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**6th. January 2025**

**Director of Administration**
**Kwoorabup Nature School**
**2 Inlet Drive**
**Denmark**
**WA, 6333**

Attention: Zoe Car,

**Tree Risk Assessment:**

**Large Karri Tree – Southwest Corner of Fenced Off School Grounds, Kwoorabup Nature School, Inlet Drive, Denmark, 6333**

**Report Reference No.: R303**

On 16/12/2024 we received an email from Zoe Car requesting that we undertake a risk assessment and report on the medium-large sized karri tree, with a history of limb failure, located close to the southwest corner of the fenced in area of the Kwoorabup Nature School grounds in Denmark, WA.

The author visited the site and carried out a Visual Tree Assessment (VTA) on the tree on 18/12/2024.

At his VTA the tree was assessed, measured, and photographed by the author.

The tree was visually inspected from the ground only; the condition of the tree and the risk of partial and/or complete failure of the tree was assessed.

No aerial inspection of any of the trees was undertaken.

This report reflects the condition of the tree as found on the day of inspection (18/12/2024). Any changes to site conditions or surroundings, such as subsequent occurrence of severe weather conditions, construction and/or landscape works, may alter the findings of the report.

The report is based on the inspection and the material available at the time of inspection. No past architect's/engineer's drawings, planning applications, planning consents and conditions, or drainage plans were made available. It is possible that the contents of such documents may directly affect the findings and recommendations of this report.

At the VTA observations for the tree were recorded. The tree was assessed against the following criteria:

*Size* – The size of each tree surveyed relative to the growth potential of the species.

*Form* – The shape and balance of the stem and canopy relative to that typical for the species and stage of maturity.

*Structure* - Physical stem, branch, and canopy structure in terms of current stability and the ability to further develop structural stability.

*Vigour* - The capacity of the tree to put on strong healthy growth and its capacity for survival.

*Disease* - The presence of disease in the tree to the extent that it was obvious to the observer and having the capacity if present to detrimentally affect the stability of the tree at the time of the survey or in the future.

*Defects* - The presence of any observable stem and large diameter (>15cm) branch defects.

*Damage* - Evidence of any physical, mechanical and or environmental damage.

*Condition* - The overall condition of the tree.

At the VTA the tree was identified to species level and described; a Quantified Tree Risk Assessment (QTRA) was caried out, and considerations for recommended essential risk reduction works were formulated.

The location of the tree in relation to surrounding above ground infrastructure is depicted in Attachment 1 below.

Data recorded for the tree at the VTA are presented in Attachment 2 below.

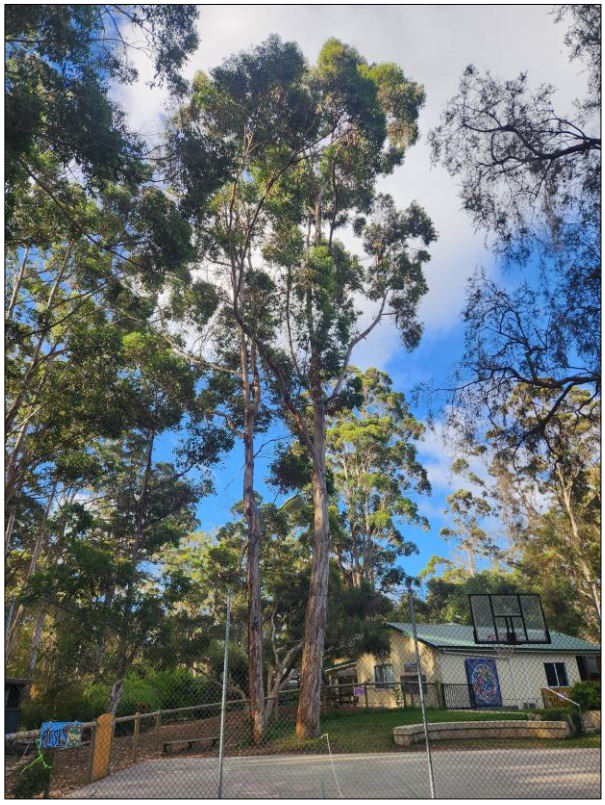


Fig.1 - View of the tree #G01C (left) and tree #G01D (right) from the west showing location relative to high value targets.
(Photo taken 18/12/2024).

Fig.2 - View of the tree #G01D (tree #G01C is obscured behind) from the south showing the relative location of the tree in relation to targets.
(Photo taken 18/12/2024).

## Quantified Tree Risk Assessment

The widely used Quantified Tree Risk Assessment Limited (QTRA) hazard rating system was used to assess the risk of failure posed by trees on the sites surveyed on the day of the author's VTA.

The QTRA system rates three components of the tree hazard analysis into several ranges

- ***Target -*** The nature of the land-use beneath or adjacent to a tree usually informs the level and extent of risk assessment to be carried out. In the assessment of targets, six ranges of value are available.

- ***Size*** of part most likely to fail. The QTRA method categorises size by the diameter of tree stems and branches into 4 ranges.

- ***Probability of Failure*** (PoF) of all or part of the tree. In the QTRA assessment, the probability of tree or branch failure within the coming year is estimated and recorded as a range of value from 1 to 7.

The QTRA output is termed the Risk of Harm and is a combined measure of the likelihood and consequences of tree failure, considered against the baseline of a lost human life within the coming year.

The Tolerability of Risk (ToR) framework adopted by the QTRA system is a widely accepted approach to reaching decisions on whether risks are broadly acceptable, unacceptable, or tolerable.

The ToR framework used by the QTRA system is summarised as having three regions of tolerance:

1. A **Broadly Acceptable Region** where the upper limit is an annual risk of death ≤1/1,000,000.
2. A **Tolerable Region** within which the tolerability of a risk will be dependent upon the costs and benefits of risk reduction. In the Tolerable Region, we must ask whether the benefits of risk control are enough to justify their cost (ALARP).
3. An **Unacceptable Region** for which the lower limit is 1/1,000

In the ToR framework adopted by the QTRA; a Risk of Harm that is less than 1/1,000,000 is Broadly Acceptable and is therefore already As Low As Reasonably Practicable (ALARP).

A Risk of Harm 1/1,000 or greater is unacceptable and will not ordinarily be tolerated.

Between these two values, the Risk of Harm falls into the Tolerable Region of ToR and will be tolerable if it is ALARP.

In the Tolerable Region, management decisions must be informed by consideration of the costs and benefits of risk control, including the nature and extent of those benefits provided by trees, which would be lost to risk control measures.

To effectively manage the risks posed by the potential for trees to fail, the Tolerable Region can be further broken down into two sections.

- From 1/1,000,000 to less than 1/10,000, the Risk of Harm will usually be tolerable providing that the tree confers ‘average benefits’ as discussed in the AQTF Practice Note (see attached QTRA Practice Note).

- As the Risk of Harm approaches 1/10,000 it will be necessary for the tree manager to consider in more detail the benefits provided by the tree and the overall cost of mitigating the risk.

A Risk of Harm in the Tolerable Region but 1/10,000 or greater will not usually be tolerable where it is imposed on others, such as the public, school pupils, staff and parents, and if retained, will require a more detailed consideration of ALARP.

In exceptional circumstances a tree owner might choose to retain a Risk of Harm that is 1/10,000 or greater. Such a decision might be based on the agreement of those who are exposed to the risk, or perhaps that the tree is of great importance. In these circumstances, the prudent tree manager will consult with the appropriate stakeholders whenever possible.

Fig.3 – Photo of the branch that failed and fell into the target area of tree #G01D on 26/11/2024.
(Photo provided by Kwoorabup Nature School by email on 17/12/2024).

Attachment 3 below is an excerpt from the QTRA Practice Note V5.2.4(AU)2019-01. This is a schematic matrix which gives advice to managers on when it is necessary to implement control measures appropriate to the degree of risk posed by a hazard vs the level of tolerance to risk broadly acceptable to society.

In the context of **trees located on school grounds**, the risk being managed is always an imposed risk **(risk is imposed on the school pupils, parents, visitors, contractors and staff),** and the amber region would therefore be used in the same way as the red region, although risk controls for amber would usually have a lower priority.

The same colour coding indicating QTRA thresholds of tolerance in Table 4 (Attachment 3) are used to indicate the author's assessed QTRA thresholds of tolerance for the tree surveyed for this report (see Table 1 below).

For a detailed explanation and overview of the methodology behind and how the QTRA system is applied please find attached with this report the current version of the Quantified Tree Risk Assessment Practice Note.

**Risk of Harm (the risk is imposed):**

– *The trees surveyed for this report (tree #G01C and #G01D) were assessed to be in the **Unacceptable Range (when imposed on others if ALARP)** for the risk posed to pedestrians passing under the canopy of the trees, or for people and/or property assets using/occupying space within the target area of failing branches the two tree (see Table 1 below).*

**Table 1.**

| Tree No. | Target | QTR Rating | ALARP Cost (AUD) Calculated 6/1/2025 (£1=AU$2.00) |
|---|---|---|---|
| **G01C** | • In the event of complete tree failure: The area immediately NE of the two trees extending through an arc of +/-60° from the butt of the tree to the NE extending out to a distance of +/- 37m.<br>• In the event of partial tree failure: The area within the combined dripline of the 2x trees (radius ranging from +/-15m to +/-25m in places, extending out from the butt of the trees).<br>• Estimated occupancy rates for the partial tree failure target area were provided by Zoe Car (3-4 hours per school day) | **1/5,000** | **$800.00** |
| **G01D** | | | |

**Risk Reduction**

Parts of the 2x larger trees surveyed (tree #G01C and #G01D) were assessed to be structurally unsound and to pose an elevated risk of failure because of their stressed condition, the propensity for the species to shed limbs, and because of demonstrated repeated historical failure of large diameter (>10cm) branches in the 2x trees. The QTRA rating for the 2x trees, in the opinion of the author, will not be able to be reduced to 1/<1,000,000 over the medium-long term (>5 years) by means of pruning and thus the RoH posed by the trees cannot be maintained at the ***Broadly Acceptable Range*** of the QTRA's framework of ToR without ongoing, timely, and costly remedial pruning works; which in turn is likely to further impact on the condition and integrity of the trees, and is likely to lead to their further decline.

Furthermore, please be advised that tree #G01A, although not as large or mature as trees #G01C and #G01D, was identified to be of the same species and was observed to be growing under similar suboptimal conditions and displayed symptoms of suppression and stress. As mentioned elsewhere in this report Karri trees, due to their habit of shedding limbs and their potential to grow very large in size, are not suitable for sites with high target area occupation rates such as where this tree was located.

Tree #G01A, in the opinion of the author, will probably mature into a specimen that will have an above average tendency to shed large diameter branches, and in future is

likely to pose a RoH rating that will fall into the ***Unacceptable Range*** of the QTRA's framework of ToR.

**Statement of Disclosure**

The owners of Greenman Trading Company and their employees specialise in the management of trees and use their qualifications, education, knowledge, training, and experience to examine trees, recommend measures to enhance the aesthetics and health of trees, and attempt to reduce the risk of harm posed by trees. Clients may choose to accept or disregard the assessment and recommendations of and report.

Greenman Trading Company cannot detect every condition that could possibly lead to the structural failure in trees. Trees are living organisms that fail in ways the arborist cannot always identify. Conditions are often hidden within trees and below ground. Greenman Trading Company cannot guarantee that a tree will be healthy or safe under all circumstances, or for a specified period. Likewise, remedial treatments cannot be guaranteed.

Treatment, pruning, and removal of trees may involve considerations beyond the scope of the services provided by Greenman Trading Company. These may include property boundaries and ownership disputes between neighbours, sight lines, landlord-tenant matters, etc. Greenman Trading Company does not take such issues into account unless complete and accurate information is disclosed.

Greenman Trading Company does not accept responsibility for the authorization or non-authorization of any recommended treatment or remedial measures.

Should you have any queries please do not hesitate to contact us.

Yours sincerely,

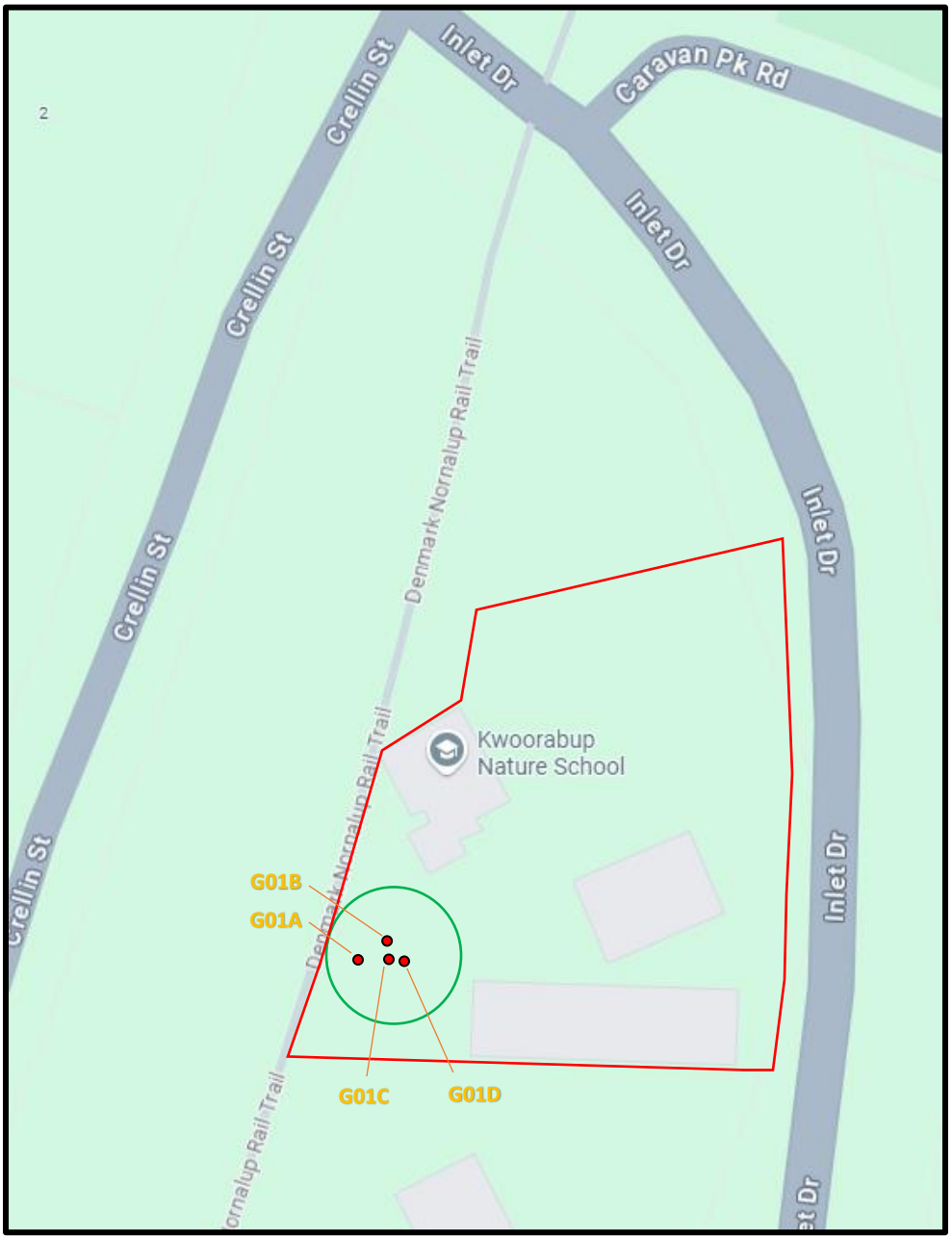
Albert Adams

*Certified Arborist*

FDSc. Arboriculture (Uni. Central Lancs., UK)
Advanced Dip. Nature Conservation (Cape Peninsula Uni. of Tech., ZA)
Cert. III Hort. (Arboricultural Trades Person)
Cert. IV Workplace Assessment and Training
Quantified Tree Risk Assessment Licensee (No.2377)

***Attachment 1***

## **Site Plan** (not to scale) **– Kwoorabup Nature School, Denmark, WA**




**Google Maps**

| Key | |
|---|---|
| ● | Approximate location of the 2x karri trees surveyed for this report |
| ○ | Approximate extent of the combined canopy of the 2x trees surveyed for this report |
| ——— | Approximate extent of fence line enclosing school grounds |
| No. | Tree Number (trees numbered/surveyed for this report) |

***Attachment 2***

## Visual Tree Assessment

(Trees Assessed on 18/12/2024)

| Tree No. | Species | Common Name | Observations | Approx. Height (m) | DBH (m) | Approx. Canopy Diameter (m) and alignment at widest point |
|---|---|---|---|---|---|---|
| G01A | *Eucalyptus diversicolor* | Karri | • Relatively small specimen for the species<br>• Shaded and supressed in condition by surrounding dominant specimens<br>• Species not suitable to site (potential to grow to large size and propensity to for mature trees to shed limbs)<br>• RoF not assessed | 18 | 0.34 | 8 |
| G01B | *Melaleuca spp.* | Paperbark species | • Small tree<br>• Shaded by surrounding closely spaced dominant trees.<br>• Phototrophic leaning NE<br>• RoF not assessed | 6 | 5x stems range 0.11 to 0.17 | 8 |
| G01C | *E. diversicolor* | Karri | • Medium size specimen for the species with potential to grow to a much larger size.<br>• Upright (excurrent) growth form – typical for the species when grown at high density in competition with surrounding trees for light.<br>• Lean north.<br>• Supressed and with relatively poor form and structure.<br>• Bifurcation at +/-18m above ground level (2-3 subdominant leaders).<br>• Canopy contained an above average amount of small diameter dead wood, no large diameter (>10cm) dead wood observed.<br>• Displayed suboptimal foliar density. | 25 | 0.47 | 15 (W-E) |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | | • Tree displayed symptoms of being stressed – epicormic shoots along stems.<br>• Species not suitable to sites with high density of targets (occupants, pedestrians and high value assets)<br>• The probability of large dimeter limb failure (+/-10cm) assessed to be high over the short-medium term (<5 years). | | | |
| G01D | *E. diversicolor* | Karri | • Medium-large size specimen for the species with potential to grow to a much larger size.<br>• **Displayed substantial evidence of repeated historical large diameter (>10cm diameter) branch failure.**<br>• Upright (excurrent) growth form – typical for the species when grown at high density in competition with surrounding trees for light.<br>• Slight lean northeast.<br>• Poor form and structure – evidence of historical loss of dominant leader at +/-20m above ground level.<br>• Crown break at +/-15m above ground level (2-3 subdominant leaders).<br>• Canopy contained dead wood.<br>• Tree displayed symptoms of being stressed – epicormic shoots along stems.<br>• Displayed suboptimal foliar density.<br>• Species not suitable to sites with high density of targets (occupants, pedestrians and high value assets).<br>• The probability of large dimeter limb failure (+/-10cm) assessed to be high over the short term (<2 years). | 37 | 0.705 | 25 (SW-NE) |

*Attachment 3*

## Table 4. QTRA Advisory - Risk Thresholds

| THRESHOLDS | DESCRIPTION | ACTION |
|---|---|---|
| | **UNACCEPTABLE**<br>Risk will not ordinarily be tolerated. | • Control the risk. |
| 1/1,000 | | |
| | **UNACCEPTABLE**<br>(where imposed on others) Risk will not ordinarily be tolerated. | • Control the risk.<br>• Review the risk. |
| | **TOLERABLE**<br>(by agreement)<br>Risk may be tolerated if those exposed to the risk accept it, or the tree has exceptional value. | • Control the risk unless there is broad stakeholder agreement to tolerate it, or the tree has exceptional value |
| 1/10,000 | | |
| | **TOLERABLE**<br>(where imposed on others) Risks are tolerable if ALARP | • Assess cost and benefits of risk control.<br>• Control the risk only where a significant benefit might be achieved at reasonable cost.<br>• Review the risk. |
| 1/1,000,000 | | |
| | **BROADLY ACCEPTABLE**<br>Risk is already ALARP | • No action currently required.<br>• Review the risk. |

***Attachment 4***

## Glossary of Terms

| | |
|---|---|
| ALARP: | As Low As Reasonably Practicable |
| Basal: | At or near ground level. |
| Callus Tissue: | Callus tissue is plant tissue which develops over the wound surface or parts of it in vigorous trees. |
| Compartmentalization: | The confinement of disease, decay or other dysfunction within an anatomically discrete region or plant tissue. |
| Dripline: | The area directly located under the outer circumference of the tree branches. |
| Ordinary Target Area | Area below the canopy of the tree or the area directly in the path of a failing tree under the force of gravity. |
| Phototrophic: | Growth in response to a light stimulus. Trees will generally grow towards sunlight and not towards a shaded area. |
| Probability: | A statistical measure of the likelihood of occurrence of an event. |
| PoF: | Probability of Failure. |
| QTRA: | Quantified Tree Risk Assessment |
| RoH: | Risk of Harm |
| Small Diameter DW: | Deadwood of a diameter < 25mm; unlikely to cause significant harm on impact below. |
| Large Diameter DW: | Deadwood of a diameter > 25mm; likely to cause significant harm on impact below. |
| Long Term: | Period >5 years from date of event |
| Medium Term: | <5 years from date of event |
| Short Term: | <2 years from date of event |
| Stress: | A condition under which one or more physiological functions are not operating within their optimum range. |
| Structural Root Zone: | The area around the base of a tree required for the tree's stability in the ground. |
| Targets: | Property, or other things (including human life) of value which might be harmed by failure of the tree or by objects falling from it. |
| ToR: | The Tolerability of Risk framework adopted by the QTRA system |
| VTA: | Visual Tree Assessment |
| Veteran Tree: | A tree that has reached full maturity and is in decline and which often represents great cultural, landscape and nature conservation value. |
| Vigour: | The current capacity to produce and display energetic active, growth. |
| Vitality: | The overall health and capacity for survival. |