27th January 2021

Jerry Hutter
Supervisor Horticulture
City of Kalamunda
PO Box 42
KALAMUNDA WA 6926

Dear Jerry,

ARBORICULTURAL ASSESSMENT AT THE KALAMUNDA HISTORY VILLAGE

Please find enclosed the results of the arboricultural assessment undertaken recently for the tree adjacent to the train platform at the Kalamunda History Village, Kalamunda.

Where recommendations for remedial arboricultural work have been made, it is imperative that it is undertaken as outlined in the Australian Standard 4373-2007: Pruning of Amenity Trees. It is also strongly advised that any remedial pruning works be undertaken by, or supervised by, a qualified arborist (AQF Level 3 in Arboriculture).

If you have any questions regarding the assessment or if I can be of service to you again in the future, please feel free to contact me.

Yours sincerely,

Brad Bowden
Principal
Bowden Tree Consultancy®

B.Sc. Sustainable Forestry
Dip. Arboriculture & Parks Management
ISA Certified Arborist – Municipal Specialist AU-0020AM & Tree Risk Assessment Qualified (TRAQ)

1.0 Introduction

1.1 Scope of Report

1.2 The purpose of this report is to summarise the results of the arboricultural assessment and provide recommendations for the mature Tasmanian blue gum tree (*Eucalyptus globulus)* located adjacent to the train platform within the Kalamunda History Village, at Williams Street, Kalamunda. The site visit and visual tree assessment was undertaken from ground level on the 20th January 2021 at 1130hrs and was accurate at the time of inspection. No soil excavation or below ground level inspection was undertaken unless specified. Viewing conditions were fine.

1.3 Concern has been raised regarding tree condition and the failure potential of the tree following the identification of a large pruning wound adjacent to the codominant stem union at the basal area of the tree. This report should be read in conjunction with the PiCUS sonic tomography report dated 20th January 2021 which summarises the further investigation testing undertaken at the trunk basal area to evaluate the internal wood condition.

1.4 Executive Summary

1.5 The Australian-native tree identified within this report provides a range of benefits to the ecosystem, to human beings for environmental and health reasons, and to the climate. Assessment has revealed a satisfactory structural condition whilst tree vitality (health condition) was assessed as high, and is indicative of the capacity of the tree to produce new wood as part of self-optimisation to maintain strength and a long useful life expectancy.

1.6 Where tree retention is desired, it is recommended to undertake the installation of a cable brace within the upper crown to provide supplementary support to the codominant stem union, to mitigate the potential for stem union failure. Additionally, deadwooding works are recommended to remove the large dead branches from the crown of the tree.

2.0 Site Observations

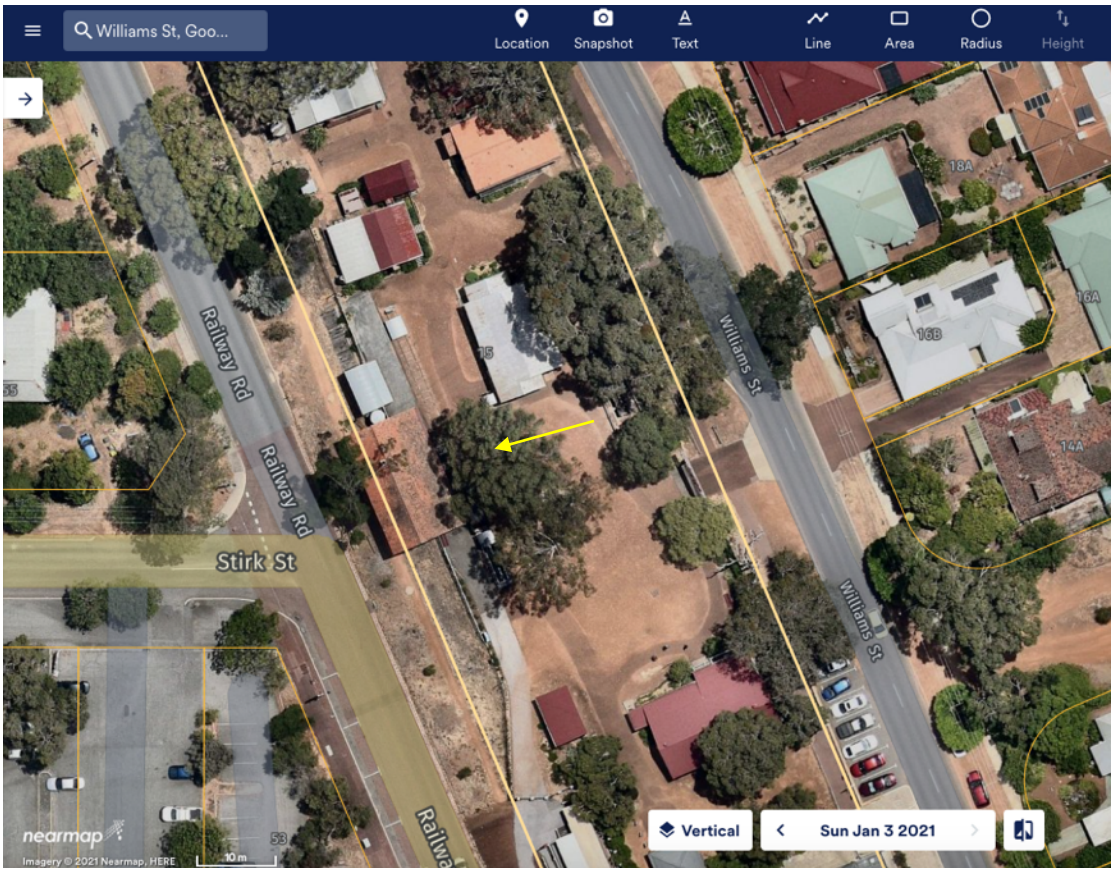

Figure 1. Aerial photo of site and location of the assessed tree (see arrow).

Figure 2. Assessed tree (see arrow); looking towards the north.

Assessed Tree:	**Botanical Name:** *Eucalyptus globulus*
Common Name:	Tasmanian blue gum
Location:	Train platform - east side
Height:	24.3m
DBH:	136cm
Crown Spread (NS/ EW):	20/16m
Structure:	Fair
Health:	High
Comments:	

- Adequate trunk basal flare was evident with buttressing visible however a number of surface woody roots were observed extending from the root collar – likely to have resulted from excessive pedestrian traffic within close proximity of the trunk basal area compacting/ shifting soil
- Several exposed surface roots were evident within 1-2m of the basal area with missing bark and exposed sapwood visible predominantly on the north side (roots not severed), however sufficient rootplate stability is deduced
- No fungal conks were observed however canker infection (species unknown) and subsequent woundwood production was evident on the northwest side however internal degradation if any is likely to be superficial and the infection minor in proportion to the entire trunk basal area circumference
- A (concealed) pruning wound cavity opening was visible at 1m above ground level on the northeast side and was adjacent to the union of the two codominant stems, however no structurally compromised stem attachments were observed
- Minor epicormic regrowth branches were evident throughout the lower crown and are likely to have resulted from previous crown lift pruning works to improve clearance (tree response to replacing foliage)
- Naturally occurring dead branches to approximately 120mm diameter were observed including such branches overhanging the phone booth area on the north side of the tree
- The previous failure of a 120mm diameter branch was evidenced by a broken branch stub within the middle crown on the west side, and with a branch stub length of approximately 400mm observed, failure during a period of high wind energy is deduced
- Further investigation using PiCUS sonic tomography revealed the trunk section to have 55% solid wood and 29% damaged wood, with the degradation predominantly centrally located
- Foliage size, colour and density was normal, and no significant foliar insect infestation and/ or disease infection symptoms were visible on sample foliage within the lower crown

Figure 3. **Adequate trunk basal flare was evident with buttressing visible and a number of woody roots were observed extending from the root collar - likely resulting from excessive pedestrian traffic within close proximity of the trunk basal area; looking towards the northeast.**

Figure 4. **Fungal canker infection was evident on the northwest side (see arrow) however internal degradation if any is likely to be superficial and the infection minor in proportion to the entire trunk basal area circumference; looking towards the southeast.**

Figure 5. **A large pruning wound was visible on the northeast side and was adjacent to the union of the two codominant stems however no structurally compromised stem attachments were observed; looking towards the west.**

Figure 6. **Naturally occurring dead branches to approximately 120mm diameter were observed including such branches overhanging the phone booth area on the north side of the tree; looking towards the northwest.**

3.0 Discussion and Recommendations

3.1 Discussion

3.2 Tree benefits: Mature urban trees confer many benefits including shade and cooler air temperatures, screening (privacy) and noise reduction, built form aesthetic amelioration, energy conservation, mitigation of the urban heat island effect, air quality improvement and oxygen production, carbon uptake/ storage and greenhouse gas reduction, minimisation of storm water run-off and improvement of water quality, fauna habitat and food source. In general, they enhance our built and natural environments with larger trees providing more benefits.

3.3 Tree risk: Tree failure is an infrequent occurrence and serious damage, injury or death from tree failure is rare (Lilly *et al*, 2011). Research finds that for Britain, with a population of 60 million people, the risk of any tree causing a fatality is exceedingly small (Ball & Ball-King, 2011). It is impossible to maintain trees completely free of risk and some level of risk must be accepted to experience the benefits that trees provide. The use of 'safe' or 'unsafe' when assessing trees is both imprecise and ambiguous, as a tree cannot be free from defects or potential hazards - such a state is simply unattainable. It is essential to maintain a balance between the benefits and costs of risk reduction, not only financial cost but also the loss of amenity and other tree related benefits.

3.4 Cable bracing: Cable bracing involves the installation of hardware within the crown of a tree to provide supplementary support by limiting the movement of stems and branches with weakened attachments. Non-invasive dynamic cables such as Yale Brace ™ or Cobra Cable ™ are predominantly used with the selected tensile strength of the installed cable being based on diameter of the stem (or branch) being supported: 2-tonne cables generally used for stems with a diameter less than 45cm at the stem attachment and 4-tonnes cables for a stem diameter greater than 45cm. Additionally, 8-tonne cables are available for exceptionally long and heavy stems and branches.

3.5 The cable is installed at a distance/ height that is approximately two-thirds the distance from the stem/ branch union out to the end of the stem/ branch. Whilst cable bracing is used generally between two stems/ branches, triangular configurations as well as more intricate spider or spoke configurations are also used when several compromised stems are to be supported. The intention of the non-rigid cable brace is to act as a catch belt in the event of excessive movement or separation at the stem/ branch unions prior to failure; therefore the cable tension should be relaxed (not taut) during normal weather conditions.

3.6 Recommendations

3.7 Undertake the installation of a non-invasive 4-tonne cable brace such as Yale brace at a height of approximately 16m between the two codominant stems, to provide supplementary support to codominant stem union.

3.8 Undertake deadwooding to remove the dead branches greater than 50mm in diameter from the crown of the tree. N.B. Broken branch stubs of nominal length in native tree species have the potential to provide food source, roost sites and habitat and can be retained to assist a range of local native fauna.

Figure 7. **The installation of a cable brace at a height of approximately 16m (see dashed line) is recommended between the two codominant stems to provide supplementary support to codominant stem union; looking towards the northwest.**

4.0 Appendix I

4.1 Arboricultural Terminology

4.2 Crown – the leaves and branches of a tree measured from the lowest branch on the trunk to the top of the tree, whilst crown lifting involves pruning of the lower branches to improve clearance for buildings, pedestrians, vehicles etc.

4.3 DBH - diameter of the main trunk, measured at breast height approximately 1.4m above ground level for urban trees.

4.4 Deadwooding – the removal of dead, diseased or damaged branch wood from the crown of the tree.

4.5 Dripline – the width of the crown of the tree measured by the lateral extent of the foliage, with the crown spread measurement indicating the widest part.

4.6 Fall zone – is the area in which the tree or tree part is likely to fall when it fails, often calculated as 1.5 times the tree height where brittle dead branches etc. may break up and scatter debris.

4.7 First order structural branch – the large branches arising from the trunk that form the main structure of the crown.

4.8 Reduction prune – pruning to reduce the extension of a branch, back to a lateral branch that is at least one-third the diameter of the branch being removed.

4.9 Root collar – area at the base of the tree were the roots and trunk merge.

4.10 Targets – an object, person or structure that would be damaged or injured in the event of tree or branch failure is referred to as the target or target area. The hazard evaluation of the target area is relative to the expected use and occupancy of that area.

4.11 Topping and Lopping – deleterious tree height and branch reduction work often at indiscriminate points and generally resulting in weakly-attached regrowth branches prone to failure as subsequent growth occurs.

4.12 Tree Protection Zone (TPZ) – the zone of the root plate most likely to contain roots that are critical for anchorage and stability (structural root zone – SRZ, generally calculated as trunk diameter x 5) and the absorbing roots responsible for the uptake of water and nutrients collectively; calculated as trunk diameter (DBH) x 12.

4.13 V-shaped union – ingrown bark from adjacent parts of the tree that are in contact with each other; usually branch forks, acutely-angled branch attachments or basal stems – often a high failure potential.

4.14 Tree Structure and Health

4.15 The structural condition ('Structure') for each tree or group of trees has been assessed using the following qualitative criteria:

- Good – generally free of structural defects
- Fair – defects evident that may be typical for the species and age class, and which could be corrected through remedial pruning works
- Poor – significant defects that are not likely to be corrected through remedial pruning or arboricultural works
- TBA – to be assessed, requiring further investigation to evaluate tree structural condition

4.16 The vitality ('Health') for each tree or group of trees has been assessed using the following qualitative criteria:

- High – consistent crown density and foliage colour, good shoot extension and an insignificant number of naturally-occurring internal dead branches
- Average – crown condition that may representative for the species and/ or seasonal, possessing satisfactory shoot extension and/ or minimal decline and dead branches
- Low – poor shoot extension, sparse crown density and not likely to be corrected through improvement of site resources and plant nutrition
- Moribund – final stages of a decline spiral

5.0 Appendix II

5.1 Author Formal Qualifications

5.2 Bachelor of Science (Sustainable Forestry) – 2012
Edith Cowan University, Joondalup & Murdoch University, Murdoch, WA.

5.3 Diploma of Applied Science (Horticulture) – 2000
Major studies Arboriculture and Parks/ Gardens management
University of Melbourne, Burnley campus, VIC.

5.4 Certificate IV (TAE40110) in Training & Assessment – 2014
Plenty Training, Robina, QLD.

5.5 Certificate of Horticultural Practice – 1994
Challenger TAFE, Murdoch campus, WA.

5.6 Additional Certifications

5.7 ISA Certified Arborist Municipal Specialist (AU-0020AM) – 2012 (recertified 2018)
International Society of Arboriculture
www.isa-arbor.com/certification/benefits/credentialsExplained.aspx

5.8 ISA Tree Risk Assessment Qualification (TRAQ) – 2013 (recertified 2018)
International Society of Arboriculture
http://www.isa-arbor.com/certification/becomequalified/becomequalified.aspx

5.9 Limitation of Liability

5.10 Bowden Tree Consultancy are tree specialists who use their qualifications, education, knowledge, training, diagnostic tools and experience to examine trees, recommend measures to enhance the beauty and health of trees, and attempt to reduce the risk of living near trees. Clients may choose to accept or disregard the recommendations of this assessment and report.

5.11 Bowden Tree Consultancy cannot detect every condition that could possibly lead to the structural failure of a tree. Trees are living organisms that fail in ways that the arboriculture industry does not fully understand. Conditions are often hidden within trees and below ground. Unless otherwise stated, observations have been visually assessed from ground level. Bowden Tree Consultancy cannot guarantee that a tree will be healthy or a low risk of harm under all circumstances, or for a specified period of time. Likewise, remedial treatments cannot be guaranteed.

5.12 Treatment, pruning and removal of trees may involve considerations beyond the scope of Bowden Tree Consultancy's service, such as property boundaries and ownership, disputes between neighbours, sight lines, landlord-tenant matters and other related incidents. Bowden Tree

Consultancy cannot take such issues into account unless complete and accurate information is given prior or at the time of the site inspection. Likewise, Bowden Tree Consultancy cannot accept responsibility for the authorisation or non-authorisation of any recommended treatment or remedial measures undertaken.

5.13 In the event that Bowden Tree Consultancy recommends retesting or inspection of trees at stated intervals, or installs any cable/s, bracing systems and support systems, Bowden Tree Consultancy must inspect the system installed at intervals of not greater than 12 months, unless otherwise specified in written reports. It is the client's responsibility to make arrangements with Bowden Tree Consultancy to conduct the re-inspection.

5.14 Trees can be managed, but they cannot be controlled. To live or work near a tree involves a degree of risk. 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 with the whole written report. If this written report is to be used in a court of law, or any other legal situation, Bowden Tree Consultancy must be advised in writing prior to the written assessment being presented in any form to any other party.

5.15 Business Details

5.16 Bowden Tree Consultancy®
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5.17 Literature Cited

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5.19 Lilly, S., Matheny, N. & Smiley, E., (2011). *Best Management Practices - Tree Risk Assessment*, Champaign, IL: International Society of Arboriculture

5.20 Mattheck, C. & Breloer, H. (1994). *The Body Language of Trees - A Handbook for Failure Analysis*. London, England: The Stationery Office.

5.21 Standards Australia, (2007). *AS4373-2007 Pruning of Amenity Trees*, Sydney: SAI Global