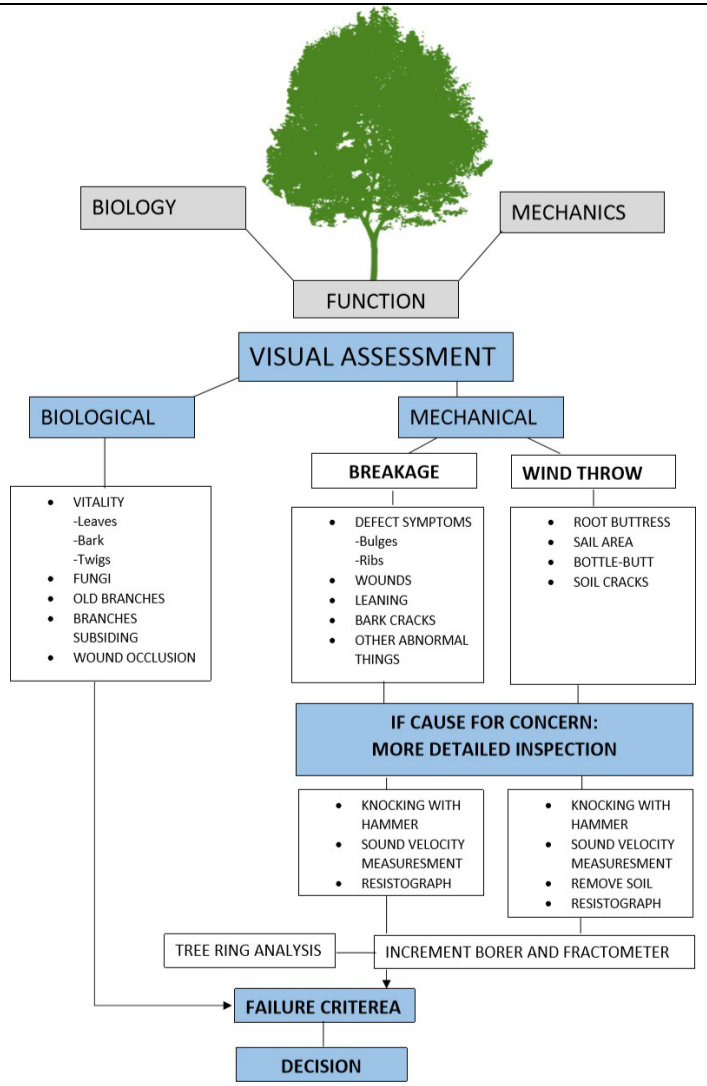


Figure 8 - VTA Procedure flowchart

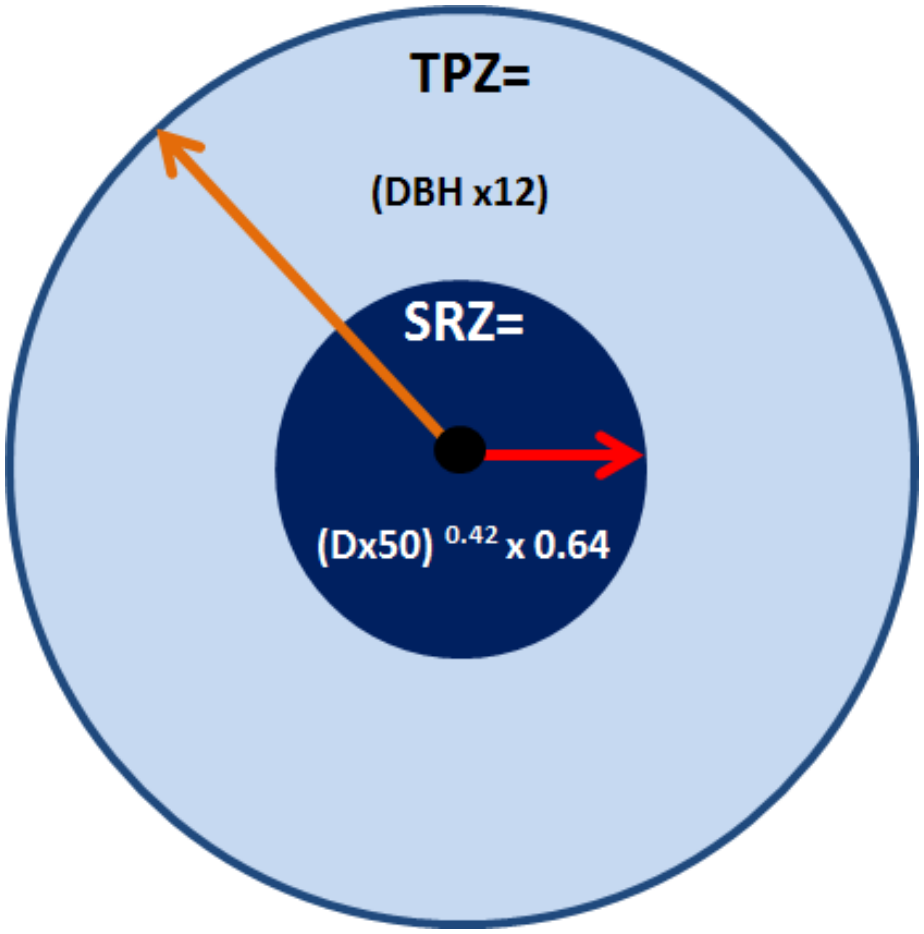


Figure 9 - A representation of TPZ & SRZ calculations

14.5.1 SIGNIFICANCE OF A TREE, ASSESSMENT RATING SYSTEM (STARS)

IACA Significance of a Tree, Assessment Rating System (STARS)© (IACA 2010)©

In the development of this document IACA acknowledges the contribution and original concept of the Footprint Green Tree Significance & Retention Value Matrix, developed by Footprint Green Pty Ltd in June 2001.

The landscape significance of a tree is an essential criterion to establish the importance that a particular tree may have on a site. However, rating the significance of a tree becomes subjective and difficult to ascertain in a consistent and repetitive fashion due to assessor bias. It is therefore necessary to have a rating system utilising structured qualitative criteria to assist in determining the retention value for a tree. To assist this process all definitions for terms used in the *Tree Significance - Assessment Criteria* and *Tree Retention Value - Priority Matrix*, are taken from the IACA Dictionary for Managing Trees in Urban Environments 2009.

This rating system will assist in the planning processes for proposed works, above and below ground where trees are to be retained on or adjacent a development site. The system uses a scale of *High*, *Medium* and *Low* significance in the landscape. Once the landscape significance of an individual tree has been defined, the retention value can be determined. An example of its use in an Arboricultural report is shown as Appendix A.

Tree Significance - Assessment Criteria

1. High Significance in landscape

- The tree is in good condition and good vigour;
- The tree has a form typical for the species;
- The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age;
- The tree is listed as a Heritage Item, Threatened Species or part of an Endangered ecological community or listed on Councils significant Tree Register;
- The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity;
- The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values;
- The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa *in situ* - tree is appropriate to the site conditions.

2. Medium Significance in landscape

- The tree is in fair-good condition and good or low vigour;
- The tree has form typical or atypical of the species;
- The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area
- The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street,
- The tree provides a fair contribution to the visual character and amenity of the local area,
- The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa *in situ*.

3. Low Significance in landscape

- The tree is in fair-poor condition and good or low vigour;
- The tree has form atypical of the species;
- The tree is not visible or is partly visible from surrounding properties as obstructed by other vegetation or buildings,
- The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area,
- The tree is a young specimen which may or may not have reached dimension to be protected by local Tree Preservation orders or similar protection mechanisms and can easily be replaced with a suitable specimen,
- The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa *in situ* - tree is inappropriate to the site conditions,
- The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms,
- The tree has a wound or defect that has potential to become structurally unsound.

Environmental Pest / Noxious Weed Species

- The tree is an Environmental Pest Species due to its invasiveness or poisonous/ allergenic properties,
- The tree is a declared noxious weed by legislation.

Hazardous/Irreversible Decline

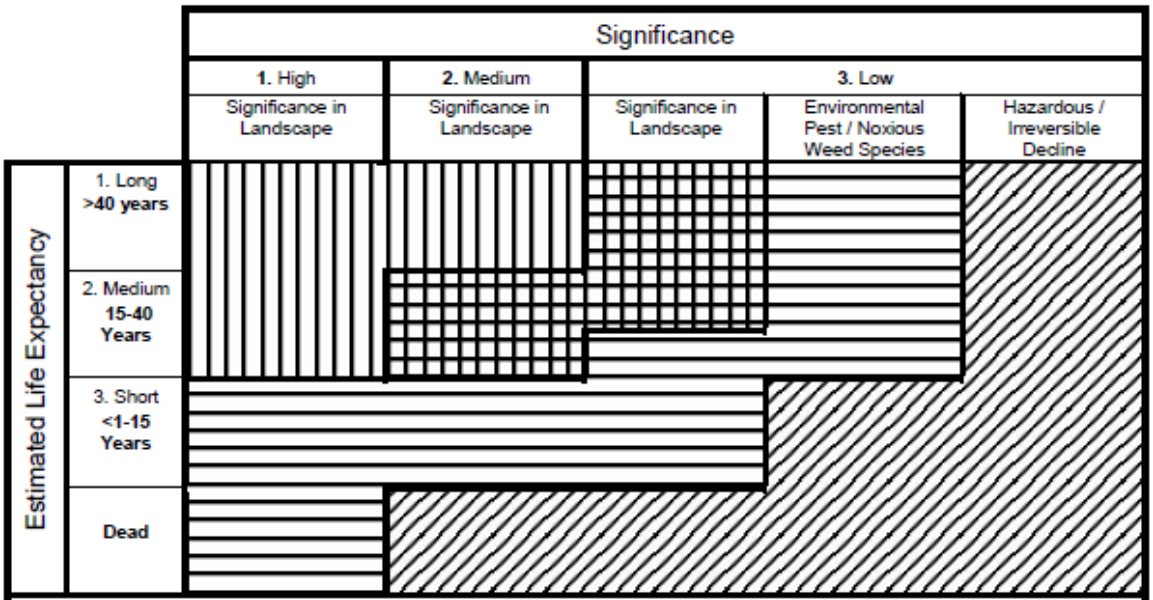
- The tree is structurally unsound and/or unstable and is considered potentially dangerous,
- The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.

The tree is to have a minimum of three (3) criteria in a category to be classified in that group.

Note: The assessment criteria are for individual trees only, however, can be applied to a monocultural stand in its entirety e.g. hedge.

IACA 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, www.iaca.org.au

Table 1.0 Tree Retention Value - Priority Matrix.



Legend for Matrix Assessment

Priority for Retention (High) - These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by the Australian Standard AS4970 *Protection of trees on development sites*. Tree sensitive construction measures must be implemented e.g. pier and beam etc if works are to proceed within the Tree Protection Zone.

Consider for Retention (Medium) - These trees may be retained and protected. These are considered less critical; however their retention should remain priority with removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.

Consider for Removal (Low) - These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

Priority for Removal - These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

USE OF THIS DOCUMENT AND REFERENCING

The IACA Significance of a Tree, Assessment Rating System (STARS) is free to use, but only in its entirety and must be cited as follows:

IACA, 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au

REFERENCES

Australia ICOMOS Inc. 1999, *The Burra Charter – The Australian ICOMOS Charter for Places of Cultural Significance*, International Council of Monuments and Sites, www.icomos.org/australia

Draper BD and Richards PA 2009, *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.

Footprint Green Pty Ltd 2001, *Footprint Green Tree Significance & Retention Value Matrix*, Avalon, NSW Australia, www.footprintgreen.com.au

IACA 2010, *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturists, www.iaca.org.au

Figure 10- Significance of a Tree Assessment Rating System (STARS) – IACA

15 APPENDIX 2: TREE PROTECTION SPECIFICATION

15.1 GENERAL

15.1.1 INTRODUCTION

- Early identification & protection of important trees on development sites is essential from the outset & will minimise problems associated with retaining inappropriate trees, & in turn focus time, resources & budget on the retention & protection of the most valuable trees on site (Standards Australia, 2009).
- Tree protection will form an essential part of the success of the development & should be prioritised at the earliest stage of the project. Where trees are proposed for retention on site, proper tree protection & management procedures will be crucial in ensuring that the trees remain valuable assets over the long-term.
- The following specification has been developed to provide detailed guidance for tree protection measures & processes associated with the development project.

15.1.2 APPLICABLE STANDARDS

15.1.2.1 Australian Standard AS4970-2009: Protection of trees on development sites (Standards Australia, 2009)

15.1.2.2 Australian Standard AS4373-2007: Pruning of amenity trees (Standards Australia, 2007)

- Australian Standards AS4373-2007 & AS4970-2009 are the underpinning documents that Arboricultural practice within Australia is based upon.
- The preparation of this specification has been prepared in accordance with & has been closely aligned with the foundations & principles of these standards.
- As such, this specification & any associated report(s) should be read in conjunction with AS4970 & AS4373.

15.1.3 APPROVAL FROM CONSENT AUTHORITY

- It is important to note that this specification & any associated report(s), do not count as approval for the recommendations contained within. It is vital that approval is obtained from the consent authority prior to following any recommendations provided by Truth About Trees as part of this specification or report.
- Upon approval from the consent authority, it is important that any variation between this specification & the Conditions of Consent (CoC) are identified, discussed & addressed with the Project Arborist, Project Manager & the consent authority to resolve any discrepancies.
- Unless otherwise advised by the consent authority, the CoC shall prevail.

15.2 PLANNING & DESIGN

- In addition to the commonly identified physical tree protection measures, tree protection is most effective when addressed through early-stage planning & design. Ideally this would mitigate the need to encroach on the tree(s) TPZ entirely resulting in only basic physical tree protection measures being required.
- The undertaking of a Preliminary Tree Assessment report is a key step in the process of tree protection. As through consultation between planners, the design team, project managers, the principal contractor & the project arborist; redesign, planning & detailed site management can achieve an outcome that both mitigates impacts to significant trees on site, & maintains the desired outcomes of the development.
- However, this may not always be feasible or have been considered early on in the development. Therefore, tree protection measures become paramount for the development to proceed successfully. At this point, the use of tree sensitive construction methods, combined with physical tree protection measures should be utilised for any part of the development that encroaches the TPZ of a tree proposed for retention.

15.2.1 TREE SENSITIVE CONSTRUCTION METHODS

- Tree sensitive construction methods are methods of construction that minimise the impact(s) to the tree(s) on site. Typically, in the form of minimising impacts associated with the below ground parts of the tree(s) root system.
- Examples of tree sensitive construction methods include, but are not limited to:
  - Pier & Beam style footings
  - Cantilevered Building Sections
  - Contiguous Piling
  - Suspended Slabs
  - Screw Piles
  - Directional under-boring

15.2.2 Construction Management Plan

- A Construction Management Plan (CMP) should be compiled by the principal contractor in consultation with the Project Arborist in order to address any issues related to aspects such as the access & egress of vehicles and machinery & the storage of site materials.

15.2.3 Order of works

- It is important that works are undertaken with a methodical approach to mitigate conflict during the different stages of construction. When works are undertaken out of sequence, it can result in additional impacts to the tree(s) proposed for retention. ***(See Section 15.11)***
- One of the most effective ways to ensure that tree protection measures remain successful, is by ensuring compliance with AS4970 and this specification. ***(See Sections 15.3 & 15.4)***

15.3 Compliance

- Compliance with this specification is best managed through the appointment of a Project Arborist to ensure that works are undertaken in accordance with the recommendations & hold-points detailed within this specification. ***(See Section 15.11)***
- This specification should be clearly communicated with the Principal Contractor & Project Manager to ensure that all works are undertaken in accordance with this specification.
- Tree protection measures should form part of the site-specific induction process to ensure that all workers on site are familiar with the requirements set out within the specification.
- The Project Arborist & Project Manager are to be responsible for the monitoring & enforcement of all tree protection measures on site.

15.4 The Project Arborist

15.4.1 Project Arborist Appointment & Qualifications

- A Project Arborist (PA) with a minimum Australian Qualification Framework (AQF) Level-5 qualification in arboriculture should be appointed as the Consulting Arborist for the project.
- The PA is to have sufficient experience in managing trees on development sites & must be familiar with the required legislation & standards, & up to date on industry best practice methodologies.
- The PA is to be appointed prior to the start of any works on site, inclusive of tree pruning & removal works & prior to site establishment & occupation.

15.4.2 Responsibilities of the Project Arborist & Record Keeping

- The PA is to be consulted at the design stage to ensure that impacts to valuable trees on site is either mitigated, or effectively managed throughout the project.
- The PA is to attend an on-site meeting with the Project Manager & Principal Contractor to discuss the requirements for tree protection measures for the project. This is to be conducted prior to any works on site & prior to site establishment & occupation.
- The PA is to be responsible for the compliance with the specification, AS4970 & any CoC placed upon the development by the consent authority.
- The PA is to guide all tree pruning & removal works in accordance with AS4970 & AS4373.
- Certification of the installation of tree protection measures and any additional relevant hold-points as detailed within ***Sections 15.10 & 15.11*** of this specification is to be undertaken by the PA in accordance with the relevant industry standards and reporting requirements.
- The PA is responsible for supervision of any & all works within the TPZ of any tree proposed for retention.
- Record keeping of all supervision works by the PA is to be completed via a statement of attendance, detailing what works were undertaken and certifying that they were undertaken in accordance with the relevant standards e.g., AS4970 & AS4373. ***(See Sections 15.10 & 15.11)***
- Whilst the above noted responsibilities are primarily that of the PA, it is the responsibility of the project manager/site manager to contact the PA prior to any works that require Arborist involvement and to assist with direct enforcement of all tree protection measures with all contractors.

15.5 TREE PROTECTION ZONE (TPZ)

15.5.1 TREE PROTECTION ZONE: DEFINITION & PURPOSE

- The Tree Protection Zone (TPZ) is defined within AS4970 as:

  ''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 to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development.'' (Standards Australia, 2009)
- The TPZ is calculated in accordance with AS4970 by taking the Diameter at Breast Height (DBH) of the subject tree and multiplying it by twelve (12).
- It is important to note that this calculation provides a notional TPZ only, which is indicative of a generalised area that a tree may require to maintain tree health & structure. There are many aspects that contribute to the TPZ, and it is up to the PA to ensure that all aspects have been considered when determining the TPZ as this may differ from the notional TPZ calculation. ***(See section 15.6)***

15.5.2 STRUCTURAL ROOT ZONE: DEFINITION & PURPOSE

- The Structural Root Zone (SRZ) is defined within AS4970 as:

  'The area around the base of a tree required 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 nominally 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.'' (Standards Australia, 2009)

15.5.3 RESTRICTED ACTIVITIES

- It is important to restrict certain activities within the TPZ in order to mitigate any detrimental impacts to the tree(s) health and condition. Some activities may not appear to be of concern, however even indirect impacts can have a long-term and lasting effect on tree health and condition.

  Examples of restricted activities as detailed within AS4970 are listed below:

- machine excavation including trenching
- excavation for silt fencing
- cultivation
- storage
- preparation of any chemicals, including cement
- parking of vehicles and plant
- refuelling
- dumping of waste
- wash down and cleaning of equipment
- placement of fill
- lighting of fires
- soil level changes
- temporary or permanent installation of utilities
- physical damage to the tree

15.6 VARIATIONS TO THE TPZ

15.6.1 TPZ ENCROACHMENTS

- Encroachment to the TPZ may at times be a necessity due to site limitations and constraints & are generally decided upon during the planning & Development Application stages. It is imperative that any encroachment to the TPZ is only undertaken with prior approval from the Consent Authority & under the guidance of the PA.
- TPZ encroachments are considered to be items that have a longer-term effect on the TPZ e.g., excavation, trenching, building footings, installation of services etc.
- There are typically two (2) categories of TPZ encroachment which each have their own specific assessment & management processes as detailed below.

15.6.1.1 Minor TPZ Encroachments:

- Where an encroachment is <10% of the trees total TPZ area & provided it is outside of the SRZ, then it is considered to be a minor encroachment.
- A minor encroachment would not generally warrant further, or detailed root investigation.
- Where an encroachment occurs, the TPZ must be adapted to compensate for the loss of area due to the encroachment, the compensated area must be contiguous to the existing TPZ.

15.6.1.2 Major TPZ Encroachments:

- Where an encroachment is >10% of the trees total TPZ area, or if it encroaches the SRZ, then it is considered to be a major encroachment.
- A major encroachment will require assessment by the PA and may require exploratory root investigation works to demonstrate the viability of the tree over the long-term. ***(See Sections 15.8.1 & 15.8.2)***
- As with a minor encroachment, where an encroachment occurs, the TPZ must be adapted to compensate for the loss of area due to the encroachment, the compensated area must be contiguous to the existing TPZ.

15.6.2 CANOPY PROTECTION

- As well as the below-ground parts, the above-ground parts of the tree also require protection throughout development.
- On occasion, the notional TPZ calculation may be located within the tree canopy, therefore, the TPZ will require adjustment to 1m outside of the dripline to ensure that the tree canopy is properly protected.
- This will generally require the TPZ and associated fencing to be extended to a distance of 1m outside the perimeter of the tree canopy dripline as a minimum. ***(See section 15.7.1)***
- In some cases, site space & constraints may result in the requirement for tree branches to be pruned. In this instance, a pruning specification may be required & must be undertaken in accordance with the relevant standards & under the guidance of the PA. ***(See sections 15.1.2.2 & 15.9.1)***

15.6.3 ADDITIONAL CONSIDERATIONS

- Variations to the TPZ may also be required where the PA has demonstrated that one of the following (or other) aspects are impacting the likely TPZ requirement for the subject tree:
    - Existing or historical structures that are likely to have impacted the location of tree roots
    - The future growth requirements of the tree, including both above & below ground parts
    - Tree health
    - Tree structure
    - The characteristics of the individual tree species & its ability to tolerate development impacts
    - Site topography & soil type

15.7 PHYSICAL TREE PROTECTION MEASURES

15.7.1 TPZ FENCING & SIGNAGE

- TPZ fencing will be required for all trees proposed for retention, unless there is an existing structure that acts as physical barrier to access of the tree.
- Fencing must be erected in accordance with AS4970 & AS4687 & should be positioned to the perimeter of the TPZ.
- Where the notional TPZ is located within or below the tree canopy, the fencing should be extended to a minimum of 1m outside of the dripline.
- Access to, or relocation of the TPZ fencing must only be acted upon following guidance from the PA.
- Signage must be attached to the TPZ fencing in a position that is clearly visible from within the site.
- Signage must be a minimum of A4 paper size & must be weather-proofed (laminated) & securely attached to the fencing in a way that ensures it remains in place throughout the development.

  (See section 15.12)

15.7.2 TRUNK & BRANCH PROTECTION

- Trunk & branch protection may be required where there is likely to be an impact to the tree from the access & egress of vehicles & machinery on site & will be advised by the PA.
- Where trunk & branch protection is required, it should comply with AS4970 & consist of:
    - Wrapping a fabric layer (hessian/geotextile) around the tree trunk/branches,
    - Placing timber battens (90mm x 45mm) spaced at 150mm & to a height of 2m above-grade around the tree.
    - Timbers are not to be attached directly to the tree. ***(See section 15.12)***

15.7.3 GROUND PROTECTION

- Ground protection is to be utilised where temporary access & egress of vehicles & machinery is required into any part of the TPZ to prevent soil compaction & root damage.

  Unless otherwise specified, ground protection should consist of a layer of geotextile fabric, well composted native woodchip mulch to a depth of 75mm-100mm & timber rumble boards placed on top. ***(See section 15.12)***

15.8 CONSTRUCTION PROCESSES & TREE SENSITIVE METHODOLOGIES

15.8.1 Root Investigations

- Where a major encroachment occurs root investigation may be required in order to ensure that any impacts to significant roots are mitigated, and tree health & structure remains viable.
- This should be completed and documented prior to the start of any works on site.
- Root investigation can be conducted using a number of methods, each with their own benefits & constraints. Whilst all methods should be non-destructive, some methods are considered to be less invasive than others such as Ground Penetrating Radar (GPR).
- The investigation should be focused along the proposed line of construction.
- However, accuracy of the results can vary depending on characteristics of the individual site. As such, the PA will need to advise as to the most appropriate & effective method of investigation. Site constraints may impact upon the feasibility of a particular method & therefore site-specific recommendations will be required.
- Regardless of the method utilised, the following aspects should be assessed & documented as part of the investigation:
    - Method used
    - Date, time & location of works.
    - Individual tree identifying reference
    - Location, size, depth & direction of travel of all roots observed.
    - Summary of the estimated significance of the observed roots
    - Recommendations for construction processes to mitigate significant impacts to the roots (generally to be included as part of AIA reporting)

15.8.2 Exploratory Excavation

- Exploratory excavation is a method that can be utilised as part of a root investigation to guide design & construction. However, due to its invasive nature it is imperative that it is conducted in a way that minimises impacts to the tree.
- Exploratory excavation must be undertaken in accordance with the aspects detailed above in; ***section 15.8.1.***
- Exploratory excavation must be undertaken in accordance with the aspects detailed below in; ***section 15.8.3.***

15.8.3 Excavation Within the TPZ

- Any excavation within the TPZ must only be undertaken following approval from the consent authority & under the supervision & guidance of the PA.
- Works must be undertaken using non-destructive measures such as hand digging, AirSpade or a Dry Vac*

  *Note that a Dry Vac differs from a regular Hydro Vac. The Dry Vac uses air pressure to break up the soil profile, rather than a water jet, reducing the likelihood of tree roots being damaged by the high-pressure water jet.
- Works must be documented & certified by the PA ***(See section 15.10)***

15.8.3.1 Root Protection

- Where roots are likely to be exposed for an extended period of time, it is important that they are adequately protected to prevent them from drying out.
- This can be achieved by wrapping the roots in hessian & ensuring that they remain moist throughout the works.
- The hessian wrap must be removed & the area back-filled with a suitable material as soon as practicable upon completion of the works.

15.8.4 Root Pruning

- Root Pruning must only be undertaken under the guidance & supervision of the PA.
- Pruning cuts should be made using a fit-for-purpose & sharp tool to ensure that cuts are made cleanly and back to a suitable point in accordance with AS4373. ***(See Section 15.1.2.2)***
- No roots greater than 25mm in diameter are to be pruned unless demonstrated viable by the PA.

15.8.5 Grade Changes Within the TPZ

- Grade changes within the TPZ will require prior approval by the consent authority & the PA. They will generally consist of a raise in soil level only & not a reduction in grade.
- Where grade changes are permitted, they will generally be restricted to a maximum fill of 200mm above existing grade.
- The fill material must be a non-compacted material that is coarser than the existing soil & must be inspected & approved by the PA.

15.8.6 UNDERGROUND SERVICES

- Where feasible, all underground services should be located outside of the TPZ.
- In situations where site limitations dictate the location of service within the TPZ, then they would ideally be installed using directional under-boring to minimise disturbance to the TPZ. ***(See Section 15.8.7)***
- Should under-boring not be feasible, then the services must be installed in accordance with ***sections 15.8.1, 15.8.2 & 15.8.3*** of this specification.

15.8.7 DIRECTIONAL UNDER-BORING

- Directional under-boring is undertaken using specialist equipment that can bore below ground to avoid conflict with trees, structures & infrastructure. Whilst it is a highly beneficial method for minimising impacts with trees, there are certain aspects that must still be considered to successfully mitigate any significant impact with tree root systems.
- Entry/exit pits – The directional drilling equipment requires an entry & exit pit in order to start the drilling process, the size may vary depending on the make/model of equipment, but 2m² should be considered as a minimum requirement. It is important to ensure that the entry/exit pit is located outside of the TPZ where possible. Where the entry or exit pit must be within the TPZ of a tree, the PA is to assess the viability of the proposal and the entry/exit pit is to be excavated using non-destructive means.
- Drilling depth – different machines are capable of drilling to different depths, and different soil types or bedrock may guide the desired depth of the bore, but generally speaking most machines are capable of drilling to a depth that avoids conflict with the tree's root system. The PA is to provide guidance on the minimum depth required based on soil type, tree species and site conditions.

15.8.8 ABOVE-GROUND SERVICES & STRUCTURES

15.8.8.1 Scaffolding

- Should scaffolding be required within the TPZ, it should be designed to mitigate impacts with the tree canopy.
- Where there is no alternative but to place scaffolding within the TPZ, it should be constructed in a way that mitigates the requirement for tree pruning where feasible.
- Should pruning be required, it should be guided by the PA in accordance with AS4373 & the relevant DCP. Note that a pruning Specification may also be required. ***(See section 15.9.2)***
- Scaffolding within the TPZ will also require adequate ground protection to minimise soil compaction & damage to the tree roots. This can be achieved by utilising the methods detailed in ***section 15.7.3*****.**
- A layer of impervious black plastic or similar must be utilised instead of geotextile to assist in preventing chemical spills from entering the soil.
- Additionally, scaffold boards or similar can be utilised on top of the mulch.

15.8.8.2 Building Alignment

- Where feasible, building alignments should be positioned outside of the TPZ & must consider the future growth of the trees above & below ground parts. This should be considered at the design stage to avoid encroachment into the TPZ. ***(See Section 15.2)***
- Where the building alignment is to be positioned within the trees TPZ, it must be done so only after consultation & assessment with the PA and following approval from the consent authority. ***(See Sections 15.3 & 15.4)***
- Tree sensitive design & construction methods will need to be utilised to minimise impacts and the PA is to supervise all works within the TPZ. ***(See sections 15.2.1 & 15.4)***

15.8.8.3 Above-ground services – pruning spec

- Consideration needs to be given at the design stage to the location of above-ground services to minimise conflict with the trees canopy. ***(See Section 15.2)***
- Where services are to pass near to, or within the tree canopy, consultation with the PA will be required.
- A pruning specification may be required to guide the installation of the service(s) and the tree(s). ***(See Section 15.9.2)***

15.9 TREE REMOVAL & PRUNING WORKS

15.9.1 GENERAL

- No tree pruning or removal works should be undertaken without prior approval from the consent authority and without consultation with the PA.
- Tree pruning and removal works are to be undertaken by a suitably qualified, experienced and insured Arboricultural contractor with a minimum AQF level 3 qualification in Arboriculture.

  Works should be undertaken in accordance with the following:

- (AS4373 – 2007) Pruning of Amenity Trees ***(See Section 15.1.2.2)***
- NSW Code of Practice for the Amenity Tree Industry 1998
- NSW Code of Practice for Work Near Overhead Power Lines 2006
- NSW Work Health & Safety Act & Regulations 2011
- Safe Work Guide to managing Risks of Tree Trimming and Removal Work 2016

15.9.2 PRUNING SPECIFICATION

- A pruning specification may be required where the proposed works exceed the allowances within the applicable DCP.
- The PA will advise when this is required, & the pruning specification must be compiled in accordance with AS4373 & AS4970. ***(See Section 15.1.2)***
- The pruning specification should clearly identify which branches require pruning & the suitable reduction point(s) that they should be pruned back to in order to ensure that tree health, form & condition are maintained.
- This document should be provided to the consent authority for approval as required & the document available on site during the pruning works.
- The PA should be advised by the Project Manager when pruning is to be undertaken, & consultation between the PA & the Arboricultural contractor that is undertaking the works, should occur prior to the works commencing.

15.10 MONITORING & CERTIFICATION

- Monitoring of the project is essential in order to ensure that tree protection measures remain in place & all tree protection & tree sensitive construction methods are undertaken in accordance with the specification & CoC.
- This can be achieved by ensuring compliance with the hold points detailed below in ***Section 15.11*.**
- All hold points will require certification by the PA.
- Certification is generally provided in a memo style certification letter, that will clearly identify & document the following items as a minimum:
  - Date, time & location of assessment/works & details of the person(s) and company(s) involved,
  - Applicable standards and or assessment methodology,
  - Detailed description of the works or assessment & detail of the involvement of the PA,
  - Description & location of trees subject to assessment,
  - Description of subject trees health & condition,
  - Photographic evidence that clearly shows examples of the works processes,
  - Non-compliance is clearly identified, documented & remediation recommendations provided.
  - Confirmation that any areas of non-compliance requiring remediation have been rectified (as required).
  - Signed acknowledgement of complying works and standards to which they have been assessed by.
- Certification will be provided to the client & will be the responsibility of the client to ensure that the certification is provided to the relevant consent authority & certifier as required.

15.11 HOLD-POINT INSPECTION SCHEDULE

Hold-Point	Description	Applicable Stage of Development	Required Actions
1	**Tree Protection Certification**	Prior to site establishment & occupation & prior to any work activities commencing on site.	• Inspect and assess the installation of all tree protection measures • Confirm that have been installed in accordance with: ◦ Conditions of Consent ◦ Tree Protection Specification & Tree Protection Plan/Drawing ◦ AS4970-2009 • Provide letter of certification in accordance with *section 15.10* of this specification
2	**Tree Pruning & Removal**	Following the installation of all tree protection measures & prior to site establishment & occupation	• Confirm that tree pruning & removal works are undertaken in accordance with the: ◦ Conditions of Consent ◦ Tree Protection Specification & Tree Protection Plan/Drawing ◦ Pruning Specification (where applicable) ◦ AS4373-2007
3	**Construction & Landscaping Within the TPZ** Supervision of all access, demolition, construction & landscaping works within the TPZ Periodic site inspections to provide ongoing monitoring of the subject trees and compliance with tree protection measures	Following tree protection certification Periodically throughout demolition & construction. At any time that access or works are required within the TPZ, temporary or otherwise.	• Assess tree health & condition • Ensure that tree protection measures remain in situ • Ensure that all works are complying with: ◦ Conditions of Consent ◦ Tree Protection Specification & Tree Protection Plan/Drawing ◦ AS4970-2009 • Provide letter of certification in accordance with *section 15.10* of this specification
4	**Post Works Certification** Final inspection of the site & trees	Following project completion to assess tree health & condition post-development	• Confirm that all tree protection measures have been removed • Undertake an assessment of the health & condition of all trees and recommend remedial works if required • Provide letter of certification in accordance with *section 15.10* of this specification

Table 6 - Hold-point Inspection Schedule

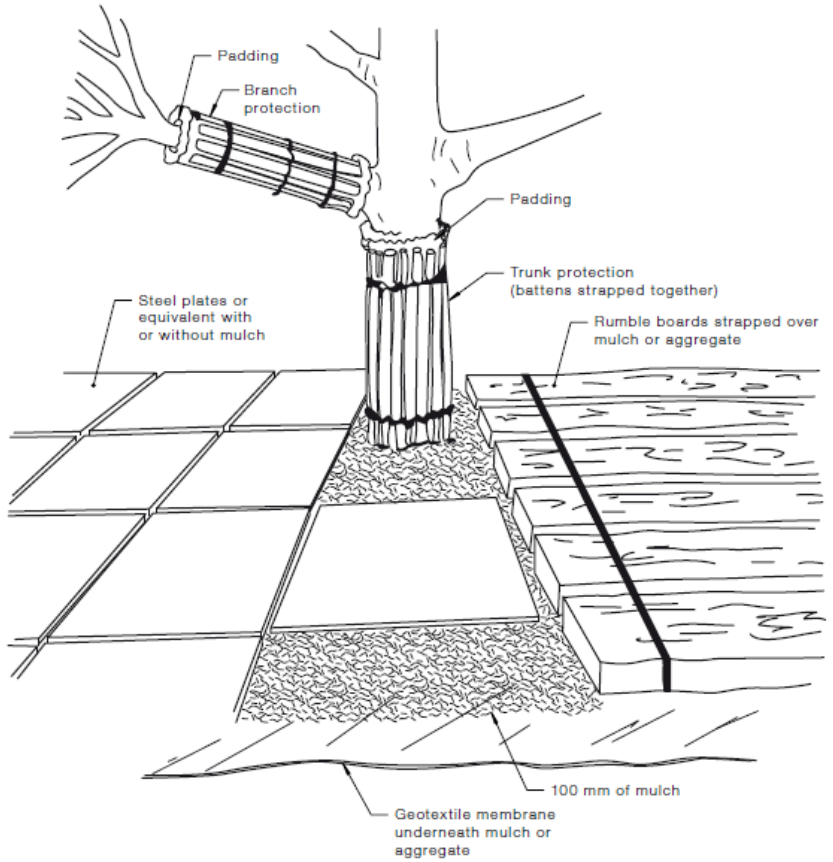
15.12 REFERENCE DIAGRAMS

Figure 81-TPZ Sign Example

LEGEND:

1 Chain wire mesh panels with shade cloth (if required) attached, held in place with concrete feet.
2 Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ.
3 Mulch installation across surface of TPZ (at the discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage of materials of any kind is permitted within the TPZ.
4 Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

Figure 92 - Tree protection fencing example - Image: (Standards Australia, 2009)



NOTES:

1 For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.
2 Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

Figure 103 - Trunk, branch & ground protection example - Image: (Standards Australia, 2009)

16 Appendix 3- Tree Protection Drawing

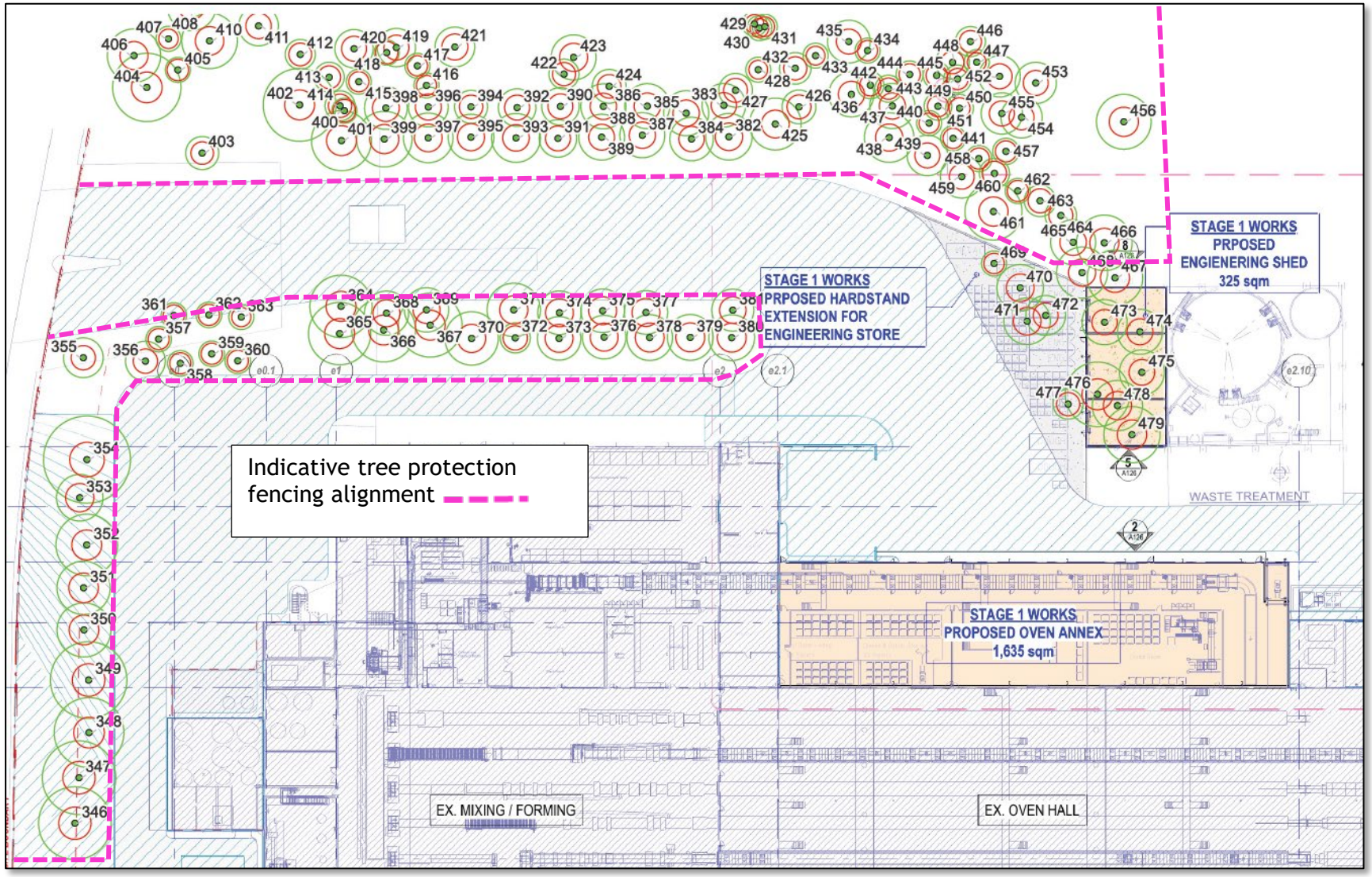


Figure 114-Tree protection drawing part 1.

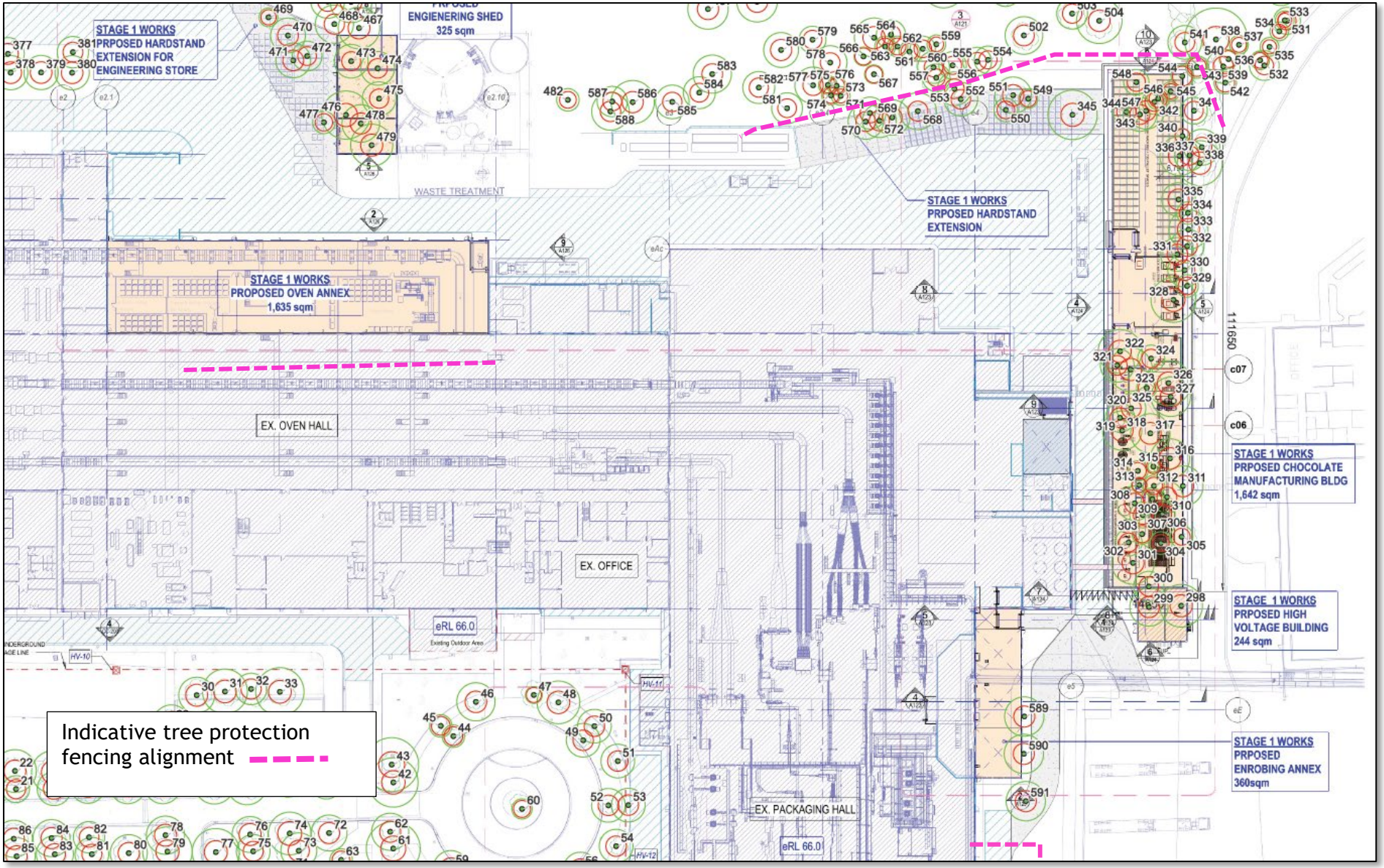


Figure 125- Tree protection drawing part 2.

17 Appendix 4- Tree Schedule

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
346	Corymbia maculata | Spotted Gum	20	10	485	555	5820	2584	Good	Good	Medium	Medium	Medium	
347	Corymbia maculata | Spotted Gum	20	11	490	560	5880	2594	Good	Fair	Medium	Medium	Medium	
348	Corymbia maculata | Spotted Gum	20	9	465	490	5580	2453	Good	Fair	Medium	Medium	Medium	
349	Corymbia maculata | Spotted Gum	20	10	510	565	6120	2604	Good	Fair	Medium	Medium	Medium	
350	Corymbia maculata | Spotted Gum	20	10	360	455	4320	2377	Good	Fair	Medium	Medium	Medium	
351	Corymbia maculata | Spotted Gum	14	6	355	450	4260	2366	Good	Good	Low	Medium	Medium	
352	Corymbia maculata | Spotted Gum	17	10	410	460	4920	2388	Good	Fair	Medium	Medium	Medium	
353	Corymbia maculata | Spotted Gum	16	6	310	405	3720	2264	Good	Fair	Medium	Medium	Medium	
354	Corymbia maculata | Spotted Gum	19	9	580	650	6960	2762	Good	Fair	Medium	Medium	Medium	Earthworks damage
355	Tristaniopsis laurina | Water Gum	4	4	265	280	3180	1939	Good	Fair	Low	Medium	Low	Earthworks damage
356	Tristaniopsis laurina | Water Gum	4	4	265	280	3180	1939	Good	Fair	Low	Medium	Low	Earthworks damage
357	Tristaniopsis laurina | Water Gum	4	2	170	200	2040	1683	Good	Fair	Low	Medium	Low	Earthworks damage
358	Tristaniopsis laurina | Water Gum	3	2	170	200	2040	1683	Good	Fair	Low	Medium	Low	Earthworks damage
359	Tristaniopsis laurina | Water Gum	3	2	170	200	2040	1683	Good	Fair	Low	Medium	Low	Earthworks damage
360	Tristaniopsis laurina | Water Gum	3	2	170	200	2040	1683	Good	Fair	Low	Medium	Low	Earthworks damage
361	Tristaniopsis laurina | Water Gum	4	3	170	200	2040	1683	Good	Fair	Low	Medium	Low	Earthworks damage
362	Tristaniopsis laurina | Water Gum	4	3	170	200	2040	1683	Good	Fair	Low	Medium	Low	Earthworks damage
363	Tristaniopsis laurina | Water Gum	4	2	135	160	2000	1533	Good	Fair	Low	Medium	Low	Earthworks damage
364	Corymbia maculata | Spotted Gum	21	9	415	465	4980	2399	Fair	Fair	Medium	Short	Low	Earthworks damage
365	Corymbia maculata | Spotted Gum	21	9	415	465	4980	2399	Fair	Fair	Medium	Short	Low	Earthworks damage
366	Corymbia maculata | Spotted Gum	21	9	425	460	5100	2388	Fair	Fair	Medium	Short	Low	Earthworks damage
367	Corymbia maculata | Spotted Gum	21	9	425	460	5100	2388	Fair	Fair	Medium	Short	Low	Earthworks damage
368	Corymbia maculata | Spotted Gum	14	6	295	360	3540	2155	Fair	Fair	Low	Short	Low	Earthworks damage
369	Corymbia maculata | Spotted Gum	14	6	295	360	3540	2155	Fair	Fair	Low	Short	Low	Earthworks damage
370	Corymbia maculata | Spotted Gum	17	7	355	400	4260	2252	Fair	Fair	Medium	Short	Low	Earthworks damage

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
371	Corymbia maculata | Spotted Gum	17	7	355	400	4260	2252	Fair	Fair	Medium	Short	Low	Earthworks damage
372	Corymbia maculata | Spotted Gum	9	4	200	280	2400	1939	Fair	Fair	Low	Short	Low	Earthworks damage
373	Corymbia maculata | Spotted Gum	17	7	290	390	3480	2228	Fair	Fair	Medium	Short	Low	Earthworks damage
374	Corymbia maculata | Spotted Gum	17	7	290	390	3480	2228	Fair	Fair	Medium	Short	Low	Earthworks damage
375	Corymbia maculata | Spotted Gum	17	7	290	390	3480	2228	Fair	Fair	Medium	Short	Low	Earthworks damage
376	Corymbia maculata | Spotted Gum	17	7	290	390	3480	2228	Fair	Fair	Medium	Short	Low	Earthworks damage
377	Corymbia maculata | Spotted Gum	17	7	290	390	3480	2228	Fair	Fair	Medium	Short	Low	Earthworks damage
378	Corymbia maculata | Spotted Gum	19	6	305	425	3660	2310	Fair	Fair	Medium	Short	Low	Earthworks damage
379	Corymbia maculata | Spotted Gum	19	6	305	425	3660	2310	Fair	Fair	Medium	Short	Low	Earthworks damage
380	Corymbia maculata | Spotted Gum	19	11	305	425	3660	2310	Fair	Fair	Medium	Short	Low	Earthworks damage
381	Corymbia maculata | Spotted Gum	12	5	280	345	3360	2117	Fair	Fair	Low	Short	Low	Earthworks damage
382	Corymbia maculata | Spotted Gum	13	5	310	375	3720	2192	Good	Fair	Low	Medium	Low	
383	Corymbia maculata | Spotted Gum	14	4	290	310	3480	2024	Fair	Fair	Low	Short	Low	
384	Corymbia maculata | Spotted Gum	12	4	290	310	3480	2024	Fair	Fair	Low	Short	Low	
385	Corymbia maculata | Spotted Gum	14	5	300	340	3600	2104	Good	Fair	Low	Medium	Low	
386	Corymbia maculata | Spotted Gum	14	5	300	340	3600	2104	Fair	Fair	Low	Short	Low	
387	Corymbia maculata | Spotted Gum	14	5	300	340	3600	2104	Fair	Fair	Low	Short	Low	
388	Corymbia maculata | Spotted Gum	14	5	300	340	3600	2104	Fair	Fair	Low	Short	Low	
389	Corymbia maculata | Spotted Gum	15	5	305	325	3660	2064	Good	Fair	Medium	Medium	Medium	
390	Corymbia maculata | Spotted Gum	14	4	250	300	3000	1996	Poor	Fair	Low	Short	Low	
391	Corymbia maculata | Spotted Gum	14	4	250	300	3000	1996	Fair	Fair	Low	Short	Low	
392	Corymbia maculata | Spotted Gum	14	4	250	300	3000	1996	Fair	Fair	Low	Short	Low	
393	Corymbia maculata | Spotted Gum	15	8	325	345	3900	2117	Good	Fair	Medium	Medium	Medium	
394	Corymbia maculata | Spotted Gum	10	3	220	260	2640	1879	Poor	Fair	Low	Short	Low	
395	Corymbia maculata | Spotted Gum	13	5	305	365	3660	2167	Fair	Fair	Low	Short	Low	
396	Corymbia maculata | Spotted Gum	13	4	265	330	3180	2077	Poor	Fair	Low	Short	Low	

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
397	Corymbia maculata | Spotted Gum	16	5	330	385	3960	2216	Fair	Poor	Medium	Short	Low	Major root damage earthworks
398	Corymbia maculata | Spotted Gum	14	4	285	355	3420	2142	Fair	Poor	Low	Short	Low	Earthworks damage
399	Corymbia maculata | Spotted Gum	14	4	370	430	4440	2322	Fair	Poor	Low	Short	Low	Earthworks damage
400	Corymbia maculata | Spotted Gum	14	3	165	235	2000	1801	Dead	Poor	Low	0	Very Low	Earthworks damage
401	Corymbia maculata | Spotted Gum	18	6	400	460	4800	2388	Fair	Poor	Medium	Short	low	Earthworks damage
402	Eucalyptus paniculata | Grey Ironbark	22	10	485	460	5820	2388	Good	Fair	Medium	Medium	Medium	Earthworks damage
403	Tristaniopsis laurina | Water Gum	4	4	220	235	2640	1801	Poor	Fair	Low	Short	Low	Earthworks damage
404	Eucalyptus tereticornis | Forest Red Gum	18	13	455	490	5460	2453	Good	Poor	Medium	Short	low	Earthworks damage
405	Eucalyptus tereticornis | Forest Red Gum	13	2	155	210	2000	1718	Fair	Fair	Low	Short	low	Earthworks damage
406	Eucalyptus camaldulensis | River Red Gum	16	8	355	395	4260	2240	Fair	Fair	Medium	Short	low	Earthworks damage
407	Eucalyptus camaldulensis | River Red Gum	5	2	140	165	2000	1553	Poor	Fair	Low	Short	low	Earthworks damage
408	Eucalyptus tereticornis | Forest Red Gum	12	4	325	345	3900	2117	Fair	Fair	Low	Short	low	Earthworks damage
409	Eucalyptus tereticornis | Forest Red Gum	8	2	100	170	2000	1572	Fair	Fair	Low	Short	low	Earthworks damage
410	Eucalyptus moluccana | Grey Box	20	13	370	410	4440	2276	Good	Fair	Medium	Medium	Medium	Earthworks damage
411	Eucalyptus paniculata | Grey Ironbark	9	7	265	315	3180	2037	Good	Fair	Low	Medium	Low	Earthworks damage
412	Eucalyptus paniculata | Grey Ironbark	11	5	200	240	2400	1817	Fair	Poor	Low	Short	low	Major root damage earthworks
413	Eucalyptus paniculata | Grey Ironbark	11	5	200	240	2400	1817	Fair	Poor	Low	Short	low	Major root damage earthworks
414	Angophora costata | Smooth-barked Apple Myrtle	14	4	200	255	2400	1864	Dead	Poor	Low	0	Very Low	Earthworks
415	Eucalyptus paniculata | Grey Ironbark	8	3	130	180	2000	1611	Fair	Poor	Low	Short	Low	Major root damage earthworks
416	Eucalyptus paniculata | Grey Ironbark	8	3	130	180	2000	1611	Fair	Poor	Low	Short	Low	Major root damage earthworks
417	Eucalyptus paniculata | Grey Ironbark	8	3	130	180	2000	1611	Fair	Poor	Low	Short	Low	Major root damage earthworks
418	Eucalyptus paniculata | Grey Ironbark	11	5	160	230	2000	1785	Fair	Poor	Low	Short	Low	Major root damage earthworks
419	Eucalyptus moluccana | Grey Box	12	4	255	300	3060	1996	Fair	Poor	Low	Short	Low	Major root damage earthworks
420	Eucalyptus moluccana | Grey Box	12	4	255	300	3060	1996	Fair	Poor	Low	Short	Low	Major root damage earthworks
421	Eucalyptus paniculata | Grey Ironbark	14	7	265	330	3180	2077	Fair	Fair	Low	Short	Low	
422	Eucalyptus paniculata | Grey Ironbark	7	3	200	250	2400	1849	Good	Fair	Low	Medium	Low	

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
423	Eucalyptus tereticornis | Forest Red Gum	21	5	300	400	3600	2252	Poor	Poor	Medium	Short	Low	
424	Eucalyptus paniculata | Grey Ironbark	12	4	225	260	2700	1879	Good	Fair	Low	Medium	Low	
425	Eucalyptus moluccana | Grey Box	16	5	345	385	4140	2216	Good	Fair	Medium	Medium	Medium	
426	Eucalyptus paniculata | Grey Ironbark	11	4	225	270	2700	1910	Good	Fair	Low	Medium	Low	
427	Eucalyptus paniculata | Grey Ironbark	8	4	225	270	2700	1910	Good	Fair	Low	Medium	Low	
428	Eucalyptus paniculata | Grey Ironbark	5	2	135	150	2000	1500	Poor	Fair	Low	Short	Low	
429	Acacia decurrens | Green Wattle	5	5	125	150	2000	1500	Good	Fair	Low	Short	Low	
430	Eucalyptus moluccana | Grey Box	6	2	100	135	2000	1500	Good	Fair	Low	Medium	Low	
431	Eucalyptus moluccana | Grey Box	8	4	135	170	2000	1572	Good	Fair	Low	Medium	Low	
432	Eucalyptus paniculata | Grey Ironbark	12	5	210	250	2520	1849	Good	Fair	Low	Medium	Low	
433	Eucalyptus tereticornis | Forest Red Gum	7	2	100	145	2000	1500	Good	Fair	Low	Medium	Low	
434	Eucalyptus tereticornis | Forest Red Gum	10	3	140	180	2000	1611	Good	Fair	Low	Medium	Low	
435	Eucalyptus paniculata | Grey Ironbark	10	4	285	300	3420	1996	Good	Fair	Low	Medium	Low	
436	Eucalyptus moluccana | Grey Box	14	5	300	335	3600	2091	Good	Fair	Low	Medium	Low	
437	Eucalyptus moluccana | Grey Box	14	5	300	335	3600	2091	Good	Fair	Low	Medium	Low	
438	Eucalyptus tereticornis | Forest Red Gum	18	5	330	370	3960	2180	Good	Fair	Medium	Medium	Medium	
439	Eucalyptus tereticornis | Forest Red Gum	18	4	270	300	3240	1996	Fair	Fair	Medium	Short	Low	
440	Eucalyptus tereticornis | Forest Red Gum	10	2	155	180	2000	1611	Fair	Fair	Low	Short	Low	
441	Eucalyptus tereticornis | Forest Red Gum	10	2	155	180	2000	1611	Good	Fair	Low	Medium	Low	
442	Eucalyptus paniculata | Grey Ironbark	14	3	180	205	2160	1701	Good	Fair	Low	Medium	Low	
443	Eucalyptus paniculata | Grey Ironbark	8	4	180	205	2160	1701	Good	Fair	Low	Medium	Low	
444	Eucalyptus paniculata | Grey Ironbark	8	4	180	205	2160	1701	Good	Fair	Low	Medium	Low	
445	Eucalyptus paniculata | Grey Ironbark	8	4	180	205	2160	1701	Good	Fair	Low	Medium	Low	
446	Eucalyptus paniculata | Grey Ironbark	10	4	200	225	2400	1769	Good	Fair	Low	Medium	Low	
447	Eucalyptus moluccana | Grey Box	8	2	100	125	2000	1500	Good	Fair	Low	Medium	Low	
448	Eucalyptus moluccana | Grey Box	13	5	225	240	2700	1817	Good	Fair	Low	Medium	Low	

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
449	Eucalyptus moluccana | Grey Box	9	3	185	200	2220	1683	Good	Fair	Low	Medium	Low	
450	Eucalyptus moluccana | Grey Box	9	3	185	200	2220	1683	Good	Fair	Low	Medium	Low	
451	Eucalyptus moluccana | Grey Box	9	3	185	200	2220	1683	Good	Fair	Low	Medium	Low	
452	Eucalyptus moluccana | Grey Box	14	4	275	300	3300	1996	Good	Fair	Low	Medium	Low	
453	Eucalyptus moluccana | Grey Box	14	4	275	300	3300	1996	Good	Fair	Low	Medium	Low	
454	Eucalyptus moluccana | Grey Box	14	4	275	300	3300	1996	Good	Fair	Low	Medium	Low	
455	Eucalyptus moluccana | Grey Box	14	4	275	300	3300	1996	Good	Fair	Low	Medium	Low	
456	Eucalyptus moluccana | Grey Box	15	10	365	435	4380	2333	Good	Fair	Medium	Medium	Medium	
457	Eucalyptus paniculata | Grey Ironbark	8	3	175	200	2100	1683	Good	Fair	Low	Medium	Low	
458	Eucalyptus paniculata | Grey Ironbark	8	3	175	200	2100	1683	Good	Fair	Low	Medium	Low	
459	Eucalyptus paniculata | Grey Ironbark	10	5	285	300	3420	1996	Good	Fair	Low	Medium	Low	
460	Eucalyptus moluccana | Grey Box	16	4	200	280	2400	1939	Good	Fair	Medium	Medium	Medium	
461	Eucalyptus moluccana | Grey Box	18	10	380	435	4560	2333	Good	Fair	Medium	Medium	Medium	
462	Eucalyptus paniculata | Grey Ironbark	8	3	160	200	2000	1683	Good	Fair	Low	Medium	Low	
463	Eucalyptus paniculata | Grey Ironbark	10	7	210	275	2520	1924	Good	Fair	Low	Medium	Low	
464	Eucalyptus paniculata | Grey Ironbark	10	7	210	275	2520	1924	Good	Fair	Low	Medium	Low	
465	Eucalyptus tereticornis | Forest Red Gum	8	4	300	345	3600	2117	Poor	Fair	Low	Short	Low	
466	Eucalyptus tereticornis | Forest Red Gum	15	7	370	430	4440	2322	Fair	Fair	Medium	Short	Low	
467	Eucalyptus tereticornis | Forest Red Gum	14	12	370	430	4440	2322	Good	Fair	Low	Medium	Low	
468	Eucalyptus tereticornis | Forest Red Gum	14	4	340	365	4080	2167	Poor	Fair	Low	Short	Low	
469	Eucalyptus tereticornis | Forest Red Gum	9	2	125	185	2000	1629	Good	Fair	Low	Medium	Low	
470	Eucalyptus moluccana | Grey Box	20	8	310	385	3720	2216	Good	Fair	Medium	Medium	Medium	
471	Eucalyptus moluccana | Grey Box	20	8	310	385	3720	2216	Good	Fair	Medium	Medium	Medium	
472	Eucalyptus moluccana | Grey Box	10	5	265	300	3180	1996	Good	Fair	Low	Medium	Low	
473	Eucalyptus paniculata | Grey Ironbark	10	7	300	310	3600	2024	Good	Fair	Low	Medium	Low	
474	Eucalyptus paniculata | Grey Ironbark	12	5	300	330	3600	2077	Good	Fair	Low	Medium	Low	

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
475	Eucalyptus paniculata | Grey Ironbark	12	10	300	320	3600	2051	Good	Fair	Low	Medium	Low	
476	Eucalyptus camaldulensis | River Red Gum	15	20	430	500	5160	2474	Good	Fair	Medium	Medium	Medium	
477	Eucalyptus camaldulensis | River Red Gum	8	5	200	250	2400	1849	Good	Poor	Low	Short	Low	
478	Eucalyptus moluccana | Grey Box	18	10	335	400	4020	2252	Good	Fair	Medium	Medium	Medium	
479	Eucalyptus moluccana | Grey Box	21	13	375	445	4500	2355	Good	Fair	Medium	Medium	Medium	
480	Eucalyptus tereticornis | Forest Red Gum	19	5	400	445	4800	2355	Fair	Poor	Medium	Short	Low	
481	Eucalyptus paniculata | Grey Ironbark	12	6	275	310	3300	2024	Good	Fair	Low	Medium	Low	
482	Acacia decurrens | Green Wattle	10	3	200	230	2400	1785	Poor	Poor	Low	Short	Low	
483	Eucalyptus tereticornis | Forest Red Gum	20	4	300	350	3600	2129	Fair	Fair	Medium	Short	Low	
484	Eucalyptus tereticornis | Forest Red Gum	13	4	285	365	3420	2167	Good	Fair	Low	Medium	Low	
485	Eucalyptus tereticornis | Forest Red Gum	10	4	185	265	2220	1895	Good	Fair	Low	Medium	Low	
486	Eucalyptus tereticornis | Forest Red Gum	15	4	240	355	2880	2142	Good	Fair	Medium	Medium	Medium	
487	Eucalyptus moluccana | Grey Box	15	10	360	405	4320	2264	Good	Fair	Medium	Medium	Medium	
488	Eucalyptus moluccana | Grey Box	15	10	360	405	4320	2264	Good	Fair	Medium	Medium	Medium	
489	Eucalyptus moluccana | Grey Box	13	9	340	360	4080	2155	Good	Fair	Low	Medium	Low	
490	Eucalyptus paniculata | Grey Ironbark	13	7	320	365	3840	2167	Good	Fair	Low	Medium	Low	
491	Eucalyptus paniculata | Grey Ironbark	13	7	320	365	3840	2167	Good	Fair	Low	Medium	Low	
492	Eucalyptus tereticornis | Forest Red Gum	13	6	300	360	3600	2155	Good	Poor	Low	Short	Low	
493	Eucalyptus tereticornis | Forest Red Gum	8	2	135	160	2000	1533	Good	Fair	Low	Medium	Low	
494	Eucalyptus tereticornis | Forest Red Gum	13	5	220	300	2640	1996	Good	Fair	Low	Medium	Low	
495	Eucalyptus tereticornis | Forest Red Gum	13	5	220	300	2640	1996	Poor	Fair	Low	Short	Low	
496	Eucalyptus tereticornis | Forest Red Gum	15	7	220	300	2640	1996	Good	Poor	Medium	Short	Low	
497	Eucalyptus tereticornis | Forest Red Gum	14	7	300	375	3600	2192	Good	Fair	Low	Medium	Low	
498	Eucalyptus tereticornis | Forest Red Gum	16	7	290	350	3480	2129	Good	Fair	Medium	Medium	Medium	
499	Casuarina glauca | Swamp she-oak	13	7	380	420	4560	2299	Fair	Fair	Low	Short	Low	
500	Eucalyptus moluccana | Grey Box	12	7	400	1200	4800	3573	Good	Poor	Low	Short	Low	Regrowth from stump

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
501	Eucalyptus paniculata | Grey Ironbark	10	6	275	300	3300	1996	Good	Fair	Low	Medium	Low	
502	Eucalyptus moluccana | Grey Box	15	10	335	385	4020	2216	Good	Fair	Medium	Medium	Medium	
503	Eucalyptus moluccana | Grey Box	6	3	275	325	3300	2064	Good	Fair	Low	Medium	Low	
504	Eucalyptus moluccana | Grey Box	10	10	405	420	4860	2299	Good	Fair	Low	Medium	Low	
505	Eucalyptus paniculata | Grey Ironbark	9	4	300	345	3600	2117	Good	Fair	Low	Medium	Low	
506	Eucalyptus paniculata | Grey Ironbark	11	8	335	385	4020	2216	Good	Fair	Low	Medium	Low	
507	Eucalyptus tereticornis | Forest Red Gum	17	10	305	345	3660	2117	Good	Fair	Medium	Medium	Medium	
508	Eucalyptus paniculata | Grey Ironbark	16	5	300	320	3600	2051	Good	Fair	Medium	Medium	Medium	
509	Eucalyptus moluccana | Grey Box	18	9	340	395	4080	2240	Good	Fair	Medium	Medium	Medium	
510	Eucalyptus tereticornis | Forest Red Gum	11	3	120	240	2000	1817	Fair	Fair	Low	Short	Low	
511	Eucalyptus paniculata | Grey Ironbark	15	9	345	400	4140	2252	Fair	Poor	Medium	Short	Low	
512	Acacia decurrens | Green Wattle	8	1	100	130	2000	1500	Poor	Poor	Low	Short	Low	
513	Acacia decurrens | Green Wattle	9	4	185	200	2220	1683	Fair	Fair	Low	Short	Low	
514	Acacia decurrens | Green Wattle	9	2	110	130	2000	1500	Fair	Fair	Low	Short	Low	
515	Melia azedarach | White Cedar	4	3	100	150	2000	1500	Fair	Fair	Low	Short	Low	
516	Acacia decurrens | Green Wattle	6	1	60	100	2000	1500	Fair	Fair	Low	Short	Low	
517	Acacia decurrens | Green Wattle	7	2	60	100	2000	1500	Fair	Fair	Low	Short	Low	
518	Eucalyptus tereticornis | Forest Red Gum	14	7	340	385	4080	2216	Good	Fair	Low	Medium	Low	
519	Eucalyptus tereticornis | Forest Red Gum	21	10	405	480	4860	2431	Poor	Fair	Medium	Short	Low	
520	Eucalyptus tereticornis | Forest Red Gum	13	7	275	320	3300	2051	Good	Fair	Low	Medium	Low	
521	Eucalyptus tereticornis | Forest Red Gum	21	10	345	425	4140	2310	Good	Fair	Medium	Medium	Medium	
522	Eucalyptus tereticornis | Forest Red Gum	12	4	185	210	2220	1718	Good	Fair	Low	Medium	Low	
523	Eucalyptus tereticornis | Forest Red Gum	12	7	235	300	2820	1996	Good	Fair	Low	Medium	Low	
524	Eucalyptus tereticornis | Forest Red Gum	24	15	580	620	6960	2707	Good	Fair	Medium	Medium	Medium	
525	Eucalyptus moluccana | Grey Box	24	18	635	750	7620	2933	Good	Fair	Medium	Medium	Medium	
526	Eucalyptus tereticornis | Forest Red Gum	17	8	310	360	3720	2155	Fair	Poor	Medium	Short	Low	

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
527	Eucalyptus tereticornis | Forest Red Gum	15	8	370	390	4440	2228	Good	Fair	Medium	Medium	Medium	
528	Eucalyptus tereticornis | Forest Red Gum	19	10	400	465	4800	2399	Good	Fair	Medium	Medium	Medium	
529	Eucalyptus tereticornis | Forest Red Gum	12	6	300	350	3600	2129	Poor	Fair	Low	Short	Low	
530	Ficus microcarpa var. hillii | Hills Weeping Fig	8	5	220	260	2640	1879	Good	Fair	Low	Medium	Low	
531	Ficus microcarpa var. hillii | Hills Weeping Fig	8	5	240	280	2880	1939	Good	Fair	Low	Medium	Low	
532	Ficus microcarpa var. hillii | Hills Weeping Fig	8	5	265	290	3180	1968	Good	Fair	Low	Medium	Low	
533	Acacia decurrens | Green Wattle	6	2	100	125	2000	1500	Fair	Fair	Low	Short	Low	
534	Acacia decurrens | Green Wattle	6	2	100	125	2000	1500	Good	Fair	Low	Short	Low	
535	Acacia decurrens | Green Wattle x 3	5	1	60	80	2000	1500	Good	Fair	Low	Short	Low	
536	Acacia decurrens | Green Wattle	9	4	165	200	2000	1683	Good	Fair	Low	Short	Low	
537	Eucalyptus moluccana | Grey Box	5	2	150	175	2000	1592	Good	Fair	Low	Medium	Low	
538	Eucalyptus moluccana | Grey Box	23	16	560	665	6720	2788	Good	Fair	Medium	Medium	Medium	
539	Eucalyptus moluccana | Grey Box	22	5	300	360	3600	2155	Good	Fair	Medium	Medium	Medium	
540	Eucalyptus paniculata | Grey Ironbark	10	4	155	235	2000	1801	Good	Fair	Low	Medium	Low	
541	Eucalyptus paniculata | Grey Ironbark	20	7	300	340	3600	2104	Good	Fair	Medium	Medium	Medium	
542	Casuarina glauca | Swamp she-oak	13	4	200	300	2400	1996	Good	Fair	Low	Medium	Low	
543	Casuarina glauca | Swamp she-oak	13	4	200	300	2400	1996	Good	Fair	Low	Medium	Low	
544	Eucalyptus tereticornis | Forest Red Gum	14	4	200	345	2400	2117	Fair	Fair	Low	Short	Low	
545	Eucalyptus paniculata | Grey Ironbark	6	4	150	180	2000	1611	Fair	Poor	Low	Short	Low	
546	Eucalyptus tereticornis | Forest Red Gum	21	4	200	280	2400	1939	Poor	Fair	Medium	Short	Low	
547	Eucalyptus moluccana | Grey Box	20	9	325	355	3900	2142	Fair	Fair	Medium	Short	Low	
548	Eucalyptus paniculata | Grey Ironbark	10	3	225	280	2700	1939	Fair	Fair	Low	Short	Low	
549	Casuarina glauca | Swamp she-oak	14	2	170	215	2040	1735	Fair	Fair	Low	Short	Low	
550	Eucalyptus paniculata | Grey Ironbark	14	4	210	260	2520	1879	Fair	Fair	Low	Short	Low	

Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
551	Eucalyptus tereticornis | Forest Red Gum	20	8	325	405	3900	2264	Fair	Fair	Medium	Short	Low	
552	Eucalyptus tereticornis | Forest Red Gum	20	5	300	335	3600	2091	Fair	Fair	Medium	Short	Low	
553	Eucalyptus tereticornis | Forest Red Gum	17	4	300	335	3600	2091	Fair	Poor	Medium	Short	Low	
554	Eucalyptus paniculata | Grey Ironbark	12	5	245	275	2940	1924	Good	Fair	Low	Medium	Low	
555	Eucalyptus paniculata | Grey Ironbark	12	6	255	290	3060	1968	Good	Fair	Low	Medium	Low	
556	Eucalyptus paniculata | Grey Ironbark	12	5	245	275	2940	1924	Good	Fair	Low	Medium	Low	
557	Eucalyptus fibrosa | Broad-leaved Ironbark	22	8	285	300	3420	1996	Fair	Fair	Medium	Short	Low	
558	Eucalyptus tereticornis | Forest Red Gum	14	3	245	260	2940	1879	Poor	Fair	Low	Short	Low	
559	Eucalyptus tereticornis | Forest Red Gum	7	2	100	165	2000	1553	Fair	Fair	Low	Short	Low	
560	Eucalyptus fibrosa | Broad-leaved Ironbark	18	4	225	260	2700	1879	Poor	Poor	Medium	Short	Low	
561	Eucalyptus fibrosa | Broad-leaved Ironbark	16	4	185	235	2220	1801	Good	Fair	Medium	Medium	Medium	
562	Eucalyptus fibrosa | Broad-leaved Ironbark	16	4	185	235	2220	1801	Good	Fair	Medium	Medium	Medium	
563	Eucalyptus fibrosa | Broad-leaved Ironbark	16	4	185	235	2220	1801	Good	Fair	Medium	Medium	Medium	
564	Eucalyptus tereticornis | Forest Red Gum	14	4	260	315	3120	2037	Good	Poor	Low	Short	Low	
565	Eucalyptus tereticornis | Forest Red Gum	20	11	350	450	4200	2366	Good	Hazard	Medium	Short	Very Low	
566	Eucalyptus tereticornis | Forest Red Gum	15	4	160	240	2000	1817	Good	Fair	Medium	Medium	Medium	
567	Eucalyptus tereticornis | Forest Red Gum	15	4	160	240	2000	1817	Good	Fair	Medium	Medium	Medium	
568	Eucalyptus paniculata | Grey Ironbark	14	5	330	350	3960	2129	Good	Fair	Low	Medium	Low	
569	Eucalyptus paniculata | Grey Ironbark	10	5	315	340	3780	2104	Good	Fair	Low	Medium	Low	
570	Eucalyptus paniculata | Grey Ironbark	10	5	315	340	3780	2104	Good	Fair	Low	Medium	Low	
571	Casuarina glauca | Swamp she-oak	18	5	285	340	3420	2104	Good	Fair	Medium	Medium	Medium	
572	Eucalyptus tereticornis | Forest Red Gum	18	6	300	360	3600	2155	Good	Fair	Medium	Medium	Medium	
573	Eucalyptus fibrosa | Broad-leaved Ironbark	10	4	100	150	2000	1500	Good	Fair	Low	Medium	Low	
574	Eucalyptus fibrosa | Broad-leaved Ironbark	15	6	150	200	2000	1683	Good	Fair	Medium	Medium	Medium	
575	Eucalyptus tereticornis | Forest Red Gum	10	2	125	200	2000	1683	Poor	Fair	Low	Short	Low	
576	Eucalyptus tereticornis | Forest Red Gum	10	2	125	200	2000	1683	Poor	Fair	Low	Short	Low	

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Tree No	Species	Height	Spread	DBH mm	DAB mm	TPZ (mm)	SRZ (mm)	Health	Structure	Landscape Significance	ELE	Retention Value	Arborist Notes
577	Eucalyptus moluccana | Grey Box	18	4	325	365	3900	2167	Fair	Fair	Medium	Short	Low	
578	Eucalyptus moluccana | Grey Box	23	7	300	340	3600	2104	Good	Fair	Medium	Medium	Medium	
579	Eucalyptus paniculata | Grey Ironbark	12	6	240	300	2880	1996	Good	Fair	Low	Medium	Low	
580	Eucalyptus tereticornis | Forest Red Gum	20	13	310	405	3720	2264	Poor	Fair	Medium	Short	Low	
581	Eucalyptus fibrosa | Broad-leaved Ironbark	12	4	275	300	3300	1996	Good	Fair	Low	Medium	Low	
582	Eucalyptus fibrosa | Broad-leaved Ironbark	14	7	285	320	3420	2051	Good	Fair	Low	Medium	Low	
583	Eucalyptus moluccana | Grey Box	22	10	340	385	4080	2216	Good	Fair	Medium	Medium	Medium	
584	Eucalyptus moluccana | Grey Box	22	8	285	305	3420	2010	Good	Fair	Medium	Medium	Medium	
585	Eucalyptus tereticornis | Forest Red Gum	21	6	300	325	3600	2064	Fair	Fair	Medium	Short	Low	
586	Eucalyptus moluccana | Grey Box	22	9	385	405	4620	2264	Good	Poor	Medium	Short	Low	
587	Eucalyptus paniculata | Grey Ironbark	14	6	270	300	3240	1996	Good	Fair	Low	Medium	Low	
588	Eucalyptus paniculata | Grey Ironbark	14	8	335	370	4020	2180	Good	Poor	Low	Short	Low	Major root damage earthworks

Table 7- Tree Schedule.