

ALL ARBOR SOLUTIONS

Arboricultural Impact Assessment & Tree Protection Specification

Prepared for:	coNEXA Sydney Pty Ltd
Site Address:	Kaluna Reserve Smithfield NSW 2164
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1.0 Summary

- 1.1 This report has been prepared for coNEXA Sydney Pty Ltd and concerns the impacts of installing a treated wastewater pipeline from Visy Recycling, Smithfield to the Western Sydney S4 data centre at Horsley Park. Specifically, it assesses the potential impacts of these works adjacent trees located within Kaluna Reserve, Smithfield.
- 1.2 The proposal involves the installation of a 560mm diameter high density polyethylene pipeline within Kaluna Reserve. The initial design of open cut trenching has been modified to underground directional drilling in order to minimise impacts to adjacent trees and the disturbance of an adjacent high-pressure gas main
- 1.3 A total of twenty-five trees were assessed as part of the proposed works. Based upon an assessment of the provided documentation the proposal does not directly or significantly impact the assessed trees. Trees identified for retention and protection are identified within table 1 below.

Table 1: Trees identified for retention.

Trees to be retained	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
Total	25

- 1.4 Data relating to trees assessed as part of the proposal can be found as **Appendix 1** Tree Assessment Schedule. Development impacts and tree protection controls can be found within **Appendix 2** Development Impacts Schedule. A tree location plan can be found as **Appendix 3**. A tree protection plan has been provided and can be found as **Appendix 4**.

2.0 Introduction

2.1 Background

- 2.1.1 This Arboricultural Impact Assessment (AIA) was prepared for coNEXA Sydney Pty Ltd. It relates to the proposed construction and installation of a treated wastewater pipe to meet the cooling requirements for the Western Sydney S4 data facility at Horsely Park.
- 2.1.2 The existing Rosehill recycled water scheme (the ‘scheme’), operated by AquaNet Sydney Pty Ltd (AquaNet) (who produce and sell recycled water) and Rosehill Network Pty Ltd (who operate and maintain the delivery network), subsidiaries of coNEXA SYD Pty Ltd (coNEXA) was initially approved as a major project (MP07_0121) under the now-repealed Part 3A of the NSW *Environmental Planning and Assessment Act 1979* (EP&A Act). The scheme receives treated effluent from Sydney Water and includes a recycled water treatment plant and an extensive pipeline network, enabling the production to high-quality non-potable water suitable for industrial use, supplying the Smithfield, Rosehill and Camellia precincts of Western Sydney.
- 2.1.3 NEXTDC Ltd (NEXTDC) is an established national developer and operator of data centres and is currently developing a network of facilities to achieve more than 3 gigawatts of data storage capacity. As part of its strategy, NEXTDC are currently seeking State significant development (SSD) consent to construct and operate the ‘Western Sydney S4 facility’ at Horsley Park, which will be capable of delivering up to 300 megawatts of data storage capacity.
- 2.1.4 While modern data centres implement advanced efficiency measures, they still require substantial cooling, with evaporative towers being the most effective. However, their reliance on large volumes of make-up water risks overdependence on Sydney’s potable water supply, which could strain the water network and create vulnerabilities during drought or restrictions.
- 2.1.5 coNEXA, in partnership with NEXTDC, are developing an extension to the scheme to provide recycled water supply to cater for the demand of NEXTDC’s facility (the ‘proposal’).
- 2.1.6 coNEXA has identified the opportunity to extend the scheme to supply the NEXTDC S4 data centre with 16.6 megalitres per day of recycled water. Technical assessments have confirmed the viability of this supply, which will be engineered to meet the data centre sector’s stringent reliability requirements. The network will incorporate redundancy and adaptive capacity to ensure continuity in the face of climate variability, peak demand, and emergency conditions.
- 2.1.7 The existing scheme terminates at VISY Recycling (VISY) at 2 Herbert Street, Smithfield. A preliminary concept design alignment has been developed for the proposal, extending the network from the existing termination at Smithfield to the NEXTDC S4 facility in Horsley Park and includes:
- A 560-millimetre (mm) diameter high-density polyethylene (HDPE) pipeline to transfer treated effluent from the Fairfield recycled water plant from the existing VISY

connection at 2 Herbert Place, Smithfield, to a proposed booster pump station at 46 Victoria Street, Smithfield.

- A 560 mm HDPE pipeline to transfer treated effluent from the pump station to a proposed reservoir at 156-166 Walworth Road, Horsley Park.
- Dual 560 mm HDPE pipelines supplying water from the reservoir to the NEXTDC facility via gravity.

2.1.8 The following documentation was reviewed and assists in the preparation of this report:

Site Survey:	Topographical survey and Utility Mapping, prepared by Astrea, dated 23.03.2026.
Design Drawings:	Section 1 Jemena Gas Encroachment SHT 01, prepared by WSce, drawing SK-0024, dated 12/12/2025.
Hydraulic Design:	-
Civil Drawings:	-
Utilities & Services:	Refer to survey drawing
Landscape Design:	-
Additional/Supplementary drawings:	-

2.1.9 The conclusions drawn within this report are based on the information provided and data collected during an on-site inspection.

2.2 Inspection Method and Data Collection

2.2.1 On the 16th of April 2026 a site inspection was undertaken and tree data collected.

2.2.2 The trees were assessed using the principles of a ground based Visual Tree Assessment (VTA)¹ and methods consistent with modern arboriculture. No aerial (climbing) inspection, tissue sampling or diagnostic testing was undertaken as part of the inspection process unless otherwise stated.

2.2.3 Full results of the tree inspection and data collection can be found within the Tree Assessment Schedule (**Appendix 1**).

2.2.4 The height, radial canopy spread, trunk Diameter at Breast Height (DSH) and trunk diameter above root buttress was collect for each tree assessed. These physical dimensions were either estimated or measured.

2.2.5 The vigour, condition and age class of the trees has been assessed and reflects the trees at the time of the inspection. The method for determining vigour, structure and age class can be found within the Tree Assessment Criteria (**Appendix 6**).

2.2.6 Each tree has been given Useful Life Expectancy (ULE) rating. This rating defines the length of time that the arborist feels an individual tree can be retained with an acceptable level of risk based on the information available at the time of inspection. The method used to

¹ Mattheck, C. and Breloer, H (2006), *The Body Language of Trees – A Handbook for Failure Analysis*, The Stationary Office. Pages 118-122.

determine these ratings can be found within the Useful Life Expectancy description and categories (**Appendix 6**).

- 2.2.7 Each tree has been assessed against the Institute of Australian Consulting Arborists (IACA) Significance of a Tree Assessment Rating System (STARS). This provides a dual method of objectively rating the viability and retention value of urban trees on development sites. The STARS assessment criteria and retention matrix table can be found within the Tree Significance Assessment Criteria and Retention Value Matrix (**Appendix 7**).

2.3 Trees on Development Sites

- 2.3.1 The Australian Standard 4970-(2025) *Protection of Trees on Development Sites* defines the requirements for assessing trees with respect to development. It provides the guidance on how to decide which trees are appropriate for retention and on the means of protecting them during construction works. It describes the areas and offsets, referred to as the Notional Root Zone (NRZ), Tree Protection Zone (TPZ) and Structural Root Zone (SRZ). This report has been prepared in accordance with the conditions set out within the standard.
- 2.3.2 Notional Root Zone – The notional root zone is defined as a specified area around a tree that triggers an assessment and arboricultural input on a development site.
- 2.3.3 Tree Protection Zone – The tree protection zone is defined as a specified area above and below ground and at given offsets from the trunk set aside for the protection of the tree's roots and crown during construction.
- 2.3.4 Structural Root Zone – The structural root zone is defined as a specified area around the base of a tree required to maintain its stability within the ground. It is expressed as a radial measurement taken from the centre of the trunk at ground level. Excavation and development works are not recommended within the structural root zone unless additional investigation as to root size and location is undertaken.
- 2.3.5 Under AS4970 development encroachments into the notional root zone are defined as either minor, moderate or major.
- A minor encroachment is less than or equal to 10% of the area of the NRZ and is outside of the SRZ. Where this occurs detailed root investigation works should not be required. To avoid a net loss of soil area and volume and area equivalent to the encroachment shall be incorporated into, and contiguous with the TPZ.
 - A moderate encroachment is greater than 10% and less than or equal to 20% of the NRZ and is outside of the SRZ. Where a moderate encroachment exists the project arborist must review the proposed impact and undertake any necessary investigation to demonstrate that the tree will remain viable. To avoid a net loss of soil area and volume and area equivalent to the encroachment shall be incorporated into, and contiguous with the TPZ.
 - A major encroachment is greater than 20% of the area of the NRZ or is inside the SRZ. Where a major encroachment exists the project arborist must explore alternative designs with the design team and/or demonstrate that the tree will remain viable. Major encroachments may require detailed root investigation works to be undertaken. To avoid a net loss of soil area and volume and area equivalent to the encroachment shall be incorporated into, and contiguous with the TPZ.

- 2.3.6 It should be understood that the notional and structural root zone are indicative and do not consider the physical constraints of a site which may influence the architecture, development and spread of a tree's root system. As such, the establishment of tree protection zones to their fullest extent may not be possible due to environmental or site constraints. Where this occurs, their establishment is to be undertaken under the guidance of the project arborist.

3.0 Findings and Observations

3.1 The site

- 3.1.1 The site is identified as Lot 20 within DP599957, otherwise known as Kaluna Reserve. It is an open reserve area that borders the northern side of Prospect Creek at Smithfield.
- 3.1.2 Existing site features include:
- Open reserve area
 - Landscape tree plantings
 - Concrete access footpath
- 3.1.3 The site is not listed as a heritage item, nor is it within a heritage conservation area, under Schedule 5, Environmental Heritage of the Cumberland Local Environment Plan 2021. The assessed trees are identified as having biodiversity value as shown within the NSW Biodiversity Values Map and Threshold Tool.
- 3.1.4 A desktop search of historical 1943 imagery suggests that the site has been significantly modified including the excavation of the existing wetland areas. The images below show the site in 1943 and as it is today.

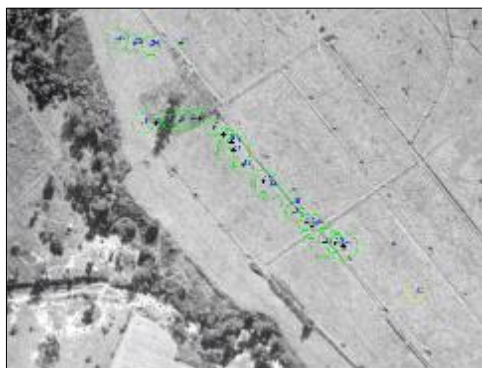


Image 1: Showing the subject trees with respect to 1943 imagery.



Image 2: Showing the subject trees as they are today.

3.2 The Trees

- 3.2.1 A total of twenty-six trees were assessed as part of this report. Individual tree details and data captured during the on-site inspection may be found as **Appendix 1** Tree Assessment schedule. Tree locations can be seen within **Appendix 3** Tree Location Plan. To assist in onsite identification of the assessed trees photographs have been provided and can be found as **Appendix 5**.

- 3.2.2 Generally the trees were found to be in good health and condition, consistent with their species type, age class and growing environment.

4.0 Impacts of the Proposed Works

4.1 General

- 4.1.1 A development Impact's schedule can be found in **Appendix 2**. This schedule identifies the specific notional root zone encroachments for each individual tree. A tree location plan can be found as **Appendix 3**.
- 4.1.2 Section 1 Jemena Gas Encroachment SHT 01, prepared by WSce, drawing SK-0024 shows the initial alignment of the proposed water pipe and forms the basis of this assessment. The initial design has been amended to change from open cut trenching to underground directional drilling. This minimises the potential impacts to adjacent vegetation and a high-pressure gas main.
- 4.1.2 It is commonly accepted that the root systems of trees are predominantly contained within the top 1m of soil (Harris et al², Hiron & Thomas³). As such, where the alignment of the proposed bore intersects or encroaches within the NRZ of an assessed tree it is recommended that the top of bore be no shallower than 1.5m depth (an additional allowance of 0.5m).
- 4.1.3 Whilst no specific site layout plan has been provided the establishment of a working site compound (assumed to be positioned within the main reserve area) has the potential to encroach upon the NRZ's of trees 1, 2, 3, 4, 5, 6, 22, 23, 24 and 25.
- 4.1.4 Excavation associated with the bore entry and exit pits is to be kept clear of the NRZ's of the assessed trees. Section 5, point 5.1.4 details the specific offsets from trees where excavation is to be avoided. In the event that excavation is required within these offsets additional tree protection measures are to be implemented under guidance of the project arborist.
- 4.1.5 Plant and equipment movements across a NRZ has the potential to compact site soils impacting upon tree health and condition. Site access routes are to be aligned beyond the limits of the NRZ's of the assessed trees. Where this is not possible appropriate ground protection measures are to be implemented to avoid damaging site soils.
- 4.1.6 Site specific tree protection information can be found as Section 5 of this report.

4.2 Trees to be removed

- 4.2.1 No trees have been identified for removal as part of the proposed works.

² Harris R W, Clark J R, Matheny N P. (2004) *Arboriculture Integrated Management of Landscape Trees, shrubs and Vines*, 4th edition, Prentice Hall

³ Hiron A D, Thomas P A. (2018) *Applied Tree biology*, Wiley Blackwell

4.3 Trees to be retained

- 4.3.1 Trees 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 and 25 are to be retained and protected throughout the development process.

4.4 Tree pruning works

- 4.4.1 No pruning works were identified at the time of undertaking this assessment.

5.0 Tree Protection Specification

5.1 Site specific

5.1.1 Trees 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24 and 25 are to be retained and protected throughout the development process.

5.1.2 Establishment of the site works compound area and/or access within Kaluna Reserve is not to be aligned within the following offsets from trees listed in table 2 below:

Table 2: Specific offsets from trees adjacent to the assumed area of a site works compound.

Tree No	Tree Species	Minimal radial offset from tree (m)
1	<i>Eucalyptus moluccana</i>	6.60
2	<i>Eucalyptus moluccana</i>	5.40
3	<i>Eucalyptus moluccana</i>	4.80
4	<i>Eucalyptus moluccana</i>	6.60
5	<i>Eucalyptus moluccana</i>	6.00
6	<i>Eucalyptus tereticornis</i>	6.00
23	<i>Araucaria cunninghamii</i>	2.00
24	<i>Araucaria cunninghamii</i>	6.00
25	<i>Araucaria cunninghamii</i>	5.40
26	<i>Araucaria cunninghamii</i>	6.60

5.1.3 Any encroachment into the above offsets shall require additional tree protection controls to be implemented under guidance of the project arborist.

5.1.4 Excavation is not to be undertaken within the following offsets as listed within table 3 below:

Table 3: No excavation within the specified offsets from trees.

Tree No	Tree Species	Minimal radial offset from tree (m)
1	<i>Eucalyptus moluccana</i>	6.60
2	<i>Eucalyptus moluccana</i>	5.40
3	<i>Eucalyptus moluccana</i>	4.80
4	<i>Eucalyptus moluccana</i>	6.60
5	<i>Eucalyptus moluccana</i>	6.00
6	<i>Eucalyptus tereticornis</i>	6.00
7	<i>Eucalyptus moluccana</i>	4.80
8	<i>Eucalyptus tereticornis</i>	4.80
9	<i>Eucalyptus tereticornis</i>	6.00
10	<i>Eucalyptus tereticornis</i>	2.40
11	<i>Eucalyptus moluccana</i>	10.20
12	<i>Eucalyptus moluccana</i>	6.00
13	<i>Eucalyptus tereticornis</i>	7.20
14	<i>Eucalyptus tereticornis</i>	8.40
15	<i>Eucalyptus tereticornis</i>	6.60
16	<i>Eucalyptus tereticornis</i>	6.00
17	<i>Eucalyptus tereticornis</i>	5.16
18	<i>Eucalyptus tereticornis</i>	7.80
19	<i>Eucalyptus tereticornis</i>	9.00
20	<i>Eucalyptus moluccana</i>	2.00
21	<i>Eucalyptus tereticornis</i>	9.00
22	<i>Eucalyptus tereticornis</i>	4.80
23	<i>Araucaria cunninghamii</i>	2.00
24	<i>Araucaria cunninghamii</i>	6.00
25	<i>Araucaria cunninghamii</i>	5.40
26	<i>Araucaria cunninghamii</i>	6.60

5.1.5 Plant and vehicle movements are to be kept clear of the NRZ's of the assessed trees, in particular when accessing the bore entry/exit pit between trees 21 and 22. Appropriate ground protection measures (refer to point 5.2.7) are to be employed where plant or vehicle movements encroach upon the NRZ's.

5.1.6 A tree protection plan has been provided and can be found as **Appendix 4**.

5.2 General

5.2.1 The Project Arborist

5.2.1.1 A project arborist shall be engaged, by the principal contractor, prior to any works commencing on the site. The project arborist shall have a minimum qualification of the Australian Qualifications Framework (AQF) level 5 in Arboriculture and at least five years of experience in managing and monitoring tree protection works on construction sites.

5.2.2 The role and responsibility of the project arborist is to provide on-going advice for works within the notional root and tree protection zones and is to include at a minimum:

- Participation in the pre-clearing site walk-through (if required), including confirmation of trees to be retained and the setup of tree protection zones
- Inspect the setup for tree protection zones prior to the commencement of any works within identified sensitive areas
- Provide advice on methods to minimise the extent of encroachment within the protection zones of trees
- Undertake supervision of works within the tree protection zone
- Provide advice for long-term tree health such as watering regimes, fertiliser application and mulching
- Provide advice on non-destructive digging techniques within notional root or tree protection zones
- Provide advice on when to stop works within a tree protection zone and make recommendations on refinements to the work methodology
- Review adequacy of site training and induction material regarding tree protection zones
- Assess and report on any significant roots that require removal prior to their removal. If structural roots are encountered and need to be cut, they shall provide advice on the position and method of removal to minimise impacts
- Undertake regular monitoring / site inspections during works to monitor tree health and recommend additional tree care if there are signs of stress

5.2.2 Site personnel

5.2.2.1 It is the principal contractor's responsibility to ensure that all site personnel, including contractors and sub-contractors, are made aware of the relevant tree protection requirements and the role of tree protection zones on the site (based on the advice and input from the project arborist).

5.2.2.2 It is the principal contractor's responsibility to be aware of the development conditions relating to trees retained on the site and provide a program of works to the project arborist prior to works commencing.

- 5.2.2.3 It is the principal contractor's responsibility to advise the project arborist of any changes to site conditions and/or the scope of works to allow for re-assessment or updates relating to retained trees.

5.2.3 Tree and vegetation removal and pruning

- 5.2.3.1 Trees and vegetation approved for removal by the relevant consent authority shall be undertaken prior to any other works commencing on site, including the establishment of tree protection zones.
- 5.2.3.2 Woody weed species are to be removed and disposed of in accordance with local council requirements and specific controls as identified for the weed species under the Biosecurity Act 2015.
- 5.2.3.3 Trees identified for removal are to be manually dismantled in manageable sized pieces. Damage to trees and vegetation identified for retention is to be avoided during felling operations. Additional care is to be observed to avoid damage to the base of retained trees and soils within the TPZ where winching and/or machinery operations are undertaken.
- 5.2.3.4 All tree removal and pruning works are to be undertaken by suitably qualified tree workers under the guidance of the Project Arborist and in accordance with Safe Work Australia's Guide to Managing Risks of Tree Trimming and Removal Works.
- 5.2.3.5 Unless otherwise advised by the project arborist stump grinding works are to be carried out to a minimum depth of 500mm below existing ground level (conditions permitting). Arisings from stump grinding works are to be removed from site and disposed of appropriately. Holes left by stump grinding works are to be back filled to existing levels with a suitable fill material.

5.2.4 The Tree Protection Zone (TPZ)

- 5.2.4.1 The tree protection zone, as defined by *AS4970*, is the designated area around a tree to protect the trunk, roots and crown during development works. It should be noted that the establishment of tree protection zones to their fullest extent may not be possible due to environmental or site constraints. Where this occurs, their establishment is to be undertaken under the guidance of the project arborist.
- 5.2.4.2 Tree protection fencing is to be installed in compliance with Section 4 of the Australian Standard *AS4970-2025 Protection of Trees on Development Sites*. Fencing shall not be removed, altered or adjusted without the project arborists approval unless otherwise advised within this report.
- 5.2.4.3 The following activities unless otherwise advised by the project arborist are restricted within the tree protection zone:
- Machine excavation including trenching
 - Excavation for silt/sediment fencing
 - Cultivation
 - Storage of materials or stockpiling of soil/spoil
 - Parking and/or operation of plant machinery
 - Preparation of chemicals, including preparation of cement products
 - The parking of vehicle and/or plant

- Refuelling
- Dumping of waste
- Washing down and cleaning of equipment (including dust suppression during demolition works)
- Placement of fill
- Lighting of fires
- Soil level changes
- Temporary or permanent installation of utilities and signs
- Physical damage to the trees

Any work within a designated tree protection zone requires advice and/or supervision from the project arborist.

5.2.4.4 Further details regarding the TPZ can be found as Figure 1.

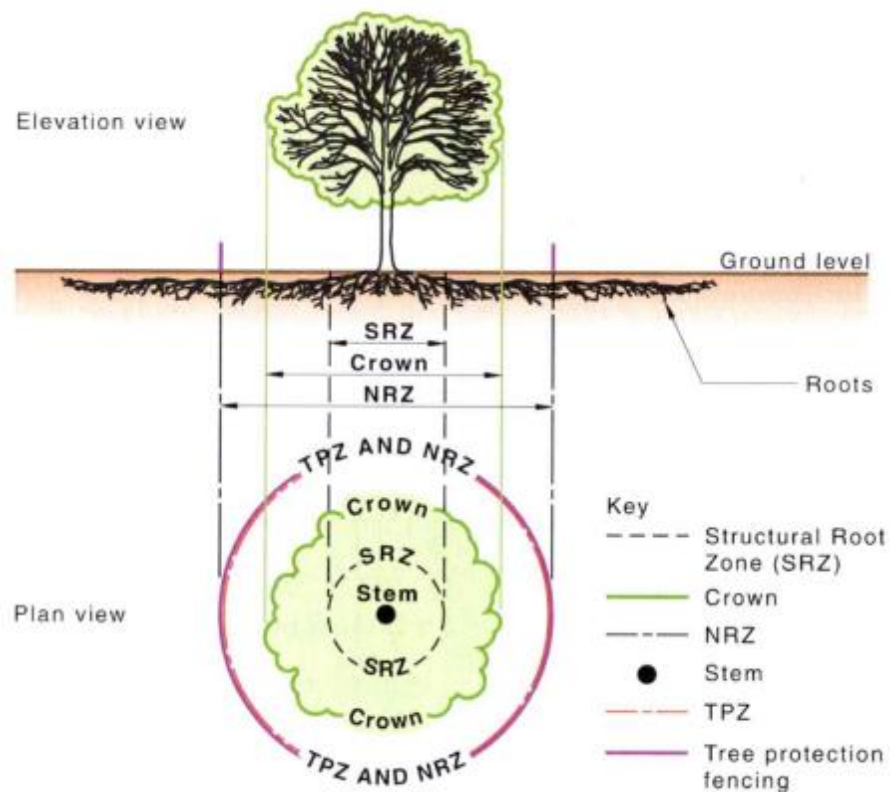


Figure 1: The tree protection zone (TPZ) is the principle means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is a minimum area isolated from construction disturbance, so that the tree remains viable. The crown of a tree may be injured by machinery such as excavators, drilling rigs, cranes, trucks, hording installation and scaffolding. The TPZ may need to include additional protection of the above ground parts of the tree. Where crown protection is required the TPZ will usually be located at least one meter outside the perimeter of the crown. Other crown protection methods may include pruning (to AS4373) or the tying-back of branches.

5.2.4.5 In the event that approved root pruning works have been undertaken a reduced protection zone may be implemented.

5.2.5 Tree protection fencing

- 5.2.5.1 Tree protection fencing is to be installed under guidance of the project arborist, at the limits of the TPZ or as determined by the project arborist. Fencing shall consist of 1.8m high interlocking chain link or plywood fencing panels. The fencing shall be erected in such a way as to prevent building materials, soil and unauthorised personnel entering the TPZ.
- 5.2.5.2 Further details regarding tree erection of tree protection fencing can be found as Figure 2. **Appendix 1** shows the initial alignment of tree protection fencing.

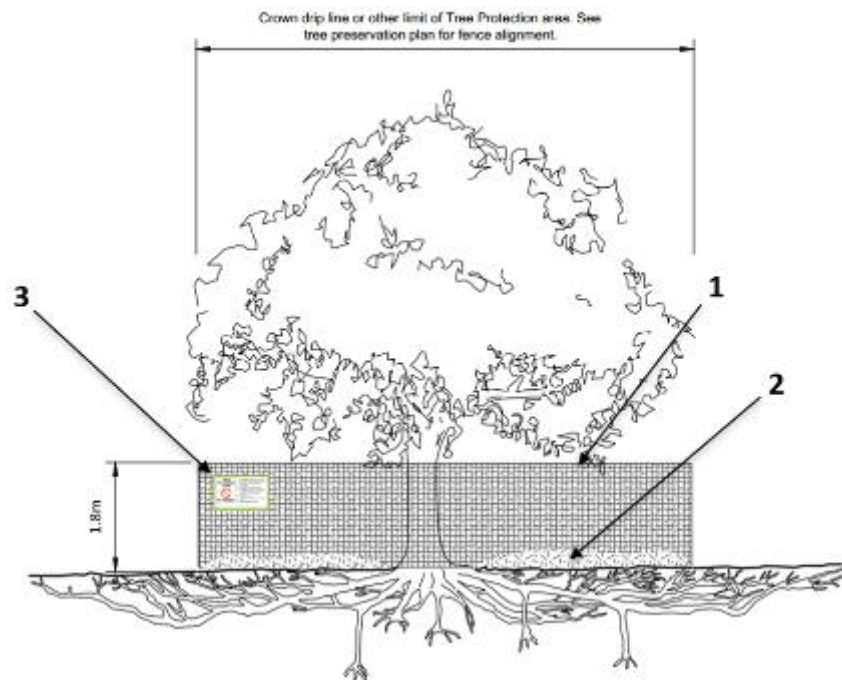


Figure 2: Tree protection zone detail. **1.** Tree Protection Fencing- To consist of chain wire mesh panels with shade cloth (if required) held in place with concrete feet or plywood or wooden fence panels. Fence to be a minimum height of 1.8m and to be established to the extent of the TPZ as directed by the project arborist. AS4687 specifies applicable fencing requirements. **2.** Mulching – The area within the TPZ is to be mulched (where practical) and maintained to a depth of 100mm. Mulch is to comply with AS4454. **3.** Signage – Signs identifying the TPZ should be placed around the edge of the TPZ and identifiable from within the development site. Lettering on the sign should comply with AS1319.

5.2.6 Signage

- 5.2.6.1 Signage shall be attached to the tree protection zone fencing. The signage is to be clearly visible from within the development site and maintained in order throughout the project works. The contact details of either the site and/or project manager shall be displayed on the sign.
- 5.2.6.2 Figure 3 below illustrates indicative tree protection zone signage.

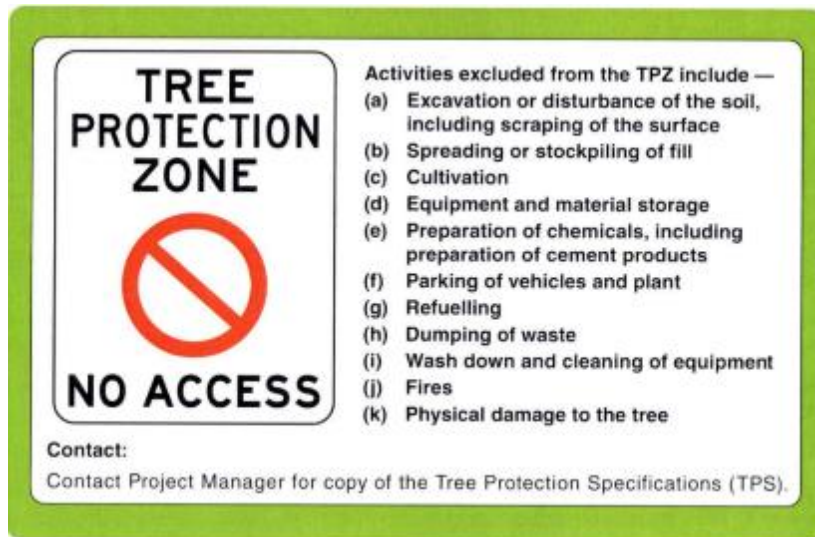


Figure 3: Example of TPZ signage.

5.2.7 Ground protection

5.2.7.1 Where temporary access or encroachment into or through a TPZ is required ground protection measures are to be implemented. The purpose of ground protection measures is to avoid damage to tree roots and compaction of the soils within the TPZ.

5.2.7.2 Suitable ground protection measures for pedestrian and/or vehicle and machinery include:

Table 3: Ground protection measures.

Pedestrian access	Heavy duty plywood boards or truck/bog mats over 75mm mulch layer. The plywood boards or truck/bog mats are to be secured in place to avoid movement Raised scaffolding walkways or ply boards fixed to wooden pallets to suspend footpath over existing grade
Light vehicle and/or machinery traffic <3T	Geo-textile fabric covered with a 100mm deep layer of mulch overlaid with rumble boards or road plates. Refer Figure 5. Truck/bog mats may be used if suitable for the applied loads.
Heavy traffic >3T	Geo-textile fabric covered with a 300mm layer of compacted road base or railway ballast. Truck/bog mats or steel road plates may be used if suitable for the applied loads. Their installation is to be advised by the project arborist.
Material laydown areas	Heavy duty plywood boards, truck/bog mats or timber supports/battens are to be used beneath materials if they are to be temporarily stored within a TPZ. The ply boards, truck/bog mats or timber supports are to be suitable for the load being placed upon them. Materials are not to penetrate existing soils or the soil profile.

5.2.7.3 The use of truck mats within a TPZ is permissible if appropriate for the weight of the traffic being used.

5.2.7.4 Ground protection measures are to be installed after clearing and grubbing activities and prior to site works commencing and maintained in good order throughout the construction process. Ground protection within a TPZ is only to be removed when deemed necessary and

under consultation with the project arborist. Care is to be undertaken when removing ground protection measures to avoid disturbance or damage to the underlying soil profile. The use of excavators to remove ground protection measures within a TPZ is to be approved and supervised by the project arborist.

5.2.7.5 When operating heavy machinery and/or plant within an area of ground protection defined access and egress routes are to be used. Machinery movement is to be minimised during working operations. The slewing, turning and rotation of heavy tracked equipment is to be minimised.

5.2.7.6 Further details regarding tree establishment of ground protection can be found as Figure 4.

5.2.8 Trunk and Branch protection

5.2.8.1 Where a tree protection zone cannot be implemented and/or there is a possibility that the tree may be damaged by machinery operating beneath the crown line of the tree protective battens are to be utilised. Protective battens are installed by first wrapping the trunk/stem or branch of the tree in hessian or like material then strapping timber battens over the top. It is recommended that timber battens with the dimensions of width 70mm and depth 35mm are used. The battens must be cut to suit the shape of the branch and are not to be directly screwed or nailed into the tree. Refer figure 4.

5.2.8.2 Further details regarding trunk and branch protection can be found as Figure 4.

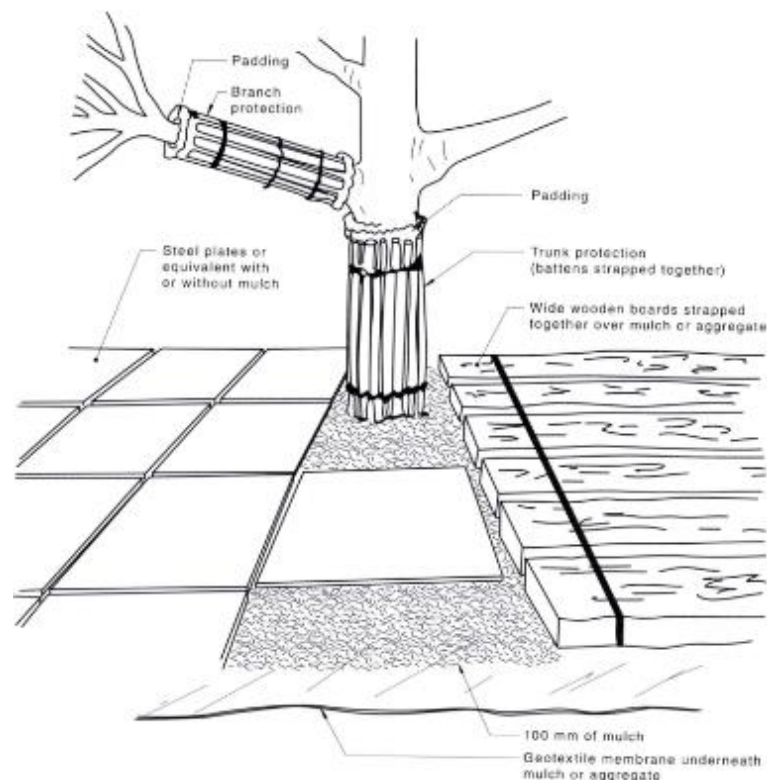


Figure 4: Trunk and branch protection shall be installed as shown in the attached diagram. The materials and positioning of protection are to be specified by the project arborist. If protecting the trunk in this manner a minimum height of 2m is recommended. No temporary power lines, stays, guys and the like are to be attached to any part of the tree. Do not drive nails into the trunks or branches. If temporary access for machinery is required within the TPZ ground protection measures will be required. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards.

5.2.9 Utilities and services within the TPZ

- 5.2.9.1 Temporary or permanent installation of above and/or below ground utilities and services are to be kept out of the TPZ.
- 5.2.9.2 Where this is not deemed possible, and the utilities and services alignment fall within the TPZ root investigation works shall be undertaken (prior to installation). Root investigation works are to be undertaken in accordance with section 5.2.11.
- 5.2.9.3 Suspension of service wires through the TPZ should be kept clear of the trees canopy and regulatory safety clearances observed.

5.2.10 Excavation within the NRZ

- 5.2.10.1 Excavations within the NRZ may only be undertaken under the advice and/or supervision of the project arborist.
- 5.2.10.2 All excavation within the tree protection zone must be carried out using tree sensitive methods as directed by the project arborist, taking care not to damage the bark and wood of any roots. Specialist tools for removing soil around roots using high-pressure air or water and a vac-truck may be an appropriate alternative to hand digging. If using high-pressure air or water, the operator is to be appropriately counselled about its use around roots prior to the works commencing. Significant damage to tree roots can be caused if high-pressure water or air is directed upon them. Damaged roots will result in reduced tree health, condition and physiological function and potentially tree death. Damage to structural roots may result in tree destabilisation and an increased risk of whole tree failure. All soil removal must be undertaken with care to minimise disturbance of roots beyond the immediate area of the 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. Once roots have been located, the trowel should be used to clear the soil away from them without damaging the bark.
- 5.2.10.3 Sub-contractors engaged in undertaking excavations within a TPZ must be made aware of all relevant tree protection controls prior to their works commencing.
- 5.2.10.4 Roots temporarily exposed by excavations must be protected from direct sunlight, drying out and extremes of temperature. Excavations are to be backfilled as soon as reasonably practicable.
- 5.2.10.5 Excavations within a TPZ are to be restricted to the footprint of any proposed structure. Battering, benching and over excavation is to be avoided.
- 5.2.10.6 Bulk excavation or works within a TPZ may only be undertaken when all associated root and tree protection issues have been addressed by the project arborist.
- 5.2.10.7 Figure 5 illustrates excavation within the TPZ.

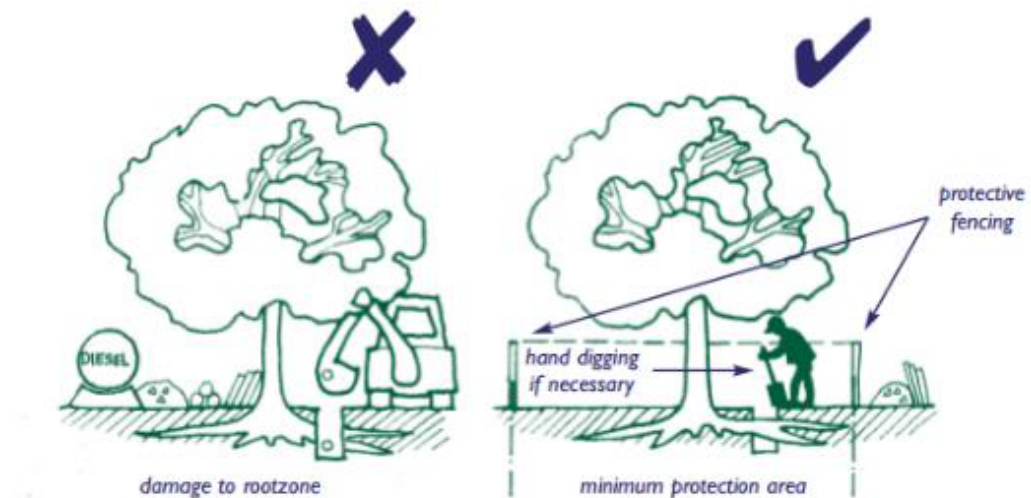


Figure 5: Excavation within a TPZ is to be undertaken manually using methods that do not damage tree roots. The use of mechanical excavation, unless advised and supervised by the project arborist is forbidden and can significantly compromise tree health, condition and stability.

5.2.11 Root investigations

- 5.2.11.1 Unless otherwise advised by the project arborist, root investigation is to be undertaken where demolition and/or construction falls within the SRZ or are considered to constitute a major encroachment into the TPZ. The alignment depth and extent of root investigation is to be advised by the project arborist.
- 5.2.11.2 All excavation for root investigation works is to be undertaken using non-destructive methods in accordance with Section 5.2.10. Damage to roots is to be avoided during the excavation works.
- 5.2.11.3 The use of ground penetrating radar to undertake root mapping may be an alternative to non-destructive digging technics. Ground penetrating radar requires specialised interpretation of the findings and is to only be undertaken by persons experienced in the field.
- 5.2.11.4 Upon completion of the excavation works the project arborist is to assess exposed roots and prepare a written report. Any root pruning undertaken as a result of root investigation work is to meet the requirements of Section 5.2.12.

5.2.12 Root pruning

- 5.2.12.1 In the event that roots are found to be in direct conflict with the removal of below ground features selective root pruning may be recommended by the project arborist. Root pruning is only to be undertaken where all other alternatives have been thoroughly explored and exhausted.
- 5.2.12.2 Root pruning is only to be undertaken under the direct supervision of the project arborist. Where possible root pruning is to be conducted prior to the main construction activities being undertaken.

5.2.12.3 All root pruning works are to be documented and recorded by the project arborist and undertaken in accordance with Section 9 of the Australian Standard AS4373-(2007) Pruning of Amenity Trees.

5.2.12.4 All root pruning cuts are to be made using sharp clean tools such as secateurs, pruners or handsaws, into clean woody tissue perpendicular to the direction of root growth. Where possible the pruning cut is to be made to an appropriate growth point along the root. Pruning equipment is to be sterilised between each root cutting using an alcohol dip or a solution of 1 part household bleach to 10 parts tap water.

5.2.12.5 It should be understood that the effects of root pruning are not always predictable and can result in a decline in tree health and/or condition.

5.2.13 Damage to trees

5.2.13.1 Damage to any part of the tree including roots, bark, trunk, branches and leaf material shall be avoided.

5.2.13.2 Damage to trees may also be incurred by contamination of the TPZ through chemical, paint or cement wash out. All cement washout, paint cleaning, plant and or machinery cleaning, fuelling (including hydraulic fluids) of plant and/or machinery, chemical storage or decanting is not to be undertaken within or near a tree protection zone.

5.2.13.3 The ripping and tearing of roots by excavators or shovels will cause damage and potentially impact tree health. Where roots are accidentally damaged during the works they are to be exposed back to intact woody tissue and pruned in accordance with the project arborist's recommendations and point 5.2.12.

5.2.13.4 Any damage to any part of a retained tree is to be reported to the project arborist immediately. The project arborist is to advise of any remediation works.

5.2.14 Additions and amendments to the approved plans

5.2.14.1 Any addition or amendment to the approved plans that involve an encroachment or alteration within a TPZ are to be forwarded to the project arborist.

5.2.14.2 The project arborist is to review the amended plans and confirm additional impacts of work variations upon the site's trees. Written confirmation or certification of work variation is to be submitted to the principal contractor/certifier by the project arborist.

5.2.14.3 Any changes or adjustments of tree retention and/or protection measures are to be implemented onsite prior to the variation's commencement.

5.2.15 Site establishment & layout

5.2.15.1 The site plans are to consider the alignment of pedestrian footpaths, access roads, positioning of site sheds, amenities, site access and egress, stockpiling areas and laydown areas with respects to the TPZ of retained trees.

5.2.15.2 Where site access roads encroach through or over a TPZ, appropriate ground protection measures are to be implemented, refer to Section 5.2.7.

5.2.15.3 All pedestrian footpaths and access routes through or over a TPZ are to be clearly demarcated, avoid the disturbance of the underlying soils and employ appropriate ground protection measures, refer to Section 5.8.

5.2.15.4 Site sheds may be positioned within a TPZ under the guidance of the project arborist. It is recommended that site sheds and amenities are mounted upon each other, where possible, to minimise their footprint and utilise available space within the site.

5.2.15.5 The stockpiling of excavated spoil, demolition detritus or storage of materials is not to be undertaken within a TPZ. In the event that this is deemed not possible the project arborist is to provide specific detail as to tree protection measures. Temporary access into a TPZ may be approved by the project arborist based upon specific circumstances.

5.2.16 Sedimentation fencing

5.2.16.1 Sedimentation fencing is not to be installed within a TPZ unless approved by the project arborist. In the event that this is deemed not possible, sedimentation fencing is to be installed in accordance with the following condition.

- Sedimentation fencing pegs are not to be driven or hammered into the ground within a TPZ. Peg holes are to be hand excavated to avoid damaging tree roots. There is to be enough flexibility in the silt fencing design to relocate pegs where roots are found to be in conflict with their installation. A minimum clearance of 100mm is to be given between tree roots and silt fencing pegs. No contiguous trenching to establish silt fencing is to be undertaken within a tree protection zone.

5.2.17 Hold points and site monitoring

5.2.17.1 The following table indicates hold points and the project arborist involvement during the demolition, construction and landscaping phases of the project.

Table 6: Hold points and site monitoring.

Hold Point	Task	Arranged by	Certification	Timing
1	Inspection of tree protection measures	Principal Contractor	Project Arborist	Upon completion of approved vegetation removal and before construction works commence.
2	Supervision of excavations within tree protection zones (if required).	Principal Contractor	Project Arborist	As and when required throughout the construction phase.
3	Practical completion.	Principal Contractor	Project Arborist	Upon completion of all construction and landscape works.

5.2.17.2 The project arborist is to provide a written summary of findings after each inspection. The summary shall identify any non-conformances, breaches of tree protection measures, damage to trees and remediation or rectification measures required. The summary of findings shall be provided to the principal certifier within seven days of the inspection.

Appendix 1: Tree Assessment Schedule

Tree No	Botanical Name	Height (m)	Canopy Spread (m)	DSH (mm)	DAB (mm)	Age Class	Vigour	Condition	ULE	Landscape Significance	Retention Value	NRZ (m)	SRZ (m)	Comments
1	<i>Eucalyptus moluccana</i>	15-20	5x5	550	650	Mature	Normal	Good	Long	High	High	6.60	2.76	Crown density appears reduced. Epicormics and twiggy dead branches in lower to mid crown.
2	<i>Eucalyptus moluccana</i>	20-25	4x4	450	550	Mature	Normal	Good	Long	High	High	5.40	2.57	Slight crown bias to the northwest due to suppression from adjacent trees, Epicormics in lower crown.
3	<i>Eucalyptus moluccana</i>	20-25	4x4	400	500	Mature	Normal	Good	Long	High	High	4.80	2.47	Codominant stems form at approx. 4m height. Stem junction appears sound. Epicormics in lower crown.
4	<i>Eucalyptus moluccana</i>	20-25	6x6	550	650	Mature	Normal	Good	Long	High	High	6.60	2.76	Epicormics in lower crown.
5	<i>Eucalyptus moluccana</i>	20-25	4x4	500	550	Mature	Normal	Good	Long	High	High	6.00	2.57	Codominant stems form at approx. 1m height (possibly a branch). Response wood development at stem junction. Stem junction appears sound. Epicormics in lower crown.
6	<i>Eucalyptus tereticornis</i>	20-25	4x4	500	600	Mature	Normal	Good	Long	High	High	6.00	2.67	Multiple stems form between 2m and 4m height. Stem junctions appear sound. Epicormics in lower crown.
7	<i>Eucalyptus moluccana</i>	15-20	4x4	400	500	Mature	Normal	Good	Long	High	High	4.80	2.47	Mistletoe in northern first order branch. Epicormics in lower crown.
8	<i>Eucalyptus tereticornis</i>	15-20	4x4	400	500	Mature	Normal	Good	Long	High	High	4.80	2.47	Crown bias to the northeast due to suppression by adjacent trees. Some bark discolouration and blistering on northern side of trunk from 2m to 4m.
9	<i>Eucalyptus tereticornis</i>	15-20	4x4	500	600	Mature	Normal	Good	Long	High	High	6.00	2.67	Codominant stems form at approx. 2.5m height. Stem junction appears sound. Twiggy dead branches and epicormics in lower to mid crown. Crown density appears reduced.
10	<i>Eucalyptus tereticornis</i>	10-15	2x2	200	300	Young	Low	Fair	Short	High	Medium	2.40	2.00	Significantly suppressed specimen. Top of crown near dead. Tree is in decline.
11	<i>Eucalyptus moluccana</i>	20-25	6x6	850	850	Mature	Normal	Good	Long	High	High	10.20	3.09	Codominant stems form at ground level. Stem junction included but appears sound. Epicormics in lower to mid crown.
12	<i>Eucalyptus moluccana</i>	20-25	4x4	500	600	Mature	Normal	Good	Long	High	High	6.00	2.67	Epicormics in lower crown.
13	<i>Eucalyptus tereticornis</i>	20-25	4x4	600	700	Mature	Normal	Good	Long	High	High	7.20	2.85	Codominant stems form at 1.5m height. Stem junctions included but appears sound. Crown density appears reduced with epicormics in lower to mid crown.
14	<i>Eucalyptus tereticornis</i>	20-25	5x5	700	700	Mature	Normal	Good	Long	High	High	8.40	2.85	Codominant stems form at approx. 0.5m height. Additional stem forms above junction. Stem junctions are included but appear sound. Epicormics in lower to mid crown.
15	<i>Eucalyptus tereticornis</i>	15-20	5x5	550	650	Mature	Normal	Good	Long	High	High	6.60	2.76	Multiple stems form at approx. 1.5m height. Crowded stem junction. Response wood development (swelling) around base of southern stem. Epicormics in lower to mid crown.
16	<i>Eucalyptus tereticornis</i>	15-20	3x3	500	600	Mature	Normal	Good	Long	High	High	6.00	2.67	Multiple stems form at approx. 1.5m height.
17	<i>Eucalyptus tereticornis</i>	15-20	3x3	430	502	Mature	Normal	Good	Long	High	High	5.16	2.48	Twin stems form at ground level. Epicormics in lower to mid crown.

Tree No	Botanical Name	Height (m)	Canopy Spread (m)	DSH (mm)	DAB (mm)	Age Class	Vigour	Condition	ULE	Landscape Significance	Retention Value	NRZ (m)	SRZ (m)	Comments
18	<i>Eucalyptus tereticornis</i>	15-20	4x4	650	650	Mature	Normal	Good	Long	High	High	7.80	2.76	Epicormics in lower crown, minor dead branches throughout crown.
19	<i>Eucalyptus tereticornis</i>	15-20	5x5	750	850	Mature	Normal	Good	Long	High	High	9.00	3.09	Codominant stems form at ground level. Stem junction included but appears sound. Epicormics and twiggy dead branches in lower to mid crown.
20	<i>Eucalyptus moluccana</i>	20-25	4x4	50	600	Mature	Normal	Good	Long	High	High	2.00	2.67	Epicormics in lower crown. Mistletoe on easter side of crown.
21	<i>Eucalyptus tereticornis</i>	15-20	5x5	750	850	Mature	Normal	Good	Long	High	High	9.00	3.09	Codominant stems form at ground level. Stem junction included but appears sound. Epicormics and twiggy dead branches in lower to mid crown.
22	<i>Eucalyptus tereticornis</i>	15-20	4x4	400	500	Mature	Normal	Good	Long	High	High	4.80	2.47	
23	<i>Araucaria cunninghamii</i>	<5	1x1	150	250	Mature	Low	Fair	Short	Medium	Low	2.00	1.85	Tree is in decline. Poor stunted form.
24	<i>Araucaria cunninghamii</i>	10-15	2x2	500	600	Mature	Normal	Fair	Medium	High	High	6.00	2.67	
25	<i>Araucaria cunninghamii</i>	10-15	2x2	450	550	Mature	Normal	Fair	Medium	High	High	5.40	2.57	
26	<i>Araucaria cunninghamii</i>	10-15	2x2	550	550	Mature	Normal	Fair	Medium	High	High	6.60	2.57	

Appendix 2: Development Impacts Schedule

Tree No	Botanical Name	Development Impacts	Design Modifications	Justification for tree removal	Methods to minimise or avoid impacts on retained trees	Retain or Remove Tree
1	<i>Eucalyptus moluccana</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 6.6m of the tree.	Nil	Establish a tree protection zone on the limits (6.6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
2	<i>Eucalyptus moluccana</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 5.4m of the tree.	Nil	Establish a tree protection zone on the limits (5.4m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
3	<i>Eucalyptus moluccana</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 4.8m of the tree.	Nil	Establish a tree protection zone on the limits (4.8m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
4	<i>Eucalyptus moluccana</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 6.6m of the tree.	Nil	Establish a tree protection zone on the limits (6.6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
5	<i>Eucalyptus moluccana</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 6m of the tree.	Nil	Establish a tree protection zone on the limits (6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
6	<i>Eucalyptus tereticornis</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works. The top of bore is to be a minimum of 1.5m (top of bore) below grade within the NRZ of the tree.	Retain
7	<i>Eucalyptus moluccana</i>	Advised initial under bore alignment is clear of the NRZ. No expected impact to the tree.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (4.8m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain

Tree No	Botanical Name	Development Impacts	Design Modifications	Justification for tree removal	Methods to minimise or avoid impacts on retained trees	Retain or Remove Tree
8	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 4.6m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (4.8m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
9	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 3.4m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
10	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is clear of the NRZ. No expected impact to the tree.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (2.4m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
11	<i>Eucalyptus moluccana</i>	Advised initial under bore alignment is approximately 6.4m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (10.2m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
12	<i>Eucalyptus moluccana</i>	Advised initial under bore alignment is clear of the NRZ. No expected impact to the tree.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
13	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 3.6m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (7.2m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
14	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 3.6m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (8.4m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
15	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 1.7m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (6.6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain

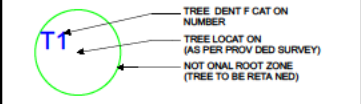
Tree No	Botanical Name	Development Impacts	Design Modifications	Justification for tree removal	Methods to minimise or avoid impacts on retained trees	Retain or Remove Tree
16	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 4.3m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
17	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 4.7m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (5.16m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
18	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 3.4m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (7.8m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
19	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 7.8m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (9m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
20	<i>Eucalyptus moluccana</i>	Advised initial under bore alignment is approximately 4.7m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (6m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
21	<i>Eucalyptus tereticornis</i>	Advised initial under bore alignment is approximately 3.7m from the position of the tree. No significant impacts arising from the under bore works.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (9m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
22	<i>Eucalyptus tereticornis</i>	The NRZ is clear of the proposed works. No expected impact to the tree.	The initial design proposed open cut trenching adjacent to the high-pressure gas main easement. This design method has been changed to directional drilling (under boring) minimising the impacts to adjacent trees and vegetation.	Nil	Establish a tree protection zone on the limits (4.8m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
23	<i>Araucaria cunninghamii</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 2m of the tree.	Nil	Establish a tree protection zone on the limits (2m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain

Tree No	Botanical Name	Development Impacts	Design Modifications	Justification for tree removal	Methods to minimise or avoid impacts on retained trees	Retain or Remove Tree
24	<i>Araucaria cunninghamii</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 6m of the tree.	Nil	Establish a tree protection zone on the limits (2m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
25	<i>Araucaria cunninghamii</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 5.4m of the tree.	Nil	Establish a tree protection zone on the limits (2m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain
26	<i>Araucaria cunninghamii</i>	No direct impact expected from under boring works. Potential NRZ encroachment arising from the establishment of a works compound area and site access requirements.	The establishment of the works compound is to take into consideration the extent of the trees NRZ. No works are to be undertaken within 6.6m of the tree.	Nil	Establish a tree protection zone on the limits (2m radius) of the NRZ. Tree protection fencing is to be established in accordance with points 5.2.4, 5.2.5 and 5.2.6 of this report. The health and condition of the tree is to be monitored throughout the duration of the project works.	Retain



TITLE/DWG NO.
Appendix 3: Tree Location Plan

DRAWN: OT
DATE: 19/04/2026
SCALE: 1:800 @ A2



NOTES:

Aerial imagery obtained from NSW Spatial Explorer.
<https://portal.spatia.nsw.gov.au/explorer/index.htm>
Accessed 18/04/2026.

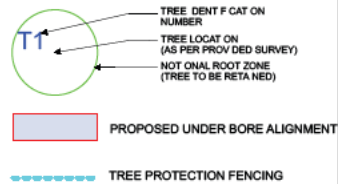
Not one root zones have been calculated in accordance with AS4970(2025) - Protection of Trees on Development Sites.

Tree locations obtained from site survey data refer to Topographic Survey and Utility Mapping, prepared by Astrea.

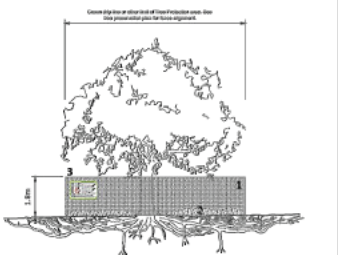


TITLE/DWG NO.
Appendix 4: Tree Protection Plan

DRAWN: OT
DATE: 19/04/2026
SCALE: 1:800 @ A2



- THE FOLLOWING ACTIVITIES ARE RESTRICTED WITHIN THE NOTIONAL ROOT ZONE:
- MACHINE EXCAVATION
 - EXCAVATION FOR SEDIMENTATION FENCING
 - STORAGE OF MATERIALS
 - STOCKPILING OF SPOIL
 - OPERATION OF PLANT
 - PARKING OF VEHICLES
 - LIGHTING OF FIRES
 - INSTALLATION OF UTILITIES



Tree protection as detailed. 5. Tree Protection Fencing: To consist of 4mm wire mesh panels with chain links of required height in place with concrete foot or ground or wooden fence panels. Panels to be a minimum height of 1.8m and to be established to the point of the TPF as directed by the project architect. 6. Notional Root Zone: To be established to the point of the TPF as directed by the project architect. 7. Signage: Signs identifying the TPF should be placed around the edge of the NRZ and identify trees within the development site. Lettering on the sign should comply with AS1225.

NOTES:

Aerial imagery obtained from NSW Spatial Explorer.
<https://portal.spatials.nsw.gov.au/explorer/index.htm>
Accessed 18/04/2026.

Notional root zones have been calculated in accordance with AS4970(2025) - Protection of Trees on Development Sites.

Appendix 5: Site Photographs.



Photograph 1: Showing trees 1, 2, 3, 4, 5 and 6.



Photograph 2: Showing trees 7, 8, 9, 10 and 11.



Photograph 3: Showing trees 12, 13, 14, and 15.



Photograph 4: Showing trees 16, 17 and 18.



Photograph 5: Showing trees 19, 20 and 21.



Photograph 6: Showing tree 22. The arrow indicates the existing recycled water access point (refer to survey data for alignment).



Photograph 7: Showing tree 23.



Photograph 8: Showing trees 24, 25 and 26.

Appendix 6: Tree Inspection criteria.

Tree number: Identifying number given to individual (or group of) trees.

Botanical Name: Latin name for tree showing genus and species.

Common Name: The common name given to the tree.

Tree Dimensions: The physical dimensions of the tree.

- **Height:** Estimated or measured height of tree in meters.
- **Spread:** Estimated or measured radial canopy spread of tree in meters.
- **Diameter at Breast Height (DSH):** The estimated or measured diameter of trunk in millimetres measured at 1.4m from ground.
- **Diameter at Base (DAB):** The estimated or measured diameter of the trunk in millimetres measured above the root flare.

Age Class: An estimation of how old the tree is in relation to its life expectancy.

- **Young** – Age less than 20% of life expectancy of tree in situ
- **Mature** – Age 20% - 80% of life expectancy of tree in situ
- **Old** – Age greater than 80% of life expectancy of tree in situ
- **Dead** – Tree is dead

Vigour: 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 categorised as Dormant, Low, Normal and High.

- **Dormant Vigour** – Determined by the existing turgidity in the lower 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. Normal vigour during dormancy is achieved when such growth is evident on a majority of branches throughout the crown.
- **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.
- **Normal 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 stringent watering and fertilisation program, or some trees may achieve an extended lifespan from continuous pollarding practices over the life of the tree.

Condition: 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 (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 normal vigour but in poor condition. Condition can be categorised as Dead, Poor, Fair and Good.

- **Dead Condition** – Tree is no longer capable of performing any of the following processes or is exhibiting any of the following symptoms; Photosynthesis via its foliage crown (as indicated by the presence of moist, green or other coloured leaves), Osmosis (the ability of the roots 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), Permanent leaf loss, Permanent leaf 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 sap wood).
- **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.

- **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.
- **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.

Useful Life Expectancy (ULE) is the length of time that the arborist assesses an individual tree can be retained with an acceptable level of risk based on the information available at the time of inspection. It is a snapshot in time of the potential an individual tree has for survival in the eyes of the assessor. ULE is not static – it is closely related to tree health and the surrounding conditions. Alterations in these variables may result in changes to the ULE assessment. Consequently, the reliability all ULE assessments have will decrease as time passes from the initial assessment and the potential for changes in variables increases. ULE can be categorised as Long, Medium, Short, Remove, Young or Small.

- **Long (L):** Trees that appear to be retainable at the time of the assessment for more than 40 years with an acceptable level of risk.
- **Medium (M):** Trees that appear to be retainable at the time of the assessment for 15-40 years with an acceptable level of risk.
- **Short (S):** Trees that appear to be retainable at the time of the assessment for 5-15 years with an acceptable level of risk.
- **Remove (R):** Trees that should be removed within the next 5 years.
- **Young or Small Trees (Y):** Trees that can be reliably moved or replaced.

Appendix 7: Tree Significance Assessment Criteria & Retention Value Matrix

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 2010.

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 quantitative 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.

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 council's 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 the 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 dimensions 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 the 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 in 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 monoculture stand in its entirety e.g., hedge.

Table 1.0 Tree Retention Value – Priority Matrix

	Tree Significance					
		1. High	2. Medium	3. Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape		
Useful Life Expectancy					Environmental Pest / Noxious Weed Species	Hazardous / Irreversible Decline
	Long >40 years					
	Medium 15-40 years					
	Short <1-15 years					
	Dead or Young & Small					

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 <i>Protection of trees on development sites</i> . 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 the 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.
	Remove (R): These trees are considered hazardous, in irreversible decline or weeds and should be removed irrespective of development.

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