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Member

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International Society of Arbor.

Local Gov. Tree Resource Assoc.

Preliminary Arboricultural Impact Assessment

Specifications and recommendations for the species, condition and potential viability in relation to the proposed development.

Prepared for
**Ulladulla Civic Centre
Princes Highway,
Ulladulla 2539 NSW**

For the proposed development at
**Shoalhaven City Council
36 Bridge Road
Nowra NSW 2541**

Prepared by
**Warwick Varley
Consulting Arborist**

**Prepared: 20th July, 2012
Reference No: D1988**

CONTENTS

1.0 INTRODUCTION.....	1
2.0 STANDARDS.....	1
3.0 DISCLOSURE STATEMENT.....	2
4.0 METHODOLOGY.....	2
5.0 PLAN 1 – TREE LOCATION TO SITE.....	5
6.0 TABLE 1 – TREE SPECIES DATA.....	6
7.0 TREE PROTECTION.....	14
8.0 PROTECTION SPECIFICATION.....	17
9.0 RECOMMENDATIONS.....	19
10.0 APPENDIX A - DEFINITIONS.....	20
APPENDIX B –PROTECTION MEASURE.....	24
APPENDIX C – Tree no. 14; Assessment.....	25

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1.0 Introduction

- 1.1 The following report has been requested by Wayne Brighton (Project Manager), care of Shoalhaven City Council, for the trees located adjacent to the area of the proposed development of the Ulladulla Civic Centre. An initial Arborist report (Ref. 1845, and dated 2nd November, 2011), being a Resource Evaluation of the site was provided to Shoalhaven City Council in November, 2011. This initial report included only a limited number of trees, in respect to the number which actually exist. This report is a preliminary Arboricultural Impact Assessment, that is it will assess all trees which may be affected by the proposed design, and include recommendations relative to the opportunity for retention in regard to the design and useful life expectancy for each tree.
- 1.2 The final plans which will include grades, sub-surface utilities and other areas that may incur work for the Civic Centre have not been provided to Allied Tree Consultancy, and nor are the surveyed locations of some trees included within this report. A single untitled plan has been provided, however has not been scaled, and is lacking detail. This plan has been utilised as a basis for proposed works, and however the trees recommended for retention/removal and associated measures of protection have been based upon this, these recommendations will change subject to the final proposal.
- 1.3 This report does not include any trees located within the north western car park (behind the Bowling club) and the related modifications which may be also proposed for this area.
- 1.4 This report will address for each tree, the;
 - species identification, location, dimensions and condition;
 - SULE and SRIV rating;
 - impact of the proposed extension and tree in relation to one another;
 - recommendations for the removal, retention and/or pruning;
 - tree protection zones and protection specifications for those trees recommended for retention.
- 1.5 The subject site resides within Ulladulla; therefore, the Shoalhaven City Council is the consenting authority for any tree works recommended within this report.

2.0 Standards

- 2.1 Allied Tree Consultancy provides an ethical and unbiased approach to all assignments, possessing no association with private utility arboriculture or further areas or organisations which may reflect a conflict of interest.
- 2.2 All tree related work outlined in this report is to be in accordance with the appropriate council – Tree Management Policy or equivalent order.

- 2.3 This report must be made available to any contractor during the tendering process, so that any cost associated with the required works for the protection of trees can be accommodated.
- 2.4 **It is the responsibility of the applicant/builder to provide the requirements outlined within this report relative to the Protection Zones, Measures (section 7.0) and Specifications (section 8.0) to all contractors associated with the project before the initiation of work.**
- 2.5 All tree related work outlined in this report is to be conducted in accordance with the:
- Australian Standard – AS4373; “Pruning of Amenity Trees”.
 - NSW Work cover Authority Code of Practice for the Amenity Tree Industry, August 1998; Catalogue No. 034.
 - All tree works must be carried out by a tertiary level (minimum Certificate-level 2) qualified and experienced (minimum 5 years) arboriculturist.
 - For any works within the vicinity of electrical lines, the arboriculturist must possess the ISSC26 endorsement (Interim guild for operating cranes and plant in proximity to overhead powerlines).
- 2.6 All trees recommended for retention within this report, must have as a minimum requirement, the removal of all dead, diseased, and crossing limbs as well as any branch stubs, pruned to the branch collar.
- 2.7 Any tree stock subject to conditions in relation to works carried out to this report must be supplied by a registered Nursery that adheres to the NATSPEC guidelines (Specifying Trees – Ross Clark).
- All tree stock must be of at least ‘Advanced’ size (minimum 75lt) unless otherwise requested.
 - All tree stock requested must be planted with adequate protection. This may include tree guards (protect stem and crown) and if planted in a lawn area, a suitable barrier (planter ring) of an area at least 1m² to prevent grass from growing within the area adjacent to the stem.

3.0 Disclosure Statement

Trees are living organisms and therefore possess natural variability. This cannot be controlled, however trees can be managed. An arborist cannot guarantee that a tree will be safe under all circumstances, nor predict the time when a tree will fail. To live or work near a tree involves some degree of risk and this evaluation does not preclude all the possibilities of failure.

4.0 Methodology

- 4.1 The following tree assessment was undertaken using criteria based upon those guidelines laid down by the International Society of Arboriculture.
- 4.2 The format of the report is composed of:

- 4.2.1 Plan 1; Tree Location Relative to Site:** This is an unscaled plan reproduced from the Site Plan as referenced in Section 4.4; Methodology, Surveyor.
- 4.2.2 Table 1;** This table compiles the species dimensions, condition and brief assessment (history, structure, pest, disease or any other variables subject to the tree) of the tree as referenced within the Plan 1. All measurements are in meters.
- 4.2.3 Tree Protection;** This offers an outline of the proposal in regards to the existing trees and those specific requirements for their retention. This will include the allocation of a Tree Protection Zone (TPZ), Protection Measures and any changes or additions required to the proposed development.
- 4.2.4 Protection Specification;** This section details the requirements of that area designated as the Tree Protection Zone (TPZ), for those trees recommended for retention.
- 4.3** The process involved in compiling information for this assessment involves:
- A site inspection on the 30th July 2012 using the method of Visual Tree Assessment¹.
 - A comprehensive assessment of tree no. 14 (*Ficus rubiginosa*) was conducted and this included removal of debris from the cavity, resonance soundings and further soundings were taken by use of a portable drill and 3mm diameter bit, for the purpose of establishing the proportion of supporting wood retained within the stem. The data extracted from the soundings was used with the 'Wood strength loss ratio' for the purpose of establishing the risk associated by the cavity. This examination also takes into account the drilling resistance, wood consistency, colour and odour.
 - The tree numbering within this report has retained the same sequence as provided within the initial Arborist Report (Resource Evaluation ,Ref. 1845, and dated 2nd November, 2011) to avoid confusion.
 - Raw data from the preliminary assessment including the specimen's dimensions was compiled by the use of a diameter tape, height clinometer, angle finder, compass, steel probes, Teflon hammer, binoculars and recording instruments.
 - Root decay can exist and in some circumstances provide no symptoms of the presence. This assessment responds to all those symptoms provided by a tree, however cannot provide a conclusive

1. Mattheck, C. Breloer, H.
The Body Language of Trees – A handbook for failure analysis
The Stationary Office, London, 1994, page 99

recommendation regarding any tree that may have extensive root decay leading to wind throw.

- All dimensions and grades referenced in this report are interpreted from this plan, including the establishment of the trees location in relation to the proposed development.

Surveyor

Drawn by: **M. Poidevin + J. Perry**

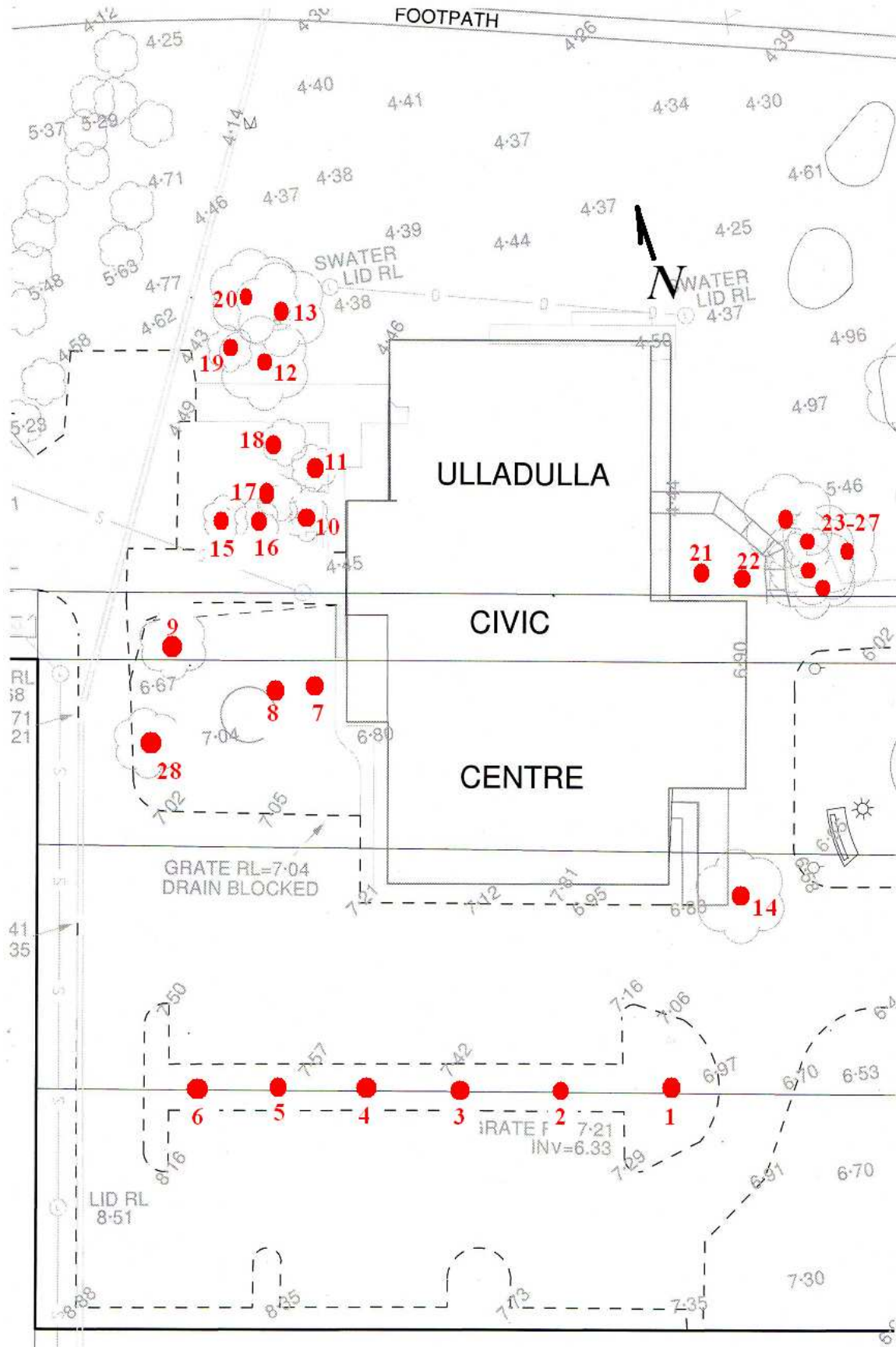
Date: **26th July 2012**

Reference: **53-2012**

Plan .: **Ulladulla Civic Centre.**

Note: Trees no. 1-8, 21 and 22 have been omitted from this survey, however due to the size, have been considered to be required for inclusion within the Arborist report. The location has been plotted onto Plan 1 by Allied Tree Consultancy. Allied Tree Consultancy is not a registered surveyor and however the accuracy of the survey is attempted, the true positions of the trees plotted onto Plan 1 may marginally deviate.

5.0 Plan 1 - Trees relative to site



Not to scale

Source: Adapted from M. Poidevin + J. Perry, dated 26th July 2012, Plan: Ulladulla Civic Centre

6.0 Table 1 – Tree Species Data, Terminology defined in Appendix A.

Tree No.	Botanical Name	Common Name	Height (m)	DBH (m)	Crown Spread (m)	Age	Crown Class	Crown Aspect	Crown Ratio	SRIV Rating	SULE Rating
1	<i>Araucaria columnaris</i>	Cook Pine	5	0.22	4 x 4	Y	D	Sym.	45%	NVG 9	A1
Assessment		This tree, is part of a line planting of six trees (being trees no. 1-6). This tree provides the typical, habit for the species, the inherent lower stem sweep exists, however the upper section of the leader has been broken (most likely storm damage), and new epicomic shoots have initiated growth. The loss of the leader and crown lifting have resulted upon the Live Crown Ratio (45%). This tree poses normal vigour. See section 7.2.2									
Exotic											
2	<i>Araucaria columnaris</i>	Cook Pine	9	0.31	4 x 4	Y	D	Sym.	90%	NVG 9	A1
Assessment		This tree provides the typical, habit for the species, the inherent lower stem sweep exists, however the upper section of the leader has been broken (most likely storm damage) 6m above the ground, and two new leaders have initiated growth. The crown lifting has impacted upon the Live Crown Ratio (90%). This tree poses normal vigour. See section 7.2.2									
Exotic											
3	<i>Araucaria columnaris</i>	Cook Pine	9	0.26	4 x 4	Y	D	Sym.	90%	NVG 9	A1
Assessment		This tree provides the typical, excurrent habit for the species, the inherent lower stem sweep exists. The crown lifting has impacted upon the Live Crown Ratio (90%). This tree poses normal vigour.									
Exotic											
4	<i>Araucaria columnaris</i>	Cook Pine	6	0.28	4 x 4	Y	D	Sym.	50%	NVG 9	A1
Assessment		This tree provides the typical, habit for the species, the inherent lower stem sweep exists, however the upper section of the leader has been broken (most likely storm damage) 6m above the ground, and new epicomic shoots have initiated growth. The crown lifting has impacted upon the Live Crown Ratio (50%). This tree poses normal vigour. See section 7.2.2									
Exotic											

Tree No.	Botanical Name	Common Name	Height (m)	DBH (m)	Crown Spread (m)	Age	Crown Class	Crown Aspect	Crown Ratio	SRIV Rating	SULE Rating
5	<i>Araucaria columnaris</i>	Cook Pine	6	0.28	4 x 4	Y	D	Sym.	90%	NVG 9	A1
Assessment		This tree provides the typical, habit for the species, the inherent lower stem sweep exists, however the upper section of the leader has been broken (most likely storm damage) 6m above the ground, and new epicomic shoots have initiated growth. The predominant foliage is chlorotic indicating predisposed stress, most likely from the lawn covered root zone. The crown lifting has impacted upon the Live Crown Ratio (90%). This tree poses normal vigour. See section 7.2.2									
Exotic											
6	<i>Araucaria columnaris</i>	Cook Pine	9	0.3	4 x 4	Y	D	Sym.	90%	NVG 9	A1
Assessment		This tree provides the typical, habit for the species, the inherent lower stem sweep exists, however the upper section of the leader has been broken (most likely storm damage) 6m above the ground, and two new leaders have initiated growth. The crown lifting has impacted upon the Live Crown Ratio (90%). This tree poses normal vigour. See section 7.2.2									
Exotic											
7	<i>Eucalyptus botryoides</i>	Bangalay	15	0.5 0.51	16 x 6	M	I	Sym.	F	NVF* 9	A2*
Assessment		This tree is indigenous to this specific area, and allowing for the maturity is most likely a remnant planting. Composed of two stems that share a common root crown, the southern stem is ascending and provides the habit typical for the species. Prior pruning to accommodate the Civic Centre has left several branch stubs (this pruning type is contrary to the requirements of the AS 4373 ²), and these are void of callous development and may have columns of decay stretching into them. An aerial assessment would be required to determine this. The northern stem extends south at a 45° angle from the vertical. This is a natural growth response, and however appears to be free of any structural flaws, extensive wounding over the top surface of the leaders (a result of Cockatoo damage) would require an aerial assessment to determine whether any decay exists. The presence of epicomic shoots over the leaders is most likely a response to this wounding. This tree provides normal vigour.									
Remnant											

² Australian Standard 4373-2007; Pruning of Amenity Trees
Australian Standards, Sydney Australia 2007, page 18, section 8.1

Tree No.	Botanical Name	Common Name	Height (m)	DBH (m)	Crown Spread (m)	Age	Crown Class	Crown Aspect	Crown Ratio	SRIV Rating	SULE Rating
8	<i>Eucalyptus botryoides</i>	Bangalay	15	0.81	13 x 8	M	D	Sym.	F	NVF* 9	D2*
Assessment		This tree is indigenous to this specific area, and allowing for the maturity is most likely a remnant planting. This tree provides the typical, habit for the species, however the 15° northern bias appears to be a natural growth response. The crown density, leaf size and colour is normal. A <i>Coprosma</i> is growing over the lower stem and this has limited the assessment. An old wound approximately 2m high on the lower section of the western side exists, and this has almost completely sealed over. A swelling exists within the lower stem as does the remains of a fungal bracket. These symptoms indicates that decay has existed within the lower stem, and resonance soundings indicate a cavity however further investigation would be required to determine whether this cavity presents an impact upon the structural integrity. A primary limb (extending south west, and 200mm in diameter) has recently failed leaving a 2m long stub, and the lowest primary limb extending north (150mm in diameter and 7m long) has died. Some wounding from Cockatoo damage exists. This tree presents normal vigour.									
Remnant											
9	<i>Agonis flexuosa</i>	Willow Myrtle	8	0.48	6 x 6	M	D	Sym.	F	NVG 10	A1
Assessment		This tree provides the typical, habit for the species, however the 15° north western bias appears to be a natural growth response. The crown density, leaf size and colour is normal. This tree presents normal vigour.									
Native											
10	<i>Casuarina cunninghamiana</i>	River Oak	15	0.39	5 x 5	M	I	W	F	NVF 9	A2
Assessment		This tree (and trees no. 11, 15-18) is part of a planted group of the same species and age. These trees are semi-mature verging onto maturity. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. The lowest primary limb extending west has a crack within it. Prior pruning has removed the majority of limbs extending east (most likely for clearance from the Civic Centre), and the majority of these cuts are flush cuts (this pruning type is contrary to the requirements of the AS 4373 ³), and these									
Indigenous											

³ Australian Standard 4373-2007; *Pruning of Amenity Trees*

Tree No.	Botanical Name	Common Name	Height (m)	DBH (m)	Crown Spread (m)	Age	Crown Class	Crown Aspect	Crown Ratio	SRIV Rating	SULE Rating
		are void of callous development. Also apparent on this tree group is damage to the roots and root flare from lawn mowers. This extent of wounding is extensive on some trees and this may lead to decay infection within the future, therefore leading to failure. This point has impacted upon the rating. This tree poses normal vigour.									
11	<i>Casuarina cunninghamiana</i>	River Oak	15	0.34	4 x 3	M	C	Sym.	F	NVF 9	A2
Assessment		This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. Prior pruning has removed the majority of limbs extending east (most likely for clearance from the Civic Centre), and the majority of these cuts are flush cuts (this pruning type is contrary to the requirements of the AS 4373 ⁴), and these are void of callous development. This tree poses normal vigour.									
Indigenous											
12	<i>Casuarina glauca</i>	Swamp Oak	16	0.44	3 x 2	M	I	Sym.	F	NVG 10	A1
Assessment		This tree is indigenous to this specific area, and allowing for the maturity is most likely a remnant planting. This tree (and trees no. 13, 19 and 20) is part of a planted group of the same species and age. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Remnant											
13	<i>Casuarina glauca</i>	Swamp Oak	16	0.6	8 x 7	M	D	Sym.	F	NVF 9	A2
Assessment		This tree is indigenous to this specific area, and allowing for the maturity is most likely a remnant planting. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. A secondary leader (300mm in diameter and 12m long) extending towards the Civic Centre has an included bark crotch, and this can be a structural weak point, though no symptoms indicating an immediate opportunity for failure									
Remnant											

Australian Standards, Sydney Australia 2007, page 18, section 8.3

⁴ Australian Standard 4373-2007; Pruning of Amenity Trees

Australian Standards, Sydney Australia 2007, page 18, section 8.3

Tree No.	Botanical Name	Common Name	Height (m)	DBH (m)	Crown Spread (m)	Age	Crown Class	Crown Aspect	Crown Ratio	SRIV Rating	SULE Rating
		exist. This tree is recommended to be monitored regarding this potential structural flaw. This tree poses normal vigour.									
14	<i>Ficus rubiginosa</i>	Port Jackson Fig	17	1.10	15 x 13	M	D	Sym.	F	NVP 6	C4
Assessment		See Appendix C for complete assessment									
Remnant											
15	<i>Casuarina cunninghamiana</i>	River Oak	15	0.26	4 x 4	M	I	Sym.	F	NVF 9	A2
Assessment		This tree is part of a planted group of the same species and age. These trees are semi-mature verging onto maturity. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Indigenous											
16	<i>Casuarina cunninghamiana</i>	River Oak	15	0.33*	6 x 4	M	C	W	F	NVF 9	A2
Assessment		This tree is part of a planted group of the same species and age. These trees are semi-mature verging onto maturity. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Indigenous											
17	<i>Casuarina cunninghamiana</i>	River Oak	15	0.26	3 x 3	M	I	Sym.	F	NVF 9	A2
Assessment		This tree is part of a planted group of the same species and age. These trees are semi-mature verging onto maturity. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Indigenous											

Tree No.	Botanical Name	Common Name	Height (m)	DBH (m)	Crown Spread (m)	Age	Crown Class	Crown Aspect	Crown Ratio	SRIV Rating	SULE Rating
18	<i>Casuarina cunninghamiana</i>	River Oak	15	0.29	3 x 3	M	C	S	F	NVF 9	A2
Assessment		This tree is part of a planted group of the same species and age. These trees are semi-mature verging onto maturity. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Indigenous											
19	<i>Casuarina glauca</i>	Swamp Oak	14	0.32	3 x 5	M	C	Sym.	F	NVG 10	A1
Assessment		This tree is indigenous to this specific area, and allowing for the maturity is most likely a remnant planting. This tree is part of a planted group of the same species and age. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Remnant											
20	<i>Casuarina glauca</i>	Swamp Oak	14	0.45	6 x 5	M	C	W	F	NVG 10	A1
Assessment		This tree is indigenous to this specific area, and allowing for the maturity is most likely a remnant planting. This tree is part of a planted group of the same species and age. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Remnant											
21	<i>Melaleuca quiquenervia</i>	Broad- leaf paperbark	12	0.23 0.24	4 x 3	M	I	Sym.	F	NVF 9	A2
Assessment		This tree is semi-mature verging onto maturity. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Native											
22	<i>Agonis flexuosa</i>	Willow Myrtle	8	0.34 0.24 0.17	6 x 6	M	I	N	F	NVG 10	A1

Tree No.	Botanical Name	Common Name	Height (m)	DBH (m)	Crown Spread (m)	Age	Crown Class	Crown Aspect	Crown Ratio	SRIV Rating	SULE Rating
Assessment		This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Native											
23	<i>Melaleuca quiquenervia</i>	Broad- leaf paperbark	10	0.53	6 x 6	M	C	N	F	NVF 9	A2
Assessment		This tree (and trees no. 24-27) is part of a planted group of the same species and age. These trees are semi-mature verging onto maturity. This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Native											
24	<i>Melaleuca quiquenervia</i>	Broad- leaf paperbark	10	0.26	2 x 2	M	I	Sym.	F	NVP 6	C2
Assessment		This tree is part of a planted group of the same species and age. These trees are semi-mature verging onto maturity. This tree is verging on suppressed and is conflicting with the growth of surrounding trees, due to the close planted association with the other trees within this group. This tree would generally be recommended for removal to allow uninterrupted growth for the surrounding trees.									
Native											
25	<i>Melaleuca quiquenervia</i>	Broad- leaf paperbark	10	0.39	5 x 5	M	C	W	F	NVF 9	D2
Assessment		This tree provides the typical, habit for the species, however some remedial pruning is required. The crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Native											
26	<i>Melaleuca quiquenervia</i>	Broad- leaf paperbark	10	0.37	5 x 6	M	C	S	F	NVF 9	A2
Assessment		This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Native											
27	<i>Melaleuca quiquenervia</i>	Broad- leaf paperbark	10	0.6 0.45	9 x 9	M	D	Sym.	F	NVF 9	A2

Tree No.	Botanical Name	Common Name	Height (m)	DBH (m)	Crown Spread (m)	Age	Crown Class	Crown Aspect	Crown Ratio	SRIV Rating	SULE Rating
Assessment		This tree provides the typical, habit for the species, the crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Native											
28	<i>Melaleuca quinquenervia</i>	Broad- leaf paperbark	10	0.15-0.5	9 x 9	M	D	Sym.	F	NVF 9	A2
Assessment		This tree is composed of six stems sharing a common root crown. This is not the typical habit, and some tendency for stem failure could exist. The crown density, leaf size and colour is normal, a small extent of deadwood exists and is appropriate to the age. This tree poses normal vigour.									
Native											

* Further investigation required to determine a confident assessment

7.0 Tree Protection

7.0.1 The estimated Tree Protection Zones of these trees, is adapted from the *Australian Standard, 4970; 2009 – Protection of Trees on Development Sites*

7.0.2 The Tree Protection Zones (TPZ) does not denote the limit of root travel, however offers a limit where excavation may not detrimentally impact upon the tree's vigour. These allocated zones allow for changes around the entire circumference of the tree, therefore changes upon only one side can allow for a reduction of this zone. Those requirements of the Tree Protection Zone are detailed within the Protection Specification, Section 8.0.

7.1 Table 2 – Protection Measures and Zones

Tree No.	Recommendation	Tree Protection Zone (m)	Structural Root Zone (m)	Protection Measure
1	Retain	2.6	1.8	Type 1
2	Retain	3.7	2.1	Type 1
3	Retain	3.1	1.9	Type 1
4	Retain	3.4	1.9	Type 1
5	Retain	3.4	1.9	Type 1
6	Retain	3.6	2.0	Type 1
7	Retain	8.5	2.7	Type 1
8	Retain	9.7	3.0	Type 1
9	Retain	5.7	2.5	Type 1
10	Retain	4.7	2.3	Type 1
11	Retain	4.1	2.1	Type 1
12	Retain	5.3	2.3	Type 1
13	Retain	7.2	2.7	Type 1
14	Remove; Poor form	13.2	3.4	-
15	Retain	3.1	1.9	Type 1
16	Retain	4.0	2.1	Type 1
17	Retain	3.1	1.9	Type 1
18	Retain	3.5	2.0	Type 1
19	Retain	3.8	2.1	Type 1
20	Retain	5.4	2.4	Type 1
21	Remove, Conflicting location	4.0	2.1	-
22	Remove, Conflicting location	5.4	2.3	-
23	Retain	6.4	2.6	Type 1
24	Remove; Poor form	3.1	1.9	-
25	Retain	4.7	2.3	Type 1
26	Retain	4.4	2.3	Type 1
27	Retain	9.0	2.9	Type 1
28	Remove, Conflicting location	7.0	3.0	-

Legend

- **Recommendation**

- Retain**

- Remove**

- Over planted:** Trees mature size is too large for the existing area

- Conflicting location:** Trees location exists within or too close to an existing structure or the proposed development.

- Weed species:** Tree species deemed undesirable

- Poor form:** the habit, vigour and/or ailing structural integrity reduces the safe useful life expectancy.

- **Tree Protection Zone (TPZ)** is the area of protection required for maintaining the trees vigour and long term viability. Measured in meters as a radius from the trees centre. The requirements of this zone are outlined within the Protection Specification, Section 8.0, and are to be adhered to, unless otherwise stated.
- **Structural Root Zone (SRZ)** is the area around the tree containing the woody roots necessary for stability. Measured in meters as a radius from the trees centre. The requirements of this zone are outlined within the Protection Specification, Section 8.0, and are to be adhered to, unless otherwise stated.
- **Protection Measure** Protective barriers are required to be installed before the initiation of demolition and/or construction, and are to be maintained up to the time of landscaping. See Appendix B. **EF**; Refers to the existing fence that exists upon the boundary line.

7.2 Proposal

7.2.1 Existing situation

The site has had considerable change from the natural grades, and is predominately composed of sealed (asphalt, concrete) areas and lawn. Due to the location on the end of the shopping mall and facing the harbour, this area is exposed, and the predominant number of trees assessed provide wounding from storm damage which has occurred upon a number of occasions. The vigour of most all the trees is normal, which tends to contradict the sealed areas and root zones. However this high level of vigour is considered to be associated with a high water table and a soil texture which is composed of a sandy loam, therefore providing good drainage, reduced compaction, and adequate root spread.

7.2.2 Trees no. 1-6:

All but one of these trees has lost its leader, and new leaders have formed. This modified habit would generally result in a reduced rating due to the structural issues that can result from the attachment points of the multiple leaders, in particular with other tree species. However these trees are all young, and allowing for the inherent tenacity of this species, the multiple leaders do not generally offer such a structural flaw. Therefore the rating has been retained as A1, NVG 9. Within this situation, the provision of remedial pruning can still be adopted for the purpose of retrieving the excurrent habit most typical of this species. This can be accomplished by the removal of all but one leader within each tree.

7.2.3 Deadwood; The primary issue with all trees within the site is the presence of deadwood. Deadwood is the result of the trees natural selecting out of limbs, and

will require pruning maintenance every 2-3 years. Deadwood is prone to decay and will inevitably fail. Other than the hazard it offers to persons and property, it also acts as a pathway for decay to enter a tree. So the removal benefits both the tree, pedestrians and property. The deadwood within the trees is typical for the species, and within some circumstances this wood is large and decaying. Along with the mandatory removal of deadwood is also the removal of hangers (ie. branches that have broken and are perched within the crown) and branch stubs. That is the remaining part of the limb that has had the end fail or has been incorrectly pruned.

7.2.4 Proposed development

The proposal consists of the construction of a new Civic Centre, and parking arrangements. The following section provides the impact this proposal will have upon the existing trees.

7.2.5 Data for specific trees

Trees no. 1-6; *Araucaria columnaris*: These trees reside within an island planting within the existing car park. These trees can be retained however will depend upon the proposed grades of the area falling within the allocated tree protection zones.

Trees no. 7 and 8; *Eucalyptus botryoides*: these two trees pose significance based upon their remnant status, however the safe useful life expectancy is pending upon an aerial assessment. The retention of these trees will require some remedial pruning. The proposed design of the centre appears to reside within the existing footprint therefore these trees could be retained, so long as no further excavation encroaches into the area of the tree protection zones which constitutes greater than 15%.

Trees no. 9; *Agonis flexuosa*: this tree is a planted specimen and poses less significance than other trees on-site. The proposed design does not appear to impact upon this tree any further than the existing structures do. This tree appears to be able to be retained.

Trees no. 10, 11, 15-18; *Casuarina cunninghamiana*: these trees are planted specimens and pose reasonable significance. Trees 11,17 and 18 appear to be able to be retained however trees 10, 11, and 15 seem to be conflicting with the location of the proposed loading dock.

Tree no. 14; *Ficus rubiginosa*: This tree is considered to pose an existing hazard for failure and is not considered viable for retention regarding a modification to the design of the proposed Civic Centre around this tree. This tree is the most significant specimen within the area and based upon the nomination for removal compensatory planting of another tree of the same species is recommended within the area adjacent to the Civic Centre. Seed stock or cuttings could be removed from this tree for the purpose of propagation so as to retain the genetic stock of the species within the area. Compensatory planting should adhere to section 2.7.

Trees no. 12, 13, 19 and 20; *Casuarina glauca*: these four trees are most likely remnant plantings and pose higher significance than other trees within the site. They do not directly conflict with the proposed design however the parking bays

do extend well into the area of the tree protection zones and this may offer an adverse impact upon the root zones.

Tree no. 21; *Agonis flexuosa*: the location of this tree conflicts with the proposed development, and based upon the proposal, this tree will require to be removed to allow for the design.

Tree no. 22, *Melaleuca quiquenervia* the location of this tree conflicts with the proposed development, and based upon the proposal, this tree will require to be removed to allow for the design.

Trees no. 23-27; *Melaleuca quiquenervia*: these trees do not appear to be directly conflicting with the proposed design however a structure does exist directly adjacent to the trees and this may adversely impact upon the root zones depending on any change in grade associated with this design. Tree number 24 is nominated to be removed due to the over planted nature of this group.

Tree no. 28, *Melaleuca quiquenervia* the location of this tree appears to conflict with the proposed loading dock, and based upon the proposal, this tree will require to be removed to allow for the design.

7.2.6 Protection measures

Trees that can be retained are recommended to have a Type I Protection Measure (protective fence) to be erected around them during the stages of development including demolition.

7.2.7 Grafted Root Zones

Allowing for the trees species, maturity and close vicinity, the area around these specimens constitutes a Grafted Root Zone. This is relevant regarding any toxins entering the soil, as what affects one tree will simultaneously affect the other. This point must be emphasised in regards to construction work where chemical spills (be it only cement wash) and drainage run off is diverted from entering the Tree Protection Zone. Stumps must not be poisoned. This is particularly significant for the following tree groups;

Group 1: Trees 1, 2, 3, 4, 5 and 6.

Group 2: Trees no. 7 and 8

Group 3: Trees no. 10, 11, 15, 16, 17 and 18

Group 4: Trees no. 12, 13, 19 and 20

Group 5: Trees no. 23, 24, 25, 26, and 27

8.0 Protection Specification

All trees remaining on the site must be protected using the following requirements before any work takes place on the site and for the duration of all construction, unless otherwise stipulated.

1. All trees referred to within the Tree Protection Zones:
 - a) shall not be fertilised during the construction process,.
2. No form of material or structure, solid or liquid, is to be stored or disposed of within the Tree Protection Zones.

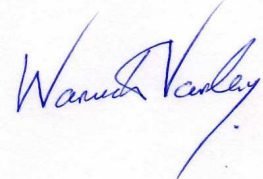
3. No lighting of fires are permitted within the Tree Protection Zone.
4. All drainage run off, sediment, concrete and mortar slurry, paints, and washings, toilet effluent, petroleum products, and any other toxic wastes must be prevented from entering the Tree Protection Zone.
5. No activity that will cause excessive soil compaction is required within the Tree Protection Zone unless stipulated within the report. Undue soil compaction will require further consultation from a qualified Arborist to determine mitigation.
6. No form of construction work or related activity such as the mixing of concrete, cutting, grinding, generator storage, or cleaning of tools is permitted within the Tree Protection Zone.
7. Any part of the tree may not be used as an anchorage point, nor should any noticeboard, telephone cable, rope, guy, framework, etc be attached to any part of the tree.
8. Soil levels within the Tree Protection Zone must remain the same. Any excavation within the Tree Protection Zone must be previously specified and allowed for:
 - a) So that to not alter the drainage to the tree.
 - b) Under specified circumstances:
 - Added fill soil does not exceed 100mm in depth over the natural grade. If the added fill does exceed 100mm or an impervious cover be used, an approved permeable material or permanent aeration system or other approved means of alleviation be utilised.
 - That no more than 80mm be removed from the natural grade. Those grades of removal exceeding 80mm shall incorporate retaining walls or other approved transitional means.
9.
 - (a) All excavation work within the Tree Protection Zone of the tree will utilise methods so that root systems are preserved intact and undamaged. Methods permitted are by hand digging, hydraulic, or pneumatic air excavation technology.
 - (b) Roots located of a smaller diameter than 50mm must be cleanly cut and dusted with a fungicide, and not allowed to dry out, with minimum exposure to the air as possible.
 - (c) Those greater than 50mm in diameter must be located in regard to their directional spread and a council tree officer or qualified Arborist be consulted to determine future action in regard to retaining the tree in a healthy state.
 - (d) Avoid excavation within the dripline during hot, dry weather.

9.0 Recommendations

- Trees no. 1-13, 15-20, 23, 25 -27 and 28: these trees are nominated for retention. The location of these trees do not appear to conflict with the proposed development however further detailed plans will be required to confirm this.
- Trees no. 14 and 24: this tree is recommended for removal based upon poor form. Relative to tree number 14 and the nomination for removal, compensatory planting of another tree of the same species is recommended within the area adjacent to the Civic Centre. Seed stock or cuttings could be removed from this tree for the purpose of propagation so as to retain the genetic stock of this species within the area. Compensatory planting should adhere to section 2.7.
- Trees no. 21, 22 and 28: the location of these trees conflict with the proposed design and are nominated for removal for this reason alone.
- **Protection measure**
Trees that can be retained are recommended to have a Type I Protection Measure (protective fence) to be erected around them during the stages of development including demolition.
- Removal of deadwood, crossing limbs and stubs from the trees to be retained.

The opinions expressed in this report by its author have been provided in the capacity of a Consulting Arborist. Any further details can be provided by contacting the author.

DATED: 30th July 2012



**Warwick Varley
Consulting Arborist**

10.0 Appendix A- Terminology Defined

DBH

Diameter at Breast Height – being the stem diameter in meters, measured at 1.4m from ground level, including the thickness of the bark.

Crown Spread

A two dimension linear measurement (in metres) of the crown plan. The first figure being the north-south span, the second being the east-west measurement.

Age

Is the estimate of the specimen's age based upon the expected life span of the species. This is divided into three stages.

Young (Y)	Trees less than 20% of life expectancy.
Mature (M)	Trees aged between 20% to 80% life expectancy.
Over-mature (O)	Trees aged over 80% of life expectancy with probably symptoms of senescence.

Crown Aspect

In relation to the root crown, this refers to the aspect the majority of the crown resides in. This will be either termed Symmetrical (SYM) where the centre of the crown resides over the root crown, or the cardinal direction the centre of the crown resides in, being either North (N), South (S), East (E) or West (W).

Crown Ratio

Refers to the density of the crown in comparison to an example of the same species and age. The crown ratio can be expected to contain the following proportions of foliage in regard to a specimen of average vigour (being 100%).

F - Full	85% - 100%
P - Partial	40% - 85%
S - Sparse	less than 40%

Height

Is a measure of the vertical distance from the average ground level around the root crown to the top surface of the crown, and on palms - to the apical growth point.

Origin

Refers to the natural occurrence of the tree species as referenced in **Forest Trees of Australia** Boland, Brooker, Chippendale, Hall, Hyland, Johnston, Kleinig, Turner. CSIRO publishing, 2002, Australia.

This may be summarised by one of the three terms:

Remnant:	natural planting and indigenous to the area.
Indigenous:	natural occurrence to the area the species is located (and possibly other areas), however planted.
Native:	does not naturally occur within the area the species is located but is found elsewhere in Australia.
Exotic:	naturally occurs in another country but not in Australia.

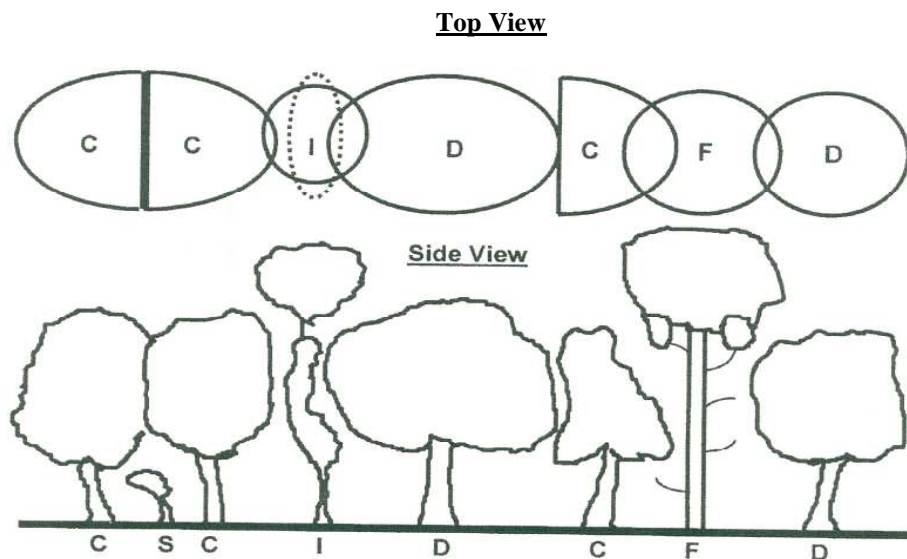
Limb Diameter

Is measured adjacent to the branch collar, which is the cross-section offering the largest diameter of the limb.

Crown Class

Is the differing crown habits as influenced by the external variables within the surrounding environment? They are:

- D** – *Dominant* Crown is receiving uninterrupted light from above and sides, also known as emergent.
- C** – *Codominant* Crown is receiving light from above and one side of the crown.
- I** – *Intermediate* Crown is receiving light from above but not the sides of the crown.
- S** – *Suppressed* Crown has been shadowed by the surrounding elements and receives no light from above or sides.
- F** – *Forest* Characterised by an erect, straight stem (usually excurrent) with little stem taper and virtually no branching over the majority of the stem except for the top of the tree which has a small concentrated branch structure making up the crown.



D C, I & S and side view, after (Matheny, N. & Clark, J. R. 1998, Trees Development, Published by International Society of Arboriculture, P.O. Box 3129, Champaign IL 61826-3129 USA, p.20, adapted from the Hazard Tree Assessment Program, Recreation and Park Department, City of San Francisco, California).

Safe Useful Life Expectancy – S.U.L.E (Barell 1995)

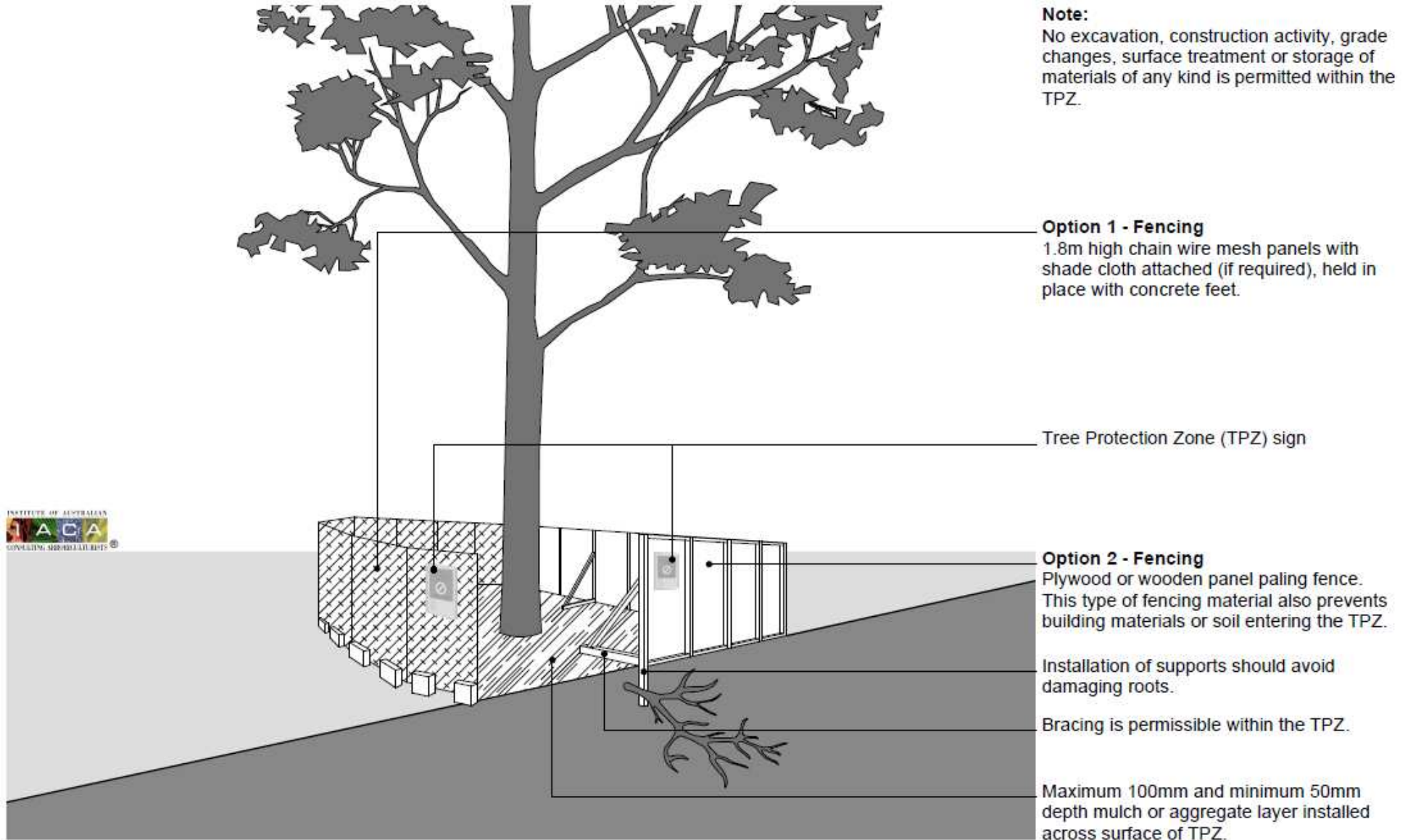
	1. Long	2. Medium	3. Short	4. Removal	5. Moved or Replaced
	Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.	Trees that appeared to be retainable at the time of assessment for 15 – 40 years with an acceptable level of risk.	Trees that appeared to be retainable at the time of assessment for 5 – 15 years with an acceptable level of risk.	Trees that should be removed within the next 5 years.	Trees which can be reliably moved or replaced.
A	Structurally sound trees located in positions that can accommodate future growth.	Trees that may only live between 15 and 40 years.	Trees that may only live between 5 and 15 more years.	Dead, dying, suppressed or declining trees through disease or inhospitable conditions.	Small trees less than 5m in height.
B	Trees that could be made suitable for retention in the long term by remedial tree care.	Trees that may live for more than 40 years but would be removed for safety or nuisance reasons.	Trees that may live for more than 15 years but would be removed for safety or nuisance reasons.	Dangerous trees through instability on recent loss of adjacent trees.	Young trees less than 15 years old but over 5m in heights
C	Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long term retention.	Trees that may live for more than 40 years but would be removed to prevent interference with more suitable individuals or to provide space for new planting.	Trees that may live for more than 15 years but should be removed to prevent interference with more suitable individuals or to provide space for new planting.	Damaged trees through structural defects including cavities, decay, included bark, wounds or poor form.	Trees that have been pruned to artificially control growth.
D		Trees that could be made suitable for retention in the medium term by remedial tree care.	Trees that require substantial remedial tree care and are only suitable for retention in the short term.	Damaged trees that are clearly not safe to retain.	
E				Trees that may live for more than 5 years but should be removed to prevent interference with more suitable individuals or to provide space for new plantings.	
F				Trees that are damaging or may cause damage to existing structures within 5 years.	
G				Trees that will become dangerous after removal of other trees for reasons given in (A) to (F).	

**Matrix – Sustainable Retention Index Value (S.R.I.V.) ©
Developed by IACA – Institute of Australian Consulting Arboriculturists**

Index values as indicated where (10) ten is the highest value.

Age Class	Vigour Class and Condition Class					
	Normal Vigour & Good Condition (NVG)	Normal Vigour & Fair Condition (NVF)	Normal Vigour & Poor Condition (LVP)	Low Vigour & Good Condition (LVG)	Low Vigour & Fair Condition (LVF)	Low Vigour & Poor Condition (LVP)
	Able to be retained if sufficient space available above and below ground for future growth. No remedial work or improvement to growing environment required. May be subject to abnormal vigour. Retention potential – Medium–Long Term	Able to be retained if sufficient space available above and below ground for future growth. Potential work may be required or improvement to growing environment may assist. Retention potential – Medium Term. Potential for longer with remediation or favourable environmental conditions.	Able to be retained if sufficient space available above and below ground for future growth. Potential work unlikely to assist condition, improvement to growing environment may assist. Retention potential – Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. No remedial work required but improvement to growing environment may assist vigour. Retention potential – Short Term. Potential for longer with remediation or favourable environmental conditions.	May be able to be retained if sufficient space available above and below ground for future growth. Remedial work or improvement to growing environment may assist condition and vigour. Retention potential – Short Term. Potential for longer with remediation or favourable environmental conditions.	Unlikely to be able to be retained if sufficient space suitable above and below ground for future growth. Remedial work or improvement to growing environment unlikely to assist condition of vigour. Remediation potential – Likely to be removed or retained for immediate – Short Term. Potential for longer with remediation or favourable environmental conditions.
Young (Y)	Index Value 9 Retention potential – Long Term. Likely to provide minimal contribution to local amenity if height <6m. High potential for future growth and adaptability. Retain, move or replace.	Index Value 8 Retention potential – Short-Medium Term. Potential for longer with improved growing conditions. Likely to provide minimal contributions in local amenity if height <5m. High-moderate potential for future growth and adaptability. Retain, move or replace.	Index Value 5 Retention potential – Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Moderate-low potential for future growth and adaptability. Retain, move or replace.	Index Value 4 Retention potential – Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Moderate potential for future growth and adaptability. Retain, move or replace.	Index Value 3 Retention potential – Short Term. Potential for longer with improved growing conditions. Likely to provide minimal contribution to local amenity if height <5m. Moderate-low potential for future growth and adaptability. Retain, move or replace.	Index Value 1 Retention potential – Likely to be removed or retained for immediate – Short Term. Likely to provide minimal contribution to local amenity if height <5m. Low potential for future growth and adaptability.
Mature (M)	Index Value 10 Retention potential – Medium-Long Term.	Index Value 9 Retention potential – Medium Term. Potential for longer with improved growing conditions.	Index Value 6 Retention potential – Short Term. Potential for longer with improved growing conditions.	Index Value 5 Retention potential – Short Term. Potential for longer with improved growing conditions.	Index Value 4 Retention potential – Short Term. Potential for longer with improved growing conditions.	Index Value 2 Retention potential – Likely to be removed or retained for immediate – Short Term.
Over-mature (O)	Index Value 8 Retention potential – Medium-Long Term.	Index Value 5 Retention potential – Medium Term.	Index Value 4 Retention potential – Short Term.	Index Value 3 Retention potential – Short Term. Potential for longer with improved growing conditions.	Index Value 2 Retention potential – Short Term.	Index Value 0 Retention potential – Likely to be removed or retained for immediate – Short Term.

Appendix B- Type 1; Tree Protective Fencing



Appendix C- Assessment of Tree no. 14; *Ficus rubiginosa*

Site Assessment

This tree is indigenous to this specific area, and allowing for the maturity is most likely a remnant planting. Located on the edge of the entrance road, the asphalt extends up to the root crown, where the roots have pushed up the road surface, via secondary growth and resulted in the uneven road surface. These roots present numerous surface wounds from traffic, as well as presenting a trip hazard.

Habit

Crown area: The crown has succumbed to pruning, and these pruning wounds provide both branch tears and lopping. This pruning type is contrary to the AS 4373, and can lead to further structural laws. At least four limbs exist within the upper crown (ranging between 70 to 200mm in diameter, and up to 6m long) with radial cracks, and each has partially failed. These limbs are estimated to have recently failed, that is within the last 12 months, and each of these limbs presents an existing hazard, and eminent risk to pedestrians. Allowing for the retention of this tree, these limbs will require removal. These limbs constitute approximately 20% of the crown mass. The vigour of this tree appears normal, however due to the large area of root zone that has been sealed over, a vigour less than that typically found within the species is estimated to exist.

Stem/leaders: Originally composed of two equally sized leaders that initiate from a 1m high stem. The southern leader has failed many years earlier, and the remaining crown mass now has a northern bias due to this loss. The northern leader has a 15° bias from the vertical. The remaining wound has an extensive cavity within it, and this extends from below the root crown and up into the remaining leader. The cavity was cleaned out and both old termite damage and active white decay was apparent within the existing wall of the stem and leader. Resonance soundings and the visual assessment indicate an extensive cavity, and this has been scaled and calculated in regard to the 'Wood strength loss ratio'⁵ with the intent of determining whether this cavity presents an impact upon the structural integrity.

The line of cross-section of the stem which presents the thinnest wall within the bottom 2m was determined and all dimensions were taken from this point. This cross-section was taken 1.4 m above the ground. A scaled representation of the stems cross-section at this point has been illustrated within Figure 1 for the purpose of interpretation within this assessment.

The size of the cavity openings were calculated as a proportion of the stems circumference, and provided a figure of 19%, which is beneath the threshold of 30% where a potential threat for failure can occur. However this will still provide an impact on the trees structural integrity due to the location of the cavity within the tension side of the stem.

The application of the 'Wood strength loss ratio', provides a ratio of the thickness of the remaining stem wall to the absolute value of the stem radius ($t/R \leq 0.3$)¹. This resulted in the approximate ratio value of 0.23. This figure is well within the bracket of values (that is below 0.3) indicating that the tree is susceptible to stem failure at the point where the soundings were taken.

Symptoms indicating that this stem has initiated failure exist. These include fibre buckling on the compression side of the stem and opposite the cavity opening, and structural cracks within the cavity and extending through that part of the stem dividing the existing leader from the failed.

⁵ Mattheck, C. Breloer, H.

The Body Language of Trees – A handbook for failure analysis
The Stationary Office, London, 1994 page 37

Further contributing factors exist which also increase the opportunity for failure. This includes the loss of the supporting tension side of the tree, which poses significance because the tension wood provides twice the support than the compression wood. The potential for failure is amplified by the exposure to the prevailing southerly wind, the northern biased crown mass, and active decay within the stem.

The opportunity for mitigation is not considered viable due to the less than average vigour. The tree would require to provide extensive adaptive growth and seal the existing decay. This would require optimal vigour which is unlikely to be available due to the sealed root zone, age of the tree, and detriment associated with the proportion of crown mass which will require removal so that the existing hazards associated with the cracked limbs are removed. (this will adversely impact upon the vigour due to the loss of the food producing leaf area and further energy required for sealing these wounds associated with the pruning cuts). The growth of the active decay will also cause further loss of the supporting structure, therefore increasing the propensity for failure.

The target zone is the existing Civic Centre, public access area and service drive.

This tree is considered to pose an existing hazard for failure and is not considered viable for retention regarding a modification to the design of the proposed Civic Centre around this tree.

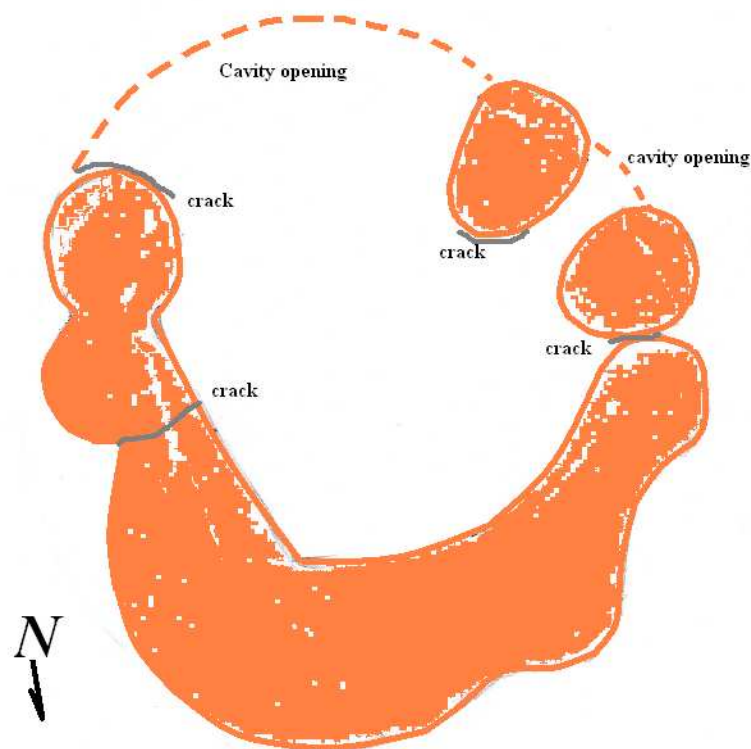


Figure 1; scaled representation of the stem cross-section 1.4 m above the ground