

Independent Arboricultural Services

19 Weinholt Street, Sherwood 4075
ABN 65 062 099 495
Email: independentarb@bigpond.com

Phone: (07) 3379 4482
Fax: (07) 3716 0008
Mobile: 0412 035 396

Web Page: www.independentarb.com.au

Arborist Report (Revision 2)

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Prepared for: Department of Environment and Heritage Protection,
c/- Ms Lauren Payne,
Senior Environmental Officer,
Environmental Services and Regulation, Northern Region
PO Box 5391,
Townsville QLD 4810

Address: 151 Abbott St, Cairns (Cairns Library)

Project: Proposed pruning

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Author: Mr. Andrew Rankine
Diploma Arboriculture / ISA Certified Arborist & Municipal Specialist AU-0269AM
ISA TRAQ (Qualified) / QTRA (Lic. No: 2768)
Current Qualified Member – Queensland Arboricultural Association (QAA)
Current Qualified Member – *Arboriculture Australia*
Current accreditation and member – International Society of Arboriculture (ISA)



This Arborist review and Comment Report has been prepared by:

Andrew Rankine
Diploma Arboriculture/AQF Level V
ISA Certified Arborist and Municipal Specialist AU-0269AM

of

Independent Arboricultural Services,
19 Weinholt Street,
Sherwood Qld 4075

The report author holds current insurances and professional qualified memberships
of
Queensland Arboricultural Association (QAA) and *Arboriculture Australia*
and
current certified qualifications and membership of
International Society of Arboriculture (ISA)

All arboricultural recommendations contained in this report have been determined in
accordance with Australian Standards AS 4373-2007 - Pruning of amenity trees and
AS 4970 – Protection of trees on development sites.

Independent Arboricultural Services is a qualified registrant on the QAA Register of
Consulting Arborists.

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¹ All appendices & attachments form part of this report and should be read as such

Independent Arboricultural Services - Disclaimer

Please Note – The material contained herein constitutes an Arborist Report only which has been prepared on an independent basis free of any bias and represents the honest opinion of the consulting arborist.

Tissue or soil samples have not been collected nor submitted for testing unless otherwise stated. Excavation is limited to minor earthworks and we submit this assessment on the basis that all data is based on visual inspection of the tree/s and its/their location, species, health and condition at the time of writing unless otherwise stated. Measurements and tree locations noted in this report are approximate and have not been determined by survey unless information and analysis has been provided by the consultant or such information is otherwise noted. Please request a more detailed arborist report if further information and analysis is required. Depending on site requirements, specific alternate specialist advice including engineering consultancy and certification may be required in combination with this assessment. This assessment contains arborist advice and associated general information only and does not purport to provide other site specific specialist advice such as engineering certification unless arrangement to source such advice for inclusion in this assessment has been requested and authorised.

This report containing opinions, advice and recommendations based on information and data gathered from site inspections carried out by personnel from Independent Arboricultural Services as well as information provided by the client and/or its representatives, is to be relied on by the client in that context. It is assumed that all such information provided to Independent Arboricultural Services is correct. All recommended arboricultural works detailed in this assessment including pruning of tree canopy or roots, tree removal, tree transplantation or other associated works including stump grinding or the application of any prescribed treatment shall be carried out in accordance with applicable standards including Australian Standards AS 4373-2007- Pruning of amenity trees and AS 4970-2009- Protection of trees on development sites.

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The invoice for this report will be issued to the person or entity as per the address advised at the time of confirmation of appointment. Assessment in this report is based on plans provided at the time of confirmation of engagement and report preparation. Additional time required for re-assessment of report detail due to subsequent re-issue of plans after report preparation will be subject to an additional fee which will be charged at our hourly rate. This report shall not be conveyed to any third party including regulatory authority/s until full payment of this invoice is received by Independent Arboricultural Services and a finalised report has been issued unless agreement to do so has been granted.

Factors including the absence of historical records or local knowledge, recognition of the variability of the integrity of a tree as a naturally living organism as well as the impact of conditions within its surrounds to which it may be subject including the impacts of mechanical force and the occurrence of weather events, do not allow an arborist to guarantee the age of a tree, or the length of time a tree/s may live or such time as it /they may fail. There is no warranty or guarantee, expressed or implied that the problems or deficiencies of the plants or property in question may not arise in the future.

Introduction

All comment and assessment detailed in this report is based on a visual inspection from the ground on 11th August, 2014 and no soil or tissue sampling has been conducted. Tree assessment and Qualitative Visual Tree Analysis has been carried out in accordance with TRAQ ISA guidelines.

This report has been compiled at the request of Mr. Scott Sullivan, Regional Manager Environment and Heritage and Ms Lauren Payne, Senior Environmental Officer, Environmental Services and Regulation, Northern Region Qld, on behalf of Environment and Heritage Protection, to report on four (4) large *Ficus sp.* (fig trees) in the garden of the Cairns Library located at 151 Abbott St, Cairns. In particular, this report will address pruning issues associated with tree work already carried out and further proposed tree work to be carried out on these figs which are the subject of Qld Heritage Place listing protection orders.

The latter-mentioned property and trees will be referred to respectively as the *Subject Property* and the *Subject Trees* in the following report.

Trees will be identified in this report by their botanical and common names. Further report details will include assessment of current tree health and form, arboricultural work required, any associated OH&S environmental or infrastructure issues. Report detail will include assessment of the suitability of assessed trees for retention on this site and appropriate strategies for their ongoing and future management and protection.

Please note: The site is listed as a State Heritage Place and therefore any interference with trees is subject to provisions of the approval under the *Queensland Heritage Act 1994 (QHA)*- General Exemption Certificate - Queensland Heritage Places, Department of Environment and Heritage: s4.2 Parks and Gardens. s4.2 Parks, gardens and landscapes

All arboricultural comment and recommendations contained in this report have been determined in accordance with Australian Standard AS 4373-2007 - Pruning of amenity trees.

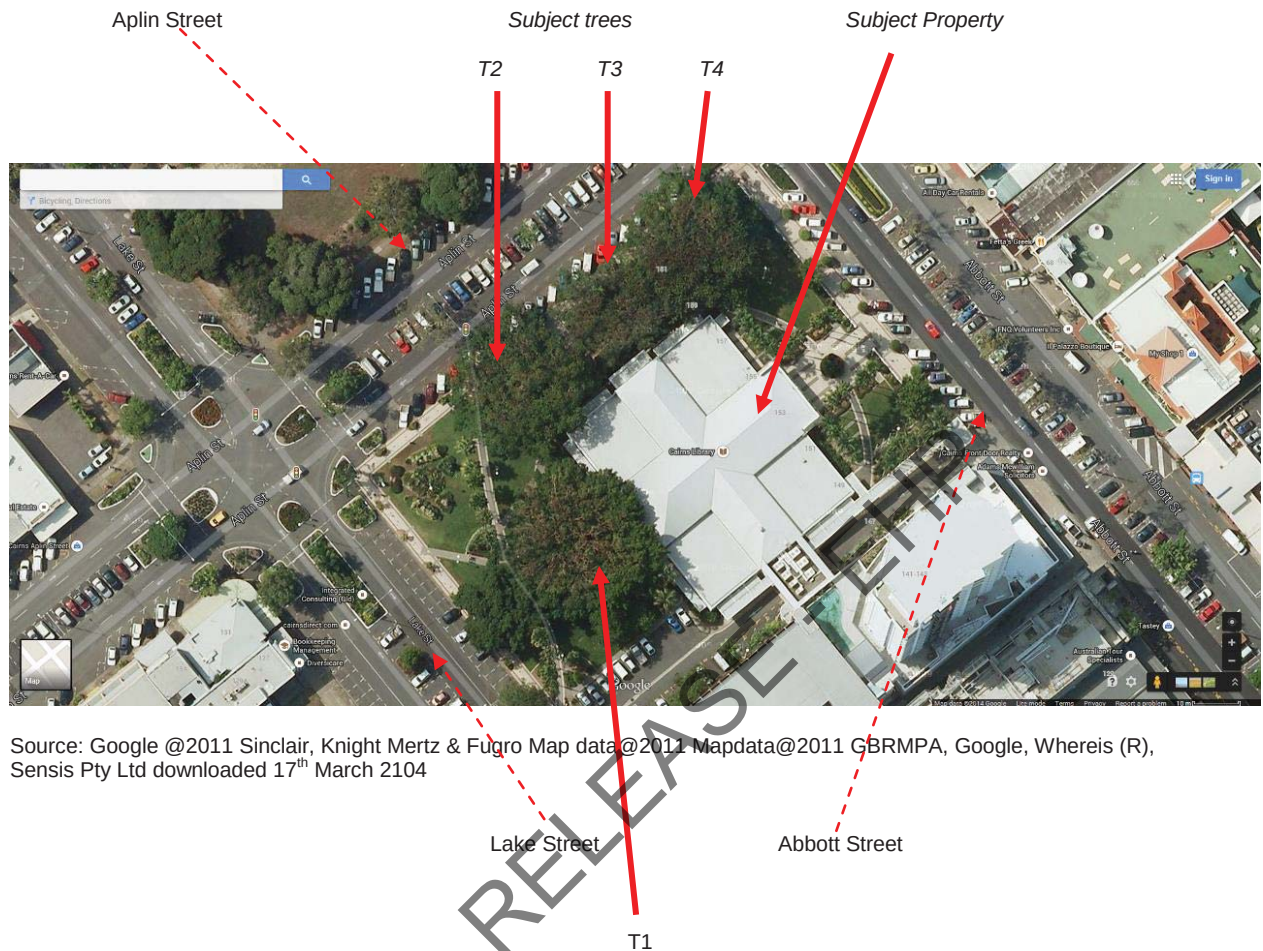
The report author holds current qualifications including Diploma of Arboriculture/AQF Level 5 and has the required experience to provide this report as well as required levels of experience and arboricultural expertise to give expert witness in arboricultural matters in a court of law.

The report author holds current insurances and qualified memberships of Queensland Arboricultural Association (QAA) and *Arboriculture Australia* as well as current accreditation and membership of International Society of Arboriculture (ISA).

For the purposes of this report reference to a Consulting Arborist is held to mean an arboricultural specialist who holds (minimum) arboricultural qualifications of Dip Arb/AQF 5, appropriate professional insurances and has appropriate experience in the protection of trees on construction sites. Where tree work is specified, the Arborist climber is to hold minimum arboricultural qualifications of AQF III, appropriate professional insurances and have appropriate experience in the pruning and felling of trees. No climbing spikes are to be used if pruning is to be carried out on live trees except in the instance of an emergency.

Independent Arboricultural Services is a qualified registrant on the QAA Register of Consulting Arborists.

Google Map: Cairns Library, 151 Abbott St, Cairns



Source: Google @2011 Sinclair, Knight Mertz & Fugro Map data @2011 Mapdata@2011 GBRMPA, Google, Whereis (R), Sensis Pty Ltd downloaded 17th March 2104

Abbreviations used in the following report include:

CRC - Cairns Regional Council
QHA - Qld Heritage Act
EHP - Department of Environment Heritage Protection
VTA - Visual Tree Assessment
OH&S - Occupational Health and Safety
ULE - Useful Life Expectancy
TPZ - Tree Protection Zone
SRZ - Structural Root Zone
DBH - Diameter at Breast Height
Diam. - Diameter
AS - Australian Standard
AS 4373: 2007 - Pruning of amenity trees
AS 4970: 2009 - Protection of trees on development sites

Background Comment

The *Subject Property* is listed on the Qld State Heritage Register (ID 601576). The building and grounds (including mature trees) are subject to provisions of the QUEENSLAND HERITAGE ACT 1992, under Criterion A, D, E & G.

A brief history of this site includes formal allotment of this land in 1885 as a municipal reserve following the creation of the Cairns Divisional Board in 1879. This municipal reserve was located some blocks away from the main settlement of lower Abbott Street, on the corner of Aplin Street where the Cairns Municipal Council was set up to administer the town area. This Council became the Cairns Town Council in 1903 which went on to become the Cairns Shire Council, then the Mulgrave Shire Council and in 1923 it became the Cairns City Council. A number of subsequent changes have occurred and the current Cairns Regional Council was formed under the Local Government (Reform Implementation) Act 2007 and council chambers are now located at 119-145 Spence Street, Cairns.

The previous council chambers on the *Subject Property* subsequently became home to the Cairns Library in 1996.

The first timber building constructed on the *Subject Property* in 1886 was replaced 1929-30 with the construction of a new building on a large corner of the gazetted reserve which was surrounded by parkland. Noting the presence of mature figs at that time, the property and new building were described as being ...

.... located on a large site bounded by Abbott, Aplin and Lake Streets, is surrounded by parkland with mature trees including Figs, Queen Palms and Traveller's Palms. The single-storeyed reinforced concrete structure, designed with classical detailing, has separate hipped roofs clad in ribbed metal sheeting and partly concealed behind a parapet.

.. and construction was ...

.. part of the third major phase of Cairns' development, between the First and Second World Wars, at the same time the city's status as the principal port of Far North Queensland was consolidated and the city centre virtually re-built.²

² Queensland Heritage Register under the Queensland Heritage Act 1992. Entry in the Heritage Register State Heritage

This report will deal with each item outlined in Briefing Notes emailed to the writer.
Briefing Notes provided are as follows:

Background Information:

1. What would a recommended, suitable trimming regime be for these species of Ficus trees?
 - a. Specify acceptable timeframes, pruning techniques (as per AS4373) and amount of percentage canopy loss per prune.

Response: Refer Section 3: Recommendations, p21-24 Pruning

Future Trimming:

1. Is further trimming (up to a proposed 25% to be conducted immediately) necessary or desirable for the long-term health of the tree?
 - a. Will further trimming leave the trees more susceptible to disease and/or death?
 - b. Is it likely that the trees will survive if further trimming is undertaken?

Response: Refer Sections 1& 3: Pruning Notes, p.p.10-15, Recommendations, p.p. 21-24
Further pruning to the extent requested is not required nor desirable for sound arboricultural reasoning outlined in the following report.

2. Is further trimming necessary or desirable for public safety reasons?
 - a. Are there parts of the trees that need to be removed for stability and/or safety? If so, specify.
 - b. Does the sail area (or height) of the trees need reducing for public safety reasons?
 - c. Do the trees in their current form present a public safety hazard from wind or cyclones?

Response: Refer Sections 1& 3: Pruning Notes, p.p.10-15, Recommendations, p.p. 21-24

3. Is further pruning necessary to reduce the risk of damage to the building, walkways, gardens and infrastructure triggered by severe weather (falling tree) or by a continuing process (resulting in lifting of walkways, debris in gutters, etc.)?

Response: Refer Sections 1: Pruning Notes, p.p.10-15
With the exclusion of T1, at this point in time, no further pruning work other than crown cleaning is required. Refer Pruning Notes, p.p.10-15, Recommendations, p.p. 21-24

4. If further trimming is required, what level would be appropriate?
 - a. Under what timeframe and to what level would further trimming be sustainable?
 - b. Specify the level and locations of recommended pruning (as per the pruning classes described in AS1940).

Response: Refer Recommendations, p.p. 21-24

Previous Trimming:

1. Was previous trimming conducted in line with the Australian Standard?
 - a. Are any 'unacceptable practices' (as described in the AS) evident in marks from previous pruning?
 - b. Is it clear what style of pruning was undertaken previously? (is this consistent with the AS and the species of tree?)
 - c. Is it clear what level of pruning (estimate percentage loss and timeframe) has been previously undertaken?

Response: Refer Section 1: Pruning Notes, p.p.10-15

Arborist Meeting Notes

An onsite meeting was held on the *Subject Property* on Monday 11th August to discuss matters in relation to the *Subject Trees*. Attendees included the writer, two (2) CRC Officers, two (2) representatives of the tree service provider and two (2) Officers of the Department of Environment and Heritage Protection (EHP).

The writer was informed that the reason for calling this meeting was as a result of a request to EHP from CRC requesting permission to carry out further pruning of *Subject Trees* in addition to recent tree work carried out to these trees on behalf of Council. The writer was informed by EHP that CRC had advised during recent conversations that reasons for this request was that they believed additional pruning to tree work carried out on their behalf in April/May this year was required to further reduce the canopies of the *Subject Trees* by 25%.

Matters discussed included the reasons for CRC request to the Department to carry out further pruning. CRC Officers stated during the meeting that the reason they have made this request is because the *Subject Trees* currently provide roosting perches for a large number of bats inhabiting this area and that they (CRC Officers) believed additional reduction pruning was necessary to further reduce the available roosting perch these trees provide which would thereby further reduce the amount of bat excrement currently falling onto adjacent footpaths, seating etc. and further reduce ongoing maintenance issues for Council.

The Arborist Brief for this report is to address the following issues in relation to the *Subject Trees*:

1. Review pruning carried out to date
2. Carryout visual tree assessment (VTA) to consider OH&S risk issues and profile of trees
3. Provide recommendations for future care and pruning needs of *Subject Trees*

Arborist Observations - General

Three (3) large mature *Ficus elastica* (Indian rubber tree)³ are located on the Aplin Street boundary and one (1) large *Ficus microcarpa* (small-leafed fig) is located on the Lake Street boundary of the *Subject Property*.

Note: Onsite identification of the three (3) large mature trees by the writer was been determined as *Ficus elastica* (Indian rubber tree). This identification has been confirmed by botanical staff of Australian Tropical Herbarium, James Cook University Cairns Campus. It is noted that there could be a discrepancy in recorded tree identification, including in Cairns Library documentation sourced from their webpage which records reference to ... *large Moreton Bay Fig trees remain as a feature of the gardens....* if indeed this reference is to the *Subject Trees*.

Please refer to Table 1, p15 for tree detail and following Section 2, p.p.16-20 for detail of tree assessment.

Please Note:

- Trees have been identified by numerical numbering, T1, T2, T3 and T4.
- Tree locations are identified on the Google Map, p6

Answers to the brief outlined above are provided on the following pages.

³ These trees appear to be identified as *Ficus Macrophylla* in Cairns Library information Brochure 'History of The City Library'

Section 1: Pruning review

The writer was informed during the onsite meeting and discussion with CRC and EHP representatives, that the request for further pruning was made as there is a perceived need to reduce the canopies of the *Subject Trees* by a further 25% to the tree work carried out earlier this year (2014) in April/May. To this end, the freshness and calliper of pruning wounds present in the canopies of all four trees indicate that they (the canopies of each tree) have been significantly reduced to an overall extent along an arbitrary single perimeter line across the entire branch structure and leaf peripheries of each tree rather than to chosen branch collar points.

It is the opinion of the writer that recent pruning exceeds guidelines within AS4373-2007 - Pruning of amenity or trees and conditions of General Exemption Certificate s4.2⁴, both in extent (20%) and manner (pruning technique/methodology).

Explanatory Note

The writer did not assess the *Subject Trees* prior to pruning and is therefore unable to verify the exact extent of leaf and branch removal however the size of remaining branch stubs indicates that canopy reduction pruning is most likely to have exceeded the allowed reduction of 20% as stated in s4.2. Should this have been the case, a written Arborist Report was required as stated in the latter EHP General Exemption Certificate⁴.

The writer is unaware if an Arborist Report was prepared prior to the commencement of recent pruning work to address the issues identified by CRC Officers or if prescriptive recommendations to resolve the issues at hand were provided to the tree service contractor.

Should the brief from CRC Tree Officers have been fully understood, the need for inspection and assessment carried out by an experienced, AQF level V qualified Arborist, would have been identified. Further pressing arboricultural issues would also have been immediately identified; issues such as the fact that the intended extent of pruning would far exceed the stipulated 20% in EHP General Exemption Certificate guideline; that is, the intended reduction pruning was to reduce tree canopies to the extent that they (the *Subject Trees*) no longer enticed the presence of such a large colony of bats for roosting on the understanding that such reduction pruning was to be carried out to an extent that all trees were 'taken back' to reduce/stop bat droppings falling onto seating and or pathways below the canopies of the *Subject Trees* (which are the subject of EHP General Exemption Certificate conditions).

Not only should the extent of pruning been identified as extremely poor practice and in fact 'lopping' of the *Subject Trees* which is not appropriate or permitted under s4.2, but during any assessment of these trees by a qualified Consulting Arborist, identification of other issues (with assessed trees) such as the extent and age of decay in the lower stem of T1 would have been immediately identified as a major cause for concern as would the presence of a large hanger (diam. >100mm) in the canopy of this tree; (also) identification of the heightened risk of potential failure due to the fact that this tree overhangs an area of high occupancy as members of the general public are encouraged to use (it) at any time. It is

⁴ General Exemption Certificate - Queensland Heritage Places, Department of Environment and Heritage: s4.2 Parks and Gardens. s4.2 Parks, gardens and landscapes
Regular maintenance and ongoing care of parks, gardens and other landscape elements helps to preserve planting schemes, keep important specimens in good health and monitor arising maintenance issues.

Pruning of trees to control size, shape, flowering and fruiting and to remove dangerous, diseased or dead vegetation:

- Pruning must be carried out in accordance with *Australian Standard Pruning and Amenity of Trees AS4373*.
- Do not remove more than 20 per cent of the canopy of a tree in any two year period, unless the work is carried out by a qualified person (for example an arborist, horticulturalist or tree surgeon) who has given a written assessment that work is required for safety reasons or the long-term health of the tree.

noted that landscaping features such as pedestrian pathways and the seating provided in this area encourage people to sit and 'enjoy' the shade and ambience these trees provide in this public park area. Such qualified arboricultural assessment and the preparation of a written report should have provided a basis for urgent and informed discussion and decision making as well as provided clear guidance on the best way to address all issues identified at the time of inspection. Further, such a report should have provided a Tree Management Plan for the *Subject Trees* for both the immediate and longer term taking into account the stated needs of all stakeholders including Tree Management Officers of both CRC, EHP in compliance with EHP Tree Management conditions.

A prepared Arborist Report should also provide Recommendations for the ongoing arboricultural management of the *Subject Trees* including guidelines and work methodology for any immediate and future pruning, including reduction pruning, for those persons carrying out the tree work clearly setting out what is expected for pruning in accordance with AS4373-2007 and other conditions of General Exemption Certificate - Queensland Heritage Places, Department of Environment and Heritage: s4.2 Parks and Gardens and landscapes.

Observations noted during inspection include:

Recent pruning does not been comply with guidelines of AS4373-2007 - Pruning of amenity trees or the conditions of General Exemption Certificate s4.2⁴ and the size of pruning wounds would indicate that the EHP guideline of 20% was exceeded as evidenced by presence of:

- Bare branch stubs with a significant calliper size (>100mm) remaining in canopies
- numerous larger pruning wounds present in canopies, in many instances wound size exceed 100mm
- stubs and tear present along branches in canopies. Note: Confirmed by tree contractor, age/freshness of wounds indicate this occurred during recent tree work
- clear stem pruning cuts present on numerous large scaffold branches in canopies
- minor amounts of deadwood >30mm still remain in canopies of T2, T3 & T4
- deadwood and hanger >50mm remaining in canopy of T1
- issues of atypical form of species of all trees and 'Best Practice Pruning' was not addressed during recent tree work

Also observed

- sooty mould present on leaves within canopy of T1 indicative of further tree health issues
- major presence of decay in lower stem structure and root flare of a significant tree (T1) which overhangs a high occupancy area accessible encouraging static use by members of the general public evidenced by siting of seating areas within tree's target zone.

Time Frame:

Refer Recommendations, p.p.21-24

Basis for Opinion

The outcomes of peer reviewed studies on the causes of tree failure are now widely accepted by the arboricultural professional, its professional associations, regulatory and government authorities including courts of law and statutory bodies on a worldwide basis. These studies have provided foundations for the determination of Pruning and other arboricultural standards which reflect the fact that there are evidenced based, valid reasons encouraging anyone engaged in the arboricultural profession, most importantly for all trained Arborists, to use to clearly identify the purpose for pruning and to minimise the number and size of pruning wounds. Research on tree failure clearly shows that pruning outside of the branch collar limits the size of wounds and reduces the potential for entry of pests and pathogen which lead to decay (not always obvious to the naked eye or untrained observer) and shortens the Useful Life Expectancy (ULE) of a tree.

Writer's Comments in support of 'Best Practice Pruning'

The science of predicting the date and time of the (potential) failure of a living organism is inexact. Just as it is not yet possible to predict weather with 100% accuracy, or predict how long one individual human will live, so too it is not possible to predict when trees will ultimately fail. It is however possible to provide guidance on the likely causes of future failure based on sound scientific research and evidence gathered to date.

Scientific research now allows prediction of likely outcomes based on known factors which will adversely affect the longevity of trees; just as it is known that smoking and/or drinking to excess or very poor diet will cause illness either in the short or longer time periods with potential for fatal consequences for humans, but with no known time period or expected date of failure, so too is it possible to state, on the basis of peer reviewed research, that the mismanagement of trees will also take its toll on their ULE (longevity). Just as it is impossible to predict weather outcomes due to the unknown and sometimes unpredictable outcome of multiple possible scenarios based on the outcome of each and every known contributing factor or foreseeable factor, so too is it impossible to predict how much any one 'lopping' event will affect the health and longevity tree at a specific period or point in time.

To determine the expected longevity of a tree, answers are required to questions such as - How many adverse influences have diminished the starch reserves of the tree? Has recent rain caused a sudden increase in the local presence of a pathogen or disease which are undetectable to the naked eye? Has a confluence of circumstances occurred, such as the sudden alliance of contributing factors to create a microclimatic utopia for pest and pathogen attack including the presence of large open wounds of a stressed tree which under normal circumstances could and probably would resist attack from pests? Just as a human who is stressed and 'run down' is more likely to catch a cold, possibly pneumonia etc., it can be predicted that the depletion of a tree's reserves (starch) will leave its natural defence system compromised and less likely to cope as well with adverse circumstances. Repetition of such adverse events, e.g. severe weather events, human intervention above or below ground such as damage during construction (recent or sometime in the past); 'lopping' and/or repeat 'lopping' of the tree canopy or root system will reduce any one tree's ability to function optimally in either the short or long term.

For these reasons it is important that the care of trees, especially those trees located in high occupancy areas, is carried out diligently by and appropriately, i.e. that they are monitored and cared for in the best manner available. It is equally important that due diligence is carried out in the care and management of such trees, including assessment by persons qualified to detect the early signs of tree failure. Optimally there should be a reporting system put in place to allow for prompt notification and rectification of issues of concern. Ground maintenance staff should receive training so that they can observe and report any unusual changes of concern in relation to the *Subject Trees* as they go about their work on a

daily, weekly or monthly basis. They should then be able to report those changes to a responsible superior for prompt and immediate attention as circumstances require. As a minimum the *Subject Trees* should be inspected by a suitably qualified Level V Arborist on 3 yearly rotational basis or sooner depending on circumstances such as severe storm weather events.

Why is the extent of branch and leaf removal critical to the ongoing health and viability of a tree?

Further to accepted opinion, guidelines for best practice methodology for carrying out pruning, as stated in AS4373-2007, are based on sound science and provide instruction on how to carry out pruning, including instruction for the selection of branches for removal. Selection criteria for branch removal includes selecting lateral branches to which the final cut is made on the basis that (those branches) are greater in size than one third of the diameter of the branch being reduced at the point of the final cut⁵. This selection methodology ensures that the remaining branches have sufficient strength and structural integrity to remain viable to provide support future growth.

Pruning just outside the branch collar promotes the wound occlusion process and minimises unwanted epicormic growth and its associative problems of poor branch attachment /high failure rate (especially in severe weather events) as well as the costly need for repetitive pruning required to 'control' such excessive and poorly attached growth. To prune otherwise is to leave the pruned tree with visually compromised form atypical of its species and exposed to the prevailing weather including sun scalding of previously unexposed parts of the tree and sudden exposure of previously unexposed (tree) structure which maybe poorly equipped to cope with strong and severe wind events for example. The tree's natural defence system of compartmentalisation is also compromised by inappropriate removal of foliage and branch structure and large wound sites exposing the inner tissue structure of the tree and as mentioned above, they (wound sites) provide easy access for pests and pathogens to attack the heartwood of a tree.

Appropriate pruning is not only a useful tool in managing cost efficiencies and tree management budgets in monetary terms. The excessive removal of branches will 'cost' a tree as well as it will lead to the depletion of the tree's carbohydrate reserves, an important resource for its (tree's) viability and survival in the long term. It is important to remember that the average life cycle/age of a tree is over 100 years and continual 'lopping' will lead to premature tree death in a much shorter time frame than might otherwise be expected.

Excessive removal of foliage will compromise the ability of the photosynthesis process to occur. Otherwise referred to as 'topping' or 'lopping', arbitrary reduction of a tree's crown is likely to cause severe xylem dysfunction as well as remove the suppression of dormant buds beneath the bark. 'Topping' has the unwanted effect of causing remaining dormant buds beneath the cambium layer along the remaining branch structure to sprout and, quite contrary to the commonly held myth that the prolific and sometimes rapid emergence of shoots, known as epicormic growth, is a sure sign that a tree is responding well to a good 'lopping', this emergence /epicormic response is an indication that a tree is in a stressed state and that the tree is racing to replace the lost foliage to restore its (compromised) ability to photosynthesise energy. Growing 40% faster than normal growth it is poorly attached (up to 70% less strength) and prone to sudden failure, especially in severe storm weather events and as it gains in weight and length.

⁵ AS 4373-2007 - Pruning of amenity trees, 7.3.2 Reduction pruning (R)

Energy reserves (starch, sugars and oils) are stored in branches, stems, trunk and roots. This energy can be preserved by removing the fewest number of live branches necessary to accomplish the desired objective⁶.

'Topping' is only ever appropriate in the rarest of circumstances and only as a last resort measure to attempt to save a tree which is of great cultural value or historical significance and it is only carried out to address serious OH&S failure risk or similar issue.

Crown reduction pruning .. (to address existing defects in trees).. involves only the outer part of the crown and therefore provides only a modest reduction in overall (tree) height

Further,

....Crown reduction usually allows a high proportion of the foliage-bearing structure to be retained with a view to retaining enough photosynthetic area for healthy growth and the maintenance of defences against dysfunction and decay in the wood..... Reduction, if done skilfully often allows the natural shape of the crown to be retained⁷

(Refer Appendix 2, p39 Normal Tree Function & Appendix 4, p.p.41-43, Cost of 'Lopping')

Concluding Remarks

For reasons outlined above, it is the opinion of the writer that recent pruning exceeds guidelines within AS4373-2007 - Pruning of amenity or trees and conditions of General Exemption Certificate s4.2⁴. Further, that recent pruning carried out in April/May of this year, 2014, is incompatible with required pruning methodologies outlined in Australian Standard AS4373 and that the extent and manner of the pruning exceeds guidelines of this standard.

No further pruning (including any pruning to further reduce the canopies of the *Subject Trees*) without proper arboricultural appraisal of all issues at hand is not supported by the writer.

During onsite discussions on Monday 11th August, the writer was led to believe that the brief provided to the CRC Tree Service Provider was to significantly reduce the canopy of the *Subject Trees*. Should EHP Officers have been made aware of the ultimate extent of pruning expected by CRC, it is the writer's understanding that they (EHP) would have required the preparation of an appraisal and written report by a qualified Consulting Arborist prior to commencement of the current pruning work or any other arboricultural treatment of these trees.

It is the writer's opinion that an amount of reduction pruning, in compliance with appropriate pruning standard guidelines, would have been feasible and such pruning would have been likely to have achieved many of the stated objectives in some measure without compromising the long term health, structural integrity and natural decurrent form of the *Subject Trees*.

In summary and as mentioned above, the importance of providing a report prepared by an appropriately qualified and experienced Consulting Arborist cannot be understated in this instance. Such a report should have contained:

- assessment of tree health and form at that point in time and photos
- informed analysis of all relevant issues, e.g. will pruning achieve the objective of reducing the attraction of the wildlife including bats

⁶ Tree Pruning (revised 2008), Companion to ANSI A300 Part 1, ISA, copyright 2002

⁷ Lonsdale, David: Principles of Tree Hazard Assessment and Management, Department of Communities and Local Government UK, Seventh Impression, 2009

- determinations based on findings for the best course of arboricultural management of *Subject Trees*
- recommendations for the most appropriate course of action to address issues of concern
- extent and methodology of carrying out proposed pruning work; for example
 - remedial pruning required to address the issues of deadwood, hangers etc,
 - analysis of reduction pruning:
 - recommendations and guidance for remedial action
 - provide a Tree Management Plan (TMP) to ensure that planned management does not compromise the long term integrity and therefore long term viability of the *Subject Trees*

Further, preparation of such a written report would not only have been prudent for reasons outlined, but it would have been used to provide guidance to those persons undertaking the tree work on the methodology of carrying out appropriate required pruning of the *Subject Trees*; i.e. so that any pruning was carried out in accordance with best arboricultural practice and that it would ensure that the integrity of the natural growth habit of the tree species was maintained or in the alternate, approval was sought and granted by EHP for variation to allowable pruning provisions based on sound reasoning.

Arborist Practitioner/s should have carried out their work in a manner which ensured that:

- all hangers, deadwood >30mm etc were removed
- remedial work carried out addressed ,removed/replaced/managed presence of decay in T1
- all work complied with requirements of EHP, General Exemption Certificate, Qld Heritage Places, s4.2, including that pruning carried out does not exceed 20% canopy reduction at any one time nor be carried out within 2 years
- it complied with guidelines within AS 4373-2007 - Pruning of amenity trees
(Refer following Background Note, p7)
- pruning was carried out in a manner to reduce the need for ongoing repeat pruning within anytime frame of less than 2 years (under normal circumstances or unless otherwise approved and/or authorised)
- ensured all pruning was carried out by appropriately briefed, trained, qualified and experienced AQF Level 3 arborist practitioner/s

The writer acknowledges the vexed nature of bat habitation areas in the urban environment however the *Subject Trees* are afforded particular protection due to their age and importance as a long standing significant historical feature of the gardens on this Heritage Listed Place (property).

The writer is aware of the serious Australia wide and local public debate surrounding the topic of vegetation, notably in relation to mature trees within the local vicinity of the *Subject Property*. In particular, the extent of local passionate public debate highlighted in two particular articles in the Cairns Post; *Destruction of historic fig tree in Cairns*, Cairns Post Friday 13 July 1951⁸ and as late as Thursday August 13, 2014 in the Cairns Post article, *Historic flying fox roosting trees in danger of chop at Novotel Oasis Resort in Cairns*,⁹.

Please refer to Appendix 1, p38 EHP Extract, Pruning Recommendations, Section 3, p.p.21-24.

Further explanatory detail is provided in Appendices 2, 4, 5 & 6 in relation to the requirements of 'Best practice pruning'. Further References are listed in the Bibliography, p37 including presentation of peer reviewed research:

James, Ken. The Bark, Arboriculture Australia, Vol 13, p6, Number 2, Winter 2011

⁸ <http://trove.nla.gov.au/ndp/del/article/40378341>

⁹ <http://www.cairnspost.com.au/historic-flying-fox-roosting-trees-in-danger-of-chop-at-novotel-oasis-resort-in-cairns/story-fnnjfp-ar-1227023996356>

Section 2: Carryout VTA for OH&S

Notes for the Visual Tree Assessment of T1, which is assessed to have a higher OH&S risk profile are detailed below. It must be decided whether this tree is to be retained and managed in the short term with a view to its removal at a later date or it is removed and replaced in the short term. Either way, it is the writer's strongest recommendation that it is isolated from public access immediately.

Notes for the Visual Tree Assessment have been grouped for trees which can be retained, i.e. T2, T3 & T4 are detailed on the following pages:

Tree 1

Overall tree risk rating: Moderate

General Comment

At the time of inspection this tree was assessed to be generally in a state of poor health and form. Extensive removal of foliage and branch structure has occurred during recent pruning and canopy spread is no longer typical of the natural decurrent growth habit of this species.

(Refer Table 1: Tree Detail, p20, Photos p.p.25-36)

Canopy

- remaining canopy foliage is sparse and lacks vigour
- sooty mould present on leaves
- an amount of deadwood >50mm, hanger, pruning stubs are present

Structure

- Multi-stemmed with significant aerial root system typical of its species
- Presence of extensive decay in the root flair and stem of the tree where it appears a host tree was once present
- Tip dieback & large (pruning) wounds present on leaders and branches

OH&S potential fall hazards

- Major leaders are supported on/above structurally compromised decay points
- Epicormic growth is present indicating current stressed state of tree health
- Future and maturing epicormic growth will represent a future OH&S fall risk as aging/maturing process occurs. An amount of decline of this growth is likely to occur as a result of overcrowding

Mitigation options

- Take proactive steps to immediately address OH&S fall risk issues due to presence of deadwood >30mm, extensive decay and future overcrowding of epicormic shoots
- Thorough review of all options in relation to the ongoing management of this tree to be carried out by qualified and experienced Consulting Arborist (Diploma Arboriculture/AQF Level V) in liaison with relevant EHP and CRC parties

Note: All pruning must be carried out by Arborist practitioner (min qualifications AQF 3) in accordance with AS 4373 - 2007 - Pruning of amenity trees*. (*Refer Footnote 9, p13)

Concluding Comment

No amount of remedial pruning or arboricultural care can restore the health and/or structural integrity of this tree so that it can remain viable in either the short or long term. Proactive steps must be taken in the short term to address the OH&S issues associated with this tree.

Please see following page for recommendations and Time frame

Tree Management Plan Timeframe

Immediate Action

Measures to address issue of potential fall risk of any/all structurally compromised leaders/stems:

- Establish perimeter fencing to isolate target zone of T1 as soon as practical

Further options for consideration include:

Short term basis

1. As safe to do so - carry out removal of deadwood >30mm and hanger
Qualified and experienced Consulting Arborist (Diploma Arboriculture/AQF Level V) to review and prescribe updated pruning requirements in a written Arborist Report as required at time of EHP & CRC management decision.

Further Options

2. Install bracing prop to address potential OH&S risk of limb failure (Refer Photos, p33) and
3. Plant advanced (NATSPEC certified) tree stock in adjacent plant site with view to removing T1 on establishment of new planting

Alternatively

4. Remove T1 and replace with advanced (NATSPEC certified) tree stock
Note: Copy of this Arborist Report must be submitted to EHP seeking permission to remove this tree prior to commencement of any removal

Ongoing

5. Consulting Arborist to review tree in 6 months and provide a Plant Health Care (PHC) programme (Refer Recommendations p.p.21-24)

Note: Option to install bracing (carried out during the establishment period of new replacement planting) would minimise time period that the Lake Street frontage of the *Subject Property* would otherwise be without trees.

Section 2: Carryout VTA for OH&S cont.

Tree 2, Tree 3 & Tree 4:

Overall tree risk rating: Low

Note: The risk rating of these trees will change over time as epicormic growth continues to gain in size and weight.

General Comment

At the time of inspection these trees were assessed to be generally in a state of fair health and their form (branch structure and foliage) is typical of their species. Extensive removal of foliage and branch structure has occurred during recent pruning and canopy spreads are no longer typical of their natural decurrent growth habit of this species.

(Refer Table 1: Tree Detail, p20, Photos p.p.25-36)

Canopies

- remaining canopy foliage is reasonably full, leaf colour and form indicates that these trees have reasonable vigour and vitality
- minor amount of deadwood >30mm, pruning stubs, tears and cracking present

Structures

- Multi-stemmed with significant aerial root systems typical of *Ficus* species
- Large pruning wound sites present on leaders and branches.

OH&S potential fall hazards

- Cracking beneath branch union was observed.
- Future epicormic growth will represent a future OH&S fall risk as it matures. An amount of decline is likely to occur as a result of overcrowding

Mitigation options:

- Address OH&S fall risk issues due to presence of deadwood >30mm and future overcrowding of epicormic shoots. Note: An amount of decline as aging /maturing process of epicormic growth is likely to occur as a result of overcrowding.
Note: All pruning must be carried out by Arborist practitioner (min qualifications AQF 3) in accordance with AS 4373 - 2007 - Pruning of amenity trees.

Tree Management Plan Timeframe

Short term

6. Carry out crown clean pruning only to address OH&S fall risk (deadwood >30mm and overcrowding of epicormic shoots as appropriate).

Note 1: Qualified and experienced Consulting Arborist (Diploma Arboriculture/AQF Level V) carry out updated VTA of trees (T2, T3 & T4) prior to pruning and provide an updated Arborist Report with written Recommendations to guide any pruning work carried out.

Note 2: All pruning to be carried out by Arborist practitioner (min qualifications AQF 3) in accordance with AS 4373 - 2007 - Pruning of amenity trees¹⁰.

Note 3: No climbing spikes are to be used unless there is an emergency event.

Note 4: No further reduction pruning is to be carried out.

¹⁰ General Exemption Certificate - Queensland Heritage Places, Department of Environment and Heritage: s4.2 Parks and Gardens. s4.2 Parks, gardens and landscapes

Pruning of trees to control size, shape, flowering and fruiting and to remove dangerous, diseased or dead vegetation:

- Pruning must be carried out in accordance with *Australian Standard Pruning and Amenity of Trees AS4373*.

Do not remove more than 20 per cent of the canopy of a tree in any two year period, unless the work is carried out by a qualified person (for example an arborist, horticulturalist or tree surgeon) who has given a written assessment that work is required for safety reasons or the long-term health of the tree.

Ongoing

Qualified and experienced Consulting Arborist (Diploma Arboriculture/AQF Level V) to review and prescribe updated pruning requirements in a written Arborist Report as required for T2, T3 & T4 on a time basis as follows:

1. Review tree health and form at the same time as carrying out next review for T1, i.e. review to be carried out no later than 6 months, i.e. prior to 11th February, 2015
2. Carryout review and report on six (6) monthly basis for next three years

then

3. Carryout review and report on 2 yearly basis as part of a Plant Health Care (PHC) programme and Plant Management Plan (PMP) for *Subject Property*

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Table 1: Tree Details

Tree	Botanical Name	Common Name	DBH (mm)	H (m)	Sp. (m)	Health	Form	Age*	ULE** yrs
1	<i>Ficus microcarpa</i>	small-leafed fig	m/s	16	E/W-18 N/S -27	P	P	S	<10
2	<i>Ficus macrophylla</i>	Moreton Bay fig	m/s	18	E/W- 26 N/S -19	F	T	M	>50
3	<i>Ficus macrophylla</i>	Moreton Bay fig	m/s	17	E/W- 20 N/S -13	F	T	M	>50
4	<i>Ficus macrophylla</i>	Moreton Bay fig	m/s	18	E/W- 32 N/S -24	F	T	M	>50

Table Legend:

m = meter mm=millimetre Hgt. - Height Sp. - Spread M - Mature S - Senescent
E - East W - West N - North S - South
H - Health F - Form
G – Good G- Good
F – Fair F – Fair
P – Poor P – Poor
D – Dead T – Typical

DBH - Diameter at Breast Height measured at 1.4m above ground level DBH is the circumference divided by π

TPZ - Tree Protection Zone TPZ = DBH x 12 (The radius of the TPZ is calculated for each tree by multiplying its DBH x 12)

Note: TPZ - minimum area is 2.0m / maximum area is 15m

SRZ - Structural Root Zone SRZ = radius = (Dx50)0.42 x 0.64 (SRZ = radius = (Dx50)0.42 x 0.64)

Note: SRZ - minimum area for trees less than 0.15m will be 1.5m

Buttress measurement: Trunk diameter measured immediately above the root buttress using the formula, p12, AS 4970-2009

* The age of these mature trees (*Subject Trees*) is likely to be in excess of 100years.

Note: the average age of trees is estimated to be in excess of 100years. Available historical records in relation to these trees indicates that they predate the establishment of the current building on this property, constructed in 1929-30.

**The Useful Life Expectancy (ULE) of Trees 2 - 4 is assessed to be >50years subject to any unexpected adverse weather event or onset of disease or other unforeseen event. In relative arboricultural terms, these trees would, under normal circumstances could reasonably be expected to live a healthy productive life for many hundreds of years to come; that is, these trees would continue to act as an active carbon store and actively photosynthesise for many years to come.

Section 3: Provide recommendations for future care and pruning needs of *Subject Trees*

Recommendations

As the *Subject Trees* are located in a high use occupancy area they should be inspected on a 6 monthly basis for the next three years, then annually on an ongoing basis until such time as the Arborist advises that inspections can be carried out on an alternate basis, i.e. two yearly basis. These arboricultural inspections are to form part of the Plant Health Care programme (PHC) and Plant Management Programme (PMP) for the *Subject Property* as part of due diligence and property management.

Preparation of Training and Reporting Programme, Plant Health Care programme (PHC) and Plant Management Programme (PMP) should be carried out immediately.

Explanatory Note:

Further pruning to reduce the canopies of these trees will exacerbate the already compromised form of the *Subject Trees*. Significant wounds in each tree are exposed to the elements, pest and pathogen attack. This 'lopping' is most likely to have shortened the expected ULE of these trees and remedial pruning only is to be carried out going forward. This pruning should be carried out by skilled and experienced arboricultural practitioners as there will always be a degree of discretion required whilst selecting branch collars and the extent of any further removal of branches or foliage with a view to minimising any further wound injury during future crown cleaning.

(Refer Section 1 & 2 above and further supporting Notes in the Report Appendices below)

The issue of managing emerging and maturing epicormic growth sprouts on and below wound sites as the *Subject Trees* respond to recent heavy pruning in April/May of 2014, will be an ongoing OH&S issue to be addressed in a Plant Health Care programme (PHC) and Plant Management Programme (PMP).

These recommendations are presented in a timeframe basis to clearly identify required response time periods to address all current issues and future arboricultural care for the *Subject Trees* as outlined in the brief provided to the report author by Mr Scott Sullivan, EHP Regional Manager, Environment and Heritage and Staff Members Ms Nina Henney, A/Principal Environmental Officer, Northern Region and Ms Lauren Payne, Senior Environmental Officer, Environmental Services and Regulation, Northern Region.

The following recommendations are presented in time frames so that they can be prioritised so that the most urgent issues can be addressed in a prompt and timely manner.

Recommendations: Immediate timeframe

It is the author's strong recommendation that:

1. T1 is to be immediately isolated to prevent public access within its target zone or including beneath its canopy.
Note: Decay, hanger and deadwood >100mm represent immediate OH&S fall risk

AND

2. No further pruning of any one of the *Subject Trees* is to be carried out i.e. no reduction of canopies by a further 25% is to be carried out
Note: Further reduction pruning will severely compromise the health and structural integrity of these trees.

Recommendations for the management of these trees in the short term is to be carried out as follows:

Short term

1. T1- Immediately establish isolation fencing to prevent public access beneath tree canopy
 2. T1 - Depending on selected option of tree removal or retention and as appropriate and safe to do so, remove and address structural issues including emergence of epicormic growth, deadwood >30mm and hanger as appropriate
 3. T2, T3, T4 - Carry out crown clean pruning to remove deadwood >30mm
- Note:
7. All pruning must be carried out in accordance with AS4373-2007
 8. All pruning must to be carried out by an arborist practitioner with minimum qualifications of AQF Level 3 under the supervision of an experienced and AQF Level 5/Diploma of Arboriculture qualified Consulting Arborist.
4. In collaboration with all relevant parties (CRC, EHP, Arboricultural and other relevant professional experts) establish Plant Health Care programme (PHC) and Plant Management Programme (PMP) including clear guidelines and instruction for the conduct of a remedial arboricultural care (pruning) programme for *Subject Trees* T2, T3, T4.
- Note 1: Arborist (AQF Level V, qualified and experienced in inspection of trees to carryout inspections on a 6 monthly basis for the next three years, then annually on an ongoing basis until such time as the Arborist advises that inspections can be carried out on an alternate basis, i.e. two yearly basis
- Note 2: All pruning must be carried out in accordance with AS4373-2007.
- Note 3: No further 'lopping' is to be carried out
- Note 4: All pruning is to be carried out by experienced Arborist practitioner/s qualified to AQF Level 3 under the supervision of an experienced Arborist qualified to AQF Level V.
- Note 5: Climbing spikes are not to be worn Arborist practitioner/s whilst carrying out pruning with the exception of an emergency.
- Note 6: If required, institute an arboricultural training programme to brief and up skill all arborist practitioners prior to commencement of any pruning. Training programme could be provided by AQF training provider in arboriculture
- Note 7: Provide arboricultural training programme (pruning) for arboricultural staff responsible for ongoing care and maintenance of *Subject Trees* which are the subject of condition s4.2 of EHP General Exemption Certificate, Heritage Places.
5. In collaboration with all relevant parties (CRC, EHP, Arboricultural and other relevant professional experts) select a preferred option for the ongoing management of T1 taking into consideration options such as:
 - Installation of bracing/branch supports and carryout crown clean pruning as practical
 - Plant advanced specimen in adjacent location with view to removing T1 tree on establishment of replacement tree
 - Remove T1 tree on establishment of replacement tree

Or

- Remove T1 and replace with advanced specimen *Ficus microcarpa* (small fruited fig) within two months in as close to the original planting site as practical.
(Refer Appendix 1, p38 EHP Guidelines)

Ongoing tree management

1. Establish tree management and arboricultural inspection programmes including appropriate line of management reporting system from Ground Staff to Property Management Superior to Consulting Arborist.
2. Provide appropriate training programme for all personnel in reporting line including Ground Staff and managing superiors.
3. Establish three yearly rotational arboricultural inspection programme to be carried out by suitably qualified and experienced AQF Diploma/Level V qualified Arborist.
4. Establish Plant Health Care programme (PHC) and Plant Management Programme (PMP) to be adopted into Property Management Plan for *Subject Property*.
5. Provide ongoing training programme (pruning) for arboricultural staff responsible for care and maintenance of these (*Subject Trees*) Heritage Listed and protected trees.

Please Note:

The *Subject trees* are located on a Heritage Listed Place and they are the subject of s4.2 of the General Exemption Certificate for Queensland Heritage Places. As such, any pruning must be carried out by qualified arboricultural professionals in accordance with Australian Pruning standard AS 4373-2007¹¹ and any pruning carried out must not exceed 20%; any repeat pruning is not be carried out within a time period of less than 2 years without sound reasoning, professional arboricultural assessment detailed in a written report and permission from EHP to do so.

For further information please refer Appendices 4-5, p.p. 41 - 43 and the following Extract Notes:

¹¹ AS4373-2007 Pruning of amenity trees

Extracts from AS4373-2007:

Assessment of trees and specification of their pruning should be carried out by a suitably qualified arborist. Pruning should be carried out by arborists or tree workers who are familiar with the principles, techniques and hazards of this work. AS4373-2007, AS4373-2007 p4

APPLICATION

This Standard is intended for use by arborists, tree workers, government departments, building contractors and others involved with contractual arrangements for tree pruning. The Standard will also serve as a guide for property owners and others who specify pruning procedures.

The procedures in this Standard are guided by theories of branch attachment and compartmentalization of decay in trees. Lopping, topping and flush cutting are unacceptable practices. AS4373-2007, s 3.2 Arborist, p5

Arborist

The person with training to AQF Level 3 in Arboriculture, or above, or equivalent recognized and relevant experience that enables the person to perform the tasks required by this Standard. AS4373-2007, s 3.2 Arborist, p5

Final cut

This is the final cut in the process of the reduction or removal of branches and stems. The purpose of this final cut is to reduce the risk of microorganism infection according to the principles of branch attachment and compartmentalization to encourage even wound closure (occlusion) (see Figure 1). AS4373-2007, s3.24, p7

.....CONSIDERATIONS BEFORE PRUNING

Prior to pruning being prescribed or undertaken a thorough inspection of the tree should be carried out by a person competent in arboricultural assessment

... include an assessment of the tree's health, growth habit, structure, stability and growing environment. The need for pruning should be determined. If pruning is required then the current and subsequent pruning requirements should be specified. ..

.. tree should not be adversely affected by pruning.

The inspection should consider hazards, habitats, species, age, condition, wind loading, location and the timing of the tree's biological processes. The distribution of the foliage and wound size should be considered. The potential impacts of the proposed pruning on the health, structure and amenity of the tree should also be considered.

NOTES:

- 1 Reference should be made to any relevant legislation including planning, heritage and protected species.*
- 2 Tree work is inherently hazardous and should be carried out by a person suitably qualified and experienced in arboriculture Work should be performed in accordance with relevant OHS guidelines.*
- 3 The person carrying out the assessment should qualification ofin arboriculture.*
- 4 Trees with hollows or other likely habitat may need further assessment by an ecologist or wildlife specialist.* AS4373-2007, s4, p9

Photos

Tree 1: *Ficus microcarpa* (small fruited fig)

Photos 1 - 4: Extensive reduction of entire tree canopy - east, west, north & southern sides



Photo 5: (Lineal) Pruning along a line to clear building



Photos 6 - 9: Pruning not carried out in accordance with guidelines AS 4373 - 2007



Photo 10: Deadwood and dieback within canopy



Photo 11: Fruiting bodies present on deadwood in tree canopy



Photos 12 - 13: Large hanger and deadwood >30mm



Photos 14 - 18: Extensive areas of decay present in stem structure



Photo 19: Sooty mould present on leaves



Photos 20 - 24: Potential target zones if limb failure occurs are over public seating and pedestrian footpaths

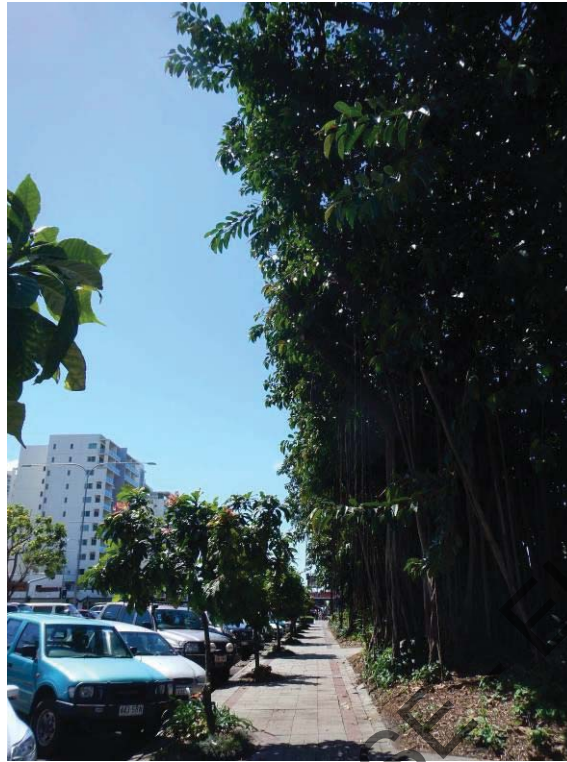


Tree 2: *Ficus macrophylla* (Moreton Bay fig)

Photos 20 - 24: Extensive reduction of entire tree canopy - east, west, north & south



Photo 25: Lineal pruning along footpath and carpark perimeters



Photos 26 - 28: Deadwood, tears and cracks remain within canopy



Photos 29 - 32: Pruning has not been carried out to AS4373-2007 - remedial pruning will be required to address future associated issues of epicormic growth



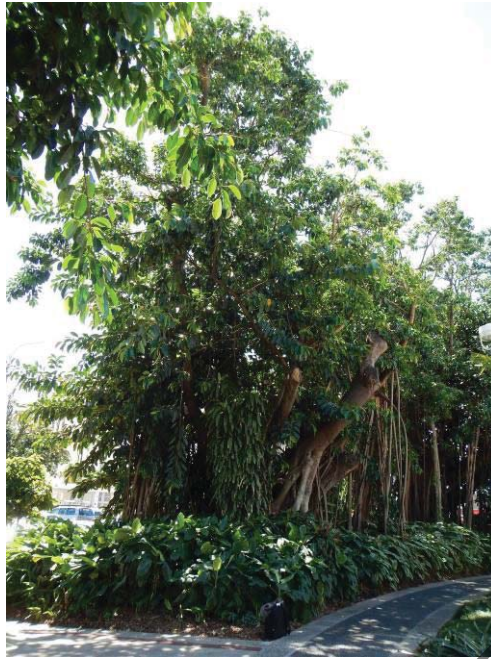
Tears within canopy



Tree 3: *Ficus macrophylla* (Moreton Bay fig)

Photos 33 - 39: Natural decurrent form of tree has been removed during extensive reduction pruning of entire tree canopy in lineal directions - east, west, north & south





Tree 4: *Ficus macrophylla* (Moreton Bay fig)

Photos 33 - 39: Natural decurrent form of T4 has been removed during extensive reduction and lineal pruning of entire tree canopy on east, west, north & south sides



[illegible]

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All comment and recommendations in this report have been determined in accordance with Australian Standards AS 4373-2007- Pruning of amenity trees and AS 4970 – Protection of trees on development sites. All recommended tree work should be carried out in accordance with these standards.

Please do not hesitate to contact the writer should any further clarification of this report be required.

Yours faithfully,

sch4p4(6) Personal information

Andrew Rankine

Diploma Arboriculture

ISA Certified Arborist & Municipal Specialist AU-0269AM

ISA TRAQ (Qualified) / QTRA (Lic. No: 2768)

Current Qualified Member – Queensland Arboricultural Association (QAA)

Current Qualified Member – *Arboriculture Australia*

Current accreditation and member – International Society of Arboriculture (ISA)

Appendices:

Appendix 1: Structure of a tree

Appendix 2: Tree Bracing

Appendix 3: EHP Guideline 4.2

Appendix 4: Common Myths about 'Lopping'

Appendix 5: Explanatory Notes

Appendix 6: Company Details

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Ken James. ENSPEC. Dynamic Loading of Trees. Measuring Root Plate. Movement

[Dynamic Loading of Trees Ken James - Arboriculture Australia](#)



Appendix 1¹²

EHP: General Exemption Certificate (Qld Heritage Places)

4.2 Parks, gardens and landscapes

Regular maintenance and ongoing care of parks, gardens and other landscape elements helps to preserve planting schemes, keep important specimens in good health and monitor arising maintenance issues. For cleaning and repairs to monuments, memorials and garden structures see 4.1 Buildings and structures.

Development	Conditions
Pruning of trees to control size, shape, flowering and fruiting and to remove dangerous, diseased or dead vegetation	<ul style="list-style-type: none"> Pruning must be carried out in accordance with <i>Australian Standard Pruning and Amenity of Trees AS4373</i>. Do not remove more than 20 per cent of the canopy of a tree in any two year period, unless the work is carried out by a qualified person (for example an arborist, horticulturalist or tree surgeon) who has given a written assessment that work is required for safety reasons or the long-term health of the tree.
Replanting to maintain garden beds.	<ul style="list-style-type: none"> Use plant species and planting designs that retain the character of the landscape or garden. Avoid use of chemical fertilizer and chemical weed killers near masonry structures.
Installation of garden sprinkler systems.	<ul style="list-style-type: none"> Position garden sprinklers so that water discharge is at least two metres away from all buildings and in-ground structures including monuments and memorials.
Removal of Class 1 declared pest plant species under the <i>Land Protection (Pest and stock route management) Act 2002</i> .	<ul style="list-style-type: none"> Within two months of removal, replace the removed tree with a species that grows to a similar height, shape and visual appearance. Plant in the same or similar position as the removed tree.
Removal of trees that have been assessed by a qualified arborist or horticulturalist as dead, dangerous or beyond curative repair.	<ul style="list-style-type: none"> Prior to removing, submit to EHP a written report prepared by a qualified person assessing the health of trees to be removed. If it is not possible to replace the removed tree with the exact same species, the report must nominate the species of replacement tree. Within two months of removal, replace the removed tree. Position new plant in the same or similar position as the removed tree.

Technical notes

This General Exemption is supported by the following technical notes:

- General Exemption technical note: Parks, gardens and landscapes—maintenance

¹² EHP, General Exemption Certificate, Queensland Heritage Places, 4.2

Appendix 2

Normal Function of a tree

Background Note:

The following diagrams and explanatory notes are useful to illustrate the structure of a tree in a normal growing environment. This information is taken from AS4970-2009-Protection of trees on development sites which has been released subsequently to AS4373-2007- Pruning of amenity trees.

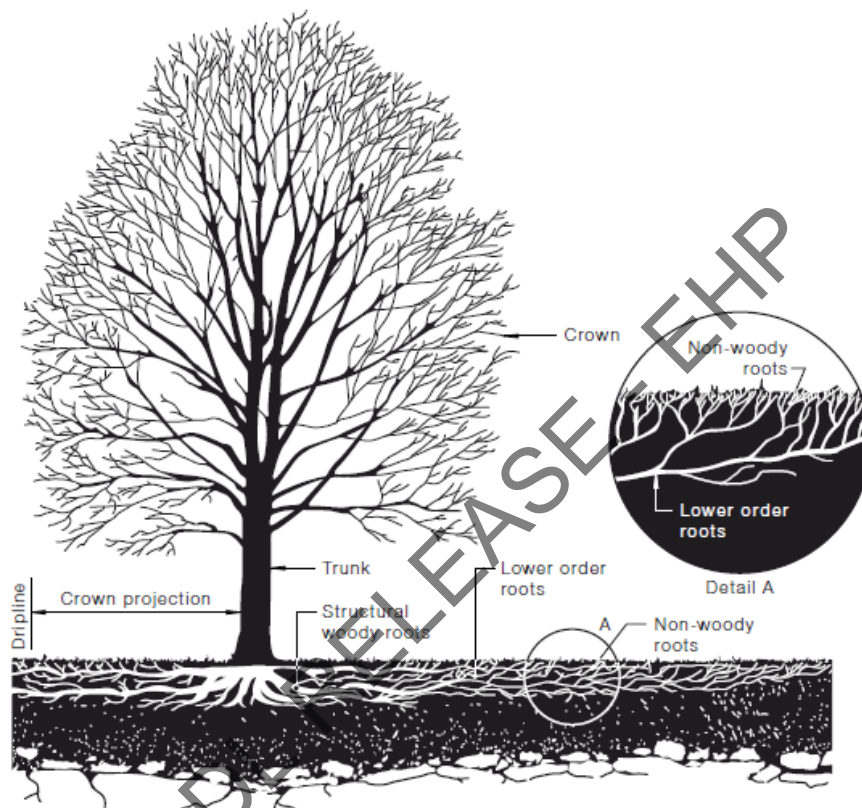


FIGURE B1 STRUCTURE OF A TREE IN A NORMAL GROWING ENVIRONMENT

B2.2 Leaves

The main function of leaves is photosynthesis, that is, the production of sugars. The sugars produced by the leaves (and any other green tissue) are the source of chemical energy for all living cells in the entire plant and as such are essential for the normal functioning and survival of the tree. Anything that directly or indirectly damages the leaves will interfere with photosynthesis.

B2.3 Trunks and branches

Branches and trunks are composed of many tissues with specialized functions including the bark (protection), phloem (transport of sugars from the leaves), vascular cambium (growth of new transport tissues), sapwood (transport of water and nutrients from the roots), heartwood (strength and structural support) and rays (internal transport and storage of sugars). Damage to branches or trunks may allow infection by plant pathogens (disease causing organisms), disrupt the movement of vital materials and structurally weaken the tree.

B2.4 Roots

The main functions of roots include the uptake of water and nutrients, anchorage, storage of sugar reserves and the production of some plant hormones required by the shoots. In order for roots to function, they must be supplied with oxygen from the soil. The root system of trees consists of several 'types' of roots found in different parts of the soil and is generally much more extensive than commonly thought. The importance of roots is easily overlooked because they are not visible, that is 'out of sight, out of mind'. Damage to the root system is a common cause of tree decline and death and is the most common form of damage associated with development sites.

Appendix 3

Bracing/Prop supports



Appendix 4

Pruning Terminology

Pruning to Australian Standard 4373-2007- Pruning of amenity trees

Please refer to the Standard for detail.

Briefly tree works should be carried out as follows:

For branch removal - a final cut shall be made as close as possible to the branch collar without cutting into the branch collar or leaving a protruding stub.

Trees should be pruned to maintain their natural habit with the exception of specific types of pruning. (see STD, Sections 7, 8 and 9.)

When pruning a tree, as little as possible should be removed. For each tree or group of similar trees, the amount to be removed shall be specified prior to commencement of work.

Consideration should be given to the species, health, age, condition and location of the tree as well as reason for pruning, location of foliage to be removed and size of cuts. Care should be taken to avoid excessive pruning. Generally, pruning works should not exceed 15% of the total tree. For branch removal, a final cut shall be made as close as possible to the branch collar without cutting into the branch collar or leaving a protruding stub. As a general rule no branch greater in size than 30% of the size of the leader should be removed. Climbing spikes should only be used if the tree is to be removed or in the event of an emergency.

Lopping and topping

Lopping (see Std 4373-2007 - Clause 3.31) and topping (see Std 4373-2007 - Clause 3.44) are unacceptable practices for the following reasons:

- (a) They increase the rate of shoot production and elongation.
- (b) The resulting regrowth is weakly attached and becomes prone to failure or collapse.
- (c) The stubs may decay.
- (d) The natural habit of the tree is destroyed.
- (e) They may reduce the lifespan of the tree.
- (f) They predispose trees to fungal infections and insect attack.

'Lopping'

The practice of cutting branches or stems between branch unions or internodes.

Aust. Std AS4373-2007 – Pruning of amenity trees

Tree Works to remove in excess of 50% of the tree canopy and/or structure including pruning which is not to the collar resulting in exposed stubs. 'Lopping' is poor pruning practice and is contrary to Australian and International Pruning Standard 4373-1996

It is generally accepted that 'lopping' will shorten the length of a tree's life and may lead to the decline and ultimate death of a tree.

Topping / heading back / lopping involves cutting back to a stub, bud or a lateral branch not large enough to assume apical dominance. Severe heading causes branch dieback, decay and sprout production from the cut ends, resulting in a potentially dangerous situation once the sprouts become large and heavy.

Topping or heading back is not recommended pruning practice. No more than 25% of the tree canopy should be removed in any one year. In most cases much less pruning is required.

ISA Arborist' Certification Study Guide 2001

Topping

Reducing the height of a tree through the practice of lopping.

Aust. Std AS4373-2007 – Pruning of amenity trees

Root Pruning

Roots are responsible for the uptake of nutrients and water and for anchoring and supporting the tree in the ground. The pruning of roots may place the tree under stress, allow entry of pathogens, including root-rotting fungi and may destabilize the tree.

Specialist advice from a person with a minimum AQF Level 4 in arboriculture should be sought before any root pruning occurs. Where possible, the root to be pruned should be located and exposed using minimally destructive techniques such as hand-digging, compressed air or water-jetting, or non-destructive techniques such as ground penetrating radar. All cuts shall be clean cuts made with sharp tools such as secateurs, pruners, handsaws, chainsaws or specialized root pruning equipment.

The effects of root pruning are not always predictable.

Aust. Std AS4373-2007 – Pruning of amenity trees

All root pruning shall be carried out in accordance with AS 4970-2009 – Protection of trees on development sites

Pruning Diagrams:

These diagrams¹³ are included for illustrative explanation. Please seek further explanation or guidance from an experienced and insured arborist practitioner qualified to AQF standard min Level 3 or qualified consulting arborist (AQF Level 5) who are current members of a recognised Australian or international arboricultural organisation such as QAA in Queensland or Australian peak arboricultural body, *Arboriculture Australia*. Total pruning, i.e. removal of crown foliage or branch structure should not exceed 15% and/or recommendations within Australian Pruning Standard AS4373-2007 - Pruning of amenity trees.

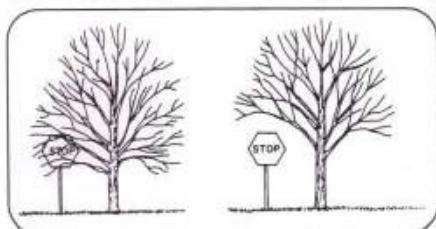


Figure 8.11 Crown raising.

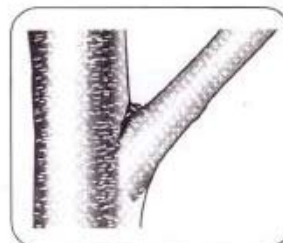


Figure 8.5 Lateral branches should be no more than half the diameter of the parent branch or stem.

Pruning guidance: Branches being removed should not measure more than 1/3 the size of adjacent stem/branch

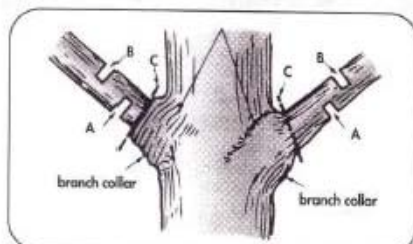


Figure 8.3 Pruning principles. The first cut (A) undercuts the limb. The second cut (B) removes the limb. The final cut (C) should be just outside the branch collar to remove the resultant stub.

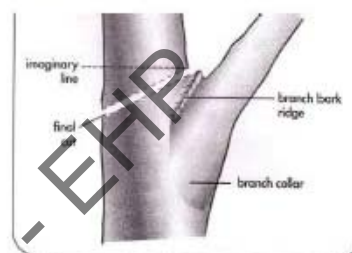
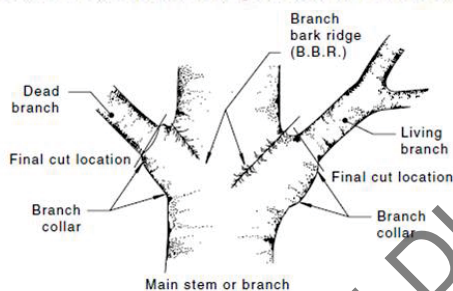
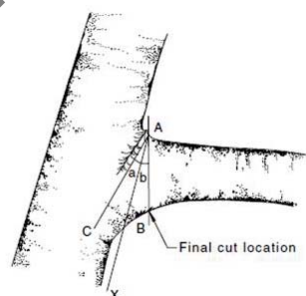
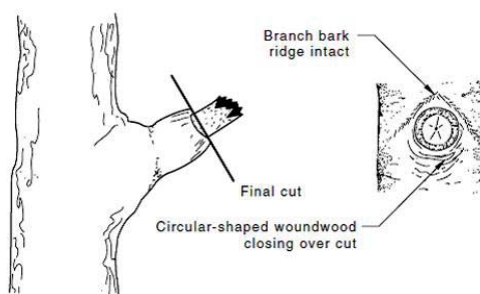


Figure 8.2 When cutting back to a lateral, bias the angle between the branch bark ridge and an imaginary line perpendicular to the leader or the branch being removed.

¹³ ISA Arborists' Certification Study Guide: 2001: Sharon J. Lilley and AS 4373-Pruning of amenity Trees



(a) Up to but not including the branch collar



NOTE: In cases where the deadwood has remained in the tree for a long period the collar may extend itself along the dead branch. This collar should be left intact.

¹³ ISA Arborists' Certification Study Guide: 2001: Sharon J. Lilley and AS 4373-Pruning of amenity Trees

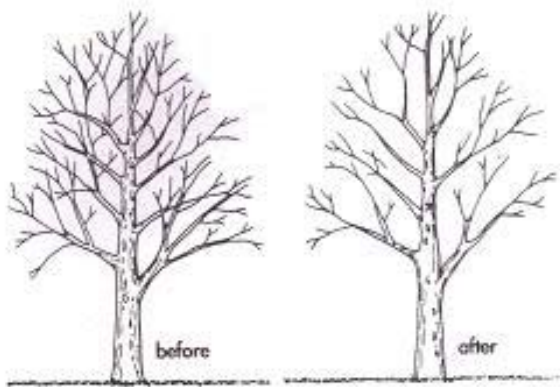


Figure 8.9 Thinning a tree removes unwanted branches, reduces weight, and allows air and light penetration.

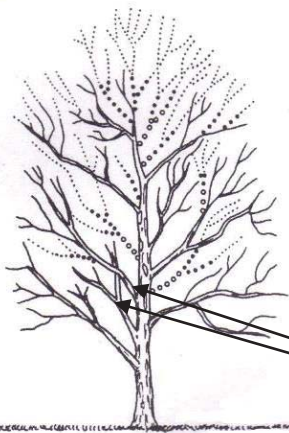


Figure 8.12
If the height of a tree must be reduced, all cuts should be made to strong laterals or to the parent limb. Do not cut limbs back to stubs or to laterals not large enough to assume apical dominance.

Pruning guidance:

Branches being removed should not measure more than $\frac{1}{3}$ the size of adjacent stem/branch

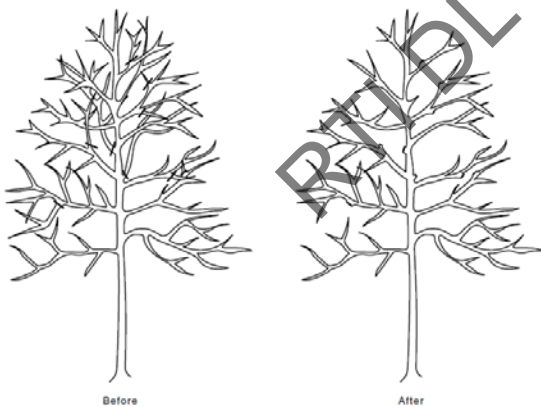


FIGURE 4 FORMATIVE PRUNING OF YOUNG AND DEVELOPING TREES

Appendix 5

Some common myths and information about 'Lopping'

It is a commonly held, though misguided, belief that reducing the height or overall size of a tree will reduce the risk of tree failure and afford the tree keeper 'control' over their tree. Further, that a good haircut is good for a tree.

Unfortunately such arbitrary reduction of large sections of tree foliage, branch structure or tree roots, otherwise referred to as 'lopping' is most likely to reduce the life expectancy of a tree and the resulting large wounds leave entry points for pests and pathogens to access the heartwood of a tree as well as leave the wound site exposed to prevailing weather and sun. Decay may not be apparent to the naked eye at first and it can take some years for decay to spread within the tree structure to the point where normal tissue function is completely compromised and partial or complete tree failure and/or tree death occurs.

Trees are generally long living organisms with a Life Expectancy upwards of 100 years if left unharmed by man or super-natural weather events.

In an urban setting, some remedial pruning maybe required from time to time to remove redundant branch structure, generally referred to as deadwood, or to redirect unwanted branch growth. It is important that such pruning is undertaken with care and that disturbance or removal of livewood is minimised.

Pruning standards have been developed in Australia which provide guidelines for tree pruning and operating standards expected of people undertaking such pruning works. The Australian standard is referred to as AS4373-2007-Pruning of amenity trees.

Removal of tree canopy in excess of 15% is likely to induce a response from the tree where it produces copious small sprouts, referred to as epicormic growth. Rather than a sign of good health, this growth is weakly attached at the point of the 'lopping' cut and sprouts increase in length at a faster rate than normal branch and leaf growth as the tree strives to replace lost structure. This weakly attached growth is prone to sudden failure and, especially when it reaches a substantial size, it can be easily dislodged by strong winds in storm weather conditions. A well pruned tree will, in normal circumstances, generally only require further remedial pruning on a 3 to 5 year cycle, however epicormic growth is likely to require removal on a yearly or more frequent basis.

'Pollarding' is a pruning practice rarely used in recent times and dates back to past centuries when epicormic growth produced by trees was used as a source of firewood and sometimes to provide fodder for stock. Whilst pollarding is no longer practiced generally for these purposes, it is a specialist method of pruning which is not generally suited to Australian native species. Pollard pruning involves the cyclical (usually annual) removal of epicormic growth above a calloused knuckle where the callus is left undisturbed by future pruning, to form a protective barrier over the livewood beneath to minimise pest, pathogen and weather penetration into the live tissue below the pruning point.

Why Lopping is both expensive for the tree keeper and poor arboricultural practice

- 'Lopping' is detrimental to the health and structural integrity of trees.
- 'Lopping' causes expensive ongoing maintenance issues
- 'Lopping' reduces the life of trees.
- 'Lopping' leads to excessive leaf loss: trees need leaves for photosynthesis
- 'Lopping' results in ugly stubs and sun-scalded wound sites.
- Tree growth is determined by the genetic potential of their species in combination with factors such as site constraints, availability of nutrients and water as well as exposure to man-made and/or weather related events.

Please refer to the PDF copy 'The Cost of Lopping' below (and attached copy) and Informative Notes in Appendix 4 above which provide further information and explanation in relation to best pruning practice and why 'lopping' leads to ugly tree form and unwanted ongoing grounds maintenance expense as well as premature tree failure.

Hiring a Qualified Arborist

Pruning large trees can be **dangerous**. If pruning involves working above the ground or using power equipment, you should hire a Qualified Arborist. An Arborist can determine what type of pruning is necessary to improve the health, appearance and safety of your trees.

When selecting an Arborist, please check that they have:

- Membership of a professional organisation, such as the Queensland Arboricultural Association (QAA).
- AQF Level 3 in Arboriculture (as specified in the Australian Standard referred to above).
- Proof of Public Liability Insurance (ensure that the policy is current).
- A list of references from previous clients (Don't be afraid to check).

You should avoid using the services of a tree company that:

- Advertise lopping as a service. A Qualified Arborist knows that lopping is harmful to trees and is *not* an acceptable practice.
- Use tree climbing spikes to climb trees that are being pruned. Climbing spikes damage trees and should only be used when a tree is to be removed.

The Cost of Lopping

Information for Tree Keepers

Lopping is not good for trees, neither is it good for tree keepers. Here is some simple information on what lopping is and why it is bad for trees and for the people who own or manage them.

What is lopping?

Lopping is the cutting of stems or branches to "stubs" or to lateral branches that are not large enough to assume the terminal role.



We hear regularly from concerned tree owners that their trees have been lopped, often after they were advised by a "tree lopper" that this would solve a perceived problem: maybe the owner was concerned that a tree had grown too tall to manage or that too many leaves were clogging up their gutters.



The reality is that lopping **creates** many more problems than it solves: Lopping often removes between 50-100% of the trees' canopy. As a trees' foliage is essential for food production, this kind of shock triggers new growth that is added to combat the massive amounts of stress that the tree suffers. This new growth is sometimes called epicormic or reaction growth.

New shoots develop profusely below a lopping cut.

The tree needs to produce a new crop of leaves as soon as possible in order to continue to produce enough food to survive.

If a tree does not have the stored energy reserves to do this, it may die.

Trees that are stressed are vulnerable to insect and disease infestations, while large, open pruning wounds expose the sapwood and heartwood to decay fungi.

For further information:



For further information on anything tree related, please contact the QAA office staff:

Ph: (07) 3821 1488 • Email: tech@qaa.com.au

Alternatively, please check out our website at: **www.qaa.net.au** where you will find heaps of information, as well as relevant links to other organisations.



Lopping may lead to decay



The preferred location to make a pruning cut is just beyond the branch collar at the branch's point of attachment. The tree is biologically equipped to occlude this kind of wound over time, provided the tree has sufficient vitality, and the wound is not too large.

A cut made midway along a branch or halfway up the tree stem creates "stubs" with wounds that the tree may not be able to close. Exposed heartwood may begin to decay. Few trees can successfully defend the multiple severe wounds caused by lopping.

Lopping creates hazards



The survival mechanism that causes a tree to produce epicormic shoots presents further problems. The shoots develop from buds near the surface of the old branches. Unlike normal branches that develop in a socket of overlapping wood tissues, the new shoots are anchored only in the outermost layers of the parent branches.

The new shoots grow very quickly, often as much as 3-4 metres in one year in some species. Unfortunately, the shoots are prone to failure especially during windy conditions.

Ironically, while the goal was to reduce the tree's height in order to make it safer, lopping has severely increased the risk of failure.

Lopping may lead to sunburn

Branches within a tree's crown produce thousands of leaves to absorb sunlight, when the leaves are removed, the remaining branches and trunk are suddenly exposed to high levels of light and heat, the result of which may be sunburn of the tissues beneath the bark. This can lead to the formation of cankers, bark splitting, branch failure and death of some branches.

Lopping makes beautiful trees ugly

The natural branching structure of a tree is a biological wonder. Lopping removes the ends of branches leaving ugly stubs. Lopping destroys the natural form of a tree.

Lopping is expensive

The cost of lopping a tree is not limited to the initial cost:

If the tree survives, it will require pruning again within a few years i.e. epicormic growth will need to be removed in order to reduce the risk of failure.

Another cost, not often perceived, is the reduction in property value. Healthy, well maintained trees can add 10-20% to the value of a property. Disfigured, lopped trees are considered an impending or ongoing expense.

Another unseen cost of lopped trees is the potential liability:

Lopped trees are prone to failure and can be hazardous: since lopping is considered to be an unacceptable pruning practice (see Australian Standard AS 4373-2007: Pruning of Amenity Trees), any damage caused by branch failure of a lopped tree may lead to a finding of negligence in a court of law.

Alternatives to lopping

Pruning or canopy reduction of a tree is sometimes unavoidable.

There are recommended techniques for performing this work (see Australian Standard AS 4373-2007: Pruning of Amenity Trees). If a branch must be shortened, it should be cut back to a lateral that is large enough to assume the terminal role. A guideline for this is generally to cut back to a lateral branch that is at least 1/3 the diameter of the limb being removed. This method of branch reduction should ideally retain the natural form of the tree.

Why should I hire a Qualified Arborist?



Trees provide an enormous range of benefits, some are often overlooked:

- Enhancement of local environment and ecosystems
- Provision of shade and shelter
- Reduction of pollutants and sequestration of Carbon Dioxide
- Improved well being

Pruning and removing trees can be a dangerous and technically difficult job, and should only be carried out by those who are trained to do so. Trees are also a great asset and can increase property values significantly as well as being large, complex organisms in their own right: poor maintenance of your trees can result in loss of tree health and / or structural stability. **Arborists care for trees** and provide services that can improve and enhance your tree's health, visual amenity and long term structural integrity.

What Services can a Qualified Arborist provide?

Consultation: Advice on everything tree related, from correct planting of recommended species to tree health, structure and stability.

Tree Health Care: Soil amelioration, foliar applications, pest and disease management.

Report Writing: Arborists' reports for Local Authorities regarding Development Sites (compliant with Australian Standard AS4970-2009 Protection of Trees on Development Sites), Tree safety and/or Impact Assessments.

Pruning: Professional pruning techniques (compliant with Australian Standard AS4373.2007. Pruning of Amenity Trees) to: reduce risk, reduce wind resistance, improve access over roads or to improve the structure of young trees.

Removal: Safe, controlled techniques to remove hazardous or dangerous trees.

Management Plans: Long term plans for long lived plants or pruning and management programs for Body Corporates, Shopping Centres and Schools.

Qualifications

As with all trades and professions, there are different levels of qualification for operators and consultants. If you are employing a consultant, they must be qualified to AQF (Australian Qualification Framework) Level 5 Diploma in Horticulture (Arboriculture). If you want a tree removed or pruned professionally, your Arborist must be qualified to a minimum AQF Level 3 in Arboriculture or AFQ Level 3 in Horticulture (Arboriculture).

When engaging an Arborist (at any level), do not be afraid to ask to see proof of Qualifications, insurance and references. Always get more than one quotation and compare advice as well as price.

Be Aware!

Tree Loppers are **NOT**
Trained Arborists!



Tree loppers are often untrained and not educated in correct pruning techniques, they are therefore not able to make informed decisions about your trees. Tree lopping is often sold as a "quick fix" for tree problems but this creates far more problems than it fixes.

Trees that are lopped are extremely likely to develop structural faults, and can become hazardous.



Need more information?

For more information on the kind of services that an Arborist can provide and advice on Qualified Arborists in your area, please contact:

QAA office on: **(07) 3821 1488** and ask for the Technical Officer, email us on: **tech@qldaa.com.au** or visit the website: **www.qaa.net.au**

AFTER THE STORM...

After the Storm...

Is there hope? (Stop before you chop!)

A storm like the one that hit Brisbane in November 2008 or the Gold Coast area in May 2009 can leave many trees in a neighbourhood looking like there's no hope for the future. Trees may have fallen, snapped, or lost large branches.

Concerned? If you are concerned about the safety of trees that are still standing, it is worthwhile considering the fact that they have weathered many other storms in the past. However, if you value your trees consider engaging an Arborist to check their health and stability.

How to select an Arborist

- ▶ **AVOID DOOR KNOCKERS:** Many so-called arborists have no training, and their best skills are removing money from the pockets of unsuspecting consumers. Unskilled workers may do more harm than good.
- ▶ Look in the Yellow Pages for Qualified Arborists under Tree Surgery or Arboriculturists. The Queensland Arboricultural Association (QAA) has Qualified Members in your area.

- ▶ Ask for Certificates of Insurance: Public Liability (minimum \$10,000,000) and Workers Compensation. Consultants should also have Professional Indemnity insurance.

Some questions to ask:

- ▶ Other than the obvious damage, is the tree generally healthy?
- ▶ Are major limbs or the main leader broken?
- ▶ Is at least half of the tree undamaged?
- ▶ How large are the wounds?
- ▶ Is the tree appropriate for the site upon which it is growing?
- ▶ Is there evidence of ground heave around the base of the tree?

Your Arborist should address all of these questions in their assessment. If you are dissatisfied, make sure that you ask questions of them.

STORM SEASON ADVICE FOR URBAN TREES

Are You Prepared?



BEFORE THE STORM...

Before the Storm...

How to Prepare

Have your trees inspected regularly (e.g. every two years) so that any problems can be addressed early and at a time that suits you. A qualified and experienced arborist can do this efficiently and economically.

Look for potential hazards and investigate the condition of your trees. You or a qualified arborist should look for damage such as: cracks in the trunk or major limbs; yellow, aged and decayed trees; hanging branches; improperly formed branches; one-sided or significantly leaning trees; and branches that may come into contact with the house.

Know your tree - Some species are more prone to storm damage. You should have a qualified arborist evaluate your trees for hardiness and resilience. Being aware of trees which may succumb to harsh weather conditions will help you decide if you want to replace these potentially dangerous species.

Do not top or lop your trees - Untrained individuals may urge you to cut back or lop all of the branches, on the mistaken assumption that it will help avoid breakage in future storms. However, professional arborists say that topping, the cutting of main branches back to stubs, is extremely harmful and unhealthy for your trees. Re-growth will be weakly attached branches that are higher and are more likely to break when a storm strikes. Also, topping will reduce the amount of foliage, on which the tree depends for the food and nourishment needed for re-growth. A topped tree that has already sustained major storm damage is more likely to die than repair itself.

Protect your assets - Trees may increase property value by up to 20%. Find out if your homeowner's insurance will cover any damage your landscape may sustain due to natural causes and include the total value of your trees when listing your assets for

coverage. A qualified arborist can provide an estimated value by inspecting your trees.

Trees are dynamic living things that require proper care. Hiring a qualified arborist who can assist you with pre-storm inspections and post-storm repairs can help avoid unnecessary loss of your trees.

Advice for pruning:

- ▶ If the work is high in the tree, or involves large branches, it's a job for a professional climbing arborist. Check the Yellow Pages, or use your favourite search engine to locate a "Tree Surgeon" or "Arborist" and look for companies that employ Qualified Arborists (Minimum AQF Level 3).
- ▶ Ensure that the Arborist that you employ is familiar with Australian Standard AS4373 (2007) Pruning of Amenity Trees.
- ▶ If the tree is young, it may be able to recover and develop new structure. A Qualified Arborist can help with this, regardless of the size of the tree.
- ▶ **DO NOT TOP OR LOP TREES.** Untrained or uninformed tree loppers may urge you to cut back all of the branches to shape the tree, or may suggest that shorter trees will be less likely to fail in future wind storms. **Topped or lopped trees are more likely to fail in the future than un-topped trees.**
- ▶ Remember that the decisions you make may have long term consequences for your trees.
- ▶ You may need your local Council's approval before you heavily prune or remove any tree. Your Arborist will be able to advise you on local laws for your particular area.



Trees & Powerlines Keeping you safe

Energex understands that trees provide shade, amenity and habitat for native wildlife. We also have a very clear understanding of the dangers posed when trees and powerlines are in close proximity, particularly during storm season. Energex's Trees and Powerlines Program works to maintain trees and vegetation for a safe community and to deliver a safe and reliable electricity supply to your home. Energex spends more than \$60 million each year maintaining trees and other vegetation around powerlines. Energex recommends hiring a Qualified Arborist for tree trimming work around privately owned powerlines. Energex's Vegetation Management contractors use nationally approved pruning techniques (*Australian Standard AS 4373 'Pruning of Amenity trees') to maintain a tree's health while encouraging growth to continue in a safer direction.

Energex & the Queensland Arboricultural Association (QAA)

Energex believes that Training is key in maintaining trees safely around powerlines. Our partnership with the QAA is a big step toward this goal. We will work together to improve training and education within both of our industries, ensuring that where possible, trees and powerlines continue to coexist harmoniously.

How to contact Energex

General Enquiries: 13 12 53
8.00am - 6.30pm Monday to Friday
Loss of power supply / electricity supply problems: 13 62 62
Reporting a dangerous situation, such as wires down: 13 19 62
By mail: ENERGEX Limited, GPO Box 1461, Brisbane Q 4001



The Queensland Arboricultural Association (QAA), is a not for profit organisation supporting tree care and the tree care industry throughout Queensland. We are dedicated to the ideal of a sustainable urban forest.

Appendix 6

Explanatory Notes and terminology

Criteria for tree retention and removal

Assessment and recommendations for tree removal or retention including trees located on development sites has been made in consideration of the following definitions and criteria from British Standard: BS 5837:2005¹⁴ which are referred to on p2 of the Australian Standard AS 4970-2009:

Criteria for tree removal

Category R: Those in such condition that any existing value would be lost within 10 years and which should, in the current context, be removed for reasons of sound arboricultural management

Criteria:

- Trees that have a serious, irremediable, structural defect, such that their early loss is expected due to collapse, including those that will become unviable after removal of other R category trees (i.e. where, for whatever reason, the loss of companion shelter cannot be mitigated by pruning)
- Trees that are dead or are showing signs of significant, immediate, and irreversible overall decline
- Trees infected with pathogens of significance to the health and/or safety of other trees nearby (e.g. disease) or very low quality trees suppressing adjacent trees of better quality

NOTE: Habitat reinstatement may be appropriate (e.g. R category tree when used as a habitat tree)

Considerations for tree retention on a development site may include the following criteria and be identified as such in this report:

Category A:

Definition:

Those of high quality and value: in such a condition as to be able to make a substantial contribution (a minimum of 40 years is suggested)

Criteria:

Mainly arboricultural values

Tree that are particularly good examples of their species, especially if rare or unusual, or essential components of groups, or of formal or semi-formal arboricultural features (e.g. that dominant and/or principal trees within an avenue)

Mainly landscape values

Trees, groups or woodlands /scrublands which provide a definite screening or softening effect to the locality in relation to views into or out of the site, or those of particular visual importance (e.g. avenues or other arboricultural features assessed as groups)

Mainly cultural values, including conservation

Tree, groups or woodlands of significant conservation, historical, commemorative or other value (e.g. veteran trees or wood-pasture)

¹⁴ British Standard: BS 5837:2005 - Trees in relation to construction - recommendations

Category B:

Definition:

Those of moderate quality and value: those in such a condition as to make a significant contribution (a minimum of 20 years is suggested)

Criteria:

Mainly arboricultural values

Trees that might be included in the high category but are downgraded because of impaired condition (e.g. presence of remediable defects including unsympathetic past management and minor storm damage)

Mainly landscape values

Trees present in numbers, usually as groups or woodlands, such as that they form distinct landscape rating than they might as individuals but which are not, individually, essentially components of formal, or semiformal arboricultural features (e.g. trees of moderate quality within an avenue that includes better. A category specimens) or, trees situated mainly internally to the site, therefore individually having little visual impact on the wider locality.

Mainly cultural values, including conservation

Trees with clearly identifiable conservation or other cultural benefits

Category C:

Definition:

Those of low quality and value: currently in adequate condition to remain until new planting could be established (a minimum of 10 years is suggested), or young trees with a stem diameter below 150mm.

Criteria:

Mainly arboricultural values

Trees not qualifying in higher categories

Mainly landscape values

Trees present in groups or woodlands, but without this conferring on them significantly greater landscape value, and/or trees offering low or only temporary screening benefit

Mainly cultural values, including conservation

Trees with very limited conservation or other cultural benefits

Note: Whilst C category trees will usually not be retained where they would impose a significant constraint in development, young trees with a stem diameter of less than 150mm should be considered for relocation should they be suitable.

For the purposes of this report hazard and risk have been determined as follows:

Hazard

Situation, condition or thing that may be dangerous. (1) in tree management, a tree or tree part that is likely to fail and cause damage or injury, and the likelihood exceeds an acceptable level of risk. (2) in tree care or forestry operations, the presence of a condition or situation that may cause harm or injury to workers.

Glossary of Arboricultural Terms, International Society of Arboriculture

Hazard and Risk

'disposition of a thing, a condition or a situation to produce injury' whereas risk is 'the chance of something adverse happening'

Risk the probability that harm may occur both magnitude of hazard and the probability of occurrence can to some extent be quantified and then combined so as to provide a risk assessment.

Lonsdale, David. Principles of Tree Hazard Assessment and Management: Published TWO, 2009

Hazard and risk or target and target zone and maybe assessed in this report in relative terms to a person, persons, property or infrastructure.

Probability

The confidence that some event will happen, measured or estimated on a scale of 0 to 1. Zero probability means improbability, a probability of 1 means certainty, a probability of 1/2 is sometimes called fifty-fifty chance or an even chance. Collins Australian Mathematics Dictionary. Collins Dove. Reprinted 1994

There are rules of addition and multiplication in probability theory. In tree-failure risk assessment the probability that the three components will combine in a common outcome is the product of their independent probabilities.

Quantified Tree Risk Assessment used in the management of amenity trees. Ellison, Michael J.

General Notes - Tree Protection

Tree Protection Zones

Crown protection

Tree crowns may be injured by machinery such as excavators, drilling rigs, cranes, trucks, hoarding installation and scaffolding. The TPZ may need to include additional protection of the above ground parts of the tree.

Where crown protection is required, it will usually be located at least one metre outside the perimeter of the crown (see Figure 2). The erection of scaffolding may require an additional setback from the edge of the crown.

Crown protection may include pruning, tying-back of branches or other measures. If pruning is required, requirements are specified in AS 4373 and should be undertaken before the establishment of the TPZ.

NOTE: Pruning may require approval from the determining authority

Aust. Std 4970-2009 – Protection of trees on development sites, s3.3.6

Root protection zone (RPZ)

A specified area below ground and at a given distance from the trunk set aside for the protection of tree roots to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development.

NOTE: Establishment of these areas may include root investigation and mapping, root pruning and installation of root barriers or other protection measures at the edge of the RPZ to prevent conflict between roots and works.

Aust. Std 4970-2009 – Protection of trees on development sites

Structural root zone (SRZ)

The area around the base of a tree required for the tree's stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres.

This zone considers a tree's structural stability only, not the root zone required for a tree's vigour and long-term viability, which will usually be a much larger area.

Aust. Std 4970-2009 – Protection of trees on development sites, s1.4.5

Tree protection zone (TPZ)

A specified area above and below ground and at a given distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development.

Aust. Std 4970-2009 – Protection of trees on development sites s1.4.7

The tree protection zone (TPZ) is the principal means of protecting trees on development sites. The TPZ is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable. The TPZ incorporates the structural root zone (SRZ) (refer to Clause 3.3.5).

Aust. Std 4970-2009 – Protection of trees on development sites s3.1

TPZ Encroachment considerations

Encroachment within TPZ is considered:-

- Minor if encroachment is less than 10% of the TPZ
- Major if encroachment is greater than 10% or inside the SRZ

Refer Aust. Std AS 4970-2009, 3.3.4 TPZ Encroachment considerations p11

Trunk and branch protection

Where necessary, install protection to the trunk and branches of trees as shown in Figure 4.

The materials and positioning of protection are to be specified by the project arborist. A minimum height of 2 m is recommended. Do not attach temporary powerlines, stays, guys and the like to the tree. Do not drive nails into the trunks or branches.

4.5.3 Ground protection

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards as per Figure 4. These measures may be applied to root zones beyond the TPZ.

Aust. Std 4970-2009 – Protection of trees on development sites, s 4.5.2

Explanatory Note:**Assessment terminology:****Diameter at Breast Height - DBH**

The nominal trunk diameter at 1.4 m above ground level determined from the circumference of the trunk divided by pi (π) (see Appendix A).

1.4.3 Diameter at breast height (DBH) Aust. Std 4970-2009 – Protection of trees on development sites

Height

Estimate measure of tree height unless specified

Spread

Distance of the total canopy measured in a straight north south line at ground level

Health

Vigour of a tree as evidenced by general appearance of crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion including pathogens and presence of dieback in crown at the time of inspection. Vigour may vary according to seasonal weather patterns and rainfall received.

Classifications are Excellent, Good, Fair and Poor.

Form or Condition

A tree can be in a state of good health but poor condition or form as determined by current site conditions such as location and affecting factors such as proximity to other trees and surrounding infrastructure, soils, structural defects all of which are not direct factors of the state of the tree's health. Factors affecting the form that the tree has taken as a result of its location within a woodlot or scrubland setting and its present ability to survive as a result of its exposure on removal of surrounding trees within that previous community.

Classifications are Good, Fair, Declining, Poor and Hazardous.

Classification and Tree description

AGE:

SAPLING

Species to 2 years

JUVENILE

Juvenile tree between 2 – 5 years

SEMI-MATURE

Tree is still growing

MATURE

Species has reached expected size and /or has begun to reproduce.

(Tree maybe classified as mature after it has reached near stable size or biomass above and below ground and maybe considered mature for > 90% of its lifespan)

SENESCENT

Over mature and signs are present of irreversible decline and decreasing biomass

HEALTH:

EXCELLENT

Exceptional specimen. Crown full and balanced. Foliage is entire with good colour. Minimal or no pathogen damage.

GOOD

Crown is full (can be unbalanced). Foliage is entire with good colour. Minimal or no pathogen damage.

FAIR

Tree has < 30% deadwood. Canopy can be unbalanced. Foliage generally with good colour, may be some discolouration present. Minor pathogen damage present (Typical for species in location)

POOR

Tree has >30% deadwood. Foliage may be discoloured or distorted and stress symptoms maybe apparent which could lead to decline of tree.

DEAD

Tree is dead.

FORM:

EXCELLENT

Excellent branch attachment, no structural defects. Trunk sound. No damage to roots and good root buttressing present

GOOD

Good branch attachment and or no minor structural defects. Trunk sound or minor damage. No damage to roots and or good buttressing.

FAIR

Some minor structural defects and or minor damage to trunk. Bark may be missing & cavities could be present. Minor damage to roots.

POOR

Major structural defects and or trunk damage and or girdling or damaged roots that are problematic.

HAZARDOUS

Tree poses immediate hazard potential that should be rectified as soon as possible.

Priority Classification and Process Descriptions

No.s	1	2	3
Definition	HIGH	PRIORITY	MAINTENANCE
Action Required	Immediate	12 months – 2yrs	3 years / as per maintenance programming
Description	<i>Tree is dead, dying or poses immediate hazard potential to people or property.</i>	<i>May represent minor hazard potential to people or property [e.g. Deadwood, trip hazard] or may present damage to property.]</i>	<i>Preventative maintenance to anticipate and minimise potential for future hazard to people or property. May be routine maintenance.</i>

Definition	Process Description
Removal	Complete tree removal leaving stump as close as possible to ground level. Recommended process will include chipping of all foliage limbs and timber and reinstatement of work site. Recommendation typically based on tree being assessed as representing a health and safety concern [Dead, dying, structurally unsound, unstable, poor form]
Remove and grind	Complete tree removal to include grinding of stump to a depth of 75 millimeters unless otherwise specified. Recommended process will include chipping of all foliage limbs and timber and reinstatement of work site. Stump site will be cleaned of all grinding debris and sawdust and backfilled with premium topsoil free from weeds.
Crown Clean (Deadwood)	Removal of all major/significant deadwood and dead branches up to [and including] 30 millimetres in diameter in trees overhanging pedestrian or vehicular areas or removal of dead branches > 50mm diameter in canopy of trees located in parkland or similar area unless otherwise specified.
Crown Clean (General Pruning)	Recommended pruning process will include removal of broken, crossing, rubbing, diseased, stressed or dying branches or limbs with poor attachment. Additional work process may include pruning to define leaders, balance the crown, reduce weight load, or clear the tree from obstructions. In summary, to rectify, as far as is possible, any structural defects and eliminate undesirable growth or deadwood.
Crown Reduction (Canopy reduction)	Recommended pruning process may include light and general pruning typically to encompass removal of up to 15% but no more than 25% of the leaf-bearing crown. By definition the unique shape and form of the tree will not be altered or compromised by the pruning process. Typically the consulting arborist will nominate the reduction percentage [%] appropriate to species, condition and assessment. Unless otherwise specified the default reduction shall not exceed 25% of the total canopy, nor leave the canopy with unbalanced form.
Crown Raising (Canopy Lift)	Pruning processes maybe involve the raising of the tree's lower canopy to a height specified in metres. Typically the process is performed to provide for pedestrian and/or vehicular clearance and unless otherwise specified the default parameters will be to provide 2 metres clearance from ground level or as specified by local or state government regulation. From time to time pruning requirements may be altered to accommodate various site specific requirements as advised by the consulting arborist accordingly.
Crown Restoration	Pruning process will encompass crown restoration and remedial works where the tree has been previously lopped or otherwise damaged. Not feasible when tree has extensive decay and should only be considered when there is evidence of healthy re-growth. When performed correctly the process of remedial pruning will most likely take several years to complete.
Hanger Limb	Pruning process may be restricted to the removal of any hanger/s or dangerous/dead/dying limbs and will typically involve the removal of a single limb. In some instances removal of an individual limb may be necessary to accommodate an obstruction and the consulting arborist will advise accordingly.
Directional Pruning	Pruning process will be restricted to pruning canopy away from buildings/service wires/property boundary and will typically be performed to avoid future growth in these areas. Where appropriate future growth will be directed away from obstruction by selected pruning so as to encourage the development of the growth of new leaders.
Boundary Pruning	In every situation EVERY EFFORT should be made to obtain the relevant authorisation to perform pruning to standard - AS 4373-2007 Pruning of amenity trees - so as to avoid "lopping" limbs to the immediate boundary. As with directional pruning optimum results will be achieved when it's feasible to eliminate undesirable growth and direct future growth. If authority to enter and work in neighbouring property is not forthcoming recommended pruning will be restricted to access for pruning works on client's property and work standards will be correspondingly comprised. Removal of significant foliage or branch structure which will severely compromise the longterm health or stability of a tree is contrary to AS 4373-2007 - Pruning of amenity trees and is never considered an appropriate solution. Please refer to the consulting arborist for further advice.

USEFUL LIFE EXPECTANCY [ULE]

SCALE

0 yrs 5yrs 5 – 20yrs 21 – 50yrs >50yrs

Useful Life Expectancy – Central theme is that in a planning context the length of time a tree can be expected to be usefully retained is the most important consideration. ULE is a guide or measure of tree life expectancy and how trees could be expected to be retained safely and usefully in normal circumstances [i.e. when not subject to abnormal or adverse conditions such as mechanical interference such as property development or impact by machinery etc]. It is based on a number of obvious management assumptions and the fundamental principles of usefulness in the landscape.

General Terms

AS 4373 – 2007 Pruning of amenity trees

The intention of this Standard is to encourage pruning practices and procedures that reduce the risk of hazard development, branch failure, pathogen infection and premature tree death.

AS 4970 – 2009 Protection of trees on development sites

This Standard provides guidance for arborists, architects, builders, engineers, land managers, landscape architects and contractors, planners, building surveyors, those concerned with the care and protection of trees, and all others interested in integration between trees and construction.

This document describes the best practices for the planning and protection of trees on development sites.

Amenity trees

Trees with recreational, functional, environmental, ecological, social, health or aesthetic value rather than for production purposes.

Aust. Std AS4373-2007 – Pruning of amenity trees

Aerial Inspection

Arborist inspection within upper tree canopy carried out by climber/arborist

Arborist

The person with training to AQF Level 3 in Arboriculture, or above, or equivalent recognized and relevant experience that enables the person to perform the tasks required by Standard 4373-2007

Aust. Std AS4373-2007 – Pruning of amenity trees

Consulting Arborist

A person with training to AQF Diploma V in Arboriculture, or above or equivalent recognized and relevant experience in excess of five years which enables the consultant to prepare arborist reports as required by local council or other government or regulatory authority including courts of law.

Tree worker

A worker who through related training (minimum AQF Level-2 in arboriculture) or equivalent recognized and relevant on-the-job experience, has demonstrated competence in pruning according to Standard.4373-2007

Aust. Std 4970-2009 – Protection of trees on development sites

Work

Any physical activity in relation to land that is specified by the determining authority.

Aust. Std 4970-2009 – Protection of trees on development sites, s1.4.9

Report Terminology and definitions

Barrier Zone - chemically defended tissue formed by the still living cambium, after a tree is wounded or invaded by pathogens to inhibit the spread of decay into new annual growth rings. Wall 4 in CODIT model. Contrast with *reaction zone*

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Bifurcation

Natural division of a branch or stem into two or more stems or parts

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Bracket

British English term for fruiting body of a decay fungus. See *conk*

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Codominant Structure

Stems or trunks of about the same size originating from the same position from the main stem.

s3.9, p6, Aust. Std AS4373-2007 – Pruning of amenity trees

When the stem bark ridge turns upward the union is strong; when the ridge turns inward the union is weak, a likely point of failure in storm or windy weather conditions or where increasing weight causes undue stress on the defective union.

Aust. & International Pruning Std 4373-1996/Draft May 29th 2006

CODIT

acronym for Compartmentalisation Of Decay In Trees (refer *Compartmentalisation*)

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Compartmentalisation

Dynamic tree defence process involving protection features that resist the spread of pathogens and decay causing organisms.

Aust. Std AS4373-2007 – Pruning of amenity trees

Natural defense process in trees by which chemical and physical boundaries are created that act to limit the spread of disease and decay organisms

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Compaction results from loads or stress forces applied to the soil as well as shear forces.

Both foot traffic and vehicle traffic exert both forces on soils. Vehicle traffic may cause significant compaction at depths of 150–200 mm (the area in which most absorbing roots are located). The degree of compaction will depend on weight of vehicles, number of movements, soil moisture levels and clay content. Soil handling, stockpiling and transporting also tend to lead to the breakdown of soil structure and thus to compaction. Vibration as a result of frequent traffic or adjacent construction activities will also compact soils.

Aust. Std 4970-2009 – Protection of trees on development sites

Compression wood

(1) in mechanics, the action of forces to squeeze, crush or push together any material (s) or substance(s): contrast with tension. (2) the ability of an internal combustion engine to contain or pressurized a combustible fuel - air mixture.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Conk

Fruiting body or nonfruiting body (sterile conk) of a fungus. Often associated with decay.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Crown

Portion of the tree consisting of branches and leaves and any part of the trunk from which branches arise.

Aust. Std AS4373-2007 – Pruning of amenity trees

Crown damage

The canopy of trees can be directly or indirectly damaged. Incorrect techniques of pruning such as lopping or flush cutting may produce wounds that are susceptible to infection by wood decay organisms. Similarly, mechanical damage to branches by machinery, etc. will also create wounds. Trees automatically respond to wounding and in doing so use stored sugars. Any wound places an additional load on trees that will inevitably be stressed during construction.

Aust. Std 4970-2009 – Protection of trees on development sites, sB3.2

Damping

Damping occurs where energy is dissipated. In trees, damping occurs naturally in three main ways with aerodynamic damping of the leaves, internal damping in the wood and root zones, and with mass damping of the branches.

James, Ken. The Bark, Arboriculture Australia, Vol 13, p5, Number 2, Winter 2011

Deadwood

Dead branches within canopy of tree.

Aust. & International Pruning Std 4373-1996/Draft May 29th 2006

Deadwood is a naturally occurring feature of most tree species and comprises dead or decaying branches within the canopy of a tree. Deadwood may have habitat value and require removal only according to the considered risk of its location, i.e. high use pedestrian area or damage to adjacent infrastructure.

Removal of deadwood is generally recommended only where it represents an unacceptable level of hazard. Consideration of the need for deadwood removal should take into account the occupancy of the target zone, i.e. high use pedestrian area or presence of infrastructure, possible damage to the tree during its removal as well as its conservation for habitat value. In some instances retention of a reduced tree structure for habitat purposes maybe considered appropriate, especially when hollows are present.

Further reference: Principles of Tree Hazard Assessment. Lonsdale, David. TSO, 2009

Deadwooding (Crown cleaning)

The removal of dead branches.

Aust. Std AS4373-2007 – Pruning of amenity trees

Recommendation to remove deadwood is for removal of all dead branches within tree canopy > 30mm diameter in trees which overhang pedestrian or vehicular areas and removal of all dead branches within tree canopy > 50mm diameter if trees are located in a Parkland or similar area.

Decay

Aust. Std AS4373-2007 – Pruning of amenity trees

The process of degradation of woody tissues by micro-organisms.

Desiccation

Severe drying out. Dehydration.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Drip Line

Is the imaginary perimeter line at soil surface level which is directly below the outermost edge of the tree's foliage or canopy

Epicormic bud

Aust. Std AS4373-2007 – Pruning of amenity trees

Latent or adventitious bud located at the cambium and concealed by the bark

Epicormic shoots

Shoots produced from epicormic buds at the cambium of trunks or branches

Aust. Std AS4373-2007 – Pruning of amenity trees

Field Capacity

Maximum soil moisture content following the drainage of water due to the force of gravity.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Included bark

Inwardly formed bark within the junction of branches or codominant stems

Aust. Std AS4373-2007 – Pruning of amenity trees

Kino - dark red to brown resin-like substance produced by trees in the genera *Eucalyptus*, *Pterocarpus* and *Butea* and related genera. Kino forms in the barrier zones. Large kino veins form in some tree in response to injury and infection.

Shigo, Alex A.: *A new Tree Biology Dictionary* 1986 Durham, New Hampshire 03824

Leaves

The main function of leaves is photosynthesis, that is, the production of sugars and oxygen. The sugars produced by the leaves (and any other green tissue) are the source of chemical energy for all living cells in the entire plant and as such are essential for the normal functioning and survival of the tree. Anything that directly or indirectly damages the leaves will interfere with photosynthesis.

Aust. Std 4970-2009 – Protection of trees on development

sites

Non-woody part of tree i.e. 'organs that increase the surface area of vascular plants, thereby capturing more solar energy for photosynthesis'. ... maybe classified as microphylls (usually spine-shaped leaves with a single vein) or megaphylls (leaves with a highly branched vascular system)

Campbell Reece Meyers, *Biology* (Aus ted. 2006), 7th ed.. Pearson Benjamin

Cummings

Needles and leaves are major energy trapping organs of a tree. Flowers are modified leaves as they fit the definition of an organ

Shigo, Alex A.: (2003), *Modern Arboriculture* Durham, New Hampshire 03824-3105, USA

Macropore

Relatively larger space between soil particles that is usually air-filled and allows for water movement and root penetration. Contrast with *micropore*.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Micropore

Space between soil particles that is relatively small and likely to be water filled

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Mortality Spiral

Sequence of stressful events or conditions causing the decline and eventual death of a tree

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Once in a mortality spiral trees are more likely to succumb to any further or additional stress factors such as drought, pest infestation or disease. (See definition Stress)

Necrosis

Localised death of tissue in a living organism

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Pathogen

A disease-causing organism.

Aust. Std AS4373-2007 – Pruning of amenity trees

Pipe

Mud filled channel extending upwards from root/ stem zone of tree

Phototropism

Influence of light on the direction of plant growth. Tendency of plants to grow towards light.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Phloem

Plant vascular tissue that transports photosynthates and growth regulators. Situated on the inside of the bark, just outside the cambium. Is bidirectional (transports up and down). Contrast with *xylem*.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Reaction wood - wood forming in leaning or crooked stems or on lower or upper sides of branches as a means of counteracting the effects of gravity. See *compression wood* and *tension wood*

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Shrub

A woody plant similar to a tree except it is usually several-stemmed and smaller than a tree.

Shigo, Alex A.: *A new Tree Biology Dictionary* 1986 Durham, New Hampshire 03824

Stem / Trunk

Organ which supports branches, leaves, flowers and fruit; may also be referred to as 'the trunk'.

Aust. Std AS4373-2007 – Pruning of amenity trees

Stress

In Plant Health Care, (1) a factor that negatively affects the health of a plant; a factor that stimulates a response. (2) in mechanics, a force per unit area.

Aust. Std 4970-2009 – Protection of trees on development sites

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Stress - acute - disorder or disease that occurs suddenly and over a short period of time

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Stress - chronic - disorder or disease occurring over a longer time.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

Tree

Long lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks.

Aust. Std AS4373-2007 – Pruning of amenity trees

Aust. Std 4970-2009 – Protection of trees on development sites

A tree has 3 major organs – roots, stem and leaves

Shigo, Alex A.: (2003), *Modern Arboriculture* Durham, New Hampshire 03824-3105, USA

Vigor

Ability of a tree to sustain its life processes.

The term 'vigour' in this document is synonymous with commonly used terms such as 'health' and 'vitality'.

1.4.8 Vigour Aust. Std 4970-2009 – Protection of trees on development sites

Inherent genetic capacity of a plant to deal with stress

Vitality

Ability of plant to deal effectively with stress

Watersprouts/ Epicormic growth (Usually multiple shoots)

Shoots produced from epicormic buds at the cambium of trunks or branches.

Aust. Std AS4373-2007 – Pruning of amenity trees

Grows 'from the stub ends and only grows from the outermost living tissue layer of that year's growth. They are weakly attached and prone to falling out or being blown off with the risk increasing markedly as they increase in size. When epicormic shoots arise from stub ends that are decaying, the chances of them falling out are significantly greater'.

Qld Arboricultural Association

Wound

An opening that is created when the bark is cut, removed or injured.

NOTE: Pruning a live branch always creates a wound, even when the cut is properly made.

Aust. Std AS4373-2007 – Pruning of amenity trees

Xylem

Main water and mineral-conducting (unidirectional, up only) tissue in trees and other plants. Provides structural support. Arises (inward) from the cambium and becomes wood after lignifying. Contrasted with *phloem*.

Glossary of Arboricultural Terms, International Society of Arboriculture 2011

RTI DL RELEASE - EHP

Species and vegetation classifications:

Ecological Significance

Species which contributes to local biodiversity. Tree may also provide habitat value to local community, i.e. food source and shelter for local native fauna.

A tree of high ecological value may refer to an endemic species located in a significant landscape location such as Riparian Zone or form part of a wildlife corridor.

Please refer to local council laws and orders

Endemic Species

Species native to local area

Exotic Species

Non-native or indigenous to a region. Maybe invasive. Contrast with *introduced species*, *native species* and *naturalized species*.

Glossary of Arboricultural Terms, ISA 2008

Term maybe used to describe a species introduced to Australia from another country.

Indigenous Species

Species native to Australia.

Introduced species

Organisms not native to a region. Contrast with *exotic species*, *native species* and *naturalized species*.

Glossary of Arboricultural Terms, ISA 2008

Landscape Significance

Species significant to area including amenity, habitat and biodiversity value to property

Please refer to local council laws and orders

Native species

Plants indigenous to a region. Naturally occurring and not introduced by man. Contrast with *exotic species*, *introduced species* and *naturalized species*.

Glossary of Arboricultural Terms, ISA

2008

Naturalized species

Non-native species that has become established in a region and propagates without human assistance.

Contrast with *exotic species*, *introduced species* and *native species*.

Glossary of Arboricultural Terms, ISA 2008

Protected Vegetation

Vegetation designated as protected by applicable local government authority or Queensland State legislature laws. Permission must be sought from the relevant authority prior to the commencement of specified tree works.

Riparian Zone Vegetation

Currently all marine plants in Queensland are afforded protection under the provisions of the *Fisheries Act 1994* and, as part of the recent integration of provisions under this act, by the Sustainable Planning Act 2009 (SPA).

Special Significance

Tree which may represent but is not limited to historical, aboriginal or protected local, state or federal significance that may fall outside of local council tree laws. Such trees may include those listed for heritage, endangered ecological community or as threatened species.

Classifications are Low, Moderate and High.

Streetscape Significance

Species providing visual significance within street and local area Please refer to local council laws and orders

Weed Species

Species designated by relevant local government authority and/or Department of Primary Industries & Fisheries Queensland)

Appendix 7: Company Detail



Independent Arboricultural Services

Independent Arboricultural Services, incorporated in May 2007, offers a completely independent arborist consulting and reporting service. Its directors and associated consultants bring extensive arboricultural knowledge gained over many years to this company. All staff hold Level V (Diploma of Arboriculture/Horticulture) to University qualifications. Specialised advice when required, such as provision of survey mapping or engineering advice and certification is sourced from reputable professional providers according to site requirements as per Australian Standard 4970-2009.

Statement of Goal

It is the goal of Independent Arboricultural Services to strive for continued improvement through the use of world's best arboricultural practice supported by ongoing education and exposure to leading industry experts and research throughout the world.

Mission Statement

It is the mission of Independent Arboricultural Services to provide timely, relevant and actionable consulting advice and practice based on the latest available and best scientific arboricultural knowledge.

Environmental Statement

Independent Arboricultural Services supports long term environmental sustainability using certified Dalton 'Revive' recycled stationery and Reflex recycled photocopy paper. All inks are recycled and all information including correspondence of reports is conveyed by electronic media where possible.

Independent Arboricultural Services actively seeks to maintain a positive carbon footprint status and to that end is committed to protecting and preserving the environment, continuing to carry out tree planting, transplanting and replacement planting where practical, having planted in excess of 4000 trees in the first 2 years after its inception in May 2007 alone. Arboricultural recommendations involving the removal of tree/s will include replanting at a minimum ratio of 2 trees for any tree removed where possible. All arboricultural recommendations are made in accordance with world's best arboricultural practice and within the Australian Standards AS 4373-2007 Pruning of amenity trees and AS 4970 – Protection of trees on development sites so as to ensure optimal outcomes for all living trees.

Independent Arboricultural Services acknowledges the benefits of healthy trees with good vigour and vitality and actively promotes better understanding in the general community of the contribution that trees make to reducing green house gasses, the contribution of trees to better water retention and the prevention of soil erosion, the ability of trees to provide protection to infrastructure by diffusing strong winds in weather events and the contribution of trees to general liveability within the urban environment.

It is an acknowledged fact that air temperature beneath a tree canopy is in excess of 5° Celsius lower than the surrounding ambient air temperature thereby reducing reliance on greenhouse gas producing airconditioners and coal fired power sources.