



MTMS Waterfall Stabling Yard and Platform  
Extension- Arboricultural Impact Assessment

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**Transport for NSW**

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## DOCUMENT TRACKING

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Template 2.8.1

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## Abbreviations

Abbreviation	
AQF	Australian Qualifications Framework
AS	Australian Standards
DBH	Diameter at Breast Height
ELA	Eco Logical Australia
HDD	Horizontal Directional Drilling
IACA	Institute of Australian Consulting Arboriculturists
m	Metre
mm	Millimetre
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
SP	Species
SRZ	Structural Root Zone
STARS	Significance of a Tree, Assessment Rating System
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment

# 1. Background

## 1.1 Proposed activity

Eco Logical Australia Pty Ltd (ELA) was engaged by AECOM on behalf of Transport for NSW to prepare an arboricultural impact assessment for a proposed Waterfall stabling and platform extension as part of the More Trains More Services (MTMS) Program.

The Proposal would include the following key elements:

- Demolition and extension of the northern end of the existing island platform at Waterfall Station by approximately 40 metres to facilitate new 10-car intercity trains
- reconfiguration of existing track within the existing siding on the western side of the rail corridor, including changes in the location and operation of freight and passenger loops
- new suburban train stabling yard to the west of the existing main line
- a new staff amenities building on the western side of the proposed stabling yard
- an elevated staff footbridge between the staff amenities building and the platform
- upgrade of the existing access road off the southbound carriageway of the Princes Highway
- reconfiguration and extension of the existing freight refuge loop by approximately 850 metres on the western side of the existing tracks, to accommodate freight trains up to 1500 metres in length
- ancillary works, including new and relocated services, lighting, CCTV, retaining walls, and landscaping
- operation of the Proposal.

## 1.2 The study area

The study area is located at Waterfall Train Station, Waterfall approximately 45 km south of the Sydney CBD and 15 km south of Sutherland. The study area is within the rail corridor and extends from the existing platform northwards to the southern extent of the Hanrob Pet Hotels, Heathcote covering 2 km of the track. The study area is zoned *SP2 – Infrastructure: Railway* under the Sutherland Shire Local Environmental Plan 2015. The study area covers the vegetation clearance footprint for the Proposal and is mapped in Appendix A.

## 1.3 Purpose of report

The purpose of this report is to:

- identify the trees within the study area that are likely to be affected by the proposed works
- assess the current overall health and condition of the subject trees
- evaluate the retention value of the subject trees
- determine the likely impact to the subject trees.

## 2. Method

### 2.1 Definitions used in this assessment

#### 2.1.1 Definition of a tree

For the purposes of this report, a tree has been defined as being:

*“a long lived woody perennial plant greater than (or usually greater than) 3 metres in height with one or two relatively few main stems or trunks (or as defined by the determining authority)”.*

#### 2.1.2 Tree protection zone (TPZ)

The TPZ is the combination of crown and root area (as defined by AS 4970-2009) that requires restriction of access during the construction process. Tree sensitive construction measures must be implemented if works are to proceed within the TPZ.

#### 2.1.3 Structural root zone (SRZ)

The SRZ is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support and anchorage of the tree. It is critical for the support and stability of trees. Severance of roots within the SRZ is not recommended as it may lead to the destabilisation and/or decline of the tree.

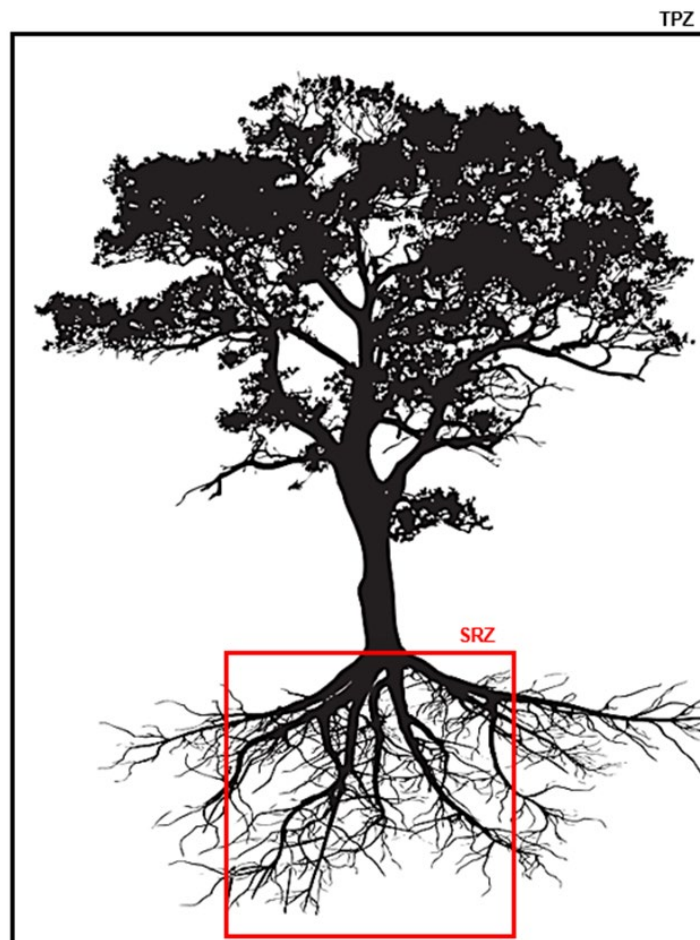


Figure 1: Indicative TPZ and SRZ

## 2.2 Tree assessment

The health and structure of the subject trees was assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994), and practices consistent with modern arboriculture. Measurements to determine the tree protection zone were carried out in accordance with Clause 3.2 and 3.3.5 of AS4970-2009 Protection of Trees on Development Sites (Standards Australia 2009).

A total of **25** subject trees were inspected on 12 April 2019 by AQF Level 5 Consulting Arborist, Elizabeth Hannon, using the methodology outlined below:

- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing. Trees that met the definition of a tree as outlined in Section 2.1.1 were inspected.
- No aerial inspections or root mapping was undertaken.
- Tree heights were determined using a clinometer 15 m from the base of the tree
- Canopy spread was determined using a measured stride out on site.
- The diameter at breast height (DBH) was measured by placing a diameter tape around the trunk of the tree at 1.4 m above ground and recording the measurement. The DBH measurements were used to determine the area for the tree protection zone (which also incorporates the structural root zone).
- The structural root zone (SRZ) was calculated by an estimated measurement of the trunk diameter taken above the root buttress
- Tree identification to species level was based on broad taxonomical features present and visible from ground level at the time of inspection.
- In the absence of a detailed survey, the locations of trees have been determined using hand held GPS units and these locations are accurate to 6 metres
- Only trees within the defined footprint have been assessed

## 2.3 Retention value

The retention value/importance of a tree or group of trees is determined using a combination of environmental, cultural, physical and social values. This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturists (IACA) *Significance of a Tree, Assessment Rating System (STARS®)*. The following categories were used:

- **Low:** These trees are not considered important for retention, and do not require special works or design modification to be implemented for their retention.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affected by the proposed works and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by Australian Standard AS4970 - Protection of trees on development sites.

Further details and assessment criteria are in Appendix B.

## 2.4 Potential impacts

Trees may be impacted by cutting or damaging roots or branches. Impacts to the tree protection zones are determined by the percentage of the area that the development incurs into the tree protection zone. The following are the definition of these impacts:

- **High impact:** The SRZ may be impacted if the proposed encroachment is greater than 20 % of the TPZ. Trees may not remain viable if they are subject to high impact.
- **Medium impact:** If the proposed encroachment is greater than 10% of the TPZ and outside of the SRZ, the project arborist may require detailed root investigation to demonstrate that the tree(s) would remain viable.
- **Low impact:** If the proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ, detailed root investigations should not be required.
- **No impact:** No likely or foreseeable encroachment within the TPZ.

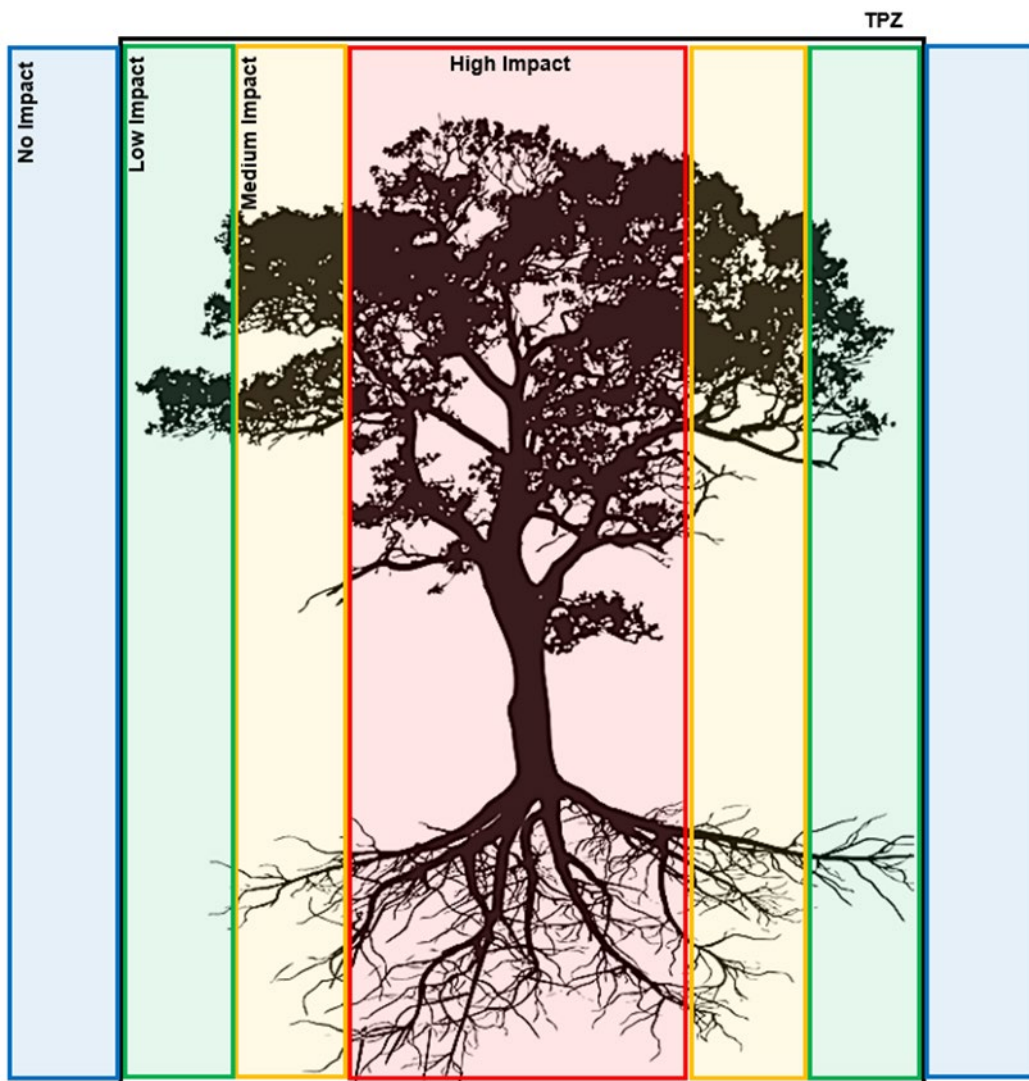


Figure 2: Indicative zones of impact



### 3. Results and discussion

Results of the arboricultural assessment are tabulated and mapped in Appendix A and Table 1.

- **High impact (>20%): 23** trees would be subject to a major encroachment (>20%) within the TPZ. These trees are unable to be sustainably retained without substantial modification of the proposed footprint. Trees in this category have the following retention values:
  - **8** trees with a low retention value
  - **14** trees with a medium retention value
  - **1** tree with a high retention value.
  
- **No impact: 2** trees will not be affected by the proposed development. Under the current proposal, these trees can be successfully retained. Trees within this category have the following retention values:
  - **2** trees with a low retention value

**Table 1: Results of arboricultural assessment**

No.	Scientific Name	Height (m)	Spread (m)	Health	Structure	Retention Value	ULE	Tree Significance	DBH (mm)	TPZ (m)	SRZ (m)	Impacts	Notes
1	<i>Cupressus sp.</i>	5	5	Good	Fair	Low	Medium	Low	350	4.2	2.1	No Impact	
2	<i>Ficus benjamina</i>	5	5	Good	Poor	Low	Medium	Low	350	4.2	2.1	No Impact	
3	<i>Corymbia gummifera</i>	8	5	Good	Fair	Medium	Medium	Medium	400	4.8	2.3	High Impact	
4	<i>Corymbia gummifera</i>	8	7	Good	Poor	Medium	Medium	Medium	350	4.2	2.1	High Impact	Multi trunked at base
5	<i>Eucalyptus sieberi</i>	12	7	Good	Fair	Medium	Medium	Medium	500	6.0	2.5	High Impact	
6	<i>Eucalyptus sieberi</i>	10	6	Good	Fair	Medium	Medium	Medium	510	6.1	2.5	High Impact	
7	<i>Eucalyptus sieberi</i>	9	7	Good	Fair	Medium	Medium	Medium	450	5.4	2.4	High Impact	Multi trunked
8	<i>Eucalyptus sieberi</i>	9	8	Good	Poor	Medium	Medium	Medium	550	6.6	2.6	High Impact	
9	<i>Eucalyptus sieberi</i>	7	5	Good	Fair	Medium	Medium	Low	250	3.0	1.8	High Impact	Multi trunked
10	<i>Eucalyptus sieberi</i>	8	4	Good	Poor	Low	Short	Low	150	2.0	1.5	High Impact	
11	<i>Eucalyptus sieberi</i>	9	3	Good	Poor	Low	Short	Low	150	2.0	1.5	High Impact	Multi trunked
12	<i>Eucalyptus sieberi</i>	8	5	Fair	Poor	Low	Medium	Medium	200	2.4	1.7	High Impact	
13	<i>Eucalyptus sieberi</i>	10	6	Good	Poor	Medium	Medium	Medium	300	3.6	2.0	High Impact	Multi trunked
14	<i>Eucalyptus sieberi</i>	7	4	Good	Fair	Medium	Medium	Low	250	3.0	1.8	High Impact	
15	<i>Eucalyptus sieberi</i>	6	5	Fair	Poor	Low	Medium	Low	150	2.0	1.5	High Impact	
16	<i>Eucalyptus sieberi</i>	7	7	Good	Fair	Medium	Medium	Medium	350	4.2	2.1	High Impact	
17	<i>Eucalyptus saligna</i>	8	9	Fair	Fair	Medium	Medium	Medium	400	4.8	2.3	High Impact	
18	<i>Eucalyptus racemosa</i>	12	11	Good	Fair	High	Medium	Medium	450	5.4	2.4	High Impact	
19	<i>Eucalyptus saligna</i>	15	12	Fair	Fair	Medium	Medium	Medium	700	8.4	2.8	High Impact	
20	<i>Eucalyptus sieberi</i>	9	7	Good	Fair	Medium	Medium	Medium	400	4.8	2.3	High Impact	
21	<i>Casuarina cunninghamiana</i>	7	3	Fair	Poor	Low	Short	Low	100	2.0	1.5	High Impact	

No.	Scientific Name	Height (m)	Spread (m)	Health	Structure	Retention Value	ULE	Tree Significance	DBH (mm)	TPZ (m)	SRZ (m)	Impacts	Notes
22	<i>Pittosporum undulatum</i>	6	5	Good	Poor	Low	Short	Low	250	3.0	1.8	High Impact	
23	<i>Casuarina cunninghamiana</i>	4	3	Poor	Poor	Low	Short	Low	100	2.0	1.5	High Impact	
24	<i>Eucalyptus sieberi</i>	4	5	Good	Fair	Medium	Medium	Medium	350	4.2	2.1	High Impact	
25	<i>Metrosideros excelsa</i>	4	2	Fair	Poor	Low	Low	Low	250	3.0	1.8	High Impact	

## 4. Tree protection plan

Following the approval of a proposed footprint, the following measures are to be implemented to protect trees to be retained:

### 4.1 Tree pruning and removal

- All tree work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture.
- All tree work must be in accordance with *Australian Standard AS 4373-2007, Pruning of Amenity Trees* and the *NSW WorkCover Code of Practice for the Amenity Tree Industry (1998)*.

### 4.2 Hold points, inspection and certification

A copy of this report must be available on-site prior to the commencement of works, and throughout the entirety of the Proposal. Hold points have been specified in the schedule of works below to ensure trees are adequately protected during construction. It is the responsibility of the principal contractor to complete each of the tasks.

- Pre-construction
  - Indicate clearly (with spray paint on trunks) trees marked for removal.
- During construction
  - Monthly inspection of trees by the project arborist (or other timing as agreed with the project arborist)
  - Notification to be given prior to the commencement of work within the tree protection zone, with supervision by the project arborist of any work undertaken in this zone.
- Post-construction
  - Final inspection of trees by project arborist after all major construction has ceased and following the removal of tree protection measures.

Once each stage is reached, the work will be inspected and certified by the project arborist and the next stage may commence. Alterations to this schedule may be required due to necessity, however, this shall be through consultation with the project arborist only.

### 4.3 Replacement planting

Any loss of trees should be offset with replacement planting in accordance with the relevant offset policy.

## 5. References

### 5.1 General references

- Barrell, J. 2001. 'SULE: Its use and status into the new millennium', in *Management of mature trees*, Proceedings of the 4th NAAA Tree Management Seminar, NAAA, Sydney.
- Brooker M.I.H, Kleinig D.A. 2006. *Field Guide to Eucalypts. Volume 1, South-eastern Australia*, 3<sup>rd</sup> ed Bloomings Books, Melbourne
- Draper, B. and Richards, P., 2009. *Dictionary for Managing Trees in Urban Environments*, Institute of Australian Consulting Arboriculturists (IACA), CSIRO Publishing, Collingwood, Victoria, Australia.
- Harris, R.W., Matheny, N.P., and Clark, J.R., 1999. *Arboriculture: integrated management of landscape trees, shrubs, and vines*, Prentice Hall, Upper Saddle River, New Jersey.
- Mattheck, C. and Breloer, H. 1994. 'Field Guide for Visual Tree Assessment' *Arboricultural Journal*, Vol 18 pp 1-23.
- Mattheck, C. 2007. *Updated Field Guide for Visual Tree Assessment*. Karlsruhe: Forschungszentrum Karlsruhe.
- IACA 2010. *IACA Significance of a Tree, Assessment Rating System (STARS)*, Institute of Australian Consulting Arboriculturalists, Australia, [www.iaca.org.au](http://www.iaca.org.au).
- Robinson L, 2003. *Field Guide to the Native Plants of Sydney*, 3<sup>rd</sup> ed, Kangaroo Press, East Roseville NSW
- Standards Australia 2007. *Australian Standard: Pruning of amenity trees, AS 4373 (2007)*, Standards Australia, Sydney.
- Standards Australia 2009. *Australian Standard: Protection of trees on development sites, AS 4970 (2009)*. Standards Australia, Sydney.

### 5.2 Project specific references

- Transport for NSW, *Project Scope of Works, More Trains More Services Stage 2, Enabling Works Scope, Reference No: 6146179, Project Phase: Project Development Controlled Document, Version 2 Final*, dated February 2019
- Kellogg Brown and Root Architecture, *Waterfall Station Illawarra Line, 36.800 km to 38.850 km, MTMS2 – Platform Extension Stabling Yard Upgrade, Concept Design, Revision B Issued for Review – 80%*, dated 31/05/19

## Appendix A Maps

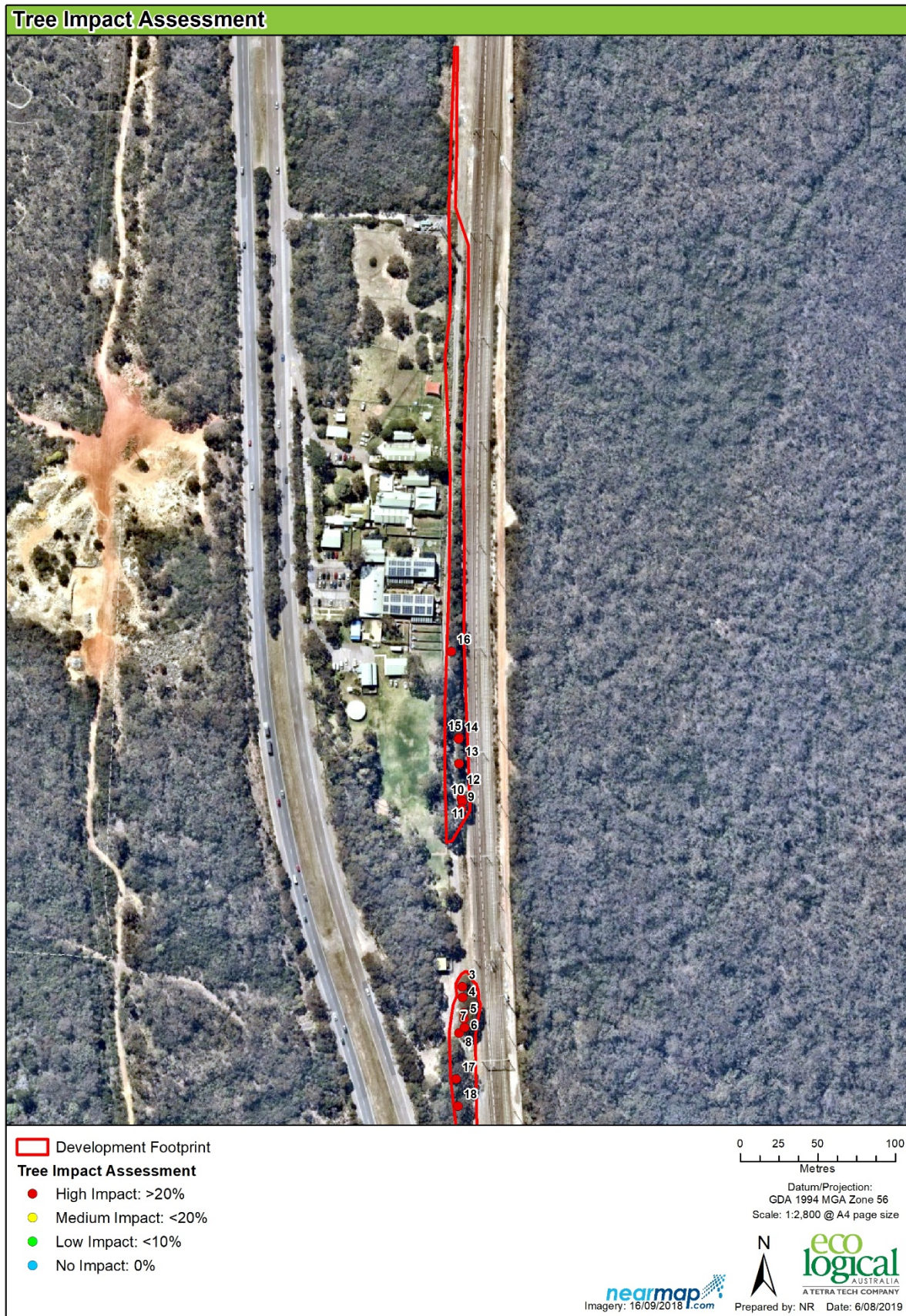


Figure 3: Tree impact map (northern section)



Figure 4: Tree impact map (mid-section)



Figure 5: Tree impact map (southern section)



## Appendix B Tree retention assessment method

### B1 Tree Significance Assessment Criteria - STARS<sup>®</sup>

Low	Medium	High
The tree is in fair-poor condition and good or low vigour.	The tree is in fair to good condition	The tree is in good condition and good vigour
The tree has form atypical of the species	The tree has form typical or atypical of the species	The tree has a form typical for the species
The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings	The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area	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 provides a minor contribution or has a negative impact on the visual character and amenity of 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 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 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 provides a fair contribution to the visual character and amenity of the local area	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'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's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ	The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values.
The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms		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.
The tree has a wound or defect that has the potential to become structurally unsound.		
The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties.		
The tree is a declared noxious weed by legislation		

## B2 Matrix assessment

		Tree significance			
		High	Medium	Low	
Useful Life Expectancy	Long >40 years				
	Medium 15-40 years				
	Short <1-15 years				
	Dead				

### Legend:

	<b>Priority for retention (High):</b> Tree considered important so should be retained and protected. Design modification or re-location of structure should be considered to accommodate the setbacks as prescribed by the <i>Australian Standard AS4970 Protection of trees on development sites</i> . Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.
	<b>Consider for retention (Medium):</b> Tree considered less important, however, retention should remain priority. Removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	<b>Consider for removal (Low):</b> Tree not considered important for retention, nor requiring special works or design modification to be implemented for their retention.

