Tree Management Strategies

Tree Risk Assessment

4 INMAN RD, CROMER
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Contents

Summary

Tree Management Strategies have been commissioned by Roderick Ward to provide a Tree Risk Assessment for thirteen trees located at 4 Inman Road, Cromer, refer to (Figure 1).

On the 20-4-23 a visual tree assessment was conducted. The QTRA method was employed to assess individual trees that could potentially impact people or property. The observations are explored below.

This report aims to:

- Assess thirteen trees and their potential to impact people or property.
- Identify, tag and recommend mitigation measures for trees posing a risk to property or human safety.

The observations are explored in the Discussion/Results (Section 3) and shown in the Tree Data Schedule (Appendix 1) of this report.

Conclusions

Trees 65, 71, 77 and 78 currently have an unacceptable risk to people following the developments construction and require remediation works to reduce the risk to an acceptable level.

Trees 66, 70, 75 and 76 will have an unacceptable risk to people following the developments approval and are recommended for removal.

Trees 67 and 69 have a tolerable risk to people following the developments approval, however, require remediation works to reduce the risk to an acceptable level.

Trees 72 and 73 have a broadly acceptable risk to people, however, are given a low retention value due to their age health and position in the landscape. Trees 72 and 73 are recommended for removal to facilitate the new landscaping plan.

Tree 74 has no risk presuming normal weather conditions.

Recommendations

Remove Tree 66, 70, 72, 73, 75 and 76. Tree removal work to be undertaken in accordance with the relevant Australian Standard for the Pruning of Amenity Trees, using a qualified Arborist (minimum Australian Qualification Framework (AQF3) Level Arborist).

The remediation works shown in the Tree Data Schedule (Appendix 1) are recommended for Trees 65, 67, 69, 71, 77 and 78 to reduce their risk to an acceptable level.

1. Introduction

Tree Management Strategies have been commissioned by Roderick Ward to provide a Tree Risk Assessment for thirteen trees located at 4 Inman Road, Cromer, refer to (Figure 1).

Tree Management Strategies uses Quantified Tree Risk Assessment (QTRA) as the method for assessing tree risk, refer to (Section 2) of this report. A QTRA assessment is based on a twelve-month assessment period considering normal weather conditions.

The Target Range or frequency of areas used has been estimated in conjunction with the client as a Target 1 which correlates to an occupied space of 2.5 hours per day averaged over 365 days a year.

This report aims to:

- Assess thirteen trees and their potential to impact people or property.
- Identify, tag and recommend mitigation measures for trees posing a risk to property or human safety.

Figure 1: Subject Site Highlighted in Red, Study Area Highlighted in Green

2. Method

2.1 Quantified Tree Risk Assessment

Tree risk management is a matter of balancing the risk of harm from falling trees, with the benefits of trees. Although it may seem counter intuitive, the condition of the trees should not be the first consideration. The first consideration should be to the usage of land on which the trees are located. The risk from falling trees/branches only exists if there is potential for tree failure, and potential for harm to result.

The risks from falling trees are usually very low and high risks will only be encountered in areas with high levels of human occupancy or with valuable property/assets. The Quantified Tree Risk Assessment (QTRA) method enables a range of approaches from broad assessment of large collections of trees to, where necessary, the detailed assessment of an individual tree.

Being able to establish a time frame as to when a person(s) or property (or both) is in a particular area for a period of time will assist with calculating an average amount of time a person(s) or property (or both) are exposed to risks in that area. Knowing the risk a person(s) or property (or both) are exposed to and the consequences of harm from that risk and subsequently, the probability of that risk to cause harm, can be used to quantify the likelihood of risk of harm. It is never to set out to remove all risks in the community, but to manage risks within broadly acceptable thresholds set by the community and to be able to justify the cost of managing those risks.

Quantified tree risk assessment (QTRA) methodology establishes these risks of harm and sets them against a threshold of what is an acceptable risk of harm and what is not, in relation to tree or part of tree failure. It is this methodology that the tree assessments have been evaluated against for this project.

Assessments were undertaken by walking the area and inspecting each tree by a visual tree assessment (VTA).

“Using a comprehensive range of values (See Tables 1, 2 & 3. QTRA enables the tree assessor to identify and analyse the risk from tree failure in three key stages. 1) To consider land-use in terms of vulnerability to impact and likelihood of occupation. 2) To consider the consequences of an impact, taking account of the size of the tree or branch. 3) To estimate the probability that the tree or branch will fail onto the land-use in question. Having estimated values for these components, the assessor can use the QTRA manual calculator or software application to calculate an annual Risk of Harm from a tree.

2.1.1 Establishing the Target Range

The targets were established in consultation with the contact officer and other staff with firsthand knowledge of who and what the potential targets were of the site and the level of time that areas are being used in a range of weather conditions. This consultation assisted with determining:

- Number of users in areas of the site and their duration in these areas;
- Areas on the sites of high volume and traffic;
- Buildings and infrastructure that sit beneath overhanging trees;
- Particular trees that have been noted as requiring particular attention;
- Volumes of vehicle traffic and car parking locations, times these areas are used and in what weather conditions they are generally used; and
- Areas on the sites of infrequent use.

Table 2, shows the target ranges and variety of targets for the QTRA calculations

Table 2. Targets

Target Range	Property (repair or replacement cost)	Human (not in vehicles)		Vehicle Traffic (number per day)	Ranges of Value (probability of occupation or fraction of $2 850 000)
1	$2 850 000 – >$285 000 (£1 500 000 – >£150 000)	**Occupation:**	Constant – 2.5 hours/day	26 000 – 2 700 @ 110kph (68mph) 32 000 – 3 300 @ 80kph (50mph) 47 000 – 4 800 @ 50kph (32mph)	1/1 – >1/10
		Pedestrians & cyclists:	720/hour – 73/hour		
2	$285 000 – >$28 500	**Occupation:**	2.4 hours/day – 15 min/day	2 600 – 270 @ 110kph (68mph) 3 200 – 330 @ 80kph (50mph) 4 700 – 480 @ 50kph (32mph)	1/10 – >1/100
		Pedestrians & cyclists:	72/hour – 8/hour		
3	$28 500 – >$2 850	**Occupation:**	14 min/day – 2 min/day	260 – 27 @ 110kph (68mph) 320 – 33 @ 80kph (50mph) 470 – 48 @ 50kph (32mph)	1/100 – >1/1 000
		Pedestrians & cyclists:	7/hour – 2/hour		
4	$2 850 – >$285	**Occupation:**	1 min/day – 2 min/week	26 – 4 @ 110kph (68mph) 32 – 4 @ 80kph (50mph) 47 – 6 @ 50kph (32mph)	1/1 000 – >1/10 000
		Pedestrians & cyclists:	1/hour – 3/day		
5	$285 – >$29	**Occupation:**	1 min/week – 1 min/month	3 – 1 @ 110kph (68mph) 3 – 1 @ 80kph (50mph) 5 – 1 @ 50kph (32mph)	1/10 000 – >1/100 000
		Pedestrians & cyclists:	2/day – 2/week		
6	$29 – $2	**Occupation:**	<1 min/month – 0.5 min/year	None	1/100 000 – 1/1 000 000
		Pedestrians & cyclists:	1/week – 6/year		

Vehicle, pedestrian and property Targets are categorised by their frequency of use or their monetary value. The probability of a vehicle or pedestrian occupying a Target area in Target Range 4 is between the upper and lower limits of 1/1 000 and >1/10 000 (column 5). Using the VOSL $2 850 000, the property repair or replacement value for Target Range 4 is $2 850- >$285.

These site assessments took into account a variety of factors, including the number of users of the area, amount of time spent in these areas and usage during extreme weather conditions, where it is anticipated the target number would be reduced due to inclement weather conditions and the target number was then reduced to reflect the possible number of users of this area/zone (eg. camping sites during summer holiday periods). Where this number was not likely to be reduced, then the target number reflected the unchanged number of users of this area. The trees in these areas were then assessed against the QTRA methodology to establish the potential risk of harm.

Where the target was property, then the target range was set against the maximum cost of damage that could be caused by the failed tree or part thereof.

2.1.2 Establishing the Size Range

The size range was determined by the size of the tree or part of the tree that was being assessed. The size range is shown in Table 1.

Table 1, shows the size ranges and the range of probability for the QTRA

Table 1. Size

Size Range	Size of tree or branch	Range of Probability
1	> 450mm (>18") dia.	1/1 - >1/2
2	260mm (10½") dia. - 450mm (18") dia.	1/2 - >1/8.6
3	110mm (4½") dia. - 250mm (10") dia.	1/8.6 - >1/82
4	25mm (1") dia. - 100mm (4") dia.	1/82 - 1/2 500

* Range 1 is based on a diameter of 600mm.

2.1.3 Establishing the probability of failure

The probability of failure range was established by means of a visual tree assessment.

“Often the nature of a structural weakness in a tree is such that the probability of failure is greatest during windy weather, while the probability of the site being occupied by people during those weather conditions is often low.” “This reduction in occupation during windy weather may be less so in warmer climates but will have some effect in most situations.”

The nature of fire damage to trees can also structurally weaken areas of the tree that increase the likelihood of tree or parts of tree failure. Fire damaged defects within a tree can prove difficult to identify through a visual tree assessment (VTA). The assessment then requires an experienced arborist with fire damaged trees who can assist with identifying areas within the tree that may have been structurally weakened by the fire and can then provide a consistent approach to the overall risks identified in the landscape.

Although it is noted that trees pose a greater risk of harm during extreme weather conditions/inclement weather conditions, fire damaged trees also pose a greater risk of harm during normal weather conditions than non-fire damaged trees. For these reasons, all trees that have potential to fail onto a readily used area or property should be assessed for defects, vitality and suitability for normal/general weather conditions through to extreme weather conditions.

The vitality and suitability of the tree will assist with calculating the stress that defects have on the structural stability of the individual branch/tree. In doing so, this will assist with providing a probability of failure for the QTRA component for normal and or extreme weather conditions, and provide details for the manager to assist with reducing potential costs of issues in the future. For this, each tree has been assessed using a visual tree assessment (VTA) and then the defect used to assist with establishing the probability of harm.
The QTRA probability of failure range is set on a scale rating from one (1) to seven (7). Where 7 is calculated to have a probability of failure of 1/1 000 000, and is deemed to be as low as reasonably practicable, meaning there is no evidence found to undertake any work to reduce the risk of harm as the threshold is already set at an acceptable threshold of 1/1 000 000. Conversely, the probability of failure rating of 1 is set for those failures that would be likely to occur within 12 months of the assessment. These can be described as having a 1/1 probability of failure. The probability of failure range is then set between the ranges 1-7, as shown in Table 3.

Table 3. Probability of Failure

Probability of Failure Range	Probability
1	1/1 - >1/10
2	1/10 - >1/100
3	1/100 - >1/1 000
4	1/1 000 - >1/10 000
5	1/10 000 – >1/100 000
6	1/100 000 – >1/1 000 000
7	1/1 000 000 – 1/10 000 000

The probability that the tree or branch will fail within the coming year.

Table 3, shows the probability of Failure

2.1.4 Risk of Harm

The information from the assessments was taken and put into the QTRA calculator. The probability of risk of harm from each entry was given a calculated score from 1/1 to 1/1 000 000 and a colour code that allows for the bell curve from the Monte Carlo Simulations.

"The risk of harm for all possible combinations of target, size and probability of failure ranges has been calculated using Monte Carlo simulations. QTRA risk of harm is a mean value from each set of Monte Carlo results. In QTRA version 5, the risk of harm should not be calculated without the manual calculator or software application." The colour index reflects where the probability calculation of the risk of harm sits on the mean curve. The colour index is as set out in the QTRA advisory risk thresholds.

Table 3, shows the QTRA Advisory Risk Thresholds

Table 4. QTRA Advisory Risk Thresholds

Thresholds	Description	Action
	Unacceptable Risks will not ordinarily be tolerated	• Control the risk
1/1 000	**Unacceptable** (where imposed on others) Risks will not ordinarily be tolerated	• Control the risk • Review the risk
	Tolerable (by agreement) Risks 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 • Review the risk
1/10 000	**Tolerable** (where imposed on others) Risks are tolerable if ALARP	• Assess costs and benefits of risk control • Control the risk only where a significant benefit might be achieved at reasonable cost • Review the risk
1/1 000 000	**Broadly Acceptable** Risk is already ALARP	• No action currently required • Review the risk

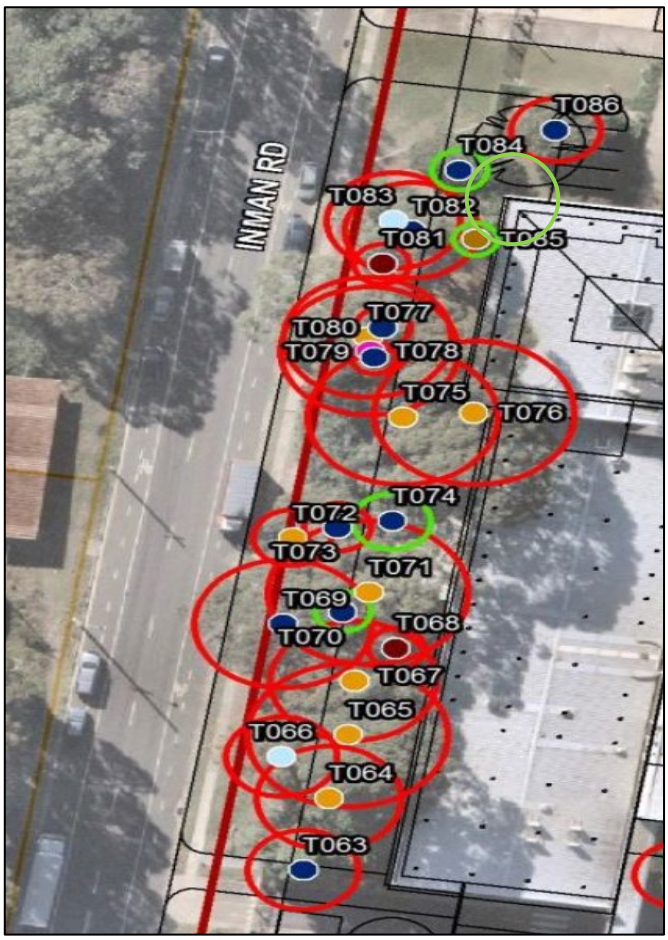
3. Discussion/Results

On the 20-4-23 a visual tree assessment was conducted. The QTRA method was employed to assess individual trees that could potentially impact people or property. The observations are explored below.

The tree data collected for thirteen trees assessed is shown in the Tree Data Schedule (Appendix 1).

Thirteen trees were individually tagged and numbered. The tree numbering coincides with the Tree Assessment Report prepared by Travers bushfire and Ecology dated the 10-8-18, refer to (Figure 2).

Figure 2: Tree Locations



Trees 65, 71, 77 and 78 have an unacceptable risk to people following the developments approval and require remediation to reduce the risk to an acceptable level, refer to the Tree Data Schedule (Appendix 1).

Trees 66, 70, 75 and 76 have an unacceptable risk to people following the developments approval and are recommended for removal, refer to the Tree Data Schedule (Appendix 1).

Trees 67 and 69 have a tolerable risk to people following the developments approval, however, require remediation to reduce the risk to an acceptable level, refer to the Tree Data Schedule (Appendix 1).

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Tree 74 has no risk presuming normal weather conditions.

4. Conclusions & Recommendations

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Recommendations

Remove Tree 66, 70, 72, 73, 75 and 76. Tree removal work to be undertaken in accordance with the relevant Australian Standard for the Pruning of Amenity Trees, using a qualified Arborist (minimum Australian Qualification Framework (AQF3) Level Arborist).

The remediation works shown in the Tree Data Schedule (Appendix 1) are recommended for Trees 65, 67, 69, 71, 77 and 78 to reduce their risk to an acceptable level.

5. References

- Shigo, A., 1986, A New Tree Biology and Dictionary: facts, photos, and philosophies on trees and their problems and proper care, Snohomish, WA
- Harris, R., Clark, J., Matheny, N., 2003, Integrated Management of Landscape Trees, Shrubs, and Vines, fourth edition, Prentice Hall, Australia
- IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS), Institute of Australian Consulting Arboriculturists, Australia, www.iaca.org.au
- Mattheck, C., Lonsdale, D. and Breloer, H. (1994). *The body language of trees*.
- Quantified Tree Risk Assessment (2015) *Practice Note v5.*

6. Appendices

Appendix 1: Tree Data Schedule

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APPENDIX 1 – TREE DATA SCHEDULE

Tree No	Genus-species	Common Name	DBH metres (radius) Breast Ht	Height Metres	Age Young Semi-Mature Mature Over Mature	Canopy Spread (Metres) (radius)	Health Good Fair Fair/Poor Poor Dead	Condition Good Fair Fair/Poor Poor Failed	Retention Value High Low Medium	Target Pedestrian Property Occupation	Target Range 1-6	Size Range 1-4	Probability of Failure 1-7	Risk Index 1-6	Risk of Harm Unacceptable Tolerable Broadly acceptable	Observations / Actions	Photo
65	*Eucalyptus botriodes*	Bangalay	90-100	15-20	Mature	8-10	Good	Fair	Medium	Occupation	1	4	2	1/5000	Unacceptable	Tree has deadwood and a failed branch overhanging proposed childcare facility. Tree has extension growth and branch end weight overhanging proposed childcare facility. Look to remove deadwood, failed branch and monitor extension growth and branch end weight annually.	
66	*Eucalyptus seiberi*	Silvertop Ash	40-50	10-15	Mature	4-6	Very Poor	Very Poor	Low	Occupation	1	4	2	1/5000	Unacceptable	Tree is in severe decline with deadwood, decay and reduction of canopy foliage. Tree is not suitable for incorporation with proposed development. Remove tree.	
67	*Eucalyptus botriodes*	Bangalay	70-80	15-20	Mature	>10	Fair	Fair/Poor	Medium	Occupation	1	4	3	1/50,000	Tolerable	Tree has deadwood overhanging proposed childcare facility. Tree has extension growth and branch end weight overhanging proposed childcare facility. Look to remove deadwood, and reduce branch end weight by 10-15%. Monitor tree heath, structure and vitality annually.	
69	*Eucalyptus saligna*	The Sydney Blue Gum	80-90	15-20	Mature	>10	Fair	Fair	Medium	Occupation	1	4	3	1/50,000	Tolerable	Tree has deadwood overhanging proposed childcare facility. Tree has extension growth and branch end weight overhanging proposed childcare facility. Look to remove deadwood and monitor extension growth and branch end weight annually.	

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70	*Leptospermum petersonii*	Lemon-Scented Tea Tree	20-30	5-10	Over-Mature	2-4	Fair/Poor	Very Poor	Low	Occupation	1	4	2	1/5000	Unacceptable	Tree is in severe decline with deadwood, decay and reduction of canopy foliage. Tree is not suitable for incorporation with proposed development. Remove tree.	
71	*Eucalyptus botriodes*	Bangalay	80-90	15-20	Mature	>10	Fair	Fair	Medium	Occupation	1	3	3	1/5000	Unacceptable	Tree has deadwood overhanging proposed childcare facility. Tree has extension growth and branch end weight overhanging proposed childcare facility. Look to remove deadwood and reduce branch end weight by 10-15%. Monitor tree heath, structure and vitality annually.	
72 73	*Melaleuca bracteata*	Black Tea-Tree	30-40	5-10	Mature	2-4	Fair	Fair/Poor	Low	Occupation	1	4	5	1/1000,000	Broadly acceptable	Trees pose minimal risk by the proposed childcare development, however, are recommended for removal to facilitate the new landscaping plan. Remove trees.	
74	*Draceana marginata*	Madagascar Dragon Tree	50-60	5-10	Mature	2-4	Fair	Fair	Medium	Occupation	1	4	6	1/1000,000	Broadly acceptable	No risk observed presuming normal weather conditions. No action.	

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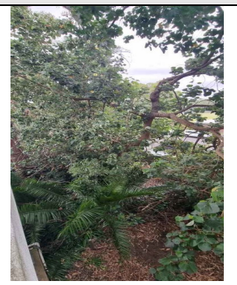
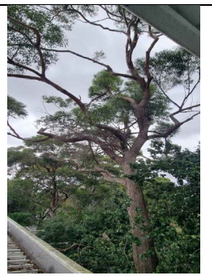
75	*Hibiscus tiliacious*	Sea Hibiscus	60-70	5-10	Mature	>10	Fair	Very Poor	Low	Occupation	1	4	2	1/5000	Unacceptable	Tree has deadwood overhanging proposed childcare facility. Tree has extension growth and branch end weight overhanging proposed childcare facility. Tree has multiple failed branches to 200mm in size. The structure and stability of Tree 75 cannot be guaranteed and has an unacceptable risk to the proposed childcare development. Remove tree.	
76	*Eucalyptus botriodes*	Bangalay	50-60	15-20	Mature	8-10	Fair	Very Poor	Low	Occupation	1	3	3	1/5000	Unacceptable	Tree has deadwood overhanging proposed childcare facility. Tree has extension growth and branch end weight overhanging proposed childcare facility. Tree has multiple failed branches to 200mm in size. The structure and stability of Tree 76 cannot be guaranteed and has an unacceptable risk to the proposed childcare development. Remove tree.	
77 78	*Eucalyptus botriodes*	Bangalay	50-60	15-20	Mature	6-8	Fair	Fair	Medium	Occupation	1	4	2	1/5000	Unacceptable	Trees have deadwood overhanging proposed childcare facility. Trees have extension growth and branch end weight overhanging proposed childcare facility. Look to remove deadwood and monitor extension growth and branch end weight annually.