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Arboricultural Report

Tree Management Plan

Ballarat Tram Museum, 100 Gillies St Nth, Ballarat, Victoria

Commissioned by Jim Neil of MKM Constructions

Inspections commenced on Thursday 7th March 2019

**Rachael Tonkin – Uber Arbor – Adv. Dip. App. Sci. Hort. (Arb)
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1. Introduction

This report was commissioned by Jim Neil to provide a Tree Management Plan of 10 trees at the Ballarat Tram Museum, 100 Gillies St Nth, Ballarat, Victoria in light of proposed developments.

The proposed development at the Ballarat Tram Museum requires 3 trees to be removed in light of a proposed building development and 7 trees that are to be retained in light of the proposed tram track addition. The impact of the development on the 7 retained trees will be discussed in this report.

This report will address the following issues:

- The health and structural condition of the trees.
- The Useful Life Expectancy and Retention Value of the trees.
- The impact that the proposed development will have on the trees including the protection zones.
- Recommendations for the safe retention of the trees.

This site was inspected by Rachael Tonkin of Uber Arbor on Thursday 7th March, 2019.

2. Executive Summary

In March 2019, Uber Arbor conducted tree assessments at the Ballarat Tram Museum, 100 Gillies Street North, Ballarat, Victoria.

Three trees are required to be removed to allow for the proposed new tram museum building.

Seven trees may be impacted by the proposed new tram tracks and these trees are discussed in detail in this report.

Protection Zones have been measured and placed on the site plan. However, there is speculation as to the exact placement of these tracks due to the potential disruption caused to the trees which are to be retained.

This report states the tree protection zones and explains in detail the zones that cannot be encroached by development in order for the trees to remain upright and healthy.

The exact placement of the tracks will be required to ascertain the level of pruning required in the trees. Once exact track placement has occurred this can be added to the report.

Any works stated above should be carried out by a qualified arborist in conjunction with the Australian Standard Pruning of Amenity Trees AS 4373-2007.

All trees should be protected in conjunction with AS4970-2009 Protection of Trees on Development Sites.

3. Methodology

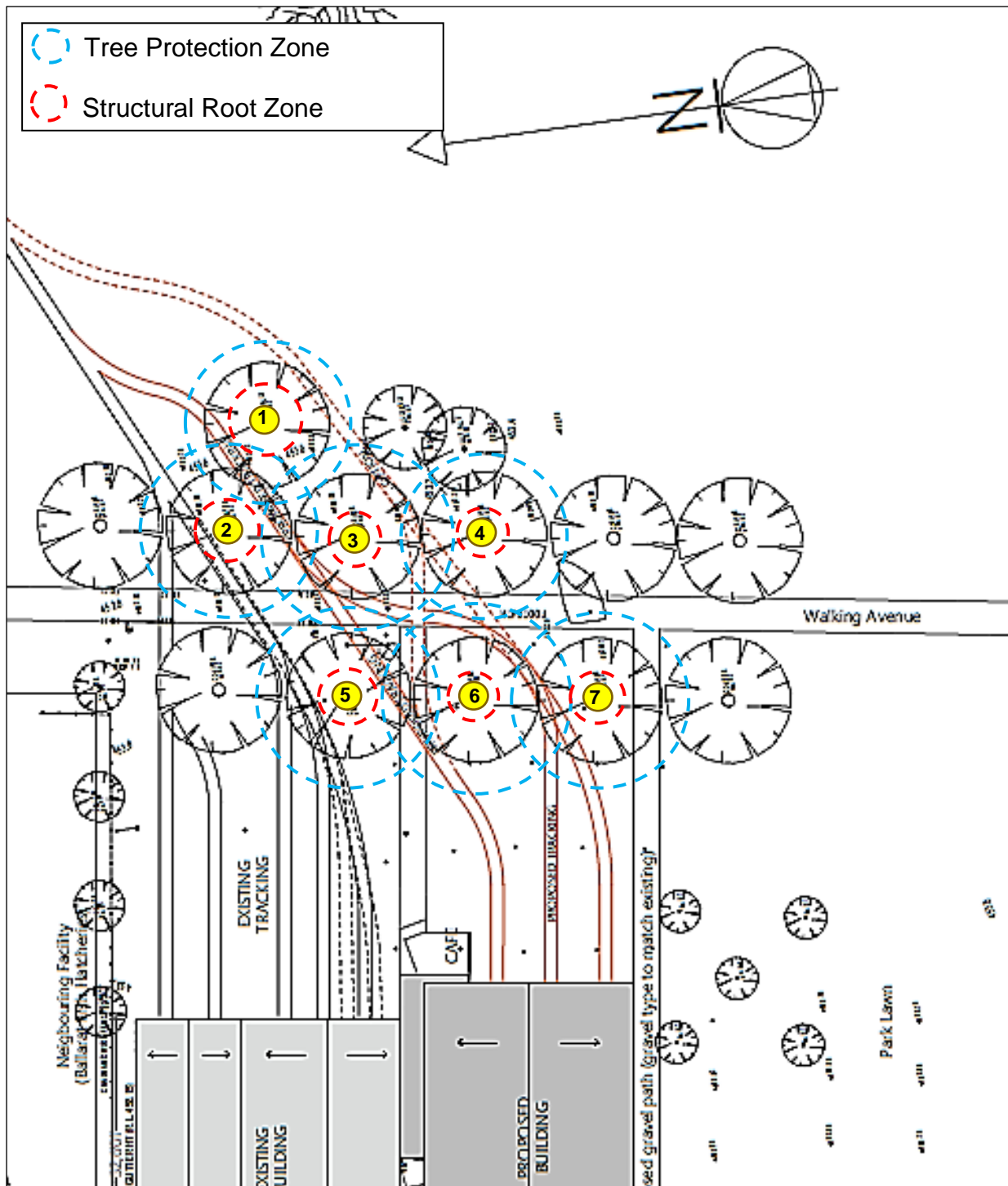
Trees have been assessed using the Visual Tree Assessment method. Assessment has occurred from the ground and no aerial inspections have taken place.

DBH (Diameter at Breast Height) and DAB (Diameter at Base) have been measured using a DBH tape.

The trees have been marked on site with a small dot of pink spray paint for ease of identification. They have been numbered and marked on the site plan provided by MKM Constructions.

Tools used during assessments include DBH tape, height meter, sounding mallet, binoculars and camera.

4.1 Tree Protection Zones




5. Observations - table

Tree #	Botanical name	Common name	Significant Y/N	Height (m)	DBH (cm)	DAB (cm)	Structure	Health	Age	TPZ (m)	SRZ (m)	ULE (years)	Retention Value	Comments
1	<i>Quercus robur</i>	Common Oak	Yes	12	76	76	Good	Fair	Mature	9.1	2.9	25+	Very high	Powdery mildew, limbs pruned will depend on precise track location
2	<i>Cedrus deodara</i>	Himalayan Cedar	Yes	17	87	89	Fair	Fair	Mature	10.4	3.2	25+	Very high	Minor limb pruning may be necessary
3	<i>Cedrus deodara</i>	Himalayan Cedar	Yes	17	91	95	Good	Good	Mature	10.9	3.2	25+	Very high	Minor limb pruning may be necessary
4	<i>Cedrus deodara</i>	Himalayan Cedar	Yes	16	80	88	Good	Fair	Mature	9.6	3.1	25+	Very high	Minor limb pruning may be necessary
5	<i>Cedrus deodara</i>	Himalayan Cedar	Yes	16	91	98	Good	Fair	Mature	10.9	3.3	25+	Very high	Pruning unlikely to be required
6	<i>Cedrus deodara</i>	Himalayan Cedar	Yes	17	93	98	Good	Good	Mature	11.2	3.3	25+	Very high	Pruning necessary, level unknown
7	<i>Cedrus deodara</i>	Himalayan Cedar	Yes	17	87	95	Good	Good	Mature	10.4	3.2	25+	Very high	Pruning necessary, level unknown
8	<i>Ulmus procera</i>	English Elm	No	12			Fair	Fair	Mature			25+	Moderate	Removal required for proposed building
9	<i>Ulmus procera</i>	English Elm	No	9			Fair	Fair	Mature			15-25	Moderate	Removal required for proposed building
10	<i>Quercus robur</i>	Common Oak	No	6			Good	Good	Immature			25+	Moderate	Removal required for proposed building


6. Observations – details

Tree #1



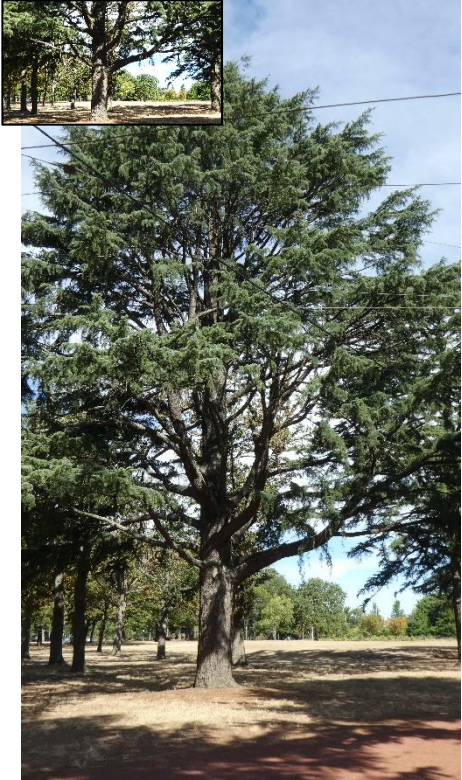
Botanical name	<i>Quercus robur</i>
Common name	<i>Common Oak</i>
Structure	<i>Good</i>
Health	<i>Fair</i>
ULE (years)	<i>25+</i>
Retention Value	<i>Very high</i>
TPZ (m)	<i>9.1</i>
SRZ (m)	<i>2.9</i>
Comments	<i>Powdery mildew, limbs pruned will depend on precise track location</i>

Tree #2



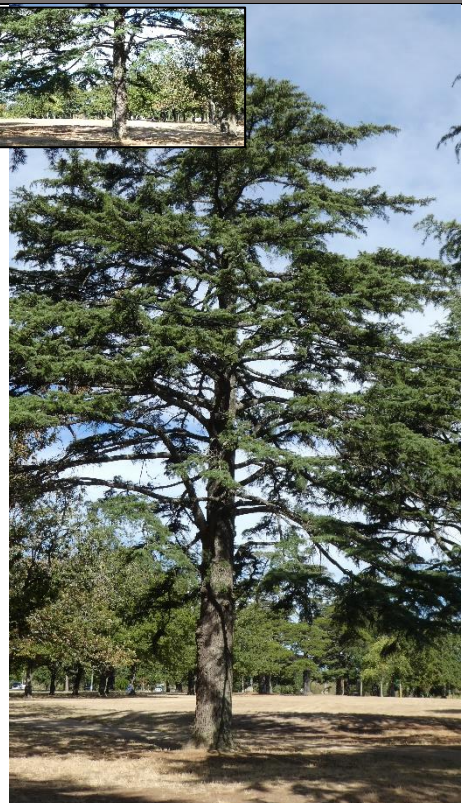
Botanical name	<i>Cedrus deodara</i>
Common name	<i>Himalayan Cedar</i>
Structure	<i>Fair</i>
Health	<i>Fair</i>
ULE (years)	<i>25+</i>
Retention Value	<i>Very high</i>
TPZ (m)	<i>10.4</i>
SRZ (m)	<i>3.2</i>
Comments	<i>Minor limb pruning may be necessary</i>

Tree #3



Botanical name	<i>Cedrus deodara</i>
Common name	<i>Himalayan Cedar</i>
Structure	<i>Good</i>
Health	<i>Good</i>
ULE (years)	25+
Retention Value	<i>Very high</i>
TPZ (m)	10.9
SRZ (m)	3.2
Comments	<i>Minor limb pruning may be necessary</i>

Tree #4



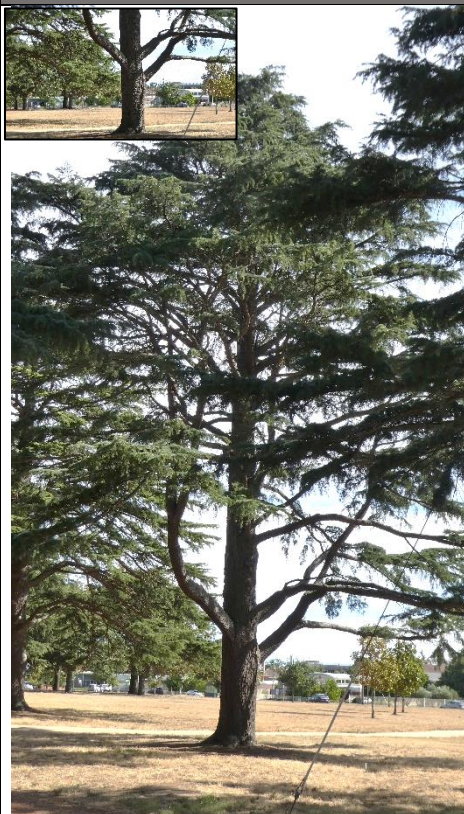
Botanical name	<i>Cedrus deodara</i>
Common name	<i>Himalayan Cedar</i>
Structure	<i>Good</i>
Health	<i>Fair</i>
ULE (years)	25+
Retention Value	<i>Very high</i>
TPZ (m)	9.6
SRZ (m)	3.1
Comments	<i>Minor limb pruning may be necessary</i>

Tree #5



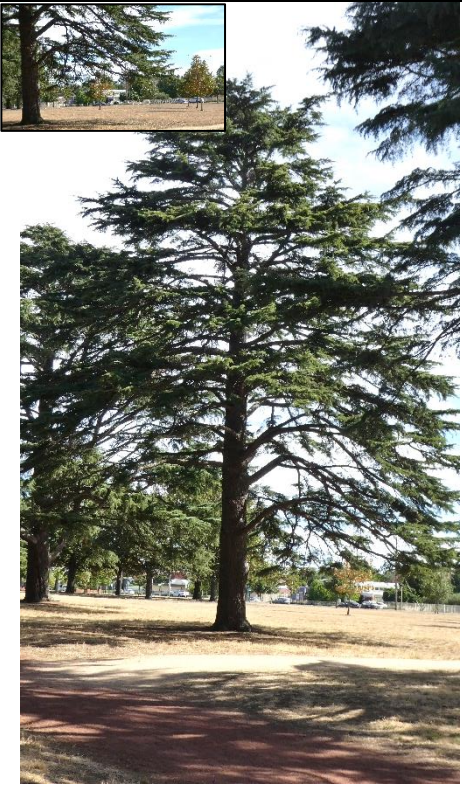
Botanical name	<i>Cedrus deodara</i>
Common name	<i>Himalayan Cedar</i>
Structure	<i>Good</i>
Health	<i>Fair</i>
ULE (years)	<i>25+</i>
Retention Value	<i>Very high</i>
TPZ (m)	<i>10.9</i>
SRZ (m)	<i>3.3</i>
Comments	<i>Pruning unlikely to be required</i>

Tree #6



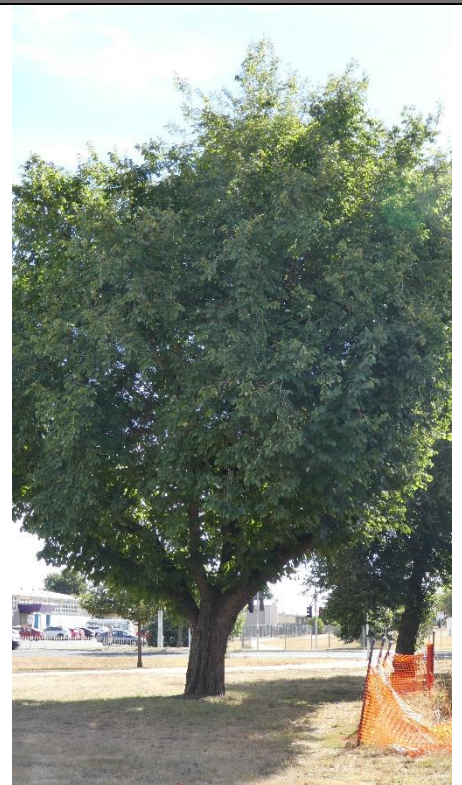
Botanical name	<i>Cedrus deodara</i>
Common name	<i>Himalayan Cedar</i>
Structure	<i>Good</i>
Health	<i>Good</i>
ULE (years)	<i>25+</i>
Retention Value	<i>Very high</i>
TPZ (m)	<i>11.2</i>
SRZ (m)	<i>3.3</i>
Comments	<i>Pruning necessary, level unknown</i>

Tree #7



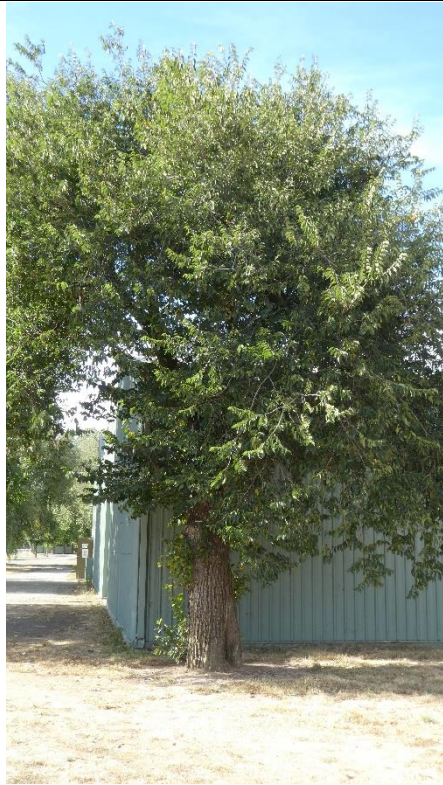
Botanical name	<i>Cedrus deodara</i>
Common name	<i>Himalayan Cedar</i>
Structure	<i>Good</i>
Health	<i>Good</i>
ULE (years)	<i>25+</i>
Retention Value	<i>Very high</i>
TPZ (m)	<i>10.4</i>
SRZ (m)	<i>3.2</i>
Comments	<i>Pruning necessary, level unknown</i>

Tree #8



Botanical name	<i>Ulmus procera</i>
Common name	<i>English Elm</i>
Structure	<i>Fair</i>
Health	<i>Fair</i>
ULE (years)	<i>25+</i>
Retention Value	<i>Moderate</i>
Comments	<i>Removal required for proposed building development</i>

Tree #9



Botanical name	<i>Ulmus procera</i>
Common name	<i>English Elm</i>
Structure	<i>Fair</i>
Health	<i>Fair</i>
ULE (years)	<i>15-25</i>
Retention Value	<i>Moderate</i>
Comments	<i>Removal required for proposed building development</i>

Tree #10



Botanical name	<i>Quercus robur</i>
Common name	<i>Common Oak</i>
Structure	<i>Good</i>
Health	<i>Good</i>
ULE (years)	<i>25+</i>
Retention Value	<i>Moderate</i>
Comments	<i>Removal required for proposed building development</i>

7. Discussion and recommendations

Tree Protection Zone

The TPZ is the area around the tree that must be protected in order for the tree to remain viable and stable. It is calculated by multiplying the Diameter at Breast Height (DBH) by 12.

Structural Root Zone

The SRZ must be protected in order for the tree to remain stable. The SRZ does not take into account the health of the tree, only the stability. Essentially, protection of the SRZ ensures that the tree remains upright.

The SRZ is calculated using a specific formula.

Limitations

AS 4970-2009 Protection of Trees on Development Sites gives examples of activities that should not be performed inside the TPZ. This includes but is not limited to:

- Machine excavation including trenching;
- Excavation for silt fencing;
- Cultivation;
- Storage;
- Preparation of chemicals, including preparation of cement products;
- Parking of vehicles and plant;
- Refuelling;
- Dumping of waste;
- Wash down and cleaning of equipment;
- Placement of fill;
- Lighting of fires;
- Soil level changes
- Temporary or permanent installation of utilities and signs, and
- Physical damage to the tree.

The proposed development

It is understood that construction of new tram tracks must allow for 300 mm of excavation for the purposes of sleepers and laying tracks at ground level.

In general, a high majority of tree roots are found in the top 500mm of soil volume.

As stated, the exact location of the new tracks has not been established. This location is dependent on the protection zones of the trees. It should be noted that the tracks cannot incorporate any sharp turns as the tram cannot accommodate this type of manoeuvre.

Trees #1 – 7

These trees are significant, and retention is required. The 'Proposed tracking' and 'Option' in the site plan do not encroach into any structural root zones of the trees. However, there is significant Tree Protection Zone encroachment in to many of the assessed trees.

The proposed tracking must be outside the Structural Root Zone and if possible, must also be outside the Tree Protection Zone of the trees. However minor encroachment into the Tree Protection Zone would be acceptable as these trees are in good condition.

To aid in establishing the exact tracking locations these distances must be maintained from the centre of each tree (measured as a radius):

- Tree #1 – 6 metres
- Tree #2 – 7 metres
- Tree #3 – 7.2 metres
- Tree #4 – 6.4 metres
- Tree #5 – 7.1 metres
- Tree #6 – 7.3 metres
- Tree #7 – 6.9 metres

It appears that it may not be possible to achieve this clearance from the trees as they are planted in close proximity to each other and protection zones overlap from tree to tree.

Other methods may be required to ascertain the exact track locations such as non-invasive root excavation to map the roots and ensure that the proposed tracks do not sever any existing ones. This can be in the form of hydro excavation or airspade. A suitably qualified arborist would be required to be on site during this process.

If there is simply not enough space to lay tracks between these trees it may still be possible to lay tracks above ground where the tracks are encroaching into the protection zones. This would ensure that no roots are cut or compacted.

Tree #8 - 10

These trees are in the building envelope of the proposed new tram museum building and cannot be retained in light of the proposed development.

8. Conclusion

10 trees have been assessed at the at Ballarat Tram Museum, 100 Gillies Street Nth, Ballarat in light of proposed developments.

- Three trees cannot be retained in light of the proposed new tram museum building and have been recommended for removal.
- Seven trees have been discussed with measurements given in regard to the proposed new tram tracks to be laid. The exact location of these tracks has not been established. This report is designed to assist with defining the locations of the proposed new tracks.
- The proposed new tracks may not be able to be laid at ground level and an alternative method may be required.
- The roots of trees #1 to 7 may require mapping in order to ascertain an exact location for the proposed new tracks.

Once the exact location of the proposed new tracks is established, the level of lower branch pruning can then be ascertained.

Any works stated above should be carried out by a qualified arborist in conjunction with the Australian Standard Pruning of Amenity Trees AS 4373-2007.

All trees should be protected in conjunction with AS4970-2009 Protection of Trees on Development Sites.

9. Appendix

9.1 References

Brooker, M and Kleinig, D 2006, *Field Guide to Eucalypts – Volume 1 3rd edn*, Blooming Books Pty Ltd, Melbourne

Costermans, L 1981, *Native Trees and Shrubs of South-eastern Australia*, New Holland Publishers, Sydney

Dunster, J 2017 *ISA Tree Risk Assessment Manual 2nd edn*, Premier Print Group

Shigo, A 1991, *Modern Arboriculture – Touch Trees*, Sherwin Dodge Printers, Littleton, New Hampshire

9.2 Data Collection Definitions

The following are definitions of the assessment categories for data collected on trees. The data collected on each tree was based on the assessors experience and opinion of the tree.

DBH

The Diameter at Breast Height is measured at approximately 1.3m above ground level and is measured in centimetres.

Age

- Immature – The tree has been growing in this area for up to 5 years. This tree may have been planted or it may be self-seeded or regenerated.
- Semi-mature – A tree of between 10% and 50% of its maturity. This tree has not reached its full size potential and maturity for that particular site and is actively growing.
- Mature – A tree of between 50% and 100% of its maturity. Generally, this tree will have reached its expected height for that particular species and site.
- Over-mature – A tree that has reached 100% of its maturity for that particular site and is beginning to show signs of senescence.

Structure

- Good – There are no evident defects in the trunk or scaffold branches and the branch unions appear to be very strong.
- Fair – The tree has some minor structural defects e.g., evidence of previous branch failure or pruning, bark missing.
- Poor – The tree exhibits defects which are likely to fail in the next five years and may need management in the future e.g., poor branch attachment, bifurcated unions.

- Very poor – The tree exhibits major structural defects e.g., large areas of missing bark, evidence of multiple branch failures, root plate damage, active splits and co-dominant stems with included unions.
- Has failed – The tree or significant parts of the tree have actively failed.

Health

- Good – The tree exhibits a full and even canopy of growth and is free of disease and pest infestations.
- Fair – The tree exhibits canopy growth to the majority of the crown. It may be affected by minor pest or disease issues but not enough to prevent growth to the majority of the tree.
- Poor – The tree exhibits canopy growth to less than half of the crown. There may be obvious signs of pest or disease issues which are contributing to the poor health of the tree.
- Moribund – The tree is lacking vitality and vigour and is in terminal decline.
- Dead – The tree is dead.

Manage Priority

- Urgent – Recommended works should be performed within the next 4 weeks.
- High – Recommended works should be performed within 1 to 6 months.
- Medium – Recommended works should be performed within 6 to 12 months.
- Low – Recommended works should be performed within 1 to 2 years.

Defect Size

This is a measurement of the diameter of the hazardous limb and is measured in centimetres.

Useful Life Expectancy (ULE)

Useful Life Expectancy is the amount of time that the tree can be retained usefully and safely provided that any recommended works are carried out and that the environmental conditions remain the same.

Retention value

Retention values should be based on qualities of the individual tree and not biased in any way. Once assessed a tree can be given a retention value which can be used in the decision-making process.

The following retention values have been developed and can be used for practical applications in tree assessments.

Very High Retention Value

- The tree offers or exhibits cultural or community values.
- The tree may have a trunk diameter (DBH) of 100cm or greater.
- The tree is in good condition with good shape, health and structure.
- The tree is of high amenity value.
- The tree may be Heritage listed.
- The tree is worthy of significant auxiliary works to accommodate its' retention.
- The tree stump is located in an area with very high biodiversity value.
- Has established hollows important for nesting and homes.

High Retention Value

- The tree poses minimal risk to person or property and has a long useful life expectancy.
- The tree may have a trunk diameter (DBH) of 40cm or greater.
- The trees worthy of auxiliary works to accommodate its' retention.
- May have minimal long-term maintenance requirements.
- Tree is of medium to high amenity value.

Moderate Retention Value

- Tree that is desirable to retain and has the potential to be a medium to long term component of the landscape with a medium to long useful life expectancy (ULE).
- The tree is in good condition with reasonable health, shape and structure.
- Tree is of medium amenity value.
- Auxiliary works should be considered to accommodate retention.

Low Retention Value

- Tree is in decline and has short useful life expectancy (ULE).
- Tree is in poor condition with faults that pose an unacceptable risk.
- The tree is an environmental weed.

- The tree is dead or nearly dead.
- Tree requires high level of auxiliary works in comparison to amenity value.
- Tree is planted in poor location and not suitable for species.

Significant trees

Trees are considered significant for a number of different reasons:

- Scientific significance such as important seed stock, remanent vegetation, outstanding size or example for species.
- Social significance such as cultural, spiritual or community importance, unique location, contribution to landscape or important landmark.
- Historic significance such as part of an historic park, garden or town, connected with commemorative events, associated with important events, person, group or institution.
- Aesthetic significance such as an exceptional looking tree, better than average example of tree species, exhibits curious or unusual growth patterns.

9.3 Limitation of Liability

Arborists are tree specialists who use their qualifications, education, knowledge, training, diagnostic tools and experience to examine trees, we recommend measures to enhance the beauty of trees and attempt to reduce the risk of living near trees.

Clients may choose to accept or disregard the recommendations of this assessment or report.

An Arborist cannot detect every condition that could possibly lead to the structural failure of a tree.

Trees are living organisms that fail in ways the Arboricultural industry does not fully understand.

Conditions are often hidden in trees and below ground. Unless otherwise stated, observations have been made visually from ground level.

An Arborist cannot guarantee that a tree will be healthy or safe under all circumstances or for a specific period of time.

Likewise, remedial treatments cannot be guaranteed. Treatment and removal / pruning of trees can involve considerations beyond the scope of An Arborist, services such as property boundaries and ownerships, disputes between neighbours, site lines, landline tenant matters and related incidents.

The Arborist cannot take such issues into account unless complete and accurate information is given in writing prior to or at the time of the site inspection.

Likewise, an Arborist cannot accept responsibility for the authorisation or non-authorisation of any recommended treatment or remedial measures undertaken. In the event that we recommend re testing or inspection of trees at stated intervals or installs any cables, bracing systems and support systems we must inspect the system installed at intervals of not greater than 6 months, unless otherwise specified in written reports.

It is the client's responsibility to make arrangements with us to conduct the re inspection.

Trees can be managed but not controlled. To live or work near a tree involves a degree of risk.

The only way to eliminate all risk associated with a tree is to eliminate the tree.

All written reports must be read in their entirety.

At no time shall part of the written assessment be referred to unless taken in full context of the whole written report.

If this report is to be used in a court of law or a legal situation, we must be advised in writing prior to the written assessment being presented in any form to any other party.

At no time can Rachael Tonkin Arborist be held responsible for the compliance to any relevant council regulation or development condition arising from recommendations contained in this report or for the standard of work completed that other persons undertake.

While Arborists can have specific knowledge in some local laws it is the owners' responsibility to obtain the relevant approvals and information for any tree work.

If you require further information or clarification, please contact me.

Regards,

Rachael Tonkin
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Arboricultural Report

Tree Management Plan

Ballarat Tram Museum, 100 Gillies St Nth, Ballarat, Victoria

Commissioned by Paul Mong of Ballarat Tram Museum

Inspections commenced on Thursday 7th March 2019
Report completed on Wednesday 9th October 2019

**Rachael Tonkin – Uber Arbor – Adv. Dip. App. Sci. Hort. (Arb)
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1. Introduction

This report was commissioned by Paul Mong of the Ballarat Tram Museum to provide a Tree Management Plan of trees with the potential to be impacted by the proposed tram track and shed construction at the Ballarat Tram Museum, 100 Gillies St Nth, Ballarat, Victoria.

This report is the second Tree Management Plan and goes into further detail regarding the previously reported trees # 1, 2, 3, 5 and 6 in regards to track placement and construction. It discusses the findings of the Tree Root Investigations conducted by Geoscan as requested by the City of Ballarat.

This report will address the following issues:

- The findings of the Geoscan report.
- The proposed method of track construction.
- Discussion on track and post placement in regards to the trees.
- Tree protection in regards to the proposed carpark construction.
- Recommendations for the safe retention of the trees.

This site was inspected by Rachael Tonkin of Uber Arbor on Thursday 7th March, 2019 and again with Jon Armstrong from Geoscan on Monday 9th September, 2019.

2. Executive Summary

In September 2019, Geoscan were contracted to conduct tree root mapping of 5 trees in regards to proposed tram track placement at the Ballarat Tram Museum, 100 Gillies Street North, Ballarat, Victoria.

The trees that were investigated were trees that have been previously reported on by Uber Arbor and are to be retained.

The root mapping which was conducted using Ground Penetrating Radar can be found on page 5 and 6 with the complete report being available in Appendix 6.2 and 6.3. This mapping will assist with ascertaining an accurate pathway for the proposed tram tracks.

In order to protect the trees appropriately construction methods have been altered to ensure as little excavation and compaction as possible.

The exact track placement has been delayed pending the root mapping and can now be planned using the mapping that has been supplied from Geoscan.

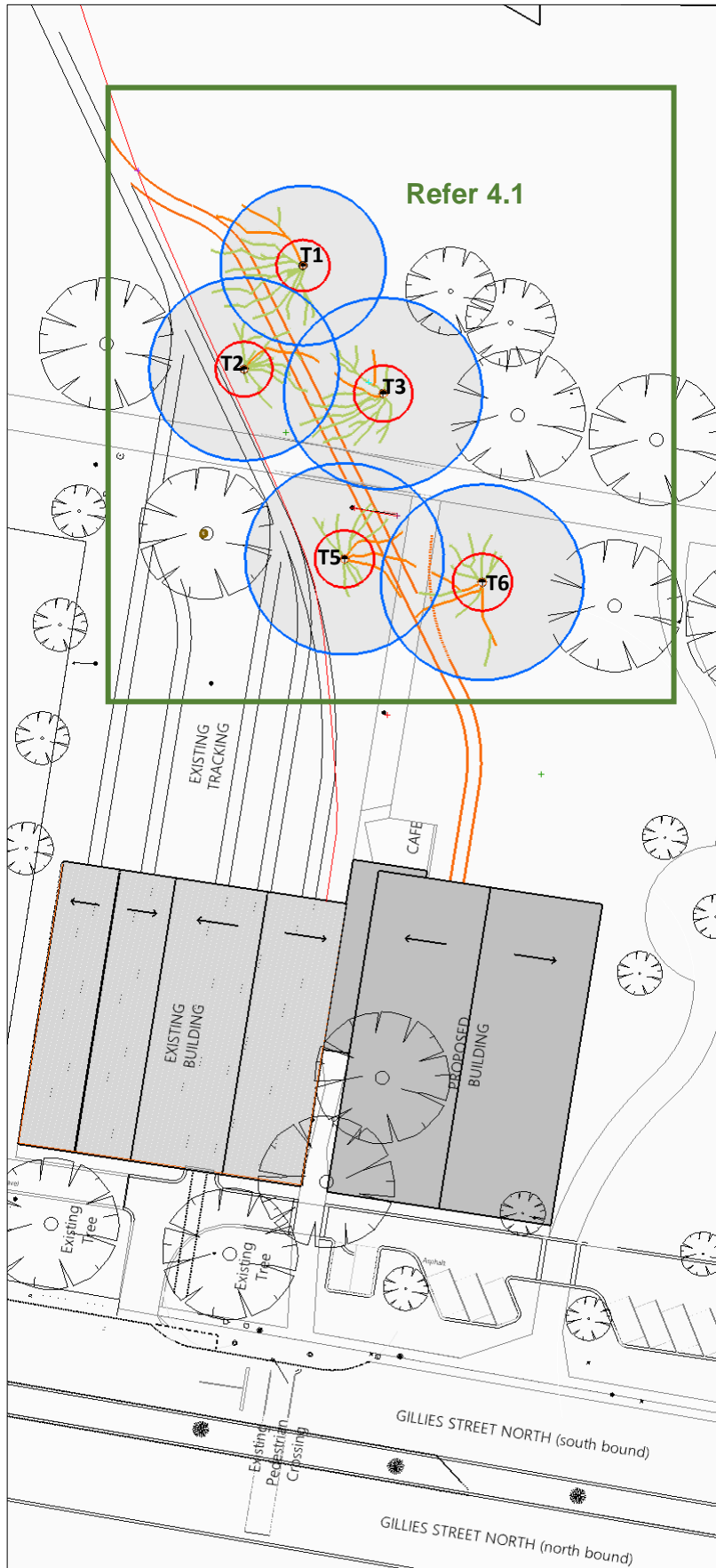
According to the root mapping there appears to be a clear path for the proposed tracks that will cause minimal impact to the retained trees. There is also scope for the tracks to branch off near Tree #6 as it enters the proposed new tram shed.

A proposed new carpark requires removal of two trees and retention of two trees that must be protected accordingly.

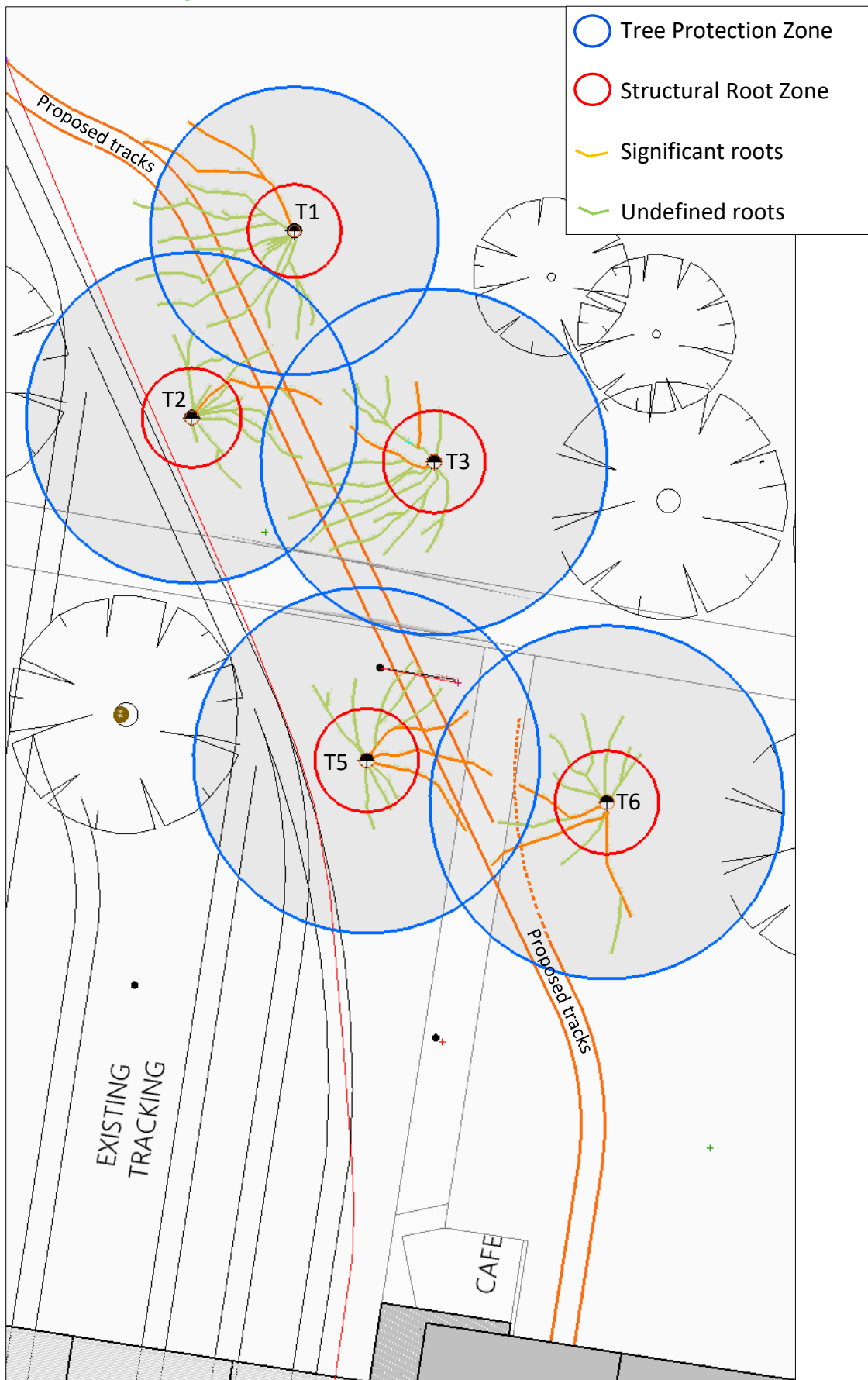
Any works stated above should be carried out by a qualified arborist in conjunction with the Australian Standard Pruning of Amenity Trees AS 4373-2007.

All trees should be protected in conjunction with AS4970-2009 Protection of Trees on Development Sites. Specific protection has been discussed in this report.

3.Site Map – Geoscan – Root Mapping



3.1 Trees – snapshot



4. Discussion and recommendations

The proposed development

It is evident from the diagram in 3.1 that encroachment into the Tree Protection Zone is required for the proposed tracks to be constructed along this proposed route.

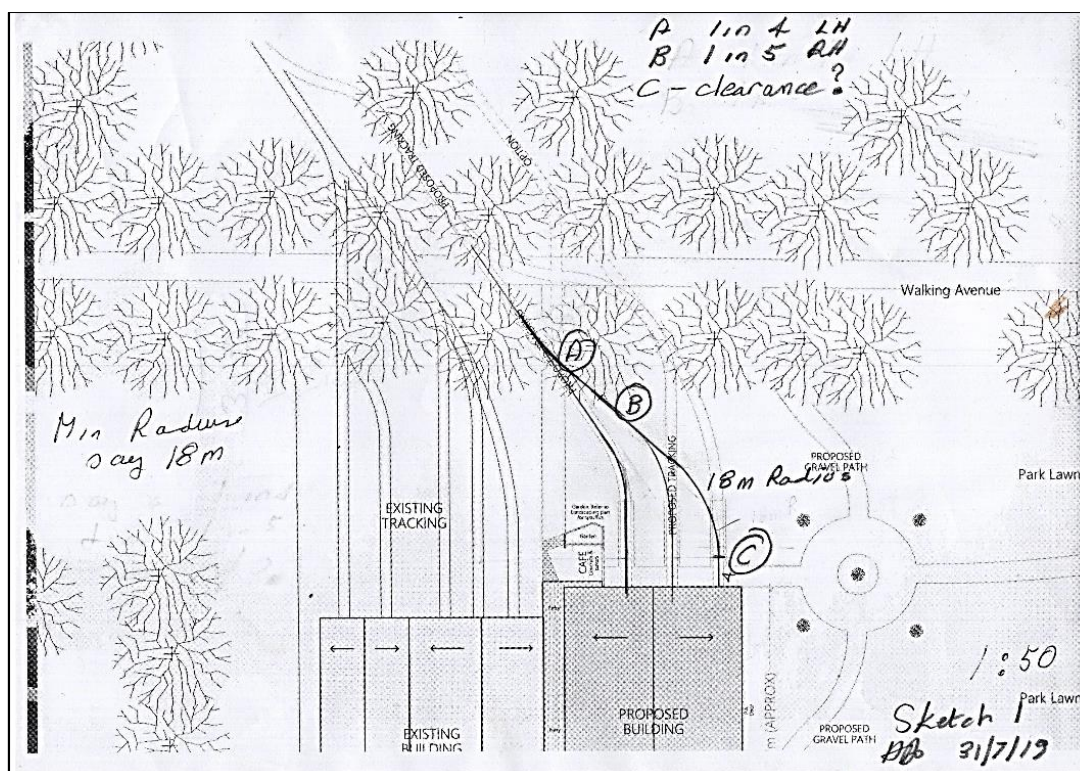
It is understood that the methods for construction have been altered to accommodate protection of the trees. The proposed tracking is to be constructed using suspended tracks on piers. The hole for the piers is to be 300 mm by 300 mm and the maximum spacing of the piers can be 2 m with staggering also possible. The depth of the pier holes is to be 1 m.

This proposed method of construction will ensure minimal or no damage to the root systems of the surrounding trees. As the tracks will be suspended (above ground level) compaction within the Tree Protection Zone will not occur.

As the exact route for the tracks has not been determined this will enable the final placement of the tracks to ensure that:

- Excavation is outside the Structural Root Zone
- No significant roots are severed within the Tree Protection Zone (in orange on plan)
- Only minimal undefined roots are severed (in green on plan)

It is understood that the track placement between tree #6 and the proposed new tram shed may differ from the plans. It is proposed that the track branch off at this stage into 2 tracks and then again into another track enabling three separate tracks to access the proposed new tram shed.



When looking at the Geoscan findings there appears to be minimal root activity on the area that is required for the tracks to divide. Provided the appropriate care is taken it is likely that this proposed track construction will cause minimal damage to the retained trees.

Tree Protection Zone

The TPZ is the area around the tree that must be protected in order for the tree to remain viable and stable. It is calculated by multiplying the Diameter at Breast Height (DBH) by 12.

Structural Root Zone

The SRZ must be protected in order for the tree to remain stable. The SRZ does not take into account the health of the tree, only the stability. Essentially, protection of the SRZ ensures that the tree remains upright.

The SRZ is calculated using a specific formula.

Limitations

AS 4970-2009 Protection of Trees on Development Sites gives examples of activities that should not be performed inside the TPZ. This includes but is not limited to:

- Machine excavation including trenching;
- Excavation for silt fencing;
- Cultivation;
- Storage;
- Preparation of chemicals, including preparation of cement products;
- Parking of vehicles and plant;
- Refuelling;
- Dumping of waste;
- Wash down and cleaning of equipment;
- Placement of fill;
- Lighting of fires;
- Soil level changes
- Temporary or permanent installation of utilities and signs, and
- Physical damage to the tree.

Protection of the tree during construction

Protection of the retained trees must begin before construction where fencing is to be installed. As construction will be inside the Tree Protection Zone fencing is required as far out as possible whilst leaving room for the construction process.

There must be no storage of construction materials within the Tree Protection Zone of the trees. This will mean that materials required may need to be stockpile several meters from the area.

It is unclear what machinery is to be used for the placement of the tracks. However, this will need to be discussed as most of the works will be inside the Tree Protection Zone so the potential for compaction is high. Larger machinery will not be permitted for construction inside the Tree Protection Zone whereas smaller machinery may be permitted for small periods of time.

All post holes for piers inside the Tree Protection Zone are to be excavated by hand and care is to be taken if roots are encountered. If the plans from Geoscan are followed the likelihood of encountering roots is low. However, if roots greater than 80 mm diameter are encountered the position of the pier holes will be required to be relocated.

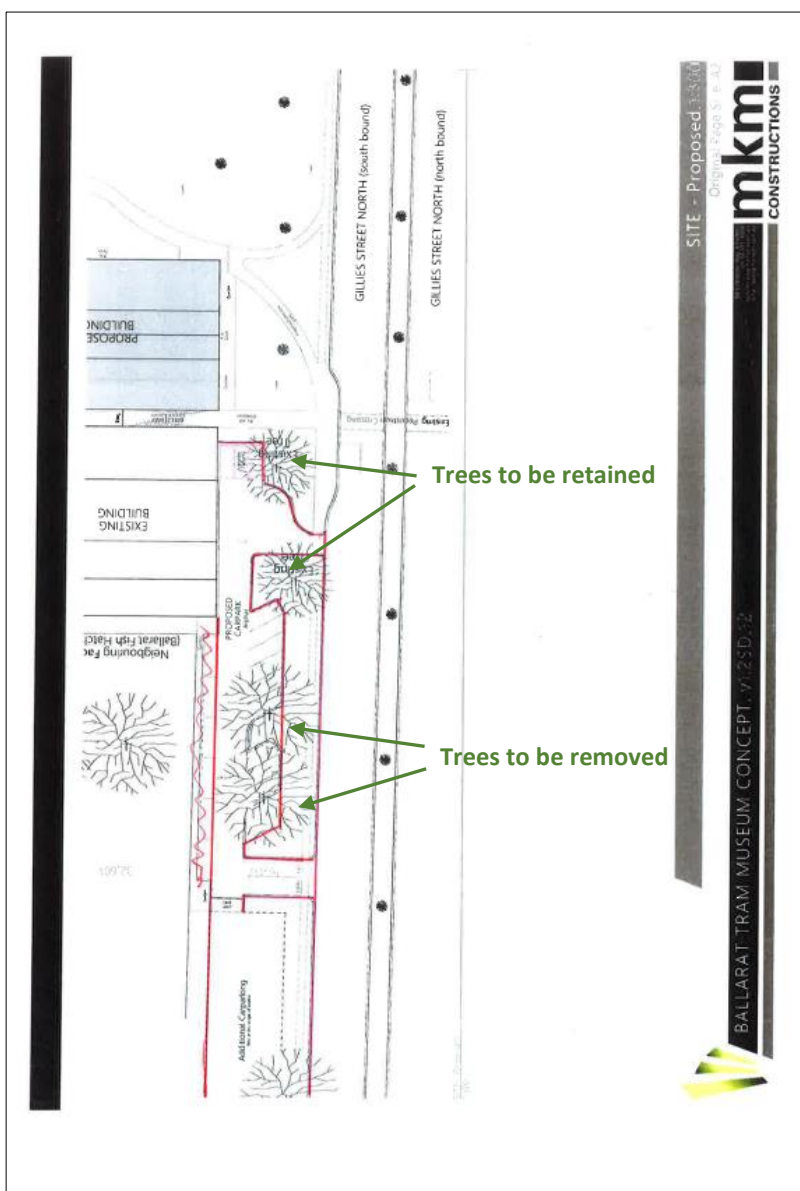
The Tree Protection Zones and Structural Root Zones must be clearly marked onsite and remain for the duration of the build. These are as follows:

- Tree #1 – TPZ 9.1 m, SRZ 2.9 m
- Tree #2 – TPZ 10.4 m, SRZ 3.2 m
- Tree #3 – TPZ 10.9 m, SRZ 3.2 m
- Tree #5 – TPZ 10.9 m, SRZ 3.3 m
- Tree #6 – TPZ 11.2 m, SRZ 3.3 m

It is likely that lower limb removal is required for Trees 3 ,5 and 6 to accommodate the height of the tram. Any pruning of lower branches must be carried out by a suitably qualified arborist in conjunction with the City of Ballarat and Australian Standard Pruning of Amenity Trees AS 4373-2007.

Carpark trees

It is understood that a carpark will be constructed at the front of the Ballarat Tram Museum to accommodate guests. As a result, 2 trees have been marked for removal to accommodate the carpark. Two other trees are to be retained within the carpark area.



Retained trees are to be protected during construction of the carpark in accordance with AS4970-2009 Protection of Trees on Development Sites.

Development of the carpark must consider the Tree Protections Zone and Structural Root Zones of the trees.

5. Conclusion

Tree Root Mapping has been undertaken by Geoscan to ascertain a potential route for the proposed tram tracks at the Ballarat Tram Museum, 100 Gillies Street Nth, Ballarat, Victoria.

The mapped roots coupled with the altered construction method will allow construction of tracks on suspended tracks. As the construction will be inside the Tree Protection Zones of trees # 1, 2, 3, 5 and 6 care is required to ensure that roots remain intact.

Care must also be taken during construction in terms of storing materials, size of machinery working within the Tree Protection Zone and excavation.

As it is likely that minor lower branch removal is required for tram clearance this must be carried out in conjunction with the Ballarat City Council and Australian Standard Pruning of Amenity Trees AS 4373-2007.

The proposed new carpark at the front of the Ballarat Tram Museum requires the removal of two trees while two other trees will remain within the carpark area.

All trees should be protected in conjunction with AS4970-2009 Protection of Trees on Development Sites.

6. Appendix

6.1 References

Matheney, N. and Clark, J. 1998, *Trees and Development – A Technical Guide to Preservation of Trees During Land Development*, United Graphics, Mattoon, IL.

Shigo, A 1991, *Modern Arboriculture – Touch Trees*, Sherwin Dodge Printers, Littleton, New Hampshire

6.2 GeoScan Report – On Tree Root Investigation, Ballarat Tram Museum



GeoScan Report - On Tree Root Investigation Ballarat Tramway Museum .

Client: Rachael Tonkin ..Uber Arbor.

Page 1.

Address:

Client Contact: Rachael Tonkin.

Mobile Number.. 0433 712 732.

email rachael@uberarbor.com.au

Job Site: 100 Gillies Street ,North Depot , Ballarat.Vic.3350..

Project Name: GPR Tree Root Investigation works

Client Project No :

Client Purchase Order No:

GeoScan Project ID# 747686 GeoScan.

OnSite Contact: Rachael Tonkin.

Inspection Date: 9th September 2019

Report Date: 16th September 2019

Location Method:

Ground Penetrating Radar..
Using MALA GPR PRO.
450 Mhz Antenna
In 2D Scan..

PAGE 2.

DETAILS OF WORKS CONDUCTED

As directed..I Conducted a GPR Tree Root Scan Investigation of selective trees .
To determined direction of tree roots and tree root depths.

DATA ACQUISITIONING

EQUIPMENT USED Detailed survey parameters are listed below.

**INSTRUMENTS &
TECHNIQUES**

MALA HDR PRO GROUND PENETRATING RADAR
Using 450 Mhz antenna in 2D scan format.

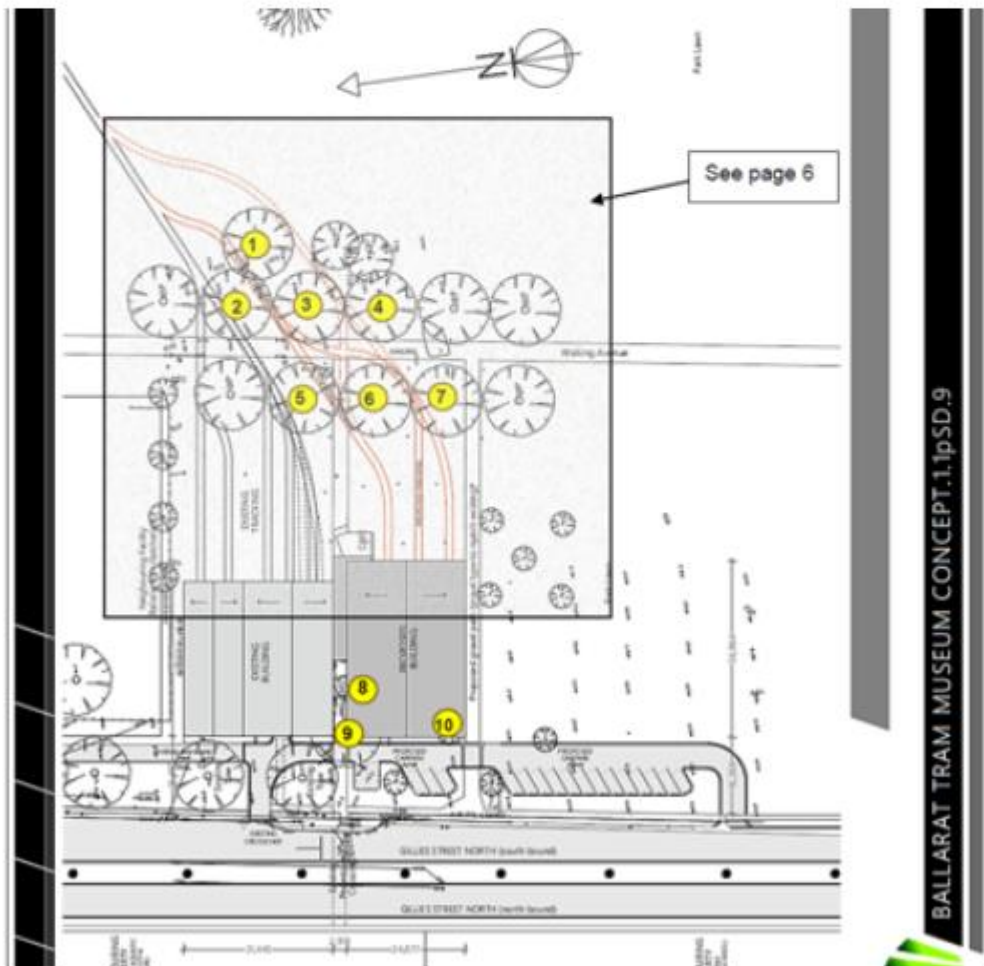
STAFFING

Jon Armstrong ..GPR Technician.

DATA RESULTS

The data was processed and filtered on-site for immediate clearance of the targets.

RELEVANT DRAWINGS



Page 4.

Ballarat Tram Museum

Tree #	Botanical name	Common name
1	<i>Quercus robur</i>	Common Oak
2	<i>Cedrus deodara</i>	Himalayan Cedar
3	<i>Cedrus deodara</i>	Himalayan Cedar
4	<i>Cedrus deodara</i>	Himalayan Cedar
5	<i>Cedrus deodara</i>	Himalayan Cedar
6	<i>Cedrus deodara</i>	Himalayan Cedar
7	<i>Cedrus deodara</i>	Himalayan Cedar
8	<i>Ulmus procera</i>	English Elm
9	<i>Ulmus procera</i>	English Elm
10	<i>Quercus robur</i>	Common Oak

OBSERVATIONS and FINDINGS

As noted in Pages 4-5...With the location and the location numbers of the trees listed...I conducted a ground penetrating radar scan investigation (GPR) for presence of tree root directions and approximate depth scan reading information,for the proposed upcoming new tram track installation works. The trees listed 1 to 5 ,were scanned around each tree trunk circumference As follows...

Tree 1..Common Oak.. From East,North and West sides of trunk area..

Tree 2..Himalayan Cedar..From South ,East and West sides of trunk area.

Tree 3..Himalayan Cedar.. From East,North and West sides of trunk area .

Tree 5..Himalayan Cedar..From South,East and West sides of trunk area.

Tree 6..Himalayan Cedar..From East,North and West sides of trunk area.

Tree 1 ..Common Oak Tree Root Investigation.

As noted during the GPR scanning process .The GPR tree root data information obtained,Indicated ,that the tree roots depths ranged from around 400mm to 1.5m.

Trees 2,3,5,and 6..Himalayan Cedar Tree Root Investigation.

As noted during the GPR scanning process ..The GPR tree root data information obtained ,indicated tree roots as generally being shallower,that the common Oak tree..

Scanned GPR information ,indicated that the tree roots of these trees ,were at similar depth ranges for each of the Himalayan Cedar trees ,from around 150mm to 900mm...

There were a couple of spots around these trees ,where small sections of the tree roots were visible closer to the base of each tree.

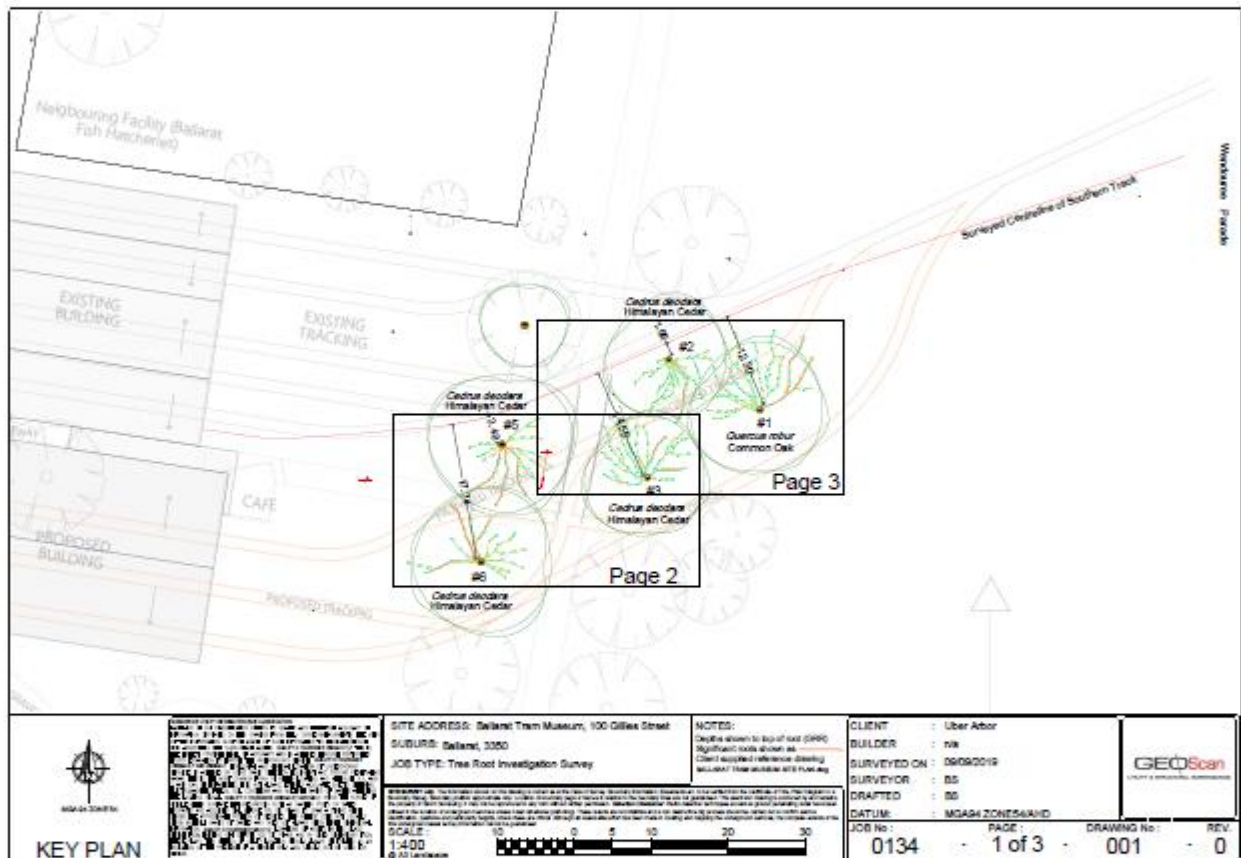
Also as noted in the scanned drawing findings information..I have noted what appears to be the larger tree roots.(Indicated with red dotted lines)

Note .. Due to the nature of the data..GPR is unable to calculate the size of tree roots..

After completion of the GPR tree root scanning process..The tree root scanned findings ,were GIS picked up and the scanned information findings,

have been supplied ,onto a supplied CAD survey drawing file..And also a PDF copy has been supplied..
For further information on the GPR scanned tree root investigation findings.
Please refer to the survey drawing file supplied.

Note..Also that the ground penetration radar scan site survey for the tree root information survey,was conducted ,using an electronic scanning device
Locations,size and depth information of each tree root sections scanned.
Are within approximate.
And information collected on the scanned findings ,have been conducted to the best of my ability..



 KEY PLAN		SITE ADDRESS: Ballarat Tram Museum, 100 Gillex Street SUBURB: Ballarat, 3380 JOB TYPE: Tree Root Investigation Survey	NOTES: Details shown to top of last (SRR) Significant roots shown as (Red dashed line) (Red solid line) (Red dotted line) (Red dash-dot line)	CLIENT : Uber Arbor BUILDER : N/A SURVEYED ON : 09/09/2019 SURVEYOR : BS DRAFTED : BS DATUM : MGA84 ZONE50MID	
		SCALE: 1:400 	JOB No: 0134 PAGE: 1 of 3 DRAWING No: 001 REV: 0		

Insurances..

The following insurances are held by GeoScan Utility and Structural Investigation

Insurance	Value	Insurer
Public Liability	\$20,000,000	QBE Insurance Ltd
Professional Indemnity	\$2,000,000	CGU Insurance Ltd
Workers Compensation	\$\$\$ - unlimited	CGU Insurance Ltd

Detailed insurance certificates are available by contacting geoscanuls@bigpond.com

LIMITATIONS: This report has been prepared for the use of Uber Arbor. In accordance with general accepted consulting practice. No other warranty, expressed or implied is made as to the professional advice included in this report. This report has not been prepared for the use of parties other than the client, the owner and their consulting advisors. It may not contain sufficient information for the purpose of other parties involved.

Due to limitations of the equipment used, there will on occasion be no indication of the presence of existing underground objects, cavities or concealed services, including pipes or cables, reinforcing steel and PT cables. Environmental and other interfering factors can hinder or prevent accurate feedback of information.

Trained staff will determine the location and position of concealed objects, cavities, services and other targets to the best of their capabilities with the latest equipment. All results relayed to the client being the most accurate information for the client to then use at their discretion.

It should be noted that the final depth information is the result of an interpretation of the collected data. Whilst state of the art equipment and qualified personnel will have been utilised for this study, there are circumstances under which the interpreted result can differ from the actual subsurface strata.

The author accepts no responsibility for actions for decisions made on the basis of the presented result. The results are presented for the client's review only and should not form the sole basis of any decision or action made in relation to this project.

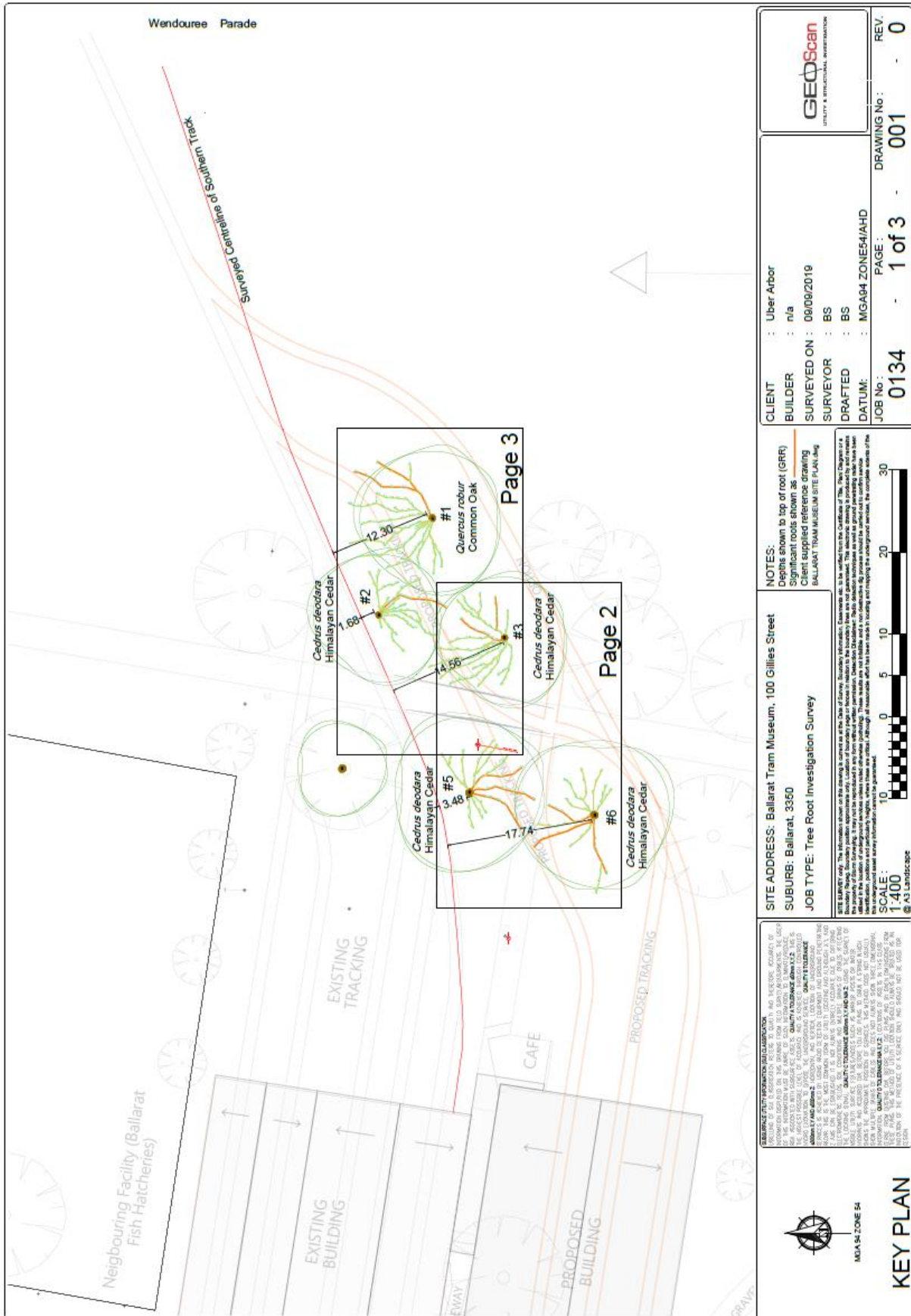
The report was prepared on completion of the fieldwork and is based on conditions encountered at the time of preparation. GeoScan Utility and Structural Investigation disclaims responsibility for any changes that might have occurred after this time.

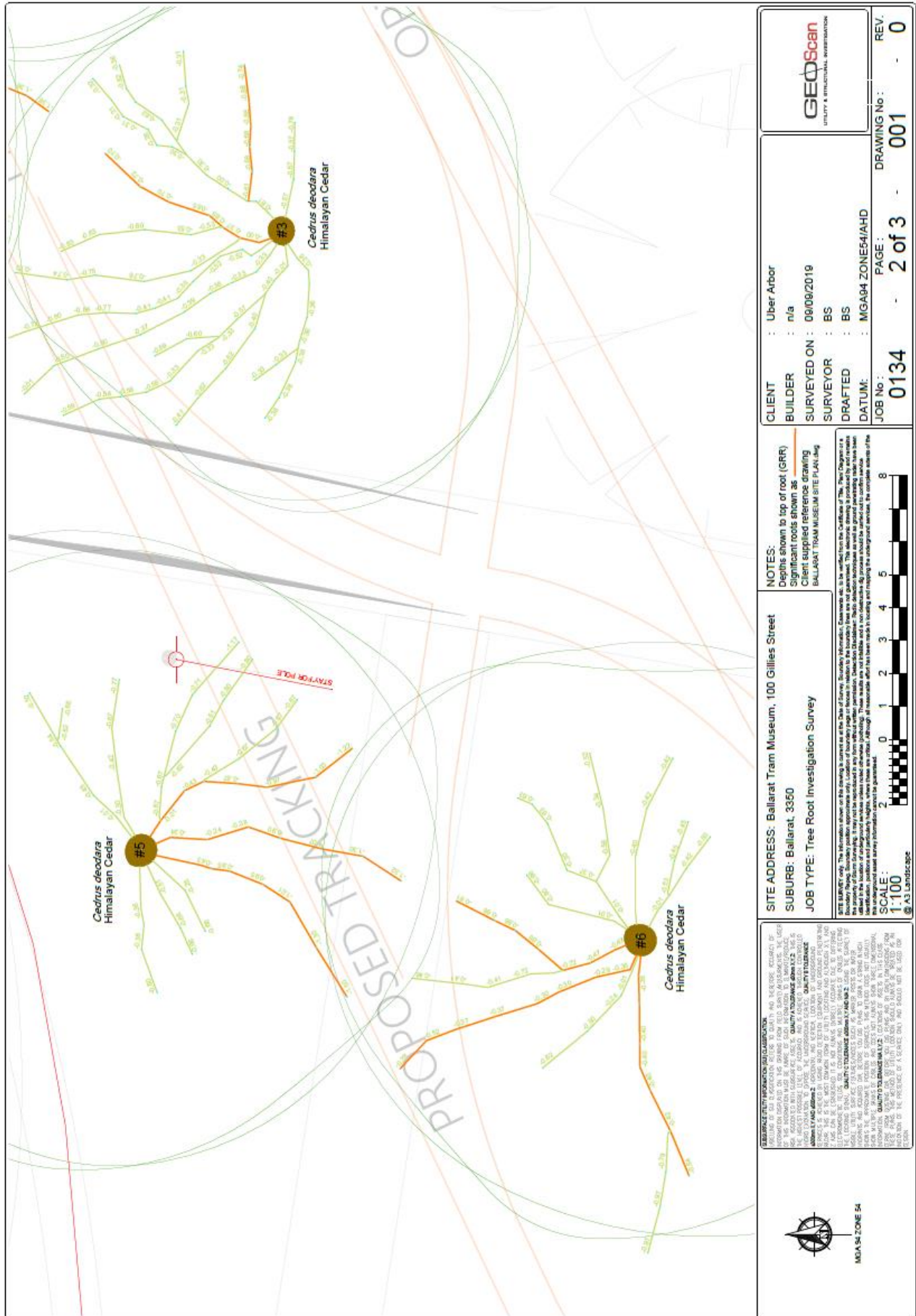
As with any form of non-destructive testing, our opinions of the results do not apply. We rely solely on data collection and criteria conformance. In this particular case of all the applied criteria has been achieved.

Whilst to the best of our knowledge, information contained in this report is correct at the date of issue, conditions on the site (including the depositing and removal of contamination) can change in a limited time. This should be taken into account if the report is used after a protracted delay. As with any other form of non-destructive testing, our opinions of results do not apply. We rely solely on data collection and criteria conformance.

If it is found that the locations differ from the interpretive result the author should be contacted immediately. Should you have any further enquiries please contact Jon Armstrong on 0417-309-710. Jon Armstrong..Director.

6.3 GeoScan Report – Tree Root Investigation – Key Plan





UBER ARBOR
 100 Gillies Street, Ballarat, VIC 3360
 03 5222 2222 | uberarborteam.com.au

GEOScan
 urban & structural investigations

CLIENT : Uber Arbor
BUILDER : n/a
SURVEYED ON : 09/08/2019
SURVEYOR : BS
DRAFTED : BS
DATUM : MGAB4 ZONE54/AHD

JOB No : 0134 **PAGE :** 2 of 3 **DRAWING No :** 001 **REV. :** 0

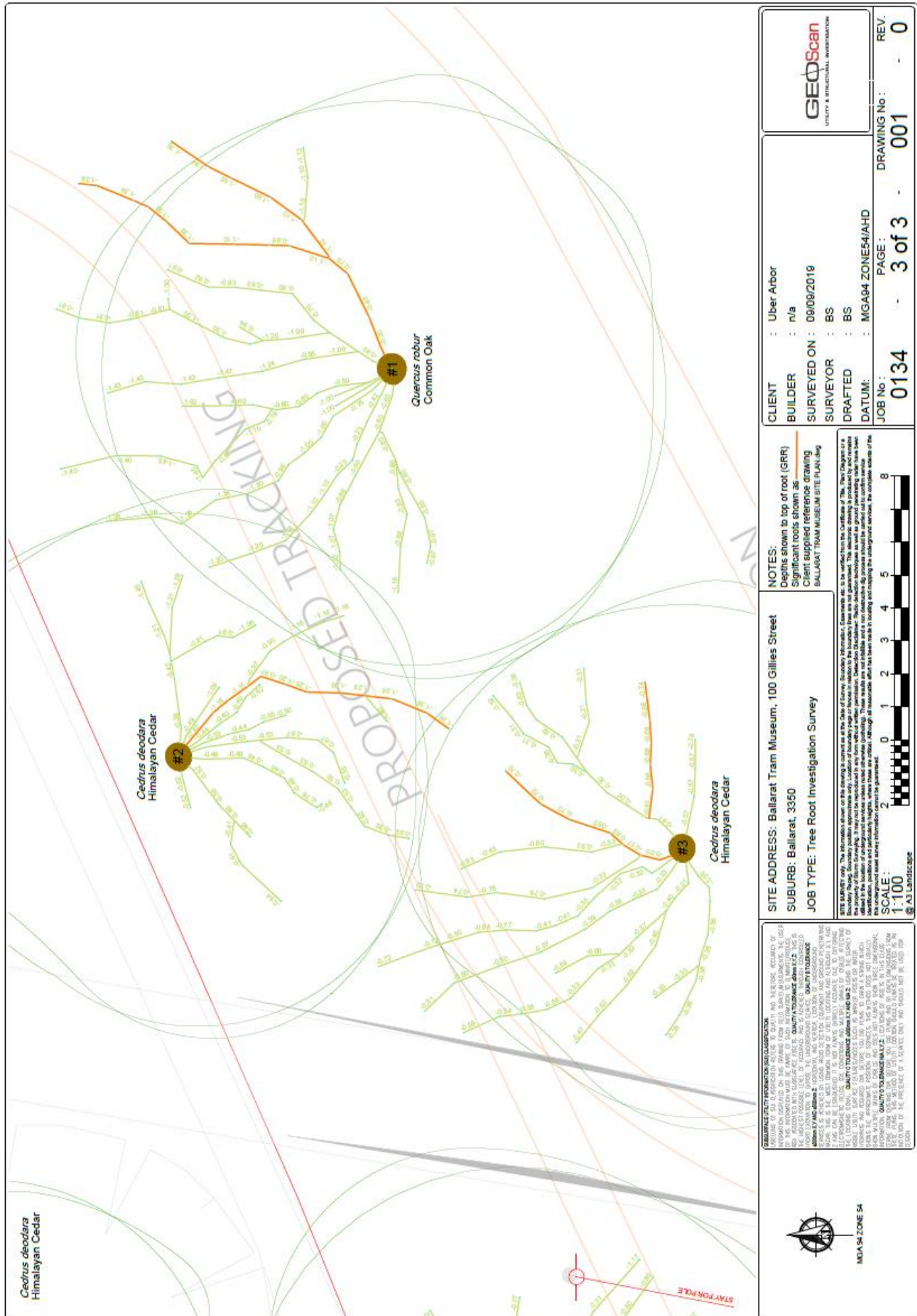
NOTES:
 Depths shown to top of root (GRR)
 Significant roots shown as
 Client supplied reference drawing
 BALLARAT TRAM MUSEUM SITE PLAN (Jg)

SITE ADDRESS: Ballarat Tram Museum, 100 Gillies Street
SUBURB: Ballarat, 3360
JOB TYPE: Tree Root Investigation Survey

SCALE: 1:100
 0 1 2 3 4 5 6 7 8
 0 2 4 6 8
 AS Units/feet

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MGA 54 ZONE 54



6.4 Limitation of Liability

Arborists are tree specialists who use their qualifications, education, knowledge, training, diagnostic tools and experience to examine trees, we recommend measures to enhance the beauty of trees and attempt to reduce the risk of living near trees.

Clients may choose to accept or disregard the recommendations of this assessment or report.

An Arborist cannot detect every condition that could possibly lead to the structural failure of a tree.

Trees are living organisms that fail in ways the Arboricultural industry does not fully understand.

Conditions are often hidden in trees and below ground. Unless otherwise stated, observations have been made visually from ground level.

An Arborist cannot guarantee that a tree will be healthy or safe under all circumstances or for a specific period of time.

Likewise, remedial treatments cannot be guaranteed. Treatment and removal / pruning of trees can involve considerations beyond the scope of An Arborist, services such as property boundaries and ownerships, disputes between neighbours, site lines, landline tenant matters and related incidents.

The Arborist cannot take such issues into account unless complete and accurate information is given in writing prior to or at the time of the site inspection.

Likewise, an Arborist cannot accept responsibility for the authorisation or non-authorisation of any recommended treatment or remedial measures undertaken. In the event that we recommend re testing or inspection of trees at stated intervals or installs any cables, bracing systems and support systems we must inspect the system installed at intervals of not greater than 6 months, unless otherwise specified in written reports.

It is the client's responsibility to make arrangements with us to conduct the re inspection.

Trees can be managed but not controlled. To live or work near a tree involves a degree of risk.

The only way to eliminate all risk associated with a tree is to eliminate the tree.

All written reports must be read in their entirety.

At no time shall part of the written assessment be referred to unless taken in full context of the whole written report.

If this report is to be used in a court of law or a legal situation, we must be advised in writing prior to the written assessment being presented in any form to any other party.

At no time can Rachael Tonkin Arborist be held responsible for the compliance to any relevant council regulation or development condition arising from recommendations contained in this report or for the standard of work completed that other persons undertake.

While Arborists can have specific knowledge in some local laws it is the owners' responsibility to obtain the relevant approvals and information for any tree work.

If you require further information or clarification, please contact me.

Regards,

Rachael Tonkin
Uber Arbor
M : 0433 712 732



Uber Arbor

tel: 0433 712 732 | rachael@uberarbor.com.au | uberarbor.com.au

Addendum report

Addendum report to 190909BallaratTramMuseum.TMP

on Thursday 28th November, 2019

Commissioned by Paul Mong of Ballarat Tram Museum

Completed on Thursday 5th December, 2019

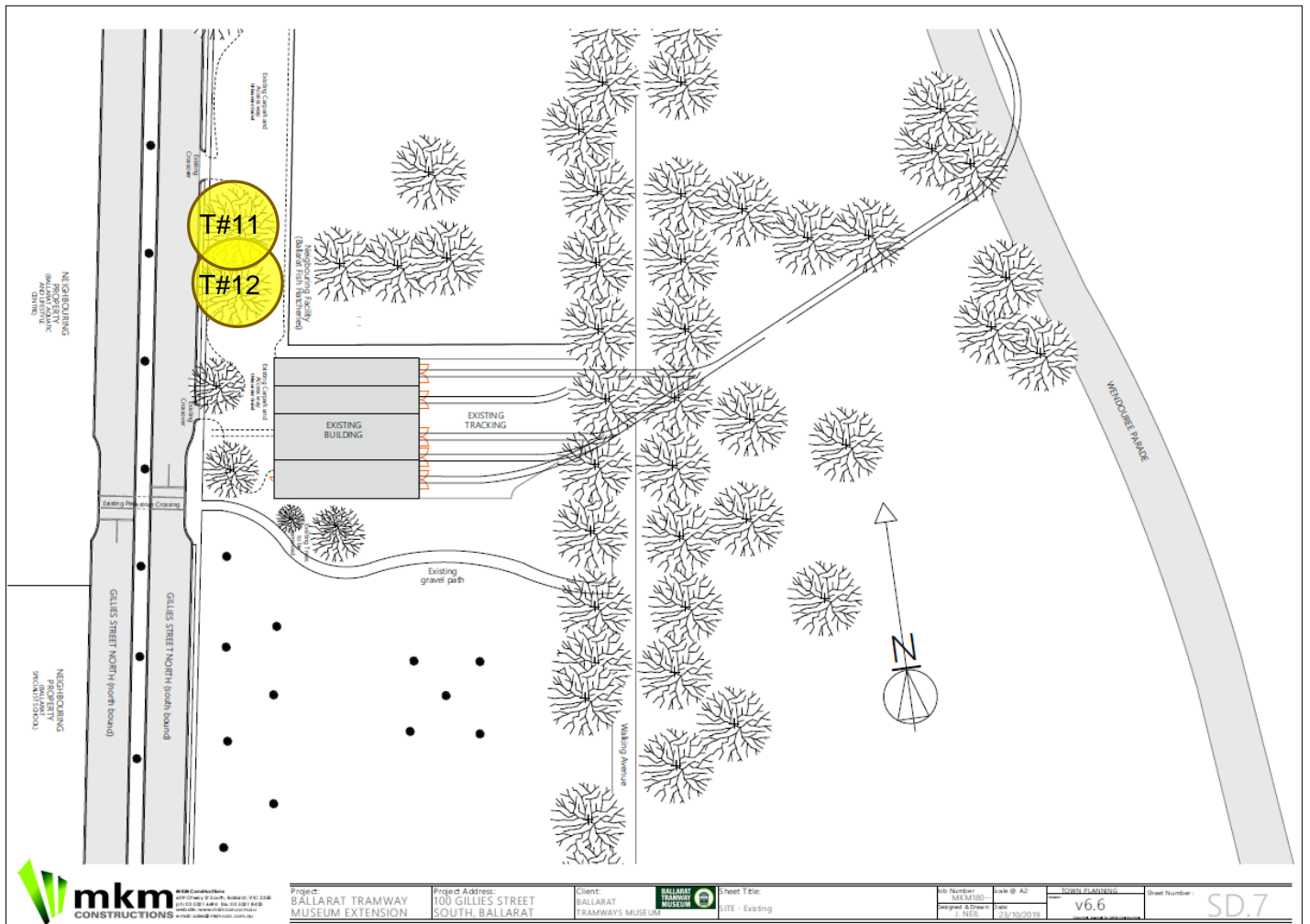
This addendum was commissioned by Paul Mong of the Ballarat Tram Museum in response to a request by the Department of Land, Water and Planning to provide an arboricultural assessment on two trees proposed for removal to the north of the existing Tramway Museum.

The tree numbering is consistent with previous Uber Arbor reports for the Ballarat Tram Museum.

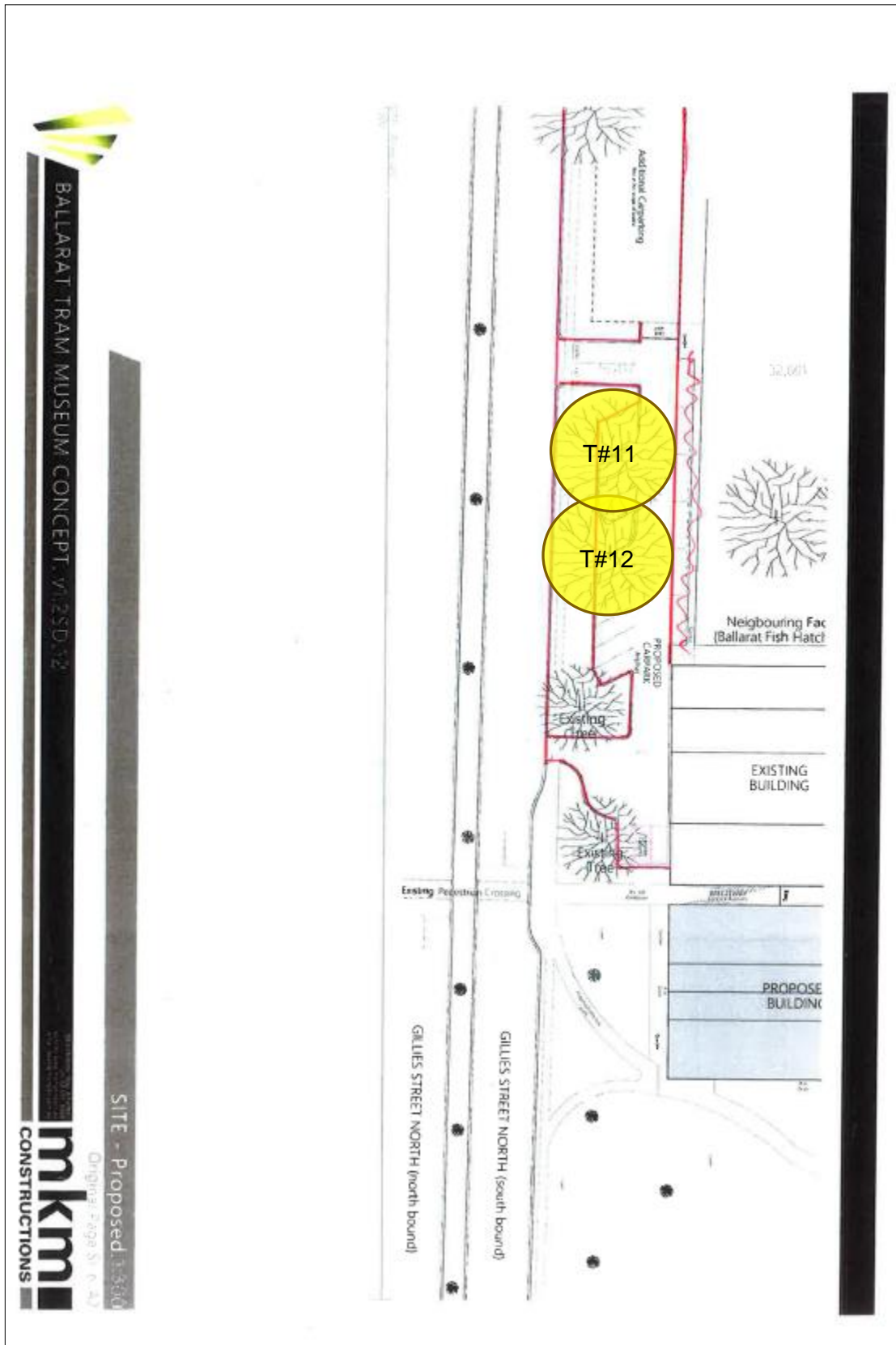
Two trees have been assessed in light of a proposed new carpark installation in front of the Ballarat Tram Museum on Gillies St, Lake Wendouree, Victoria. The following information has been found:

- Both trees are exotic Salix species. They have a Useful Life Expectancy of 5 to 15 years and a Retention Value of Moderate.
- The trees are in varying states of senescence with dieback and significant root decay.
- Both trees cannot be retained in light of the proposed carpark construction.

Site Plan – Ballarat Tram Museum, Gillies Street, Lake Wendouree

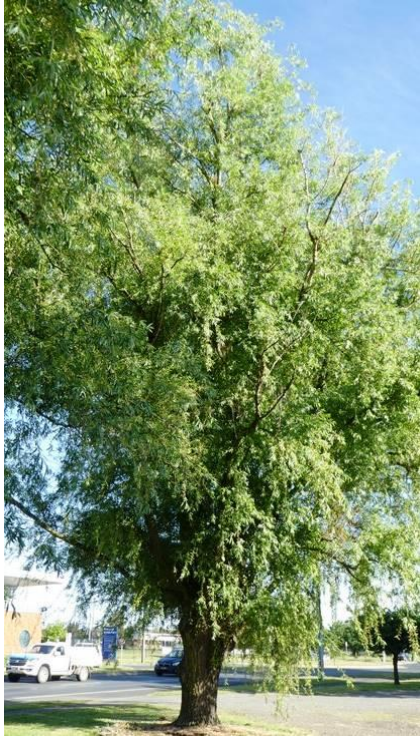


Site Plan – Proposed carpark - Ballarat Tram Museum, Gillies Street, Lake Wendouree



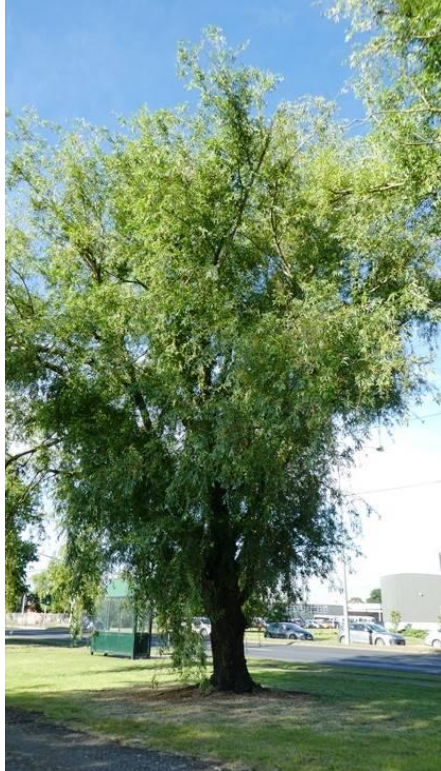
Tree details - Findings

Tree #11



Botanical name	<i>Salix x sepulcralis</i> <i>'Chrysocoma'</i>
Common name	<i>Weeping Willow</i>
Structure	<i>Fair</i>
Health	<i>Fair</i>
DBH cm	89
DAB cm	91
TPZ m	10.7
SRZ m	3.2
ULE (years)	5-15
Retention Value	<i>Moderate</i>
Comments	<i>Significant root decay, tip dieback, deadwood, decay</i>

Tree #12



Botanical name	<i>Salix x sepulcralis</i> <i>'Chrysocoma'</i>
Common name	<i>Weeping Willow</i>
Structure	<i>Fair</i>
Health	<i>Fair</i>
DBH cm	72
DAB cm	78
TPZ m	8.6
SRZ m	3
ULE (years)	5-15
Retention Value	<i>Moderate</i>
Comments	<i>Significant root decay, tip dieback, deadwood, decay</i>

Discussion

Both trees are situated in the heritage Precinct of Ballarat. The exact genus of *Salix* is not certain. It is likely to be a hybrid of 2 or more *Salix* sp. These trees are not considered a 'weed' by the City of Ballarat although most *Salix* species are now considered this way.

The trees are in a stressed and senescent state. The root damage likely to be caused by traffic and other mechanical means is substantial.



Figure 1 and 2: The significant decay in the roots of the Willow trees at the Ballarat Tram Museum

Root decay can be seen in a variety of places around both trees. This decay has travelled up the tree and is now impacting the longevity of both trees.



Figure 3 and 4: The tip dieback in both Willow trees caused by decay in the roots at the Ballarat Tram Museum

Previous pruning cuts have not calloused well which is another indication of the declining state of the trees.



Figure 2: Old pruning cuts that have not calloused at the Ballarat tram Museum

These trees are both in the direct path of the proposed carpark and cannot be retained in light of the proposed carpark construction.