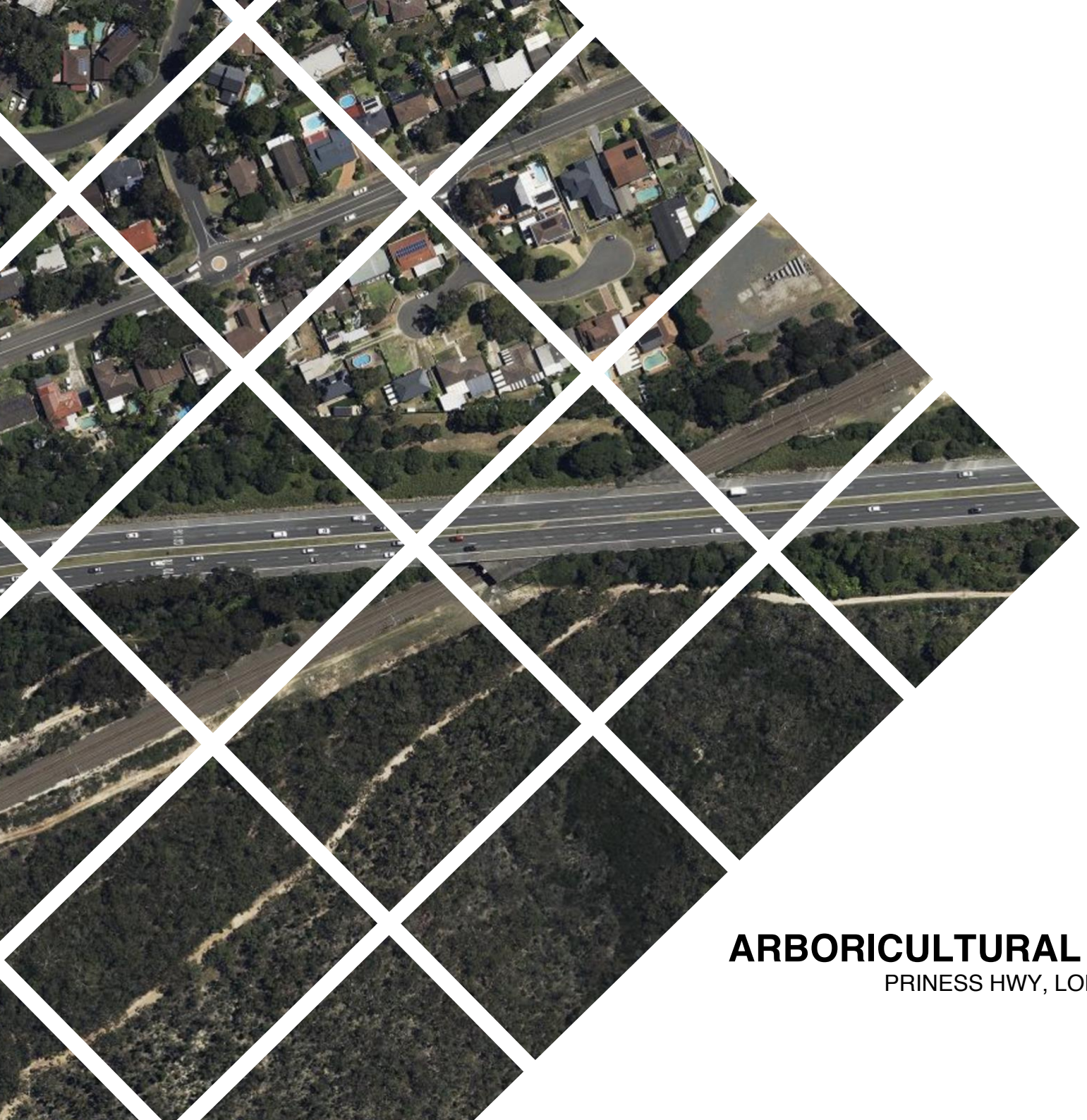

Syner Tree
URBAN ARBORICULTURE

ARBORICULTURAL IMPACT ASSESSMENT

PRINESS HWY, LOFTUS, NSW, SUPERSITE

PROJECT ADDRESS

Address	Princess Hwy, Loftus, NSW, Supersite (Rail Corridor) – Title:2/DP1183944

CLIENT INFORMATION

Client	Hanlon Industries Pty Ltd
Client Address	71A Burrows Rd, Alexandria NSW 2015
Project Manager	Dean Johns

DOCUMENT TRACKING

Report Name	*'Arboricultural Impact Assessment (Princess Hwy, Loftus, NSW, Supersite) 8th of December 2023'*
Project Number	SynerTree-2023-QU-0100
Prepared by	Mathew Phillips
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Company	Synertree Pty Ltd
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2 SUMMARY OF ASSESSMENT

The proposed development includes the installation of a digital billboard within the rail corridor adjacent the princess highway. I have inspected all trees that could be affected by the development and list their details in Appendix 3.

Eleven (11) high category trees and three (3) low category trees will be lost because of this proposal. However, they are not visible from outside the site and the retention of all significant boundary tree cover will ensure there is no impact on the wider setting. This proposal does not include a landscaping plan, however, an offset strategy for replacement trees should be imposed under the conditions of consent. The proposed changes may adversely affect a further four (4) high category trees and four (4) low category trees if appropriate protective measures are not taken. However, if adequate precautions to protect the retained trees are specified and implemented through the arboricultural Tree Protection Plan (TMP01) included within this report, the development proposal will have no adverse impact on the contribution of trees to local amenity or character.

3 INTRODUCTION

3.1 Instruction.

This Arboricultural Impact Assessment (AIA) has been prepared for Hanlon Industries Pty Ltd (The Client) in relation to the proposed development at Tittle2/DP1183944 NSW 2232. This report investigates the impact of the proposed development on trees in proximity to the site and provides the following information to guide their appropriate management throughout the development process:

- A schedule of the relevant trees to include basic data and a condition assessment that are likely to be affected by the proposed works (Appendix 3).
- An appraisal of the impact of the proposal on trees.
- A preliminary Tree Management Plan (TMP01) setting out appropriate protective measures and management for trees to be retained (Appendix 4).

3.2 Purpose of this report.

This report analyses the impact of the development proposal on trees with additional guidance on their appropriate management including protective measures. Its primary purpose is for the consent authority to review the tree information in support of the planning submission and for its use as a basis for issuing a planning consent or engaging in further discussions towards that end. Within this planning process it will be available for inspection by people other than tree experts, so the information is presented to be helpful to those without a detailed knowledge of the subject.

3.3 Scope of this report.

This report is only concerned with the twenty-two (**22**) prescribed trees located within or adjoining the study site. It takes no account of other trees, shrubs or groundcovers within the site unless stated otherwise. It includes a preliminary TMP01 based on the site visit and the documents/drawings provided, listed in Section 3.5 below.

3.4 Further explanations.

To make this report easier to use, its emphasis is on keeping the main text concise with minimal background explanations. Where appropriate, further explanations and information are included as appendices.

3.5 Documents & information provided.

The TMP01 within Appendix 4 is derived from the information provided by the project engineer and surveyors listed below:

- *DWG- DA01 (Rev B) Proposed Digital Sign General Arrangement & Site Plan (Denis Blunt Consulting Engineers 11/01/22).*
- *DWG- DA02 (Rev C) Proposed Digital Sign General Arrangement & Site Plan (Denis Blunt Consulting Engineers 27/10/22).*
- *DWG- Plan of Detail and Levels at Proposed Signage Location – Princess Highway, Loftus Sheet 1(LTS 17/11/21).*
- *DWG- Plan of Detail and Levels at Proposed Signage Location – Princess Highway, Loftus Sheet 2 (LTS 17/11/21).*
- *DWG- 23058trees – Survey Plan Showing Partial Detail for Trees Lot 2 in DP1183944 Access Via Giles Street & Wheatley Road Yarrawarrah, NSW, 2233 (CMS Surveyors 06/12/2023).*

3.6 Qualifications & experience.

This report is based on site observations and provided information. All conclusions have been reached considering the experience and qualifications of the onsite assessor as outlined within Appendix 1.

3.7 Site Plan.

Figure 1 (maps.six.nsw.gov.au)

4 THE LAYOUT DESIGN

4.1 The TreeAZ method of tree assessment

The TreeAZ method of assessing trees is a method of tree assessment that determines the retention value of trees in the planning process. Simplistically, trees assessed as potentially important are categorised as 'A' and those assessed as less important are categorised as 'Z' Further explanation of TreeAZ can be found in Appendix 2 and at www.treeaz.com.

In the context of a new development, all the 'Z' trees are discounted as a material constraint in layout design. All the 'A' trees are potentially important, and they dictate the design constraints. This simple categorisation of trees is suitable for use by the architect to optimise the retention of the best trees in the context of other material considerations.

4.2 Site visit and collection of data

4.2.1 Site visit

I conducted an accompanied site visit on the 6th of December 2023. All my observations were made from ground level, and I estimated all dimensions unless otherwise indicated. Aerial inspections, root or soil analysis, exploratory root trenching and internal diagnostic testing were not undertaken as part of this assessment and access to the subject trees was unrestricted.

4.2.2 Brief site description

The study site is within the suburb of Yarrawarrah. The site is bounded by residential properties on Wheatley Road to the north and the Pacific Highway and the Royal National Park to the south. The vegetation of the site consists of significant indigenous trees and native and exotic species.

4.2.3 Collection of basic data

I have inspected each tree and have collected information on genus, species, diameter at base (DAB), diameter at breast height (DBH), structural root zone (SRZ), tree protection zone (TPZ), height, vigour, condition, age class, estimated life expectancy (ELE) and potential for contribution to amenity in a development context. I have recorded this information in the tree schedule included in Appendix 3. Methodology for these assessments is also outlined within Appendix 3. Each tree was then allocated to one of four categories ('AA,' 'A,' 'Z' or 'ZZ'), as outlined within Section 4.1 and Appendix 2, which reflected its suitability as a material constraint on development.

4.2.4 Identification and location of the trees

Identification to species level was based on broad taxonomical features present and visible at ground level. I have illustrated the locations of the trees on the Tree Management Plan (Plan TMP01) included as Appendix 4. This plan is for illustrative purposes only and should not be used for directly scaling measurements. TPZ's should be measured as a radius using the tree schedule included within Appendix 3.

4.2.5 Advanced interpretation of data

The Australian Standard *Protection of trees on development sites* (AS4970-2009), recommends that the trunk diameter measurement for each tree be used to calculate the tree protection zone (TPZ), which can then be interpreted to identify the design constraints and once a layout has been consented, the exclusion zone is to be protected by fencing or ground protection.

4.3 Plan updates:

A review of the supplied site plans indicates that the proposed footing as shown within the Section Plan was not shown, this has been illustrated within my TMP01 Tree Removal Plan Sheet 4 of 5, and TMP01 Tree Protection Plan Sheet 5 of 5.

4.4 The use of the information in layout design

The information listed in Appendix 3 can be used to provide guidance to the constraints of the design based on the locations of all the 'A' trees. All the 'Z' trees can be discounted because they were not considered worthy of being a material constraint.

4.4.1 Tree Protection Zone (TPZ)

As described within AS-4970, the TPZ is a combination of the root area and crown area requiring protection. The TPZ is an area isolated from construction disturbance, so that the tree remains viable. In some cases, it may be possible to encroach into or make variations to the theoretical TPZ. TPZ's are calculated by multiplying the diameter at breast height by twelve. This result is a setback distance radially from the trunk.

- The TPZ should not be less than 2m nor greater than 15m (Except where crown protection is required).
- The TPZ incorporates the structural root zone (SRZ).
- The TPZ of palms, other monocots, cycads, and tree ferns should be not less than 1m outside the crown projection.

4.4.1.1 A Minor Encroachment

If the proposed encroachment is less than 10% of the area of the TPZ and is outside the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. Variations must be made by the project arborist considering relevant factors listed below.

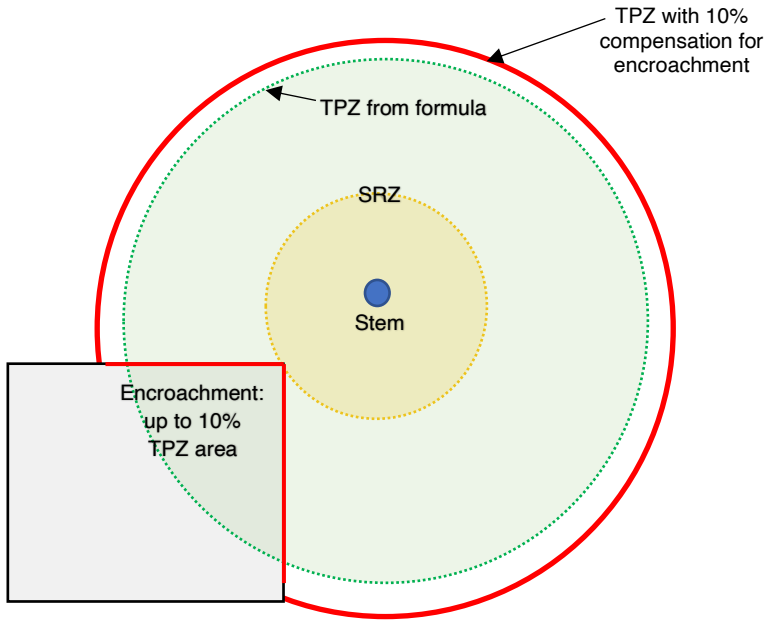
4.4.1.2 A Major Encroachment

This is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods., the project Arborist should consider the following:

- Location and distribution of the roots to be determined through non-destructive investigation methods (pneumatic, hydraulic, hand digging or ground penetrating radar). Note: regardless of the method, roots must not be cut, bruised, or frayed during the process. It is imperative that the exposed roots are kept moist, covered with hessian and the excavation back filled as soon as possible.
- The potential loss of root mass resulting from the encroachment: number and size of roots,
- Tree species and tolerance to root disturbance,
- Age, vigour, and size of the tree,
- Lean and stability of the tree. Note: Roots on the tension side are likely to be most important for supporting the tree and are likely to extend for a greater distance.
- Soil characteristics and volume, topography, and drainage,
- The presence of existing or past structures or obstacles affecting root growth,
- Design factors. Tree sensitive construction measures such as pier and beam, suspended slabs, cantilevered building sections, screw piles and contiguous piling can minimize the impact of encroachment.
- When siting a structure near to a tree, the future growth of the tree, both above and below ground should be considered. Precautions should be taken at the planning and design stage to minimize potential conflict between trees and new structures. When the root zone is reactive clay, techniques such as localized pier and beam (bridged), screw pile footings or root and soil moisture control barriers may be appropriate to minimize effects on structures.
- Collaboration may be required between the project arborist and the geotechnical or structural engineer.

4.4.1.3 Encroachment into the tree protection zone.

Encroachment into the tree protection zone is sometimes unavoidable. An example of a TPZ encroachment by area is shown below, to assist in reducing the impact of such incursions.



4.4.2 Structural Root Zone (SRZ)

As described within AS-4970, the SRZ is a radial distance from the centre of a tree's trunk, where it is likely that structural, woody roots would be encountered. The distance is calculated on the trunk buttress at ground level. The SRZ may also be influenced by natural or built structures, such as rocks and footings. The SRZ only needs to be calculated when a major encroachment (>10%) into a TPZ is proposed.

5 IMPACT ASSESSMENT

5.1 Summary of the impact on trees

I have assessed the impact of the proposal on trees by the extent of disturbance in TPZs and the encroachment of structures into the SRZ as shown within TMP01-Tree Removal Plan, Sheet 4 of 5, (Appendix 4). All trees that may be affected by the development proposal are listed below in Table 1.

Impact	Reason	Important trees		Unimportant trees	
		AA	A	Z	ZZ
Trees to be removed	Installation of billboard, footings, and line of site		1A,1B,1,2, 3,4,5,7,8,9, 11.	6,10,12.	
Retained trees that may be affected through TPZ disturbance	Installation of footings			13.	
Retained trees to be pruned to fit in the development proposal	Space for the billboard			13.	
Retained trees with no TPZ disturbance			14,18,19,20.	15,16,17.	

Table 1

5.2 Detailed impact Assessment

5.2.1 Category A trees to be removed.

The proposed development will necessitate the removal of eleven (11) high category trees (Trees 1A, 1B, 1, 2, 3, 4, 5, 7, 8, 9 and 11. These trees will be directly impacted by the proposed works and the required line of sight for the billboard. These trees are considered important trees and display good vigour (health) and condition. In order to compensate for the loss of amenity, consideration should be given to replacement planting within or adjacent the site.

5.2.2 Category A trees that could potentially be adversely affected through TPZ disturbance.

Four (4) category A trees (Trees 14,18, 19 & 20) could potentially be adversely affected through disturbance to their TPZ's if adequate tree protection is not installed.

5.2.3 Category Z trees to be removed.

The proposed development will necessitate the removal of three (3) low category trees (Trees 6,10 & 12). None of these trees are considered important or worthy of special measures to ensure their preservation.

5.2.4 Category Z trees to be retained.

Four (4) low category trees (Trees 13,15,16 & 17) could be successfully retained without any adverse effects if appropriate protective measures are properly specified and controlled through a detailed arboricultural Tree Protection Plan.

5.3 Proposal to mitigate any impact.

5.3.1 Protection of retained trees.

The successful retention of trees within the site depends on the quality of tree protection and the administrative procedures to ensure protective measures remain in place throughout the development. This is best achieved through a detailed arboricultural Tree Protection Plan, that can be specifically referred to within a planning permit. An arboricultural Tree Protection Plan (TMP01) is Setout within Appendix 4.

5.3.2 New Planting

In the context of the loss of trees, an offset strategy should be imposed within the conditions of consent. The new trees should have the potential to reach a significant height without excessive inconvenience and be sustainable into the long term, significantly improving the potential of the site to contribute to local amenity and character.

5.3.3 Summary of the impact on local amenity.

The proposed changes may adversely affect trees proposed for retention, however, provided adequate precautions to protect the retained trees are specified and implemented as set out in the arboricultural TMP01 included in this report, the development proposal is not expected to adversely affect the contribution of the retained trees to the local amenity.

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State Environmental Planning Policy (Biodiversity and Conservation) 2021

7 APPENDIX 1: Qualifications and experience of Mathew Phillips

Contact Details info@synertree.com.au– Level 4, 406/1-3 Dunning Avenue Rosebery NSW 2018 – P: 0433085573

1. Qualifications:
   - Certificate III in Horticulture (Arboriculture) @ Canberra Institute of Technology 2002-2004
   - Diploma of Arboriculture (AHC50516) @ TAFE NSW 30 August 2018-2019
   - Quantified Tree Risk Assessment (QTRA), Registered licensee No. 6067 @ Richmond College NSW 22nd & 23rd August 2019
   - Quantified Tree Risk Assessment (QTRA) Advanced User Training Registered licensee No. 6067 @ Richmond College NSW 18th March 2020

2. Practical experience:
   I have been involved within the Arboricultural industry for more than 10 years, initially studying and being employed as a climbing Arborist where I developed practical skills and expertise recognised within the industry. With career development and further study in the field I progressed to a consulting Arborist trained in Quantified Tree Risk Assessment and consulting on development projects including state significant developments. As the Director and senior consultant for SynerTree Pty Ltd, I have consulted on hundreds of Arboricultural projects.

3. Continuing professional development:

   - Member of Arboriculture Australia 2023.
   - Where shade hits the pavement May 2023.
   - Arboriculture Australia National Conference 28th-30th May 2023.
   - 24th National Street Tree Symposium 7th-8th September 2023.
   - ISA Tree Risk Assessment Qualification (TRAQ) Nov 2023.

8 APPENDIX 2: TreeAZ categories methodology

Category Z: Unimportant trees not worthy of being a material constraint.

Local policy exemptions: Trees that are unsuitable for legal protection for local policy reasons including size, proximity, and species.

Z1	Young or insignificant small trees, i.e., below the local size threshold for legal protection, etc
Z2	Too close to a building, i.e., exempt from legal protection because of proximity, etc
Z3	Species that cannot be protected for other reasons, i.e., scheduled noxious weeds, out of character in a setting of acknowledged importance, etc

High risk of death or failure: Trees that are likely to be removed within 10 years because of acute health issues or severe structural failure.

Z4	Dead, dying, diseased or declining
Z5	Severe damage and/or structural defects where a high risk of failure cannot be satisfactorily reduced by reasonable remedial care, i.e., cavities, decay, included bark, wounds, excessive imbalance, overgrown and vulnerable to adverse weather conditions, etc
Z6	Instability, i.e., poor anchorage, increased exposure, etc

Excessive nuisance: Trees that are likely to be removed within 10 years because of unacceptable impact on people.

Z7	Excessive, severe, and intolerable inconvenience to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e., dominance, debris, interference, etc
Z8	Excessive, severe, and intolerable damage to property to the extent that a locally recognized court or tribunal would be likely to authorize removal, i.e., severe structural damage to surfacing and buildings, etc.

Good management: Trees that are likely to be removed within 10 years through responsible management of the tree population.

Z9	Severe damage and/or structural defects where a high risk of failure can be temporarily reduced by reasonable remedial care, i.e., cavities, decay, included bark, wounds, excessive imbalance, vulnerable to adverse weather conditions, etc.
Z10	Poor condition or location with a low potential for recovery or improvement, i.e., dominated by adjacent trees or buildings, poor architectural framework, etc.
Z11	Removal would benefit better adjacent trees, i.e., relieve physical interference, suppression, etc.
Z12	Unacceptably expensive to retain, i.e., severe defects requiring excessive levels of maintenance, etc.

NOTE: Z trees with a high risk of death/failure (**Z4**, **Z5** & **Z6**) or causing severe inconvenience (Z7 & Z8) at the time of assessment and need an urgent risk assessment can be designated as **ZZ**. **ZZ** trees are likely to be unsuitable for retention and at the bottom of the categorization hierarchy. In contrast, although **Z** trees are not worthy of influencing new designs, urgent removal is not essential and they could be retained in the short term, if appropriate.

Category A: Important trees suitable for retention for more than 10 years and worthy of being a material constraint.

A1	No significant defects and could be retained with minimal remedial care
A2	Minor defects that could be addressed by remedial care and/or work to adjacent trees
A3	Special significance for historical, cultural, commemorative or rarity reasons that would warrant extraordinary efforts to retain for more than 10 years
A4	Trees that may be worthy of legal protection for ecological reasons (Advisory requiring specialist assessment)

NOTE: Category **A1** trees that are already large and exceptional or have the potential to become so with minimal maintenance, can be designated as **AA** at the discretion of the assessor. Although all **A** and **AA** trees are sufficiently important to be material constraints, **AA** trees are at the top of the categorization hierarchy and should be given the most weight in any selection process.

TreeAZ is designed by Barrell Tree Consultancy (www.barrelltreecare.co.uk) and is reproduced with their permission.

9 APPENDIX 3: Tree schedule

NOTE: Colour annotation is AA & A category trees with green background; Z & ZZ category trees with blue background;

trees to be removed in red text.

Tree No.	Genus Species (Common Name)	Stem DIA at Buttress	Trunk DIA (DBH)	Canopy (N,S,E,W)	Height (m)	Condition	Vigour	E.L.E	Age Class	SRZ	TPZ	Tree AZ Category	Arborist Notes	Encroachment %	Impact Assessment Result
1A	Homalanthus populifolius (Native poplar)	0.17	0.17	2,1,2,2	5-10	GOOD	GOOD	15>40	MATURE	1.6	**2.0**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	Specimen against chain-link fence.	0%	Remove for line of sight.
1B	Eucalyptus species (Gum Tree)	0.17	0.17	1,1,1,1	5-10	GOOD	GOOD	15>40	SEMI MATURE	1.6	**2.0**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	No fruit, potentially E.botryiodes.	0%	Remove for line of sight.
1	Allocasuarina spp. (She Oak)	0.17	0.17	2,2,2,2	5-10	GOOD	GOOD	15>40	SEMI MATURE	1.6	**2.0**	A1 No significant defects and could be retained with minimal remedial care	No fruit, potentially A.torulosa	0%	Remove for line of sight.
2	Eucalyptus botryoides (Bangalay)	0.17	0.17	2,2,2,2	5-10	GOOD	GOOD	15>40	SEMI MATURE	1.6	**2.0**	A1 No significant defects and could be retained with minimal remedial care		0%	Remove for line of sight.
3	Eucalyptus species (Gum Tree)	0.17	0.17	1,1,1,1	5-10	GOOD	GOOD	15>40	SEMI MATURE	1.6	**2.0**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	No Fruit.	0%	Remove for line of sight.
4	Eucalyptus species (Gum Tree)	0.17	0.17	1,1,1,1	5-10	GOOD	GOOD	15>40	SEMI MATURE	1.6	**2.0**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	No Fruit.	0%	Remove for line of sight.
5	Eucalyptus punctata (Large Fruited Grey Gum)	0.2	0.2	2,2,2,2	5-10	GOOD	GOOD	15>40	MATURE	1.7	**2.4**	A1 No significant defects and could be retained with minimal remedial care		14.70%	Within footprint
6	Eucalyptus species (Gum Tree)	0.2	0.2	1,1,1,1	5-10	DEAD	DEAD	DEAD	OVER MATURE	1.7	**2.4**	Z4 Dead, dying, diseased or declining	Expired, leaf and twigs still attached within crown.	1%	Remove for line of sight.
7	Toona ciliata (Red Cedar)	0.17	0.17	1,1,1,1	5-10	FAIR	GOOD	15>40	MATURE	1.6	**2.0**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	Codominant at base.	21.40%	Within footprint
8	Eucalyptus punctata (Large Fruited Grey Gum)	0.4	0.35	3,3,3,3	10-15	GOOD	GOOD	15>40	MATURE	2.3	**4.2**	A1 No significant defects and could be retained with minimal remedial care		32%	Remove for line of sight.
9	Eucalyptus species (Gum Tree)	0.25	0.2	2,2,2,2	5-10	GOOD	GOOD	15>40	MATURE	1.8	**2.4**	A1 No significant defects and could be retained with minimal remedial care	No fruit, potentially E.botryiodes.	57.20%	Within footprint
10	Percea americana (Avocado)	0.17	0.17	1.5,.15,.15,.15	5-10	GOOD	LOW	15>40	MATURE	1.6	**2.0**	Z3 Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc	Leaf consistant with sharwill and Sheapard varities.	30%	Within footprint
11	Acacia spp.	0.4	0.35	3,3,3,3	<5	GOOD	GOOD	<1-15	MATURE	2.3	**4.2**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	No fruit.	27%	Within footprint
12	Pittosporum undulatum (Sweet Pittosporum)	0.3	0.25	1,1,1,1	<5	POOR	LOW	<1-15	OVER MATURE	2.0	**3.0**	Z4 Dead, dying, diseased or declining	10% live crown, specimen declining down to lower branches within crown.	21%	Within footprint
13	Eucalyptus botryoides (Bangalay)	0.6	0.6	12, 8,8,8	10-15	FAIR	GOOD	15>40	MATURE	2.7	**7.2**	Z4 Dead, dying, diseased or declining	The tree assessment reveals a co-dominant trunk with a compression fork and bark inclusion at the base. Habitat boxes are strategically placed at 3m and 5m, with a habitat deadwood log secured to the FOB on the western side of the trunk. Notably, a significant wound on the northern dominant leader exhibits multiple fungal brackets, indicative of Fomitiporia robusta, a wood-decaying fungal pathogen associated with white rot. These brackets, ranging from 40-150mm in radius, are broadly attached to the heartwood at 4-6m. Additionally, a 100mm diameter deadwood above showcases a similar fungal bracket. The upper crown remains optimally structured, unaffected by the lower compression fork.	11.20%	Retain & Protect
14	Acacia longifolia (Sydney Golden Wattle)	0.17	0.17	2,2,2,2	<5	GOOD	GOOD	15>40	MATURE	1.6	**2.0**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	Top of embankment.	0%	Retain & Protect
15	Ligustrum lucidum (Broad-leafed Privet)	0.2	0.17	2,2,2,2	5-10	GOOD	GOOD	15>40	MATURE	1.7	**2.0**	Z3 Species that cannot be protected for other reasons, i.e. scheduled noxious weeds, out of character in a setting of acknowledged importance, etc	Scheduled noxious weed, exempt under DCP.	0%	Retain & Protect
16	Pittosporum undulatum (Sweet Pittosporum)	0.2	0.17	1,1,1,1	<5	DEAD	DEAD	DEAD	OVER MATURE	1.7	**2.0**	Z4 Dead, dying, diseased or declining	Poor specimen, declining crown.	0%	Retain & Protect
17	Pittosporum undulatum (Sweet Pittosporum)	0.2	0.2	2,2,2,2	5-10	POOR	LOW	<1-15	OVER MATURE	1.7	**2.4**	Z4 Dead, dying, diseased or declining	Poor specimen, declining crown.	0%	Retain & Protect
18	Eucalyptus botryoides (Bangalay)	0.4	0.4	6,1,3,4	10-15	FAIR	GOOD	15>40	MATURE	2.3	**4.8**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	Crown form suppressed by Tree 20.	0%	Retain & Protect
19	Pittosporum undulatum (Sweet Pittosporum)	0.17	0.17	2,2,2,2	<5	FAIR	LOW	<1-15	OVER MATURE	1.6	**2.0**	A2 Minor defects that could be addressed by remedial care and/or work to adjacent trees	Poor specimen, declining crown.	0%	Retain & Protect
20	Eucalyptus botryoides (Bangalay)	1.2	1	10,9,9,9	10-15	GOOD	GOOD	15>40	MATURE	3.6	**12.0**	A1 No significant defects and could be retained with minimal remedial care	Dominant specimen of the site, unlike Tree 13, the specimen is free of disease with a good structure. Habitat boxes have been installed at 3m and 4m.	0%	Retain & Protect

Methodology for collection of tree basic data

GROUND BASED VISUAL TREE ASSESSMENT (VTA):
The subject tree(s) were assessed using the Visual Tree Assessment criteria as described in The Body Language of Trees- A Handbook for Failure Analysis and the methodology outlined within this section. The assessment was limited to a visual examination of the subject tree(s) from ground level only, unlessspecified within the TMP under 'Arborist Comments.' No internal diagnostic or tissue testing will be undertaken as part of a ground based visual assessment, unless specified.

TREE DIMENSIONS AND LOCATIONS:
Tree trunk diameters, heights and defect heights were estimated. The location of the subject tree(s) will be determined from supplied plans, plotted on the supplied plans, or indicated on an aerial photo/map. Trees not shown on supplied plans will be plotted in their approximate location only and or measured from identified infrastructure.

VIGOUR ASSESSMENT:
Ability of a tree to sustain its life processes. This is independent of the condition of a tree but may impact upon it. Vigour can appear to alter rapidly with change of seasons (seasonality) e.g., dormant, deciduous, or semi-deciduous trees. Vigour can be categorized as:
Good Vigour: Ability of a tree to maintain and sustain its life processes. This may be evident by the typical growth of leaves, crown cover and crown density, branches, roots and trunk and resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.
High Vigour: Accelerated growth of a tree due to incidental or deliberate artificial changes to its growing environment that are seemingly beneficial, but may result in premature aging or failure if the favourable conditions cease, or promote prolonged senescence if the favourable conditions remain, e.g. water from a leaking pipe; water and nutrients from a leaking or disrupted sewer pipe; nutrients from animal waste, a tree growing next to a chicken coop, or a stock feed lot, or a regularly used stockyard; a tree subject to a stringent watering and fertilising program; or
some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.
Low Vigour: Reduced ability of a tree to sustain its life processes. This may be evident by the atypical growth of leaves, reduced crown cover and reduced crown density, branches, roots and trunk, and a deterioration of their functions with reduced resistance to predation. This is independent of the condition of a tree but may impact upon it, and especially the ability of a tree to sustain itself against predation.
Dormant Tree Vigour: Determined by existing turgidity in lowest order branches in the outer extremity of the crown, with good bud set and formation, and where the last extension growth is distinct from those most recently preceding it, evident by bud scale scars. Good vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.

AGE:
Most trees have a stable biomass for the major proportion of their life. The estimation of the age of a tree is based on the knowledge of the expected lifespan of the taxa in situ divided into three distinct stages of measurable biomass, when the exact age of the tree from its date of cultivation or planting is unknown and can be categorized as:
Young: Tree aged less than <20% of life expectancy, in situ.
Mature: Tree aged 20-80% of life expectancy, in situ.
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.

PERIOD OF TIME:
The life span of a tree in the urban environment may often be reduced by the influences of encroachment and the dynamics of the environment and can be categorized as:
Short Term: A period less than <1 – 15 years,
Medium Term: A period 15 – 40 years, and
Long Term: A period greater than >40 years.

CONDITION ASSESSMENT:
A tree's crown form and growth habit, as modified by its environment (aspect, suppression by other trees, soils), the stability and viability of the root plate, trunk, and structural branches (first (1st) and possibly second (2nd) order branches), including structural defects such as wounds, cavities or hollows, crooked trunk or weak trunk/branch junctions and the effects of predation by pests and diseases. These may not be directly connected with Vigour, and it is possible for a tree to be of good Vigour but in poor condition. Condition can be categorized as:
Good Condition: Tree is of good habit, with crown form not severely restricted for space and light, physically free from the adverse effects of predation by pests and diseases, obvious instability, or structural weaknesses, fungal, bacterial or insect infestation and is expected to continue to live in much the same condition as at the time of inspection provided conditions around it for its basic survival do not alter greatly. This may be independent from or contributed to by vigour.
Fair Condition: Tree is of good habit or misshapen, a form not severely restricted for space and light, has some physical indication of decline due to the early effects of predation by pests and diseases, fungal, bacterial, or insect infestation, or has suffered physical injury to itself that may be contributing to instability or structural weaknesses, or is faltering due to the modification of the environment essential for its basic survival. Such a tree may recover with remedial works where appropriate, or without intervention may stabilise or improve over
time, or in response to the implementation of beneficial changes to its local environment. This may be independent from or contributed to by vigour.
Poor Condition: Tree is of good habit or misshapen, a form that may be severely restricted for space and light, exhibits symptoms of advanced and irreversible decline such as fungal, or bacterial infestation, major die-back in the branch and foliage crown, structural deterioration from insect damage e.g. termite infestation, or storm damage or lightning strike, ring barking from borer activity in the trunk, root damage or instability of the tree, or damage from physical wounding impacts or abrasion, or from altered local environmental conditions and has been unable to adapt to such changes and may decline further to death regardless of remedial works or other modifications to the local environment that would normally be sufficient to provide for its basic survival if in good to fair condition. Deterioration physically, often characterised by a gradual and continuous reduction in vigour but may be independent of a change in vigour, but characterised by a proportionate increase in susceptibility to, and predation by pests and diseases against which the tree cannot be sustained. Such conditions may also be evident in trees of advanced senescence due to normal phenological processes, without modifications to the growing environment or physical damage having been inflicted upon the tree. This may be independent from or contributed to by vigour.
Dead: Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms:
Processes
-Photosynthesis via its foliage crown (as indicated by the presence of moist, green, or other coloured leaves); Osmosis (the ability of the root system to take up water); Turgidity (the ability of the plant to sustain moisture pressure in its cells); Epicormic shoots or epicormic strands in Eucalypts (the production of new shoots as a response to stress, generated from latent or adventitious buds or from a lignotuber).
Symptoms
-Permanent leaf loss; Permanent wilting (the loss of turgidity which is marked by desiccation of stems leaves and roots); Abscission of the epidermis (bark desiccates and peels off to the beginning of the sapwood).

ESTIMATED LIFE EXPECTENCY:
ELE gives an estimation of how long a tree is likely to remain viable within the landscape based on species, stage of life cycle, health, contribution to the local environment, amenity values, conflicts with adjacent infrastructure and risk to the community. The ELE is also based on the site conditions not significantly being altered and any prescribed maintenance recommendations such as Crown maintenance and Deadwood removal. The age class of the assessed tree is dependent on known species characteristics and longevity in the urban environment and partially aids in the assessment of the ELE:
Long >40 years,
Medium 15-40 years,
Short <1-15 years and
Dead.

STRUCTURAL ROOT ZONE (SRZ):
The SRZ is described in AS-4970 is the area around the base of a tree required for the tree's stability in the ground. Severance of structural roots within the SRZ is not recommended as it may lead to the destabilisation and/or demise of the tree.

TREE PROTECTION ZONE (TPZ):
As described within AS-4970 is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. TPZ's are calculated by multiplying the diameter at breast height by twelve. This result is a setback distance radially from the trunk.
In some cases, it may be possible to encroach into or make variations to the theoretical TPZ. A Minor Encroachment is less than 10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ. A Major Encroachment is greater than 10% of the TPZ or inside the SRZ. In this situation the Project Arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

TREE MANAGEMENT PLAN (TMP01) - GUIDANCE

1. INTRODUCTION.
This Tree Management Plan (TMP) sets out general principles that must be followed when working within a Tree Protection Zone (TPZ). The purpose of this guidance is to demonstrate to Council that the tree protection issues have been properly considered and to provide a written record of how they will be implemented. This TMP must be kept onsite, and form part of the site-specific induction. All contractors and site workers must be briefed on these specifications prior to commencing work on-site. All individuals operating on site, and specifically those working within Tree Protection Zones (TPZ), are expected to receive a comprehensive briefing based on this guidance.

1.1 What is a Tree Protection Zone (TPZ)?
A TPZ is the area surrounding trees where disturbance must be minimised if they are to be successfully retained. All TPZs close to the construction area are illustrated within this TMP. Damage to roots or degradation of the soil through compaction and/or excavation within TPZs is likely to cause serious damage. Any work operations within TPZs must be carried out with great care if trees are to be successfully retained. As described within Australian Standard 4970 'Protection of Trees on Development Sites 2009'. The TPZ is a combination of the root area and crown area requiring protection. TPZ's are calculated by multiplying the diameter at breast height by (12) twelve. This result is a setback distance radially from the trunk. The TPZ is an area isolated from construction disturbance, so that the tree remains viable. In some cases, it may be possible to encroach into or make variations to the theoretical TPZ.

1.2 What is an encroachment into the TPZ?
A 'Minor Encroachment' is encroachment is less than <10% of the area of the TPZ and is outside the SRZ. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.
A 'Major Encroachment' is encroachment is greater than >10% of the TPZ or inside the SRZ. In this situation the project arborist must demonstrate that the tree would remain viable. This may require root investigation by non-destructive methods or the use of sensitive construction methods.

1.3 TPZ considerations.
(a) The TPZ is not less than 2m nor greater than 15m (Except where crown protection is required).
(b) The TPZ incorporates the structural root zone (SRZ).
(c) The TPZ of palms, monocots, cycads, and tree ferns should be not less than 1m outside the crown projection.

1.4 What is a Structural Root Zone (SRZ).
The SRZ is described in AS-4970 is the area around the base of a tree required for the tree's stability in the ground. A larger area is required to maintain a viable tree. Severance of structural roots within the SRZ is not recommended as it may lead to the destabilisation and/or demise of the tree. The SRZ only needs to be calculated when a major encroachment into a TPZ is proposed. There are many factors that affect the size of the SRZ (e.g., tree height, crown area, soil type and soil moisture). The SRZ may also be influenced by natural or built structures, such as rocks and footings. An indicative SRZ radius can be determined from the trunk diameter measured immediately above the root buttress.

1.5 SRZ Considerations.
(a) R(srz) is the structural root zone radius.
(b) The SRZ for trees less than 0.15m diameter is 1.5m.
(c) The SRZ formula does not apply to palms, other monocots, cycads, and tree ferns.
(d) This does not apply to trees with an asymmetrical root plate.

GUIDANCE 1: ARBORIST (AQF-5) RESPONSIBILITIES

(a) An AQF-5 Arborist must be engaged as the project arborist prior to any works being conducted onsite. The project arborist must also do the following:
  (i) Conduct a pre-start meeting with the project manager and contractor to discuss the establishment of tree protection measures prior to any works starting onsite.
  (ii) Inspect and certify the tree protection measures that have been installed as specified within this TMP, including a written certificate that must be supplied to the Chief Certifying Authority prior to any works being conducted onsite.
  (iii) Conduct monthly compliance inspections with written a certificate delivered to the chief certifying authority as well as any requirements specified by Council.
  (iv) The project arborist must supervise all works within a TPZ.
  (v) Where compliance has been breached, the project arborist must notify the project manager immediately and in writing where a 'Stop Work Order' must be issued to the contractor. The project arborist must then compile a statement for issue to the chief certifying authority outlining the damage or impact and recommendations for remediation.
  (vi) The project arborist must conduct a final tree protection certification and document the status of the protected trees for compliance with the conditions of consent.

GUIDANCE 2: TREE PROTECTION ZONE (TPZ)

(a) Before the commencement of works, Tree Protection Zones (TPZ) must be established around all trees to be retained not less than the distance indicated in the TPZ schedule shown within Appendix 4.
(b) Tree protection must be installed and maintained in accordance with the Australian Standard 4970-2009 Protection of Trees on Development Sites, the TPZ schedule within Appendix 4 and this TMP.
(c) Tree Protection Fencing must be installed and maintained prior to the commencement of any works and in accordance with the following:
  (i) A 1.8-metre-high fully supported chainmesh protective fencing, secured and fastened to prevent movement shall be installed at the perimeter of the TPZ. Woody roots must not be damaged or destroyed during the establishment or maintenance of the fencing.
  (ii) The area within the fencing shall be mulched to a depth of 75mm and kept free of weeds and grass for the duration of works.
  (iii) Tree Protection Signage shall be attached facing outwards in a visible position identifying the name and contact details of the site Arborist. All signs must remain in place throughout all work on site.
  (iv) Tree Protection Fencing must not be relocated unless written approval is obtained from the Site Arborist and a copy is provided to Council which outlines alternate protection measures required to ensure all trees remain viable and confirmation that the relocation of the fencing will not impacted the tree/s.
(d) The ground surface protection must be installed if construction access is required through any TPZ and part (g)(i) of this condition has been approved:
  (i) Protected with boarding (i.e. scaffolding board or plywood sheeting or similar material), placed over a layer of mulch to a depth of at least 75mm and geotextile fabric.
  (ii) The protective boarding must be left in place for the duration of the construction and development.
(e) The following works must be excluded from within any TPZs:
  (i) Excavation (except for localised siting of piers / demolition of the concrete slab).
  (ii) Soil cut or fill including trenching.
  (iii) Soil cultivation, disturbance, or compaction.
  (iv) Stockpiling, storage or mixing of materials.
  (v) The parking, storing, washing, and repairing of tools, equipment, and machinery.
  (vi) The disposal of liquids and refuelling.
  (vii) The disposal of building materials.
  (viii) The siting of offices or sheds.
  (ix) Any action leading to the impact on tree health or structure.
(f) Any trenching works for services / hydraulics / drainage etc must not be undertaken within any Tree Protection Zone (TPZ) unless approved by Council. Alternative installation methods for services, such as directional boring/drilling, or redirection of services shall be employed.
(g) All work undertaken within or above the TPZ must be:
  (i) Carried out in accordance with a work methodology statement prepared by an Arborist (minimum AQF Level 5).
  (ii) Supervised by a qualified Consultant Arborist (minimum AQF Level 5)

GUIDANCE 3: TREE PROTECTION DURING CONSTRUCTION

(a) Stockpiling, storage or mixing of materials, washing of equipment, vehicle parking, disposal of liquids, machinery repairs and refuelling, disposal of building materials such as cement slurry, siting of offices or sheds and the lighting of fires, must not occur within12 metres of the trunk of any tree (including trees in adjoining properties).
(b) Any excavations within the TPZ must be undertaken using non- destructive methods (such as by hand or with an Airspade) to ensure no tree roots greater than 40mm diameter are damaged, pruned or removed.
(c) Footings shall be relocated / realigned if any tree root greater than 40mm in diameter is encounter during excavations. A minimum of 150mm clearance shall be provided between the tree root and footing.
(d) All excavations located within the TPZ must be supervised by a qualified Consultant Arborist, who holds the Diploma in Horticulture (Arboriculture), Level 5 under the Australian Qualification Framework.
(e) All root pruning must be undertaken by a qualified Arborist with a minimum AQF level 3.

GUIDANCE 4: TREES APPROVED FOR REMOVAL

(a) Only trees detailed within the conditions of consent are approved for removal. Tree removal must not occur until the Construction Certificate has been issued or as specified within the conditions of consent.
(b) All tree removal works must be carried out by a qualified Arborist, with a minimum Level 3 AQF in arboriculture and in accordance with WorkCover's Code of Practice – Amenity Tree Industry.

GUIDANCE 5: TREE PRUNING

(a) A 'Pruning Specification Report' prepared by a qualified Arborist (minimum AQF Level 5) must be submitted to and approved by Council's Area Planning Manager prior to the issuing of the Construction Certificate. The report must include:
  (i) Number of branches and orientation, branch diameter, percentage of canopy to be pruned/removed.
  (ii) Photos with individual branches which are recommended for pruning/removal to be clearly marked. (Please note reports which include photos with a single vertical line as the area recommended for pruning will not be accepted).
  (iii) A maximum of 5% canopy removal and maximum of 100mm diameter branches will be permitted by Council.
  (iv) Pruning work must be specified in accordance with Australian Standard 4373–2007, Pruning of Amenity Trees.
  (v) Tree removal must not be recommended in this report.
  (vi) All approved tree pruning works must be carried out by a qualified Arborist, with a minimum Level 3 AQF in arboriculture and in accordance with Work Cover Code of Practice – Amenity Tree Industry.
  (vii) Any pruning works carried out under this consent must not result in the death of the tree, the creation of a hazard or in excessive or inappropriate amounts of pruning, which result in the overall shape of the tree becoming unbalanced and/or unstable.
  (viii) The consent from Council's Tree Management Officer must be obtained prior to the undertaking of any additional tree pruning works or pruning of any tree roots greater than 40mm in diameter.

GUIDANCE 6: CROWN PROTECTION

Tree crowns may be injured by machinery such as excavators, drilling rigs, cranes, trucks, hoarding installation, and scaffolding. The TPZ may need to include additional protection of the above ground parts of the tree. Where crown protection is required, it will usually be located at least one metre outside the perimeter of the crown. The erection of scaffolding may require an additional setback from the edge of the crown. Crown protection may include pruning, tying-back of branches or other measures. If pruning is required, requirements are specified in AS 4373 and should be undertaken before the establishment of the TPZ.

GUIDANCE 7: STREET TREE PROTECTION

All street trees directly outside the site must be retained and protected in accordance with the Australian Standard 4970 Protection of Trees on Development Sites. All street trees must be protected during the construction works as follows:
(a) Tree trunk and major limb protection must be undertaken prior to the commencement of any works. The protection must be installed and certified by a qualified Arborist (AQF level 3) and must include:
  (i) An adequate clearance, minimum 250mm, must be provided between the structure and tree branches, limbs, and trunks always.
  (ii) Tree trunk/s and/or major branches, must be protected by wrapped hessian or similar material to limit damage.
  (iii) Timber planks (35mm x 90mm or similar) must be placed around tree trunk/s. The timber planks must be spaced at 100mm intervals and must be fixed against the trunk with tie wire, or strapping. The hessian and timber planks must not be fixed to the tree in any instance, or in any fashion.
  (iv) Tree trunk and major branch protection is to remain in place for the duration of construction and development works and must be removed at the completion of the project.
  (v) All hoarding support columns are to be placed a minimum of 300mm from the edge of the existing tree pits/setts, so that no sinking or damage occurs to the existing tree setts. Supporting columns must not be placed on any tree roots that are exposed.
  (vi) Young street trees shall be protected by installing three (3) wooden takes around the edge of the tree pit. Hessian shall be wrapped around the stakes. If existing stakes are already in place, these shall suffice as tree protection.
  (vii) Temporary signs, or any other items, shall not be fixed or attached to any street tree.
  (viii) Materials or goods, including site sheds, must not be stored, or placed around or under the tree canopy or within two (2) metres of tree trunks or branches of any street trees.
  (ix) Any excavation within any area known to or suspected of having street tree roots greater than 40mm diameter must be undertaken by hand.
  (x) Any trenching works for services / hydraulics / drainage etc must not be undertaken within 12 metres of any street tree. Alternative installation methods for services, such as directional boring/drilling, or redirection of services shall be employed where large woody roots greater than 40mm diameter are encountered during the installation of any services.
  (xi) Existing sections of kerbs adjacent to any street tree must not be removed without approval from the Council's Tree Management Officer.
  (xii) Any damage sustained to street tree/s because of construction activities (including demolition) must be immediately reported to the Council's Tree Management Officer. Any damage to street trees because of construction activities may result in a prosecution under the Local Government Act 1993 and the Environmental Planning and Assessment Act 1979.

GUIDANCE 8: NON-DESTRUCTIVE ROOT INVESTIGATION

Exploratory root investigation must be undertaken by a qualified Arborist (minimum AQF Level 5) in the following circumstances:
a) Prior to the demolition of any structure within the SRZ of a tree.
b) Prior to the demolition of any structure that will result in a major encroachment.
c) Where services are proposed through a TPZ.
d) Where a structure is proposed within a TPZ that will result in a major encroachment.

GUIDANCE 9: INSTALLING SERVICES WITHIN A TPZ

For the purposes of this guidance, services are considered as structures. All services should be routed outside the TPZ. If underground services must be routed within the TPZ, they should be installed by directional drilling or in manually excavated trenches using non-destructive methods. The directional drilling bore should be at least 600 mm deep. The project arborist should assess the likely impacts of boring and bore pits on retained trees. The bore pits should be excavated outside of the TPZ. Excavation to upgrade existing services or install new services in TPZs may damage retained trees and should only be chosen as a last resort. If excavation emerges as the preferred option, the decision should be reviewed by the project Arborist before any work is carried out. If excavation is agreed, all digging should be done carefully and follow the guidance set out above.

GUIDANCE 10: EXCAVATION WITHIN A TPZ

Any approved excavation must be carried out carefully through non-destructive methods such as 'hydro-vacuum excavation' (sucker truck) or 'Air spade' and must be supervised by the project arborist. Non-destructive means no damage is to occur to roots greater than 40mm diameter and fine feeder roots where possible. It's important that Hydro-vacuum compressed air jets must not exceed 100psi at the attachment head. Excavated roots should be wrapped in hessian immediately once uncovered to limit adverse impact to the bark or wood of roots. All soil removal must be undertaken with care to minimise the disturbance of roots beyond the immediate area of excavation. Where possible, flexible clumps of smaller roots, including fibrous roots, should be retained if they can be displaced temporarily or permanently beyond the excavation without damage. If digging by hand, a fork should be used to loosen the soil and help locate any substantial roots. Exposed roots to be removed should be cut cleanly with sharp saw or secateurs 10–20cm behind the final face of the excavation. Roots temporarily exposed must be protected from direct sunlight, drying out and extremes of temperature by appropriate covering.

GUIDANCE 11: DEMOLITION OF SURFACES OR STRUCTURES WITHIN A TPZ

Definitions of surfaces and structures
For the purposes of this guidance, the following broad definitions apply:

Surfaces: Any hard surfacing used as a vehicular road, parking or pedestrian path including tarmac, solid stone, crushed stone, compacted aggregate, concrete, and timber decking. This does not include compacted soil with no hard covering.
Structures: Any man-made structure above or below ground including service pipes, walls, gate piers, buildings, and foundations. Typically, this would include drainage structures, carports, bin stores and concrete slabs that support buildings.

Demolition and access.
Roots frequently grow adjacent to, and beneath existing surfaces/structures so great care is needed during access and demolition. Damage can occur through physical disturbance of roots and/or the compaction of soil around them from the weight of machinery or repeated pedestrian passage. This is not generally a problem whilst surfacing/structures are in place because they spread the load on the soil beneath and further protective measures are not normally necessary. However, once they are removed and the soil below is newly exposed, damage to roots becomes an issue and the following guidance must be observed:
a) No vehicular or repeated pedestrian access into TPZs unless on existing hard surfacing or custom designed ground protection.
b) Regular vehicular and pedestrian access routes must be protected from compaction with temporary ground protection as set out in AS4970-2009.
c) TPZs exposed by the work must be protected as set out in AS4970-2009 until there is no risk of damage from the development activity.
d) Removal of surfacing/structures.
e) Removing existing surfacing/structures is a high-risk activity for any adjacent roots and the following guidance must be observed:
f) Appropriate tools for manually removing debris may include a pneumatic breaker, crowbar, sledgehammer, pick, mattock, shovel, spade, trowel, fork, and wheelbarrow. Secateurs and a handsaw
g) must also be available to deal with any exposed roots that have to be cut.
h) Machines with a long reach may be used if they can work from outside TPZs or from protected areas within TPZs. They must not encroach onto unprotected soil in TPZs.
i) Debris to be removed from TPZs manually must be moved across existing hard surfacing or temporary ground protection in a way that prevents compaction of soil. Alternatively, it can be lifted out by machines provided this does not disturb TPZs.
j) Great care must be taken throughout these operations not to damage roots.
k) If appropriate, leaving below ground structures in place should be considered if their removal may cause excessive root disturbance.

GUIDANCE 12: INSTALLING SURFACES WITHIN A TPZ

Basic principles.
New surfacing is potentially damaging to trees because it may require changes to existing ground levels, result in localised soil structure degradation and/or disrupt the efficient exchange of water and gases in and out of the soil. Mature and over-mature trees are much more prone to suffer because of these changes than young and maturing trees. Adverse impact on trees can be reduced by minimising the extent of these changes in TPZs. Generally, the most suitable surfacing will be relatively permeable to allow water and gas movement, load spreading to avoid localised compaction and require little or no excavation to limit direct damage. The actual specification of the surfacing is an engineering issue that needs to be considered in the context of the bearing capacity of the soil, the intended loading, and the frequency of loading. The detail of product and specification are beyond the scope of this guidance and must be provided separately by the appropriate specialist.

Establishing the depth of excavation and surfacing gradient.
The precise location and depth of roots within the soil is unpredictable and will only be known when careful digging starts on site. Ideally, all new surfacing in TPZs should be no-dig, i.e., requiring no excavation whatsoever, but this is rarely possible on undulating surfaces. New surfacing normally requires an evenly graded sub-base layer, which can be made up to any high points with granular, permeable fills such as crushed stone or sharp sand. This sub-base must not be compacted as would happen in conventional surface installation. Some limited excavation is usually necessary to achieve this and need not be damaging to trees if carried out carefully and large roots are not cut. Tree roots and grass roots rarely occupy the same soil volume at the top of the soil profile, so the removal of a turf layer up to 50mm is unlikely to be damaging to trees. It may be possible to dig to a greater depth depending on local conditions, but this would need to be assessed by an arboriculturist if excavation beyond 5cm is anticipated. On undulating surfaces, finished gradients/levels must be planned with sufficient flexibility to allow on-site adjustment if excavation of any high points reveals large, unexpected roots near the surface. If the roots are less than 40mm in diameter, it would normally be acceptable to cut them, and the gradient formed with the preferred minimal excavation of up to 5cm. However, if roots over 40mm in diameter are exposed, cutting them may be too damaging and further excavation may not be possible. If that is the case, the surrounding levels must be adjusted to take account of these high points by filling with suitable material. If this is not practical and large roots have to be cut, the situation should be discussed with the project Arborist before a final decision is made.

Base and finishing layers.
Once the sub-base has been formed, the load spreading construction is installed on top without compaction. In principle, the load spreading formation will normally be cellular and filled with crushed stone although the detail may vary with different products. Suitable surface finishes include washed gravel, permeable tarmac or block pavers set on a sand base. However, for lightly loaded surfacing of limited widths (<3m) such as pedestrian paths, pre-formed concrete slabs may be appropriate if the sub-base preparation is as set out above. In some situations, limited width floating concrete rafts constructed directly on the soil surface may be acceptable, but the design must not include any strip-dug supports.

Edge retention.
Conventional kerb edge retention set in concrete filled excavated trenches is likely to result in damage to roots and should be avoided. Effective edge retention in TPZs must be custom designed to avoid any significant excavation into existing soil levels. For most surfaces, the use of pre-formed edging secured by metal pins or wooden pegs is normally an effective way of minimising any adverse impact on trees from the retention structure.

Installing new surfacing on top of existing surfacing.
In some instances, existing surfacing can be retained and used as a base for new surfacing. Normally, this will not result in significant excavation that could expose roots so special precautions are not necessary. However, if large roots already protrude above the proposed sub-base level, then the precautions and procedures set out above must be observed.

GUIDANCE 13: INSTALLING STRUCTURES WITHIN A TPZ

Basic principles
New structures in TPZs are potentially damaging to trees because they may disturb the soil and disrupt the existing exchange of water and gases in and out of it. Mature and over-mature trees are much more prone to suffer because of these changes than young and maturing trees. Adverse impact on trees can be reduced by minimising the extent of these changes in TPZs. This can be done by constructing the main structures above ground level on piled supports and redirecting water to where it is needed. The detailed design and specification of such structures is an engineering issue that should be informed and guided by the project Arborist. Conventional strip foundations in the TPZ for any significant structure may cause excessive root loss and are unlikely to be acceptable. However, disturbance can be significantly reduced by supporting the above ground part of the structures on small diameter piles/piers or cast floor slabs set above ground level. The design should be sufficiently flexible to allow the piles to be moved if significant roots are encountered in the preferred locations.

Small sheds and bin stores.
These light structures do not normally require substantial foundations and can have permeable bases. Ideally, their bases should be of a no-dig, load-spreading construction set directly on to the soil surface. They require a flat base and so an undulating site will need levelling to provide a suitable surface. Excavation of any high points by up to 5cm and filling depressions with permeable fill to provide a flat base will normally be acceptable provided no roots greater than 4cm in diameter need to be cut. If large roots are found, the preferred course of action would be to raise the base level of the structure by filling rather than cutting roots.
However, if this is not practical and large roots have to be cut, the situation should be discussed with the project Arborist before a final decision is made. Above the base, there will often be a protective covering fixed onto a frame that can rise directly from the base or be fixed to supports either banged into the ground or set in carefully dug holes. Provided the supports are well spaced, i.e., greater than 1.5m apart, and of a relatively narrow diameter, i.e., not more than 15cm, it is unlikely they will cause any significant disturbance to TPZs.

GUIDANCE 14: INSTALLING SOFT LANDSCAPING WITHIN A TPZ

For the purposes of this guidance, soft landscaping includes the re-profiling of existing soil levels and covering the soil surface with new plants or an organic covering (mulch). It does not include the installation of solid structures or compacted surfacing. Soft landscaping activity after construction can be extremely damaging to trees. No significant excavation or cultivation, especially by rotovators, should occur within TPZs. Where new designs require levels to be increased to tie in with new structures or the removal of an existing structure has left a void below the surrounding ground level, good quality and relatively permeable topsoil should be used for the fill. It should be firmed into place but not over compacted in preparation for turfing or careful shrub planting. Ideally, all areas within SRZs should be kept at the original ground level and have a mulched finish rather than grass to reduce the risk of mowing damage.

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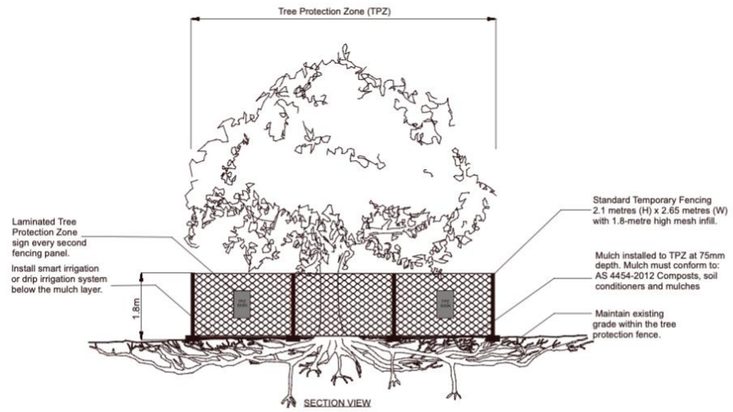
Project: PRINCES HWY, LOFTUS, NSW, SUPERSITE
Client: HANLON INDUSTRIES
Drawing Name: TMP01-Method Statement
Date: 08/12/2023
Scale: 1:200 @ A3
Sheet No. 1 of 5



S-1 TREE PROTECTION FENCING

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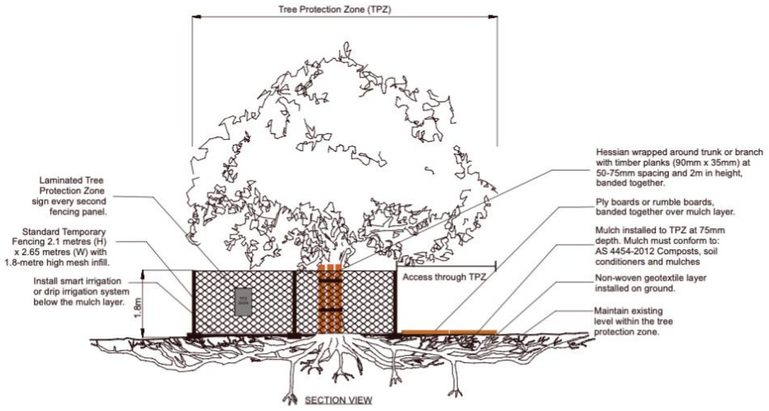
TREE PROTECTION FENCING (S-1).

(a) The precise location of the fencing must be agreed with the project arborist at the pre-start meeting.
(b) Tree protection fencing must be installed to the TPZ of retained trees prior to the commencement of any works onsite and must be maintained for the duration of the development.
(c) Tree protection signage shall be attached to fencing, facing outwards in a visible position identifying the name and contact details of the project arborist and must remain in place for the duration of the development.
(d) Tree protection fencing must not be relocated unless written approval is obtained from the project arborist and notification is provided to Council that outlines alternate protection measures required to ensure all trees remain viable and confirmation that the relocation of the fencing will not impact the tree/s.



S-2 TRUNK, BRANCH & GROUND PROTECTION

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TRUNK, BRANCH & GROUND PROTECTION (S-2).

(a) Trunk protection must be installed to street trees or trees where the tree protection fencing setback is to be reduced for works within the TPZ and must comply with the guidelines set out within AS4970-2009 Protection of trees on development sites.

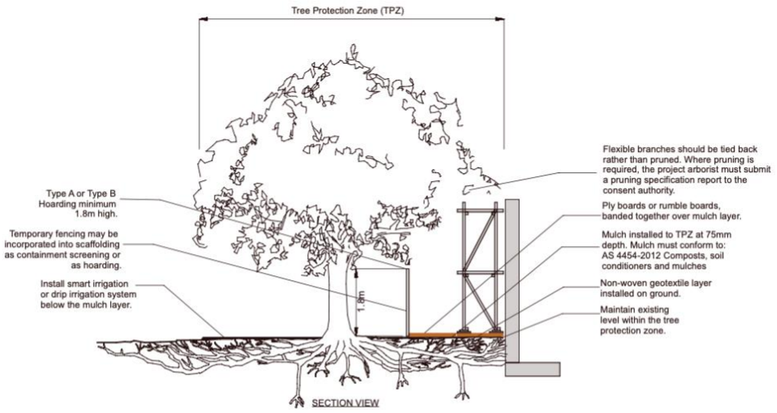
Trunk protection requirements:

(i) Hessian double wrapped around the trunk of the tree to a height of 2m above ground level.
(ii) Timber planks 35 x 90mm shall be wrapped/banded together on top of the hessian at 50mm - 100mm spacing, extending to a height of 2m above ground level.
(iii) Small trees that cannot support trunk protection must be protected with a 1m x 1m timber frame.

(b) Branch protection must be installed where branches are exposed beyond tree protection fencing or where impacts are likely to occur during installation of scaffolding or operations around the crown.
(c) Ground protection must be installed if construction access is required through any TPZ. Ground protection requirements are shown within S-2 and consist of boarding (i.e., scaffolding board or plywood sheeting or similar material), placed over geotextile fabric (bottom) and a 75mm layer of mulch. The ground protection must be left in place for the duration of the development.

Ground protection requirements:

(i) Non-woven geotextile must cover the ground level.
(ii) Mulch installed to TPZ at 75mm depth. Mulch must conform to: AS 4454-2012 Composts, soil conditioners and mulches.
(iii) Ply boards or rumble boards banded together over the mulch layer.



S-3 SCAFFOLD PROTECTION

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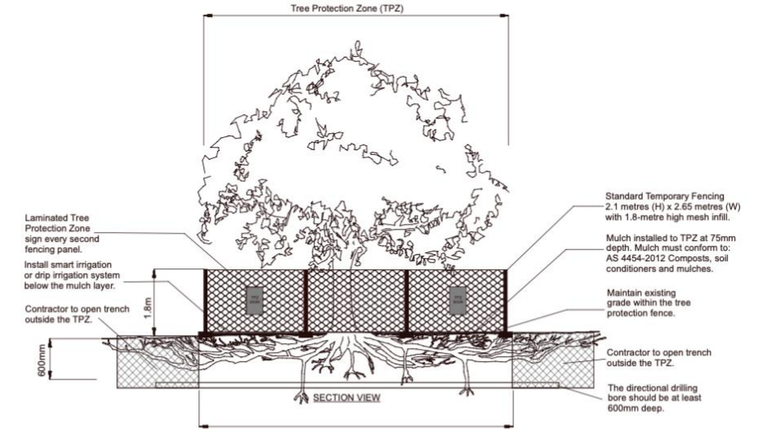
SCAFOLD PROTECTION (S-3).

Where scaffolding is required, it should be erected outside the TPZ. Where it is essential for scaffolding to be erected within the TPZ, branch removal should be minimized. This can be achieved by designing scaffolding to avoid branches or tying back branches. Where pruning is unavoidable it must be specified by the project arborist in accordance with GUIDANCE 5 TREE PRUNING and will require approval by council. The Ground below the scaffolding should be protected by boarding (e.g., scaffold board or plywood sheeting) as shown in S-3 below. Where access is required, a board walk, or other surface material should be installed to minimise soil compaction. Boarding should be placed over a layer of mulch 75mm deep and impervious sheeting to prevent soil contamination. The boarding should be left in place until the scaffolding is removed.



S-4 TREE PROTECTION - BORING BELOW THE TPZ

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UNDERBORING BELOW A TPZ (S-4).

The directional drilling bore should be at least 600 mm deep. The project arborist should assess the likely impacts of boring and bore pits on retained trees. The bore pits should be excavated outside of the TPZ. The decision to underbore should be reviewed by the project Arborist before any work is carried out.

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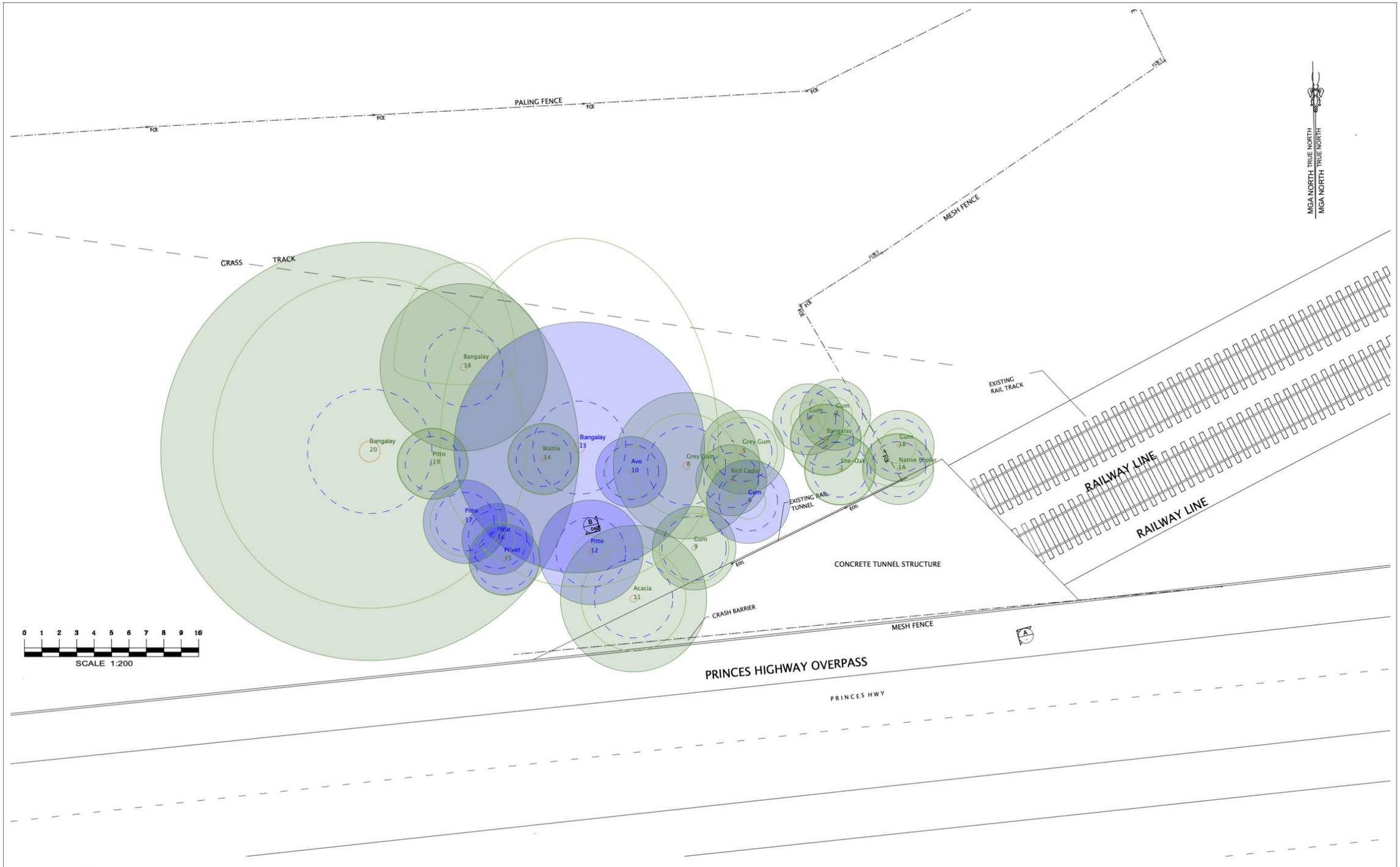
Project:	PRINCESS HWY, LOFTUS, NSW, SUPERSITE
Client:	HANLON INDUSTRIES
Drawing Name:	TMP01-Protection Specifications
Date:	08/12/2023
Scale:	1:200 @ A3
Sheet No.	2 of 5



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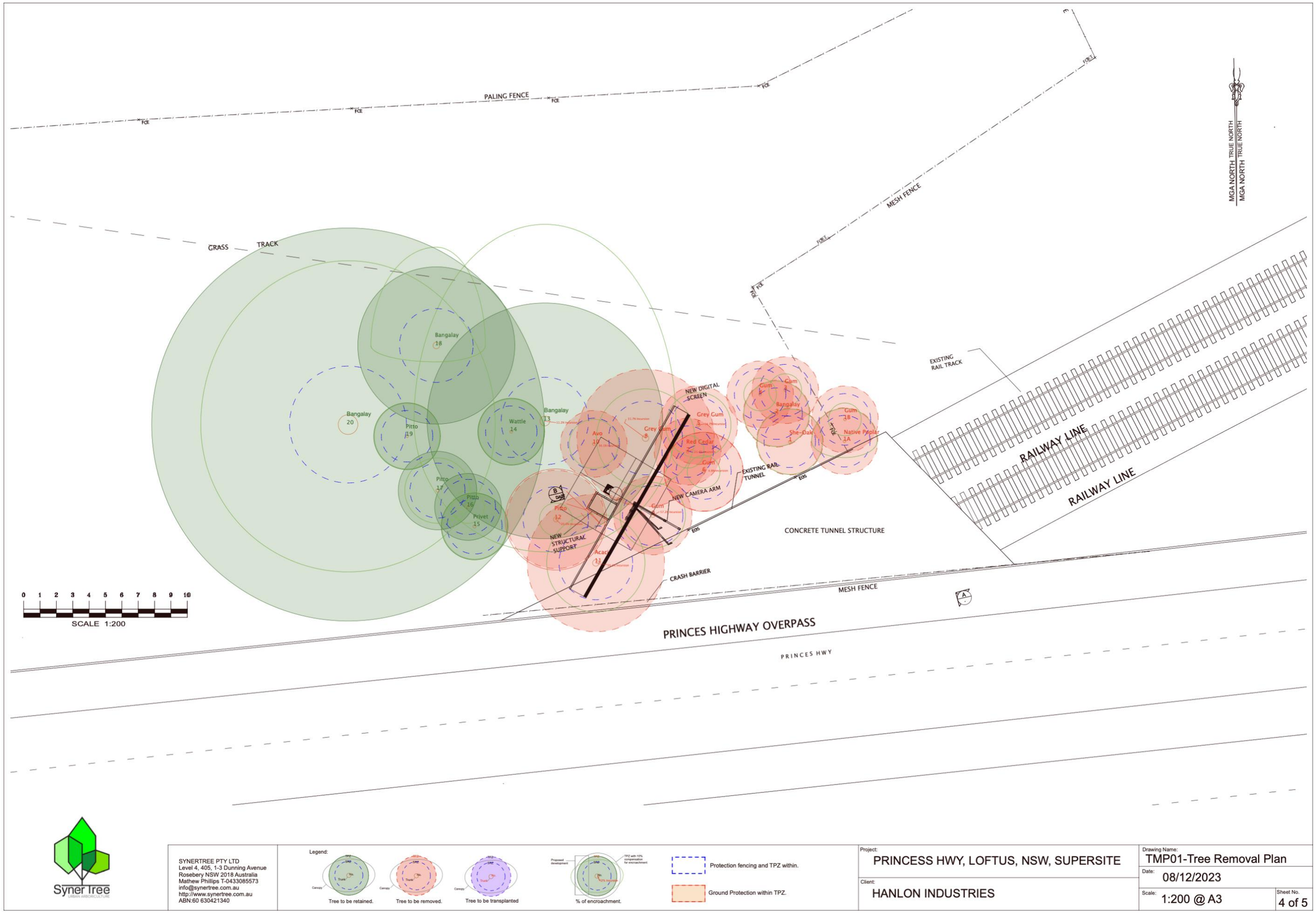
Legend:

A or AA Category Tree

Z or ZZ Category Tree

Project:	PRINCESS HWY, LOFTUS, NSW, SUPERSITE
Client:	HANLON INDUSTRIES
Drawing Name:	TMP01-Tree Survey (TreeAZ)
Date:	08/12/2023
Scale:	1:200 @ A3
Sheet No.	3 of 5



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Legend:

Tree to be retained. Tree to be removed. Tree to be transplanted

% of encroachment.

Protection fencing and TPZ within.

Ground Protection within TPZ.

Project: PRINCESS HWY, LOFTUS, NSW, SUPERSITE

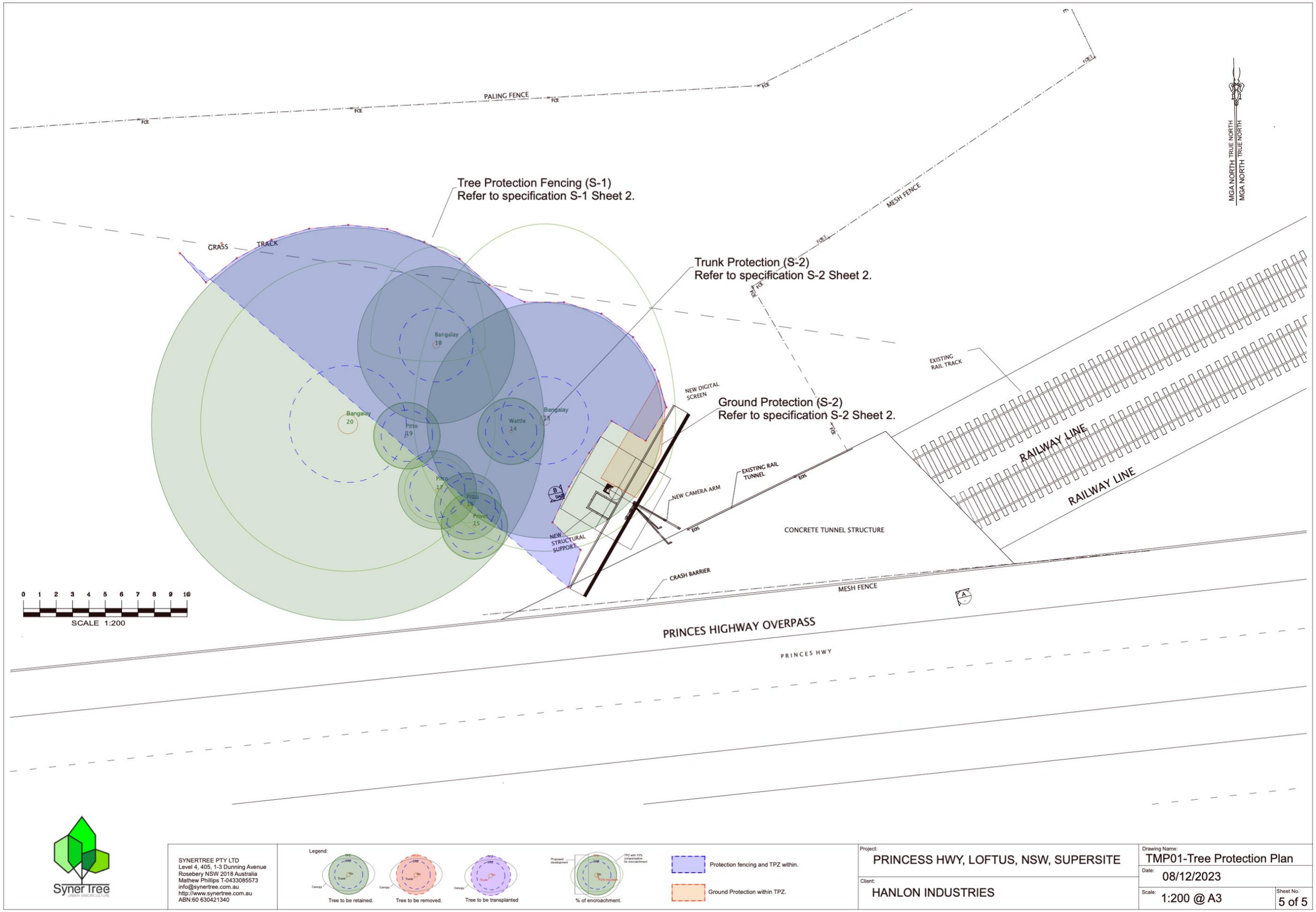
Client: HANLON INDUSTRIES

Drawing Name: TMP01-Tree Removal Plan

Date: 08/12/2023

Scale: 1:200 @ A3

Sheet No. 4 of 5



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Legend:

Tree to be retained.

Tree to be removed.

Tree to be transplanted

% of encroachment.

Protection fencing and TPZ within.

Ground Protection within TPZ.

Project: PRINCESS HWY, LOFTUS, NSW, SUPERSITE	Drawing Name: TMP01-Tree Protection Plan
Client: HANLON INDUSTRIES	Date: 08/12/2023
	Scale: 1:200 @ A3
	Sheet No. 5 of 5