



the  
**arbor centre**  
CONSULTANCY

Stage 1: Preliminary Tree Survey Report  
*Murdoch University Civil Works, Murdoch, Western Australia*  
November 2023

Prepared for:



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# 1. Purpose of this Report

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To survey and inspect selected trees as identified within/adjacent Murdoch University proposed carpark in Western Australia (total of x 55 trees) to benchmark current health and structural status and identify preliminary management considerations in light of the future construction (refer Figure 1 and Appendix A for detail).



Figure 1. Satellite image showing approximate area assessed at Murdoch University proposed carpark, Murdoch, Western Australia. Image Source – [www.NearMap.com](http://www.NearMap.com). Image date October 14<sup>th</sup>, 2023



## 2. Background

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### 2.1 Brief

At the request of Peritas Group, Arbor Centre has been engaged to undertake an Arboricultural inspection and review of the trees identified for retention within and adjacent the proposed construction of a Murdoch University carpark, as well as assisting to select which option for development will result in the best outcome for the existing trees.

Arbor Centre's brief was to attend site to obtain and provide the following information:

- Identify genus, species and common name for each of the trees;
- Comment on current health, structure & age of the identified trees;
- Obtain height, canopy spread and trunk diameter measurements;
- Provide Tree Protection Zone (TPZ) & Structural Root Zone (SRZ) radii for each tree;
- Compile general information relevant for the individual specimens including if further specialist input may be required;
- Conclusions and Recommendations.

### 2.2 Arboricultural Inspection

Arbor Centre undertook an Arboricultural assessment of the x 55 trees situated within the site on the 16<sup>th</sup> of November 2023. The assessment was a visual inspection undertaken from ground level and did not incorporate any form of below ground or aerial inspection of the trees.

### 2.3 Limitations of this Report

The information contained within this Stage 1 Arboricultural Report is not intended, or suitable to be used as a final '*Tree Management Plan*' for the trees proposed to be retained. But rather, is to provide guidance on how the subject trees currently present; and to provide considerations and recommendations on how best to protect, manage and retain the trees throughout the proposed development project and over the longer term.

Further to the above, this assessment and report does not attempt to predict or quantify potential tree failures. The partial or complete failure of trees and/or tree parts is a natural part of any environment and may be influenced by a wide range of factors, including (but not limited to); tree age and condition, quality



of previous remedial and Arboricultural works afforded; abrupt changes to the local growing environment, prior root zone incursion/impacts and high winds or other extreme climatic events.

## **2.4 Achieving Successful Tree Retention**

It is important to recognise early in the planning stage of a project that mature trees can and have been successfully retained into projects within the Perth Metropolitan area.

In order for successful tree retention to be achieved, appropriate and timely Arboricultural inputs are required into (but may not be limited to)

- Developing tree sensitive designs and works methodology;
- Providing tree and project specific Tree Management Specifications into documentation that is applicable to implementation prior to, during and potentially post project completion and;
- Undertaking ongoing tree monitoring and (where required) implementing Arboricultural remediation works.



### 3. Summary of Arboricultural Survey & Assessment

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A total of x 55 trees were assessed and inspected within/adjacent the site. Each of the specified trees were visually inspected from ground level to assess and record the species; tree height and canopy spread; trunk diameter; age status; ULE, current tree health and structure and observations/comments relevant for the individual specimen - refer *Appendix B Table of Results* for detail.

#### 3.1 Tree Species Diversity

The majority of the tree population within the area assessed contained 45.4% Endemic West Australian species, 27.3% being Australian Native species and 27.3% of the trees assessed were considered Introduced species within the area of assessment.

A total of x 9 different species were assessed in the area at the time of inspection, 51% of the tree population was made up of x 2 species with the other x 7 species making up the remaining 49%.

A breakdown of the species is as follows:

- *Corymbia calophylla* (Marri) x 14 (25.5%)
- *Pinus pinaster* (Maritime Pine) x 14 (25.5%)
- *Acacia* species (Wattle) x 9 (16.4%)
- *Eucalyptus camaldulensis* (River Red Gum) x 6 (10.9%)
- *Eucalyptus rudis* (Flooded Gum) x 6 (10.9%)
- *Banksia ilicifolia* (Holly-leaved banksia) x 2 (3.6%)
- *Corymbia ficifolia* (WA Red-Flowering Gum) x 2 (3.6%)
- *Acacia saligna* (Golden Wreath Wattle) x 1 (1.8%)
- *Schinus terebinthifolius* (Brazilian Pepper) x 1 (1.8%)

#### 3.2 Tree Age and Useful Life Expectancy (ULE)

Of the 55 trees; 75% were assessed as mature, 16% classified as semi-mature, and 9% classified as juvenile at the time of inspection.

The majority of trees (69%) were assessed to have an estimated useful life expectancy (ULE) of 40+ years; 18% had a ULE of 10 - 40 years; 11% had a ULE of 5-10 years; and 2% were confirmed dead (no active conductive tissue) at the time of inspection.





### 3.3 Tree Health

The majority of trees assessed displayed Good to Acceptable Health status (89%). At the time of assessment, approximately 7% of trees onsite displayed Questionable Health, 2% of trees onsite displayed Poor Health and 2% of the trees were confirmed dead (no active conductive tissue).

The signs/symptoms of reduced tree health observed may be attributed (but may not limited) to -

- Previous root loss/root zone impact (proximity trenching/excavations; demolition of previous structures; below ground service installations, changes to soil level; mechanical damage/root scalping; maintenance of walk paths; mechanical damage/root scalping that occurred as part of civils and road construction, etc.);
- The combination of excavations in close proximity to root zones (refer above point) and a lack of timely remedial work (that would have limited tree decline and stress);
- Mechanical damage to the trees conductive tissue (e.g. vehicle/machinery impacts; poor prior pruning practices; bird or fauna damage etc.);
- Competition and canopy suppression (lack of available above and below ground growing space);
- Environmental influences (poor seasonal rainfall, possible storm damage etc.);
- The influence of pests and/or disease;
- Natural senescence (old age);
- Potential soil issues (i.e. nutritional deficiencies or toxicities or the presence of a soil-borne disease etc.);
- Seasonal water table fluctuations;
- Potential pH (Potential Hydrogen) and/or EC (Electrical Conductivity) and/or nutritional toxicities of both the soil and or ground water.

**Note:** - Consideration needs to be given to the sensitive nature and aversion of endemic trees to root zone impact and disturbance and that obvious canopy decline can manifest many years after the event.

### 3.4 Tree Structure

The majority of the trees that were assessed have developed a Good to Acceptable structure (87%). Several structural issues were observed within the surveyed tree population including canopy suppression, deadwood in canopies, bark inclusions, bifurcations, failures in canopies etc., however; these issues are generally considered manageable within the scope of an ongoing, proactive tree management program.

13% of the trees assessed displayed Questionable – Poor above ground structural form and will require further discussion with Arbor Centre to develop appropriate long term tree management approaches or





implement a remove and replace program – please refer *Appendix B – Table of Results Observations and Comments* for individual requirements.

### 3.5 Transplant Viability

The majority of the trees (76%) assessed are species considered not tolerant of the transplant/relocation process predominantly due to scale & species of trees. It was found that only 24% of the tree population is considered viable for the transplant process. Due to the significant and increasing loss of endemic vegetation within the greater Perth area and the potential to transplant these species (given the appropriate levels and standards of input and aftercare), consideration should be given to salvaging and utilising these trees elsewhere.

Preparation time for mature tree relocations can range from approximately 3 months to 12 months or longer depending on species characteristics, individual tree and site-specific details. Similarly, establishment post-transplant can range from 3 – 10 years. Monocots such as Palm Trees don't require advanced preparation prior to relocation and can re-establish in half the time of eudicots.

**Note:** *Further specialist Arboricultural inputs will be required from Arbor Centre Tree Supply and Relocation Division in identifying, preparing, relocating and re-establishing trees that are proposed for potential relocation within and/or externally to the development site. See Appendix F for further details of Arbor Centre's Relocation process.*

### 3.6 Protection of Trees during Construction

Specialist Arboricultural input will be required to determine & incorporate protection and remedial measures into the construction 'specifications' for the development including: - Construction methodologies and measures to be actioned during project activities as well as, recognising and quantifying unexpected damage as it occurs, to enable suitable measures to be prescribe that help to offset the impacts of root loss or injury that arise.

These processes are important in identifying measures that minimize tree root and canopy impact being included into the project documentation and implemented during construction – *refer Appendix C. Overview of Australian Standards AS 4970, AS 4373 & AS 2303; Section 4 Preliminary Tree Preservation Considerations and Section 6. Recommendations for further detail.*



### **3.7 Preliminary Recommendations**

#### **3.7.1 Trees Marked for Removal by Others x 8 Trees**

x 8 trees have been identified as requiring removal (by others) due to conflicts with the proposed development, Consideration could be given to the relocation of amenable species (if required) – refer Appendix B and F for further detail.

#### **3.7.2 Consider Removal/Replacement x 1 Trees**

x 1 of the assessed trees have been identified as Consider Removal/Replace due to being confirmed dead (i.e. no active conductive tissue – indicating recovery is impossible); poor health and or structural status or having Known Weed Species status. Consideration should be given to the utilisation of branch and log sections and timber for habitat and /or dune protection – refer *Appendix B – Table of Results* for further detail.

#### **3.7.3 Retain (Conditional) x 4 Trees**

x 4 trees have been identified as requiring further Arboricultural investigations to:

- Validate preliminary observations and/or;
- Discuss observations made at the time of inspection; and
- Subsequently provide more definitive recommendations regarding the nature of Arboricultural works and time frames that may apply (refer Appendix B Table of Results for further detail).

Investigations may include structural assessments and soil profile assessments to assess growing media and to determine possible remediation that may be required.

#### **3.7.4 Retain; Develop and Implement Tree Retention Specifications x 42 Trees**

The remaining x 42 trees have all been identified as worthy of retention (or relocation) subject to being afforded the appropriate tree protection measures during the development process.

Specialist Arboricultural input will be required for all trees that are considered for retention; to determine & incorporate protection and remedial measures into the final design specifications of the proposed development; construction methodologies and measures to be actioned prior to and during project activities.

This will ensure that measures to minimize tree root and canopy impact on specimens identified for retention can be included into the project specifications and documentation and implemented during construction (refer Appendix F for further detail).



Almost all trees will require ground works for the development of the interchange and subsequent PSP, to be undertaken within their nominal Tree Protection Zone's (TPZ), and for some trees within their nominal Structural Root Zone's (SRZ), it is because of this that the adoption of AS 4970 should be combined with Arbor Centre's expertise.



## 4. Preliminary Tree Preservation Considerations

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### 4.1 Introduction

Root zone impacts (and associated root loss) can negatively affect tree health (and stability) many years after the event, it is essential for tree success that tree protection and remedial measures are factored into design refinements and works methodologies and appropriately implemented and that specific remedial measures are actioned and appropriately supervised, to ensure the potential longevity of retained trees can be realised.

Below is an outline of the matters that will need to be addressed as part of developing and implementing a Tree Retention Plan for the specimens proposed to be retained into the Murdoch University site.

### 4.2 Tree Preservation Considerations

- Refinement and further specialist Arboricultural input will be required in determining forward works/demolition and construction methodologies (and specifications) prior to finalising and implementing a design; to ensure minimal tree root and canopy impact can be designed into the project.

***Note:** A collaborative review of proposed designs and works methodologies with Arbor Centre and other relevant parties is recommended to develop and implement modifications and refinements where required to reach a successful tree retention outcome for the project – Refer Appendix D, and E for preliminary considerations regarding design modifications.*

- Avoiding disturbance/ incursion into the Tree Protection Zone (TPZ) projections and that where encroachment into the TPZ area is unavoidable, Arbor Centre to provide inputs into appropriate works methodologies and/or remedial measures prior to any incursion occurring. Further, there may be a requirement for Arbor Centre to be present during the proposed works to assess tree impacts and prescribe and/or undertake necessary remedial works.
- The implementation of tree specific Tree Protection Zones (TPZs) and the erection of approved protective fencing and identification signage to be installed prior to the commencement of the works period at the delineation of the TPZs (refer Appendix C – Overview of Australian Standards AS 4373 & AS 4970 for a high-level overview of the tree retention process).



- Any below ground services and infrastructure that are proposed to travel through/encroach within the identified TPZs i.e., crossovers, below ground infrastructure, pipe works, footings, water, power, gas, telecommunications, irrigation etc., should be relocated/diverted to outside of the TPZ projection(s). This should be undertaken in conjunction with Arbor Centre to identify where new service alignments are best located to minimise impact on the subject trees - including methodologies associated with their installation.
- Where diversion of proposed below ground services and/or other works within the TPZ is not achievable, Arboricultural input(s)/approval will be required prior to works occurring to; quantify potential root loss; limit unnecessary root or canopy damage/impact and/or provide remedial measures necessary.
- Where scheduled works cannot reasonably be diverted outside the TPZ, Arboricultural supervision will be required to quantify potential root loss, limit unnecessary root damage/impact, and/or provide possible remedial measures necessary to offset potential root loss. Works include but are not limited to:
  - Clearing/Demolition and site stripping
  - Civils works
  - Below ground service installation/upgrades
  - Any soil level changes (cut and/or fill)
  - Any Construction
  - Hard and Soft Landscaping (including irrigation installation).
- Selective pruning of the tree's canopies can help improve structural form and site safety and crown lifting for construction, vehicular or machinery access may be required (to varying degrees) – refer Appendix C – *Overview of Australian Standards AS4373* for further detail.
- Pruning of roots (subject to Arbor Centre approval) where proposed works may encroach into the TPZ area(s), will need to be undertaken by, or under the supervision of Arbor Centre.
- Supplementary watering of the trees - subject to the amount of potential root loss sustained & seasonal variation\* - may be required.



*\*Note: Timing of works around the tree(s) could have significant implications regarding irrigation rates and frequencies and the associated level of maintenance required i.e., active growing periods within warmer months as opposed to slower growth periods in winter.*

- Potential remedial measures for both canopy and root zone (i.e., soil wetting agents and liquid organic soil drenching) being subject to Arboricultural approval.
- Installation of surface protection and/or trunk and branch protective measures may need to be considered for the site (where identified by Arbor Centre and if required) to enable vehicle/machinery movement within the TPZ.
- The Tree Protection Zones are to be retained for the duration of the construction period and are not to be modified without prior approval from Arbor Centre. Contractors are to be made aware of the Tree Protection Zone within the site's works area, and that no works are to occur within this area without prior approval from Arbor Centre.
- Restricted activities within the TPZs are to be specified in construction documentation & drawings and subject to prior approval by the Arbor Centre through the development and construction phases as identified. The construction TPZs are to be treated as a "No Go" zones and provision for many construction activities will need to be facilitated elsewhere on site.

For example: -

- Traversing and/or Parking of plant machinery or vehicles (where root protection measures have not been implemented);
- Storage for construction or deleterious materials (where root protection measures have not been implemented);
- Locations for site offices or toilets (where root protection measures have not been implemented);
- Mechanical removal of vegetation;
- Unprotected vehicle refuelling;
- Preparation of chemicals and concrete washout;
- Areas to dump construction and general waste;
- Wash down or cleaning of any kind;
- Excavation and dewatering activities; and
- Or any other activity that may harm or injure the tree above or below ground.



- Offset Planting should be considered where tree retention cannot be suitably managed. All stock which is to offset any loss must conform with the Australian Standards (AS 2303:2015 'Tree stock for landscape use') and approved soil remediation works, and planting techniques are to be utilised. Associated destructive testing should be undertaken by Arbor centre for any stock which is purchased for the project (refer Appendix C – Overview of AS 2303 and Appendix H for further detail regarding tree stock and offset planting locations).
- Regular Arboricultural inspections &/or supervision during the construction/works period will be critical in ensuring tree welfare is preserved.

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**References:** AS 4373 2007, AS 4970 2009, Harris et. Al 2004





## 5. Conclusions

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The trees surveyed for this report currently provide valued environmental, habitat, aesthetic and amenity benefits for the Murdoch University site and the local Murdoch area. The benefits of these services can be expected to increase as urbanisation of the local area continues.

With mature trees becoming increasingly rare in the urban environment (largely due to infill developments including road and pedestrian way upgrades, street refurbishments, etc.), and the many decades it takes to replace lost canopy, it would be reasonable for high priority being given to their retention within the proposed design (where possible). It may be that not all the trees included in this survey could be reasonably retained as part of the works proposed.

Achieving the successful preservation & protection of the assessed trees will require specialist and timely Arboricultural input into the development of construction specifications and drawings.

Consideration needs to be given to the sensitive nature and aversion of endemic trees to root zone impact and disturbance. Due to the nature of tree growth and function and the ability of many trees to store and reuse resources in times of stress; it is possible for there to be a significant time delay between injury to a tree's root system occurring and visible decline in the tree canopy becoming evident.

Further consultation with Arbor Centre is recommended regarding:

- Identification of trees where extent of root loss may compromise tree safety/survival;
- The finalisation of a tree sensitive design for the project;
- Identifying and quantifying the impacts of the type of works being proposed around the trees and their associated methodologies;
- Practical measure that could be applied to mitigate or otherwise limit construction impact during and after the construction and development phases;
- The development of Tree Retention Specifications for the project that inform contractors and supervisors on how to factor site specific work methods into their costings;
- Ongoing monitoring and reporting requirements for the duration of the project.

Consideration needs to be given to the specialised nature of the tree management works contained within this report which; if undertaken or specified incorrectly, may have a negative effect on tree health and/or structure. It is imperative that only Arboricultural organisations with staff suitably qualified and experienced in tree management and/or tree preservation or relocation are engaged in monitoring, maintaining, and managing the trees into the future.



Any further recommendations made should be specified by an (minimum) Australian Qualification Framework Level 5 Arborist (AQF 5 – *Diploma in Arboriculture*); in keeping with the Australian Standards AS 4970 '*Protection of Trees on Development Sites*' 2009 & AS 4373 '*Pruning of Amenity Trees*' 2007 and be approved prior to commencement by the Arbor Centre.

Trees are dynamic, ever-changing organisms. Regular Arboricultural inspections should be undertaken in an ongoing capacity by the Arbor Centre to assess, identify and report any change or tree related problems that may cause issues in and around the trees assessed for this project.



## 6. Recommendations

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### 6.1 Timely Design Reviews and Associated Arboricultural Inputs

That timely Arboricultural reviews and ongoing refinement of the concept plans, design and work methodology(s) is undertaken by Arbor Centre (in collaboration with the Design Team), to develop and implement worthwhile tree sensitive designs for existing tree retention and new tree installations.

### 6.2 Site and Tree Geo Location Validation

Validation of the sites survey data should be undertaken to ground truth location of the tree in relation to the proposed structures and works. This will ensure that any issues regarding alignments in conflict with existing tree are addressed in the design stages for the project.

### 6.3 Develop Site Specific Tree Specifications

Based on the final design arisen from 6.1, that Tree and Site-specific retention specifications (for new and existing trees) be developed by Arbor Centre (in collaboration with the Design Team) for all proposed construction, with implementation on ground to the necessary standards throughout the duration of the project (applicable throughout the duration of the project).

### 6.4 Implementation of Alternative Hardstand Designs to Accommodate Root Growth

That the alternative hardstand designs that have been discussed within this report are explored further with Arbor Centre and the Design Team to develop and implement a tree/root sensitive design that significantly reduces ongoing maintenance costs and increases functionality of hardstand surfaces (refer Appendix D & E for further detail).

### 6.5 Ongoing Arboricultural Inspections and Reporting

With the adoption of tree retention and new tree planting strategies and methods that are discussed within this report, that ongoing Arboricultural inspections and reporting should form part of the project brief for tenderers (as part of Arbor Centre being appointed to the project). Lines of reporting will require further discussion.



## 7. References & Reading

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Standards Australia, 2015, *Australian Standards AS2303: Tree Stock for Landscape Use*, Standards Australia, Sydney, Australia





# Appendix A – Tree Location Image

**Figure 2: Tree location Image.**  
 Image Source – [www.nearmaps.com](http://www.nearmaps.com) , Image date 14<sup>th</sup> October 2023

**Note:** Tree locations are approximate and for reference purposes only (the GIS coordinates are to be used as a guide only to verifying location and tree specific information). The GIS Data is deemed reliable but provided "as is" without warranty of any representation of accuracy, timeliness, reliability or completeness. The map documents do not represent a legal survey of the land and are for graphical purposes only. Use of the Data for any purpose should be with acknowledgment of the limitations of the Data, including the fact that the Data is dynamic and is in a constant state of maintenance, correction, and update.



## Appendix B – Table of Results and Field Definitions

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### Field Definitions

**Arbor Centre Tree ID Number** - States Arbor Centre's individual tree identification number for this project.

**Species Identification** - States the genus, species and common name for each tree.

**Age Status:** - States the estimated age at the time of assessment. (Juvenile, Semi Mature, Mature, Post Mature).

**Tree Height** - Measured in meters taken from ground level to the highest point of the trees canopy.

**Canopy Spread** - Measured in meters taken at the widest points of the trees canopy.

**Useful Life Expectancy:** - Provides estimation of the individual trees remaining Useful Life Expectancy (ULE) (0 Dead, <5 Years, 5 – 10 years, 10 – 40 years, or 40+ years).

**Tree Health:** - States the health of the tree at the time of assessment. (Good, Acceptable, Questionable, Poor, Dead). Refer *Health and Structure Definitions* below for further explanation.

**Canopy Structure:** - States the structure of the tree at the time of assessment. (Good, Acceptable, Questionable, Poor) Refer *Health and Structure Definitions* below for further explanation.

**Trunk Diameter:** - Accurate measurement of trunk diameter in millimetres. Measured at 1.4 meters above ground level for single stemmed trees; immediately below bifurcation in co-dominant stemmed trees or at ground level for multi stemmed trees.

**Transplantable:** - Yes, No or Yes but not recommended.

**Minimum Preparation Time:** - Minimum time required prior to relocation.



**Tree Protection Zone (TPZ) Radius:** - Minimum root zone required to be protected during construction, development or during any activities that may encroach into the zone which may cause harm or injure the tree and its parts. Measured in meters, as a **radius** from centre of trunk. Calculated as:  $x12 \text{ DBH}$ . *Note: - TPZ is to not be <2 meters and not >15 meters or measured to the extent of canopy, whichever is greater. As per Australian Standards AS 4970 "Protection of trees on development sites" 2009.*

**Structural Root Zone (SRZ) Radius:** - The SRZ is the nominal area required for tree stability, further investigations are required to validate work-specific SRZ's. A larger area (TPZ) is required to maintain a viable tree through the development. The SRZ is **not** a replacement for the Tree Protection Zone (TPZ) and should not be considered as such.

**Observations & Comments:** - Provides general information relevant for the individual specimen.

**Preliminary Recommendation:** - Provides preliminary recommendations for the assessed specimens Consider Removal, Retain, or Retain (Conditional - seek further Arboricultural advice), considering the proposed development for the site

**Longitude & Latitude:** - Provides X & Y location coordinates for the individual tree.





## Health and Structure Definitions

Tree Health	Definition
Good	Tree displays typical foliage size, colouration and density for a specimen of the species. Seasonal stem elongation and wound wood response also appears typical. A build-up of seasonal deadwood may be present.
Acceptable	Tree displays typical foliage size and colouration. Canopy mass may be slightly thin or have more than typical amount of deadwood present within canopy. Seasonal stem elongation and wound wood response may be inhibited. Tree may be displaying a response to recently changed environs.
Questionable	Tree displays less than typical foliage size, colouration and density for a specimen of the species. Large sections of deadwood may be evident in upper canopy. Seasonal stem elongation and wound wood response may be suppressed. Retention of the tree requires remedial works in order for the specimen to become "Acceptable".
Poor	Tree canopy indicates decline. Tree displays less than 30% live canopy mass and will be problematic to long term retention. Beginning of spiral of decline. Remedial works unlikely to improve tree health.
Dead	Tree has no living conductive tissue within its main stem.

Tree Structure	Definition
Good	Primary framework has structure that is typical of the species at its stage of maturity. Secondary (and beyond) branch attachments are typical of the species. The tree may have inconsequential/minor imperfections.
Acceptable	Primary framework has structure that is typical of the species at its stage of maturity, but which presents defects that may need to be monitored. Secondary (and beyond) branch attachment are typical of the species, but presents structural defects that may require remedial work within the scope of ongoing maintenance. Can include storm damaged and Lopped trees that have developed acceptable branch attachment (subject to species).
Questionable	Primary and secondary framework has evidence of its structural integrity being compromised (i.e.: Storm damage, deleterious pruning, breaks, cracks, fractures, included bark, major decay, poor branch taper etc.). Retention of the tree requires remedial works in order for the specimen to become "Acceptable".
Poor	Tree displays significant structural defects that will be problematic to long term retention. i.e.: extensive stem cavities, split/broken unions. Remedial works unlikely to improve form.



Arbor Centre Tree ID No.	Tree Tag No	Species (& Common Name)	Age	Tree Height (m)	Canopy Spread (m)	Useful Life Expectancy (ULE)	Tree Health	Canopy Structure	Trunk Diameter (m)	Diameter at Ground level (m)	Transplantable	Minimum Preparation Time	TPZ Radius (m)	SRZ Radius (m)	Observations & Comments	Preliminary Recommendation	Longitude	Latitude
AC0001		<i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (River Red Gum)	Mature	13	15	40+ years	Acceptable	Acceptable	0.63	0.693	No		7.56	2.837	Multi stemmed form; Bark included branch/stem unions; Canopy suppression - major; Bifurcates at ground level; Deadwood - major (50mm to 150mm); Previous failures - major (50mm to 150mm)	Retain; Develop and implement tree retention specifications	115.8297158	-32.07120998
AC0002		<i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (River Red Gum)	Mature	8	7	40+ years	Acceptable	Acceptable	0.18	0.198	No		2.16	1.676	Bark included branch/stem unions; Canopy suppression - major; Bifurcates between 2m and 4m; Deadwood - major (< 50mm); Previous failures - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.8297374	-32.07119639
AC0003		<i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (River Red Gum)	Mature	11	6	40+ years	Acceptable	Acceptable	0.37	0.407	No		4.44	2.269	Canopy suppression - minor; Deadwood - major (50mm to 150mm); Previous failures - major (50mm to 150mm); Habitat Value - native fauna observed	Retain; Develop and implement tree retention specifications	115.8297417	-32.07122666
AC0004	325	<i>Corymbia calophylla</i> (Marr)	Mature	17	15	40+ years	Acceptable	Acceptable	0.63	0.693	No		7.56	2.837	Reasonable specimen; Bark included branch/stem unions; Canopy slightly sparse; Bifurcates at ground level; Deadwood - major (50mm to 150mm); Previous failures - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.8298486	-32.07142189
AC0005		<i>Corymbia calophylla</i> (Marr)	Mature	9	6	0 (Dead)	Dead	Poor	0.26	0.286	No		3.12	1.956	Dead Tree	Consider Removal/Replacement; Consider utilisation as habitat tree should retention be required	115.8299438	-32.07138668
AC0006	326	<i>Corymbia calophylla</i> (Marr)	Mature	12	9	5-10 years	Questionable	Acceptable	0.56	0.616	No		6.72	2.700	Canopy suppression - major; Canopy indicates decline; Canopy sparse; Bifurcates between ground level and 1m; Deadwood - major (150mm to 300mm); Wounding noted to main stem; Wounding noted to canopy; Previous failures - major (150mm to 300mm)	Retain (Conditional); Tree has either visual and/or structural and/or health matters that require specific inputs and further arboricultural advice	115.8299419	-32.07136814
AC0007	328	<i>Corymbia calophylla</i> (Marr)	Mature	13	10	10-40 years	Acceptable	Acceptable	0.47	0.517	Yes	12 Months	5.64	2.508	Canopy suppression - minor; Deadwood - major (50mm to 150mm); Wounding noted to main stem; Previous failures - major (50mm to 150mm)	Retain; Develop and implement tree retention specifications	115.8299574	-32.07137185
AC0008		<i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (River Red Gum)	Mature	20	21	40+ years	Good	Acceptable	1.09	1.199	No		13.08	3.572	Good Specimen; Bark included branch/stem unions; Bifurcates between 1m and 2m; Deadwood - major (< 50mm); Wounding noted to main stem; Previous failures - major (50mm to 150mm)	Retain; Develop and implement tree retention specifications	115.8301977	-32.07125138
AC0009		<i>Pinus pinaster</i> (Maritime Pine)	Mature	10	8	40+ years	Good	Acceptable	0.24	0.264	No		2.88	1.892	Bark included branch/stem unions; Canopy suppression - major; Deadwood - minor	Retain; Develop and implement tree retention specifications	115.8302117	-32.07110634
AC0010		<i>Pinus pinaster</i> (Maritime Pine)	Mature	14	19	40+ years	Good	Acceptable	0.81	0.891	No		9.72	3.153	Canopy suppression - major; Bifurcates at 4m+; Deadwood - major (150mm to 300mm); Rubbing, crossing stems - major (50mm to 150mm); Previous failures - major (50mm to 150mm)	Retain; Develop and implement tree retention specifications	115.830187	-32.07108039
AC0011		<i>Pinus pinaster</i> (Maritime Pine)	Mature	14	10	40+ years	Good	Good	0.38	0.418	No		4.56	2.294	Good Specimen; Bifurcates at 4m+; Deadwood - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.830213	-32.07094323
AC0012		<i>Pinus pinaster</i> (Maritime Pine)	Mature	13	7	40+ years	Good	Good	0.34	0.374	No		4.08	2.190	Good Specimen; Canopy suppression - minor; Deadwood - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.8301456	-32.0709803
AC0013		<i>Acacia</i> Species (Wattle)	Mature	6	6	5-10 years	Poor	Questionable	0.19	0.209	No		2.28	1.715	Multi stemmed form; Canopy suppression - major; Canopy indicates decline; Canopy sparse; Bifurcates at ground level; Deadwood - major (50mm to 150mm); Previous failures - major (50mm to 150mm)	Retain (Conditional); Tree has either visual and/or structural and/or health matters that require specific inputs and further arboricultural advice	115.830111	-32.07097413



Arbor Centre Tree ID No.	Tree Tag No	Species (& Common Name)	Age	Tree Height (m)	Canopy Spread (m)	Useful Life Expectancy (ULE)	Tree Health	Canopy Structure	Trunk Diameter (m)	Diameter at Ground level (m)	Transplantable	Minimum Preparation Time	TPZ Radius (m)	SRZ Radius (m)	Observations & Comments	Preliminary Recommendation	Longitude	Latitude
AC0014		Acacia Species (Wattle)	Mature	8	10	5 - 10 years	Questionable	Acceptable	0.35	0.385	No		4.20	2.216	Multi stemmed form; Canopy suppression - major; Deadwood - major (50mm to 150mm); Previous failures - major (50mm to 150mm)	Tree has been marked for removal by others	115.8300758	-32.07098401
AC0015		Acacia Species (Wattle)	Mature	7	9	5 - 10 years	Questionable	Acceptable	0.28	0.308	No		3.36	2.018	Multi stemmed form; Canopy suppression - major; Deadwood - major (50mm to 150mm)	Tree has been marked for removal by others	115.8300696	-32.0709884
AC0016		Acacia Species (Wattle)	Mature	7	8	5 - 10 years	Acceptable	Questionable	0.26	0.286	No		3.12	1.956	Multi stemmed form; Canopy suppression - major; Deadwood - major (< 50mm); Previous failures - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.8301011	-32.0709488
AC0017		Corymbia ficifolia (WA Red Flowering Gum)	Mature	7	6	10 - 40 years	Acceptable	Acceptable	0.26	0.286	No		3.12	1.956	Canopy indicates decline; Canopy slightly sparse; Bifurcates between 1m and 2m; Deadwood - major (< 50mm); Wounding noted to main stem; Wounding noted to canopy; Previous failures - major (< 50mm); Surface roots; Surface root damage - minor; Pest/disease impacts - minor	Retain (Conditional); Tree has either visual and/or structural and/or health matters that require specific inputs and further arboricultural advice	115.829255	-32.07075515
AC0018		Corymbia ficifolia (WA Red Flowering Gum)	Mature	8	6	40 + years	Good	Acceptable	0.32	0.352	No		3.84	2.134	Reasonable specimen; Bifurcates between ground level and 1m; Deadwood - minor; Canopy/infrastructure conflict - minor; Tree stakes require removal	Retain; Develop and implement tree retention specifications	115.8293276	-32.07068996
AC0019		Eucalyptus rudis (Flooded Gum)	Mature	15	16	40 + years	Good	Questionable	0.57	0.627	No		6.84	2.720	Bark included branch/stem unions; Canopy suppression - major; Bifurcates between 2m and 4m; Deadwood - major (50mm to 150mm); Rubbing, crossing stems - major (150mm to 300mm); Previous failures - major (150mm to 300mm)	Retain; Develop and implement tree retention specifications	115.8294085	-32.07063807
AC0020		Eucalyptus rudis (Flooded Gum)	Mature	11	9	40 + years	Acceptable	Acceptable	0.3	0.330	No		3.60	2.077	Canopy suppression - major; Deadwood - minor; Wounding noted to main stem; Tree on lean - minor	Retain; Develop and implement tree retention specifications	115.8294338	-32.07062324
AC0021		Eucalyptus rudis (Flooded Gum)	Mature	12	10	40 + years	Acceptable	Acceptable	0.25	0.275	No		3.00	1.924	Canopy suppression - major; Deadwood - major (50mm to 150mm); Tree on lean - minor	Retain; Develop and implement tree retention specifications	115.8294456	-32.07062139
AC0022		Eucalyptus rudis (Flooded Gum)	Semi-Mature	11	5	10 - 40 years	Acceptable	Acceptable	0.17	0.187	No		2.04	1.637	Leggy form; Bark included branch/stem unions; Canopy suppression - major; Canopy slightly sparse; Deadwood - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.8294487	-32.07063992
AC0023		Corymbia calophylla (Marr)	Mature	17	11	40 + years	Good	Acceptable	0.6	0.660	No		7.20	2.779	Bark included branch/stem unions; Canopy suppression - minor; Bifurcates between 1m and 2m; Deadwood - major (150mm to 300mm); Rubbing, crossing stems - major (50mm to 150mm); Wounding noted to canopy; Previous failures - major (150mm to 300mm)	Retain; Develop and implement tree retention specifications	115.8295247	-32.07066031
AC0024		Corymbia calophylla (Marr)	Semi-Mature	6	4	40 + years	Good	Acceptable	0.18	0.198	Yes	12 Months	2.16	1.676	Canopy suppression - major; Deadwood - major (< 50mm); Previous failures - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.8295321	-32.07069491
AC0025		Corymbia calophylla (Marr)	Mature	12	10	40 + years	Acceptable	Acceptable	0.61	0.671	No		7.32	2.799	Reasonable specimen; Canopy slightly sparse; Bifurcates between ground level and 1m; Deadwood - major (50mm to 150mm); Previous failures - major (50mm to 150mm); Previous fire damage to main stem - minor	Retain; Develop and implement tree retention specifications	115.8295902	-32.07068255
AC0026		Corymbia calophylla (Marr)	Juvenile	5	3	40 + years	Acceptable	Acceptable	0.13	0.143	Yes	6 Months	2.00	1.462	Canopy suppression - major; Deadwood - minor; Previous failures - minor	Retain; Develop and implement tree retention specifications	115.8296241	-32.07072024



Arbor Centre ID No.	Tree Tag No	Species (& Common Name)	Age	Tree Height (m)	Canopy Spread (m)	Useful Life Expectancy (ULE)	Tree Health	Canopy Structure	Trunk Diameter (m)	Diameter at Ground level (m)	Transplantable	Minimum Preparation Time	TPZ Radius (m)	SRZ Radius (m)	Observations & Comments	Preliminary Recommendation	Longitude	Latitude
AC0027		<i>Corymbia calophylla</i> (Marr)	Juvenile	5	3	40+ years	Acceptable	Acceptable	0.13	0.143	Yes	6 Months	2.00	1.462	Canopy suppression - major; Deadwood - minor; Previous failures - minor	Retain; Develop and implement tree retention specifications	115.8296241	-32.07072024
AC0028		<i>Corymbia calophylla</i> (Marr)	Juvenile	5	3	40+ years	Acceptable	Acceptable	0.13	0.143	Yes	6 Months	2.00	1.462	Canopy suppression - major; Deadwood - minor; Previous failures - minor	Retain; Develop and implement tree retention specifications	115.8296241	-32.07072024
AC0029		<i>Corymbia calophylla</i> (Marr)	Juvenile	5	3	40+ years	Acceptable	Acceptable	0.13	0.143	Yes	6 Months	2.00	1.462	Canopy suppression - major; Deadwood - minor; Previous failures - minor	Retain; Develop and implement tree retention specifications	115.8296241	-32.07072024
AC0030		<i>Eucalyptus rudis</i> (Flooded Gum)	Mature	8	10	40+ years	Good	Acceptable	0.28	0.308	No		3.36	2.018	Canopy suppression - major; Deadwood - minor; Previous failures - major (< 50mm); Tree on lean - minor	Retain; Develop and implement tree retention specifications	115.8296674	-32.07066525
AC0031		<i>Eucalyptus rudis</i> (Flooded Gum)	Mature	13	11	40+ years	Acceptable	Acceptable	0.47	0.517	No		5.64	2.508	Reasonable specimen; Bifurcates between 2m and 4m; Deadwood - major (< 50mm); Previous failures - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.829723	-32.0706896
AC0032		<i>Pinus pinaster</i> (Maritime Pine)	Mature	10	5	40+ years	Good	Good	0.2	0.220	Yes	6 Months	2.40	1.752	Good Specimen; Canopy suppression - minor; Deadwood - minor	Retain; Develop and implement tree retention specifications	115.8297786	-32.07070541
AC0033		<i>Pinus pinaster</i> (Maritime Pine)	Mature	15	11	10-40 years	Acceptable	Acceptable	0.59	0.649	No		7.08	2.760	Bifurcates at 4m+; Deadwood - major (50mm to 150mm); Rubbing, crossing stems - major (< 50mm); Previous failures - major (50mm to 150mm)	Retain; Develop and implement tree retention specifications	115.8299466	-32.07078943
AC0034		<i>Pinus pinaster</i> (Maritime Pine)	Mature	15	10	40+ years	Acceptable	Acceptable	0.44	0.484	No		5.28	2.440	Reasonable specimen; Canopy suppression - minor; Deadwood - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.83003	-32.07081044
AC0035		<i>Acacia</i> Species (Wattle)	Mature	8	7	10-40 years	Questionable	Acceptable	0.21	0.231	No		2.52	1.788	Leggy form; Multi stemmed form; Canopy suppression - major; Bifurcates between ground level and 1m; Deadwood - minor; Previous failures - major (< 50mm)	Retain (Conditional); Tree has either visual and/or structural and/or health matters that require specific inputs and further arboricultural advice	115.8299716	-32.07087376
AC0036		<i>Acacia</i> Species (Wattle)	Mature	8	8	10-40 years	Acceptable	Acceptable	0.25	0.275	No		3.00	1.924	Multi stemmed form; Canopy suppression - major; Bifurcates at ground level; Deadwood - minor; Previous failures - minor	Tree has been marked for removal by others	115.8299476	-32.07089044
AC0037		<i>Pinus pinaster</i> (Maritime Pine)	Mature	13	9	40+ years	Good	Acceptable	0.47	0.517	No		5.64	2.508	Reasonable specimen; Canopy suppression - minor; Bifurcates at 4m+; Deadwood - major (< 50mm); Habitat Value - native fauna observed	Retain; Develop and implement tree retention specifications	115.8298512	-32.07095716
AC0038		<i>Acacia</i> Species (Wattle)	Mature	6	7	10-40 years	Acceptable	Questionable	0.31	0.341	No		3.72	2.106	Multi stemmed form; Canopy suppression - major; Bifurcates at ground level; Deadwood - major (50mm to 150mm)	Tree has been marked for removal by others	115.8298271	-32.07091639
AC0039		<i>Acacia</i> Species (Wattle)	Mature	5	10	5-10 years	Acceptable	Questionable	0.17	0.187	No		2.04	1.637	Bark included branch/stem unions; Canopy suppression - major; Canopy indicates decline; Canopy sparse; Bifurcates between ground level and 1m; Deadwood - major (150mm to 300mm); Rubbing, crossing stems - major (50mm to 150mm); Previous failures - major (50mm to 150mm); Tree on lean - major	Tree has been marked for removal by others	115.8297814	-32.07099732



Arbor Centre Tree ID No.	Tree Tag No	Species (& Common Name)	Age	Tree Height (m)	Canopy Spread (m)	Useful Life Expectancy (ULE)	Tree Health	Canopy Structure	Trunk Diameter (m)	Diameter at Ground level (m)	Transplantable	Minimum Preparation Time	TPZ Radius (m)	SRZ Radius (m)	Observations & Comments	Preliminary Recommendation	Longitude	Latitude
AC0040		<i>Acacia saligna</i> (Golden Wreath Wattle)	Mature	7	15	10 - 40 years	Acceptable	Questionable	0.42	0.462	No		5.04	2.393	Canopy suppression - minor; Bifurcates between ground level and 1m; Deadwood - major (50mm to 150mm); Rubbing, crossing stems - major (50mm to 150mm); Previous failures - major (50mm to 150mm)	Tree has been marked for removal by others	115.8297375	-32.0709593
AC0041		<i>Acacia Species</i> (Wattle)	Mature	6	6	10 - 40 years	Acceptable	Acceptable	0.29	0.319	No		3.48	2.048	Multi stemmed form; Bark included branch/stem unions; Canopy suppression - major; Bifurcates at ground level; Deadwood - major (< 50mm); Previous failures - major (< 50mm)	Tree has been marked for removal by others	115.8297457	-32.07093878
AC0042		<i>Schinus terebinthifolius</i> (Brazilian Pepper)	Semi-Mature	7	7	40 + years	Acceptable	Acceptable	0.23	0.253	No		2.76	1.858	Weed species - WONS	Tree has been marked for removal by others	115.8297417	-32.07092736
AC0043		<i>Corymbia calophylla</i> (Marr)	Mature	13	17	40 + years	Acceptable	Acceptable	0.88	0.968	No		10.56	3.264	Reasonable specimen; Canopy suppression - minor; Bifurcates at ground level; Deadwood - major (50mm to 150mm); Rubbing, crossing stems - major (< 50mm); Previous failures - major (< 50mm)	Retain; Develop and implement tree retention specifications	115.8306525	-32.07114096
AC0044		<i>Pinus pinaster</i> (Maritime Pine)	Semi-Mature	13	4	40 + years	Good	Acceptable	0.22	0.242	Yes	6 Months	2.64	1.824	Reasonable specimen; Canopy suppression - minor; Deadwood - minor	Retain; Develop and implement tree retention specifications	115.8306179	-32.07117154
AC0045		<i>Corymbia calophylla</i> (Marr)	Semi-Mature	10	4	40 + years	Acceptable	Acceptable	0.22	0.242	Yes	12 Months	2.64	1.824	Reasonable specimen; Canopy suppression - minor; Bifurcates between 2m and 4m; Deadwood - minor	Retain; Develop and implement tree retention specifications	115.8306089	-32.07116876
AC0046		<i>Pinus pinaster</i> (Maritime Pine)	Mature	16	5	40 + years	Good	Acceptable	0.28	0.308	Yes	6 Months	3.36	2.018	Reasonable specimen; Canopy suppression - minor; Deadwood - minor	Retain; Develop and implement tree retention specifications	115.8305984	-32.07117216
AC0047		<i>Pinus pinaster</i> (Maritime Pine)	Mature	12	5	40 + years	Acceptable	Acceptable	0.23	0.253	Yes	6 Months	2.76	1.858	Reasonable specimen; Canopy suppression - minor; Deadwood - minor	Retain; Develop and implement tree retention specifications	115.8306009	-32.07114776
AC0048		<i>Pinus pinaster</i> (Maritime Pine)	Semi-Mature	9	3	40 + years	Acceptable	Acceptable	0.12	0.132	Yes	6 Months	2.00	1.414	Canopy suppression - minor; Canopy slightly sparse; Deadwood - minor	Retain; Develop and implement tree retention specifications	115.8305836	-32.07115332
AC0049		<i>Corymbia calophylla</i> (Marr)	Juvenile	4	3	40 + years	Good	Acceptable	0.12	0.132	Yes	6 Months	2.00	1.414	Canopy suppression - minor; Deadwood - minor; Rubbing, crossing stems - minor	Retain; Develop and implement tree retention specifications	115.8305746	-32.07115054
AC0050		<i>Pinus pinaster</i> (Maritime Pine)	Mature	19	12	10 - 40 years	Acceptable	Acceptable	0.55	0.605	No		6.60	2.680	Canopy suppression - minor; Canopy starting to indicate decline; Canopy sparse; Deadwood - major (50mm to 150mm)	Retain; Develop and implement tree retention specifications	115.8305762	-32.07109957
AC0051		<i>Banksia ilicifolia</i> (Holly-Leaved Banksia)	Semi-Mature	4	2	40 + years	Acceptable	Acceptable	0.1	0.110	No		2.00	1.310	Reasonable specimen; Canopy suppression - minor; Pest/disease impacts - minor	Retain; Develop and implement tree retention specifications	115.8305527	-32.0711666
AC0052		<i>Banksia ilicifolia</i> (Holly-Leaved Banksia)	Semi-Mature	4	2	40 + years	Acceptable	Acceptable	0.1	0.110	No		2.00	1.310	Reasonable specimen; Canopy suppression - minor; Pest/disease impacts - minor	Retain; Develop and implement tree retention specifications	115.8305527	-32.0711666



Arbor Centre Tree ID No.	Tree Tag No	Species (& Common Name)	Age	Tree Height (m)	Canopy Spread (m)	Useful Life Expectancy (ULE)	Tree Health	Canopy Structure	Trunk Diameter (m)	Diameter at Ground level (m)	Transplantable	Minimum Preparation Time	TPZ Radius (m)	SRZ Radius (m)	Observations & Comments	Preliminary Recommendation	Longitude	Latitude
AC0053		<i>Pinus pinaster</i> (Maritime Pine)	Mature	21	13	40 + years	Acceptable	Acceptable	0.69	0.759	No		8.28	2.947	Reasonable specimen; Deadwood - major (150mm to 300mm); Habitat Value - hollows present; Habitat Value - native fauna observed	Retain; Develop and implement tree retention specifications	115.8304996	-32.0711805
AC0054		<i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (River Red Gum)	Semi-Mature	6	3	40 + years	Acceptable	Acceptable	0.15	0.165	No		2.00	1.553	Canopy suppression - minor; Deadwood - minor; Wounding noted to main stem; Root/infrastructure conflict - major; Canopy/infrastructure conflict - major; Tree growing between fence panel	Retain; Develop and implement tree retention specifications	115.8305471	-32.07119656
AC0055		<i>Eucalyptus camaldulensis</i> var. <i>camaldulensis</i> (River Red Gum)	Mature	8	5	40 + years	Acceptable	Acceptable	0.21	0.231	No		2.52	1.788	Bark included branch/stem unions; Canopy suppression - minor; Wounding noted to main stem; Root/infrastructure conflict - major; Canopy/infrastructure conflict - major	Retain; Develop and implement tree retention specifications	115.8305212	-32.07119996



## Appendix C – Overview of Australian Standards AS 4970, AS 4373 & AS 2303

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### AS 4970 'Protection of Trees on Development Sites' 2009

To successfully incorporate trees into the urban environment, careful consideration, planning and protection should be afforded to both above and below ground parts of the tree - leaves, branches, stems of the above ground parts and below ground, absorbing roots and structural roots.

The operations and activities associated with the construction and development process can have adverse effects on tree health and stability. Those activities that can potentially impact on the tree(s) will require remedial measures to be taken prior to, during and post development to ensure that all reasonable measures are taken to offset such damage.

Damage to tree roots is often irreversible and a common cause of tree decline and/or death following the construction and development phase. The implementation of a Tree Protection process will help lessen the impact that proposed development will have on the root zone (resulting from grade changes, excavations, soil compaction, mechanical damage etc...) and enable timely remedial action to help the tree to retain enough root mass for the continuation of natural growth and development.

Australian Standards have created AS 4970 'Protection of Trees on Development Sites' 2009 that addresses many of the issues that construction and development can have on trees and specifies a process on how to avoid unnecessary damage and outlines guidance only on measures to protect tree welfare during the construction and development phase.

It is important to recognise that the TPZ's identified in this report are simply an indicative measurement of a boundary around the tree beyond which disturbance is considered inconsequential and is unrestricted. However, the main purpose of this circumference around the tree is to recognise that the works proposed within the indicative boundaries have been assessed, modified (where applicable) and approved by a suitably qualified person (minimum) Australian Qualification Framework Level 5 Arborist (AQF 5 – *Diploma in Arboriculture*) prior to the commencement of works.

Where encroachment (building, construction, excavation, landscaping or otherwise) into the Tree Protection Zone is required, Arboricultural input will be necessary to assess the extent of potential impact that may occur and if required, provide Arboricultural measures that can be taken to enable modification of the TPZ and allow root zone encroachment to occur.





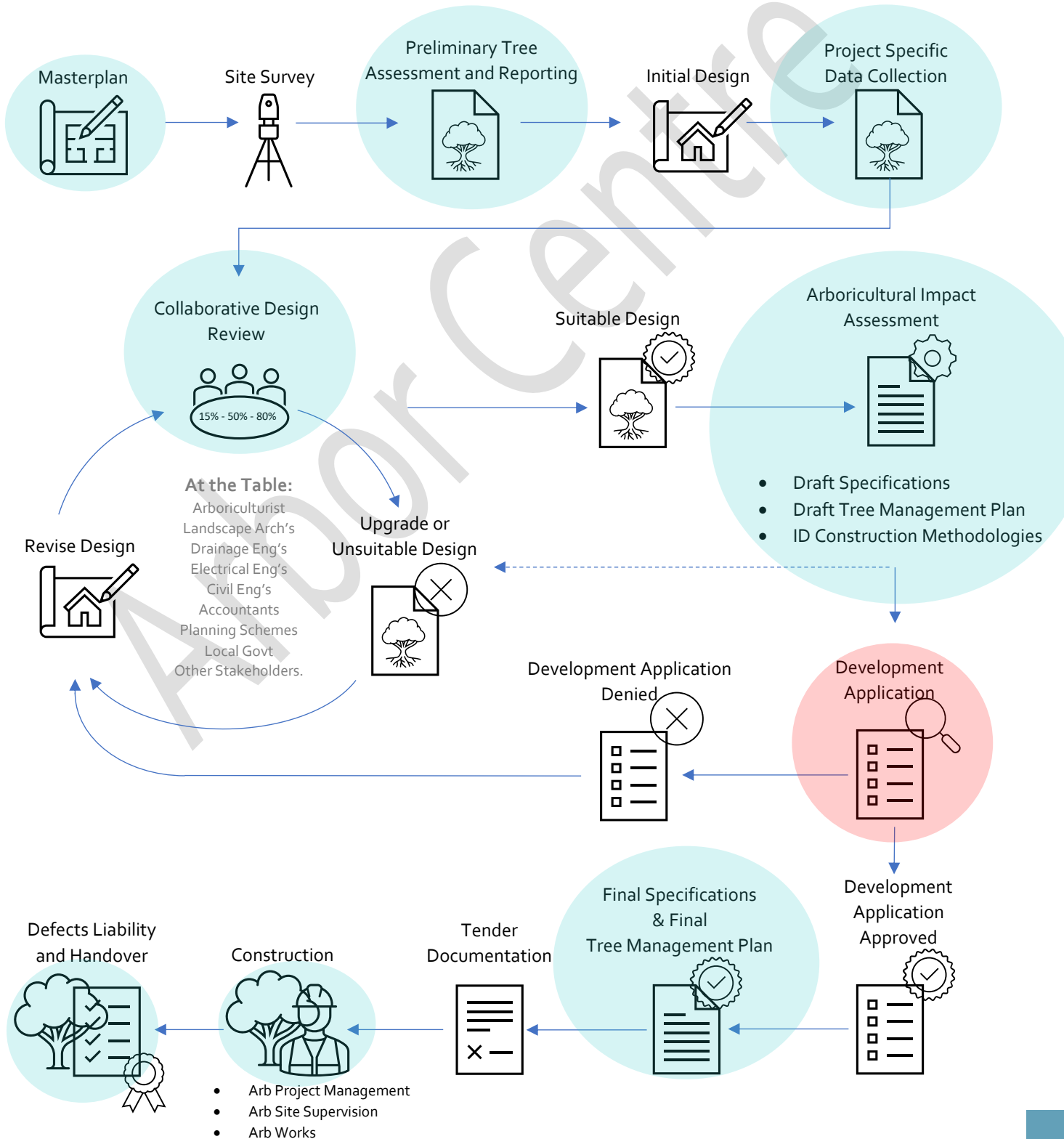
In addition to the above and as recognised in the Australian Standard, all tree preservation recommendations need to appreciate the individual tree characteristics, tolerances that the species possess, the site-specific soil type(s), and other environmental conditions or circumstances that are specific to the site.





# AS4970 Workflow process

Arboricultural assessments, data collection, reviews, and documentation for tree retention in urban developments



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### **AS 4373 'Pruning of Amenity Trees' 2007**

AS 4373 '*Pruning of Amenity Trees*' 2007 has been developed to provide a guide on tree pruning procedures and practices to limit poor or deleterious type pruning being unnecessarily inflicted onto amenity trees.

The result of incorrect pruning of a tree is often irreversible, can negatively impact its health and structure and create unnecessary hazards within and surrounding the trees.

Correct tree pruning practices can reduce the likelihood of branch failures, limit pest and disease infestations, improve site safety and tree amenity, encourage sound structural development and extend tree longevity.

Any pruning works undertaken to the assessed trees should be specified by a (minimum) Australian Qualification Framework Level 5 Arborist (AQF 5 – *Diploma in Arboriculture*); comply with the Australian Standards AS 4373 '*Pruning of Amenity Trees*' 2007 and be undertaken by suitably trained and qualified Arborists with a minimum AQF Certificate 3 in Arboriculture under the supervision of the Arbor Centre.

### **AS 2303 'Tree Stock for Landscape Use' 2015**

It is essential that the tree specimens selected for planting are fit for purpose, in good condition and not compromised at the time of planting.

This includes -

- Appreciating that the investment in a tree is in the root system that it needs to sustain itself through to maturity; not the size of the canopy mass as a seedling or sapling or as a semi mature tree.
- Trees require structurally sound root systems to establish into the landscape and thrive over the long term. This can be supported by ensuring trees are produced in a manner such that the tree's root system is reasonably free of root entanglement and; that the ratio of above ground dynamic (canopy) mass is proportional to a healthy below ground dynamic (root) mass. AS 2303 '*Tree stock for landscape use*'; is an Australian Standard that provides guidance in achieving this by providing quantifiable tree performance measures that can be used as KPI's for the contract growing of trees. Management of tree production using Australian Standard AS 2303 should be exercised by a suitably qualified Arboriculturist/Horticulturists.
- Recognizing the importance of maintaining stock quality, despite potential changes to planting dates and timeframes, (as this is not covered under Australian Standards) – i.e. that the holding of stock beyond the time when it was selected and approved for planting, may require re-potting



or other treatment (to avoid irreversible root entanglement, that compromises the capacity of the tree to perform to expectations in the longer term).

- Ensure trees receive appropriate and sufficient preparation prior to planting and after care post planting.

**References:** AS 4373 2007, AS 4970 2009. AS 2303-2015

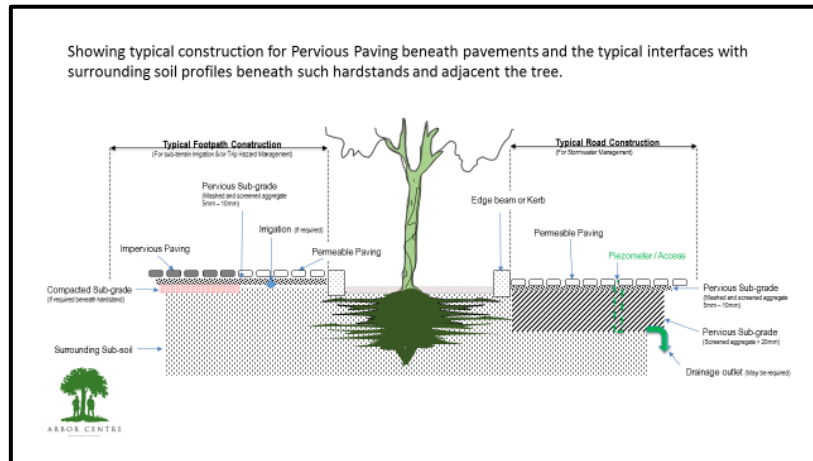
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## Appendix D – Road/Path/Hardstand Construction Modifications

### Pervious paved surfaces

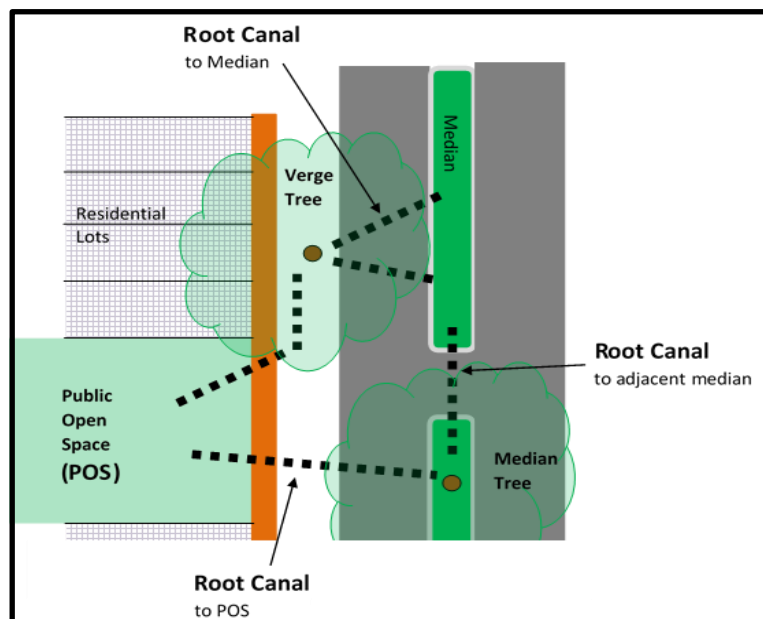
- The use of aggregate layer beneath **Pervious paved surfaces (Permeable &/or Porous type paving – refer figure 3)** provides benefit that include creating soil accessibility for tree roots, Soil moisture harvesting, Stormwater harvesting, and can help in mitigating pavement trip hazards.



**Figure 3.** Diagrammatic example of how pervious paving may be utilised within the landscape –Image property of Arbor Centre

### Root canals

- The use of **root canals** (refer figure 4) utilizing secure areas near tree plantings for tree root development so as to minimize the need for rootable soil space immediately surrounding the tree.



**Figure 4.** Showing root canal possibilities to consider in urban design – image property of Arbor Centre





## Water Sensitive Urban Design (WSUD)

Consideration should be given to the Implementation of WSUD water harvest and storage strategies throughout the site to minimize storm water runoff and better utilize and manage water from rain events (refer figures 5, 6 & 7).

Strategies may include (but may not be limited to);

1. Use of permeable and/or porous paving on roads, footpaths and parking bays etc.
2. Installation of below ground water storage cells.
3. Installation of rain gardens, swales etc...



Figure 5. Water Sensitive Urban Design - Image Source –<https://www.watersensitivesa.com/aila-award-winning-projects-embrace-wsud/>



Figure 6. Permeable paving- Image Source <https://treenet.org/wsud-research-applied-latest-addition-symposium-resources/>



Figure 7. Treenet Inlet. Image Source <https://spacedownunder.com.au/resources/>





## Geoweb Information

### GEOWEB® LOAD SUPPORT

The GEOWEB® load support system stabilizes the selected infill and provides economical solutions to unstable surface or base problems in three key areas: 1) a load distribution system over weak soils, 2) base stabilization for paved surfaces and 3) surface stabilization for unpaved surfaces.

- Significantly minimizes surface rutting.
- Distributes loads laterally and reduces vertical deflection and subgrade contact pressures.
- Controls shearing and lateral movement of the coarse and permeable infill material.
- With open aggregate infill, reduces storm water runoff and creates on-site water detention/retention basin.
- In most cases, the GEOWEB® system doubles the effective structural number for load support, reducing base requirements by half.

#### TYPICAL APPLICATIONS

- site access roads
- permeable, load-supporting surfaces
- roadway shoulders
- intermodal/port facilities
- transportation/storage yards
- stabilized drainage layer
- trails and walkways
- track ballast and subballast structures
- stabilized base for asphalt or modular block pavements
- boat ramps/low water crossings
- foundation mattresses and pipeline protection



### load support

- Perforations and a textured surface increase the friction angle between aggregate infill and the cell wall, generating better aggregate lockup and greater overall load distribution.
- Perforations facilitate lateral cell-to-cell drainage of excessive ground and surface water, reducing the negative effects of trafficking over saturated soils.

Figure 8. Example of GeoWeb product – Image source <https://www.geofabrics.co/sites/default/files/brochures/Geoweb-General-Brochure-M056-10-14NZ.pdf>







**Figure 9.** Example of GeoWeb product being installed within Epsom Avenue, Belmont – Image source City of Belmont (WA)





## Appendix E – Infrastructure Protection Treatments



**Fortress5**

**Five core fundamentals underpin the integrity of our Infrastructure Protection solution. These are built around the combination of this premium product and our highly skilled application of it.**

- 1** Comprehensive project preparation and advice, including 'Site-Specific' assessment of the working environment
- 2** Project Managed service delivery throughout with final inspection Certification
- 3** Proprietary Infrastructure Protection Coating with unique formula; highly adaptable to site circumstances, best in class protection and easily identified from other products
- 4** On-site 'Site Specific' preparation process and application, all delivered by highly skilled and accredited Arbor Centre staff
- 5** Warranty options exist for the combination of the product and its 'Site-Specific' application

Figure 10. Example of Fortress5 – Image source Arbor Centre

Prepared for: Peritas Group

Stage 1 – Preliminary Tree Survey Report – Murdoch University Civil Works – November 2023

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## Appendix F – Mature Tree Relocation Considerations



Figure 11. Port Jackson Fig Tree being Relocated by Arbor Centre in 2008 – Image Source Arbor Centre Group PTY LTD

### Pre-relocation tree preparation (in situ)

The required preparation period would be carried out in situ. Consideration will need to be given (but not limited) to: -

- Utilising specimens that are in good health and that are at the early stages of their mature timeframe will increase the longevity of the transplant once relocated;
- Approvals and permits for excavation and associated root ball preparation works (if required) that will need to take place;
- Root ball size and depth will differ from species to species and can vary in different parts of the site due to below ground influences i.e.: Water table levels, changes in soil type, if the tree is irrigated, previous root zone disturbance and damage etc. can influence size and depth;
- Verification of below ground services;
- Water source being made available at the tree for a period of 6 - 12 months;
- Remedial measures may need to be applied during this preparation period to improve tree health;
- Monitoring and maintenance requirements throughout the preparation period.



**\*Note:** Due to specific morphological traits and characteristics, Palms (and some select monocots) may not generally require the same level or duration of pre-relocation preparation as other species.

### **Final Location for Transplanted Trees**

Consideration will need to be given to the final location of the tree(s). Further discussion is required with the Arbor Centre regarding limitations for both the site and the tree(s) in question. Considerations will need to include (but are not limited to):

- Whether relocation into off site storage is required prior to final planting;
- Compatibility of the tree with its adjacent surrounds;
- Below ground service locations;
- Consideration will need to be given to the logistical aspects (crane type, heavy machinery, trailers etc.) of each of the trees' locations; potential storage off site (if required) and the final planting areas;
- (If required) planting pits are of suitable size to accommodate the width and depth of root ball and below ground services relocated/redirected if within the allocated root ball dimensions;
- Logistics and timing associated with the relocation;
- Remedial pruning requirements;
- Refurbishment of the extraction site;
- Watering requirements for a minimum 3 years post transplanting (Water source, locations, irrigation system, the development of an appropriate watering schedule(s) over this period and potentially for a further 3-5 years);
- Stabilisation measures (if identified by the Arboriculturist);
- Aftercare responsibilities through the 3-year re-establishment phase.

### **Transplant Guarantee**

It is important that the tree transplanting exercise is covered by warranties that reasonably protect Peritas Group and the Client from the loss of amenity.



## Appendix G – Tree Protection Notes for Incorporation into Construction Drawings

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Incorporating the below Tree Protection notes onto demolition, construction, service, landscape etc. Drawings as an immediate tree protection reference point would be beneficial for contractors (and subcontractors) reading drawings specific to their works.

Including (but not limited to);

- THE NOMINATED PROJECT ARBORICULTURIST IS ARBOR CENTRE GROUP PTY LTD CONTACT No. 08-9359 9300.
- THE IDENTIFIED TREES ARE TO BE PROTECTED AND PRESERVED IN ACCORDANCE WITH ARBOR CENTRES TREE PROTECTION SPECIFICATION FOR THE DURATION OF WORKS.
- THE TREES ARE TO BE FENCED AND SIGNED AT THE SPECIFIED TPZ DELINEATION IN ACCORDANCE WITH THE ARBORICULTURAL PROTECTION SPECIFICATIONS AND ADVICE FROM ARBOR CENTRE.
- NO UNAUTHORISED ACCESS OR WORKS ARE TO OCCUR WITHIN TPZ AREA WITHOUT PRIOR CONSULTATION AND FORMAL APPROVAL FROM ARBOR CENTRE.
- THE PROJECT ARBORICULTURIST IS TO BE NOTIFIED A MINIMUM OF 5 WORKING DAYS PRIOR TO WORKS PROPOSED WITHIN THE TPZ.
- ANY WORKS WITHIN THE TREE PROTECTION ZONE ARE TO BE CARRIED OUT IN ACCORDANCE WITH ADVICE FROM AND UNDER THE SUPERVISION OF THE ARBOR CENTRE.



If you have any queries or if we can be of further assistance, do not hesitate to call the Arbor Centre office on (08) 9359 9300.

Regards,



**Alex Bodestaff – Commercial Director – Urban Planning Consultant**

B. Urb&RegPlan. Curtin Uni

On Behalf of

**Rob Bodestaff – Principal – Arboricultural Consultant**

Grad. Cert. Arb Melb. Uni.  
Adv Dip. Arb & Hort. Murdoch  
ISA Arb. (AU-0015A)

And assisted by

**Indira Savory – Trainee Arboricultural Assistant**

AQF Level 2 Arboriculture – Joondalup

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Any arboricultural advice contained herein has been provided in good faith and based upon the material information available, provided, and pertinent at the time the advice was given. Arbor Centre will not accept liability arising out of loss or damage that results from:-

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- The provision of misleading or incorrect information to Arbor Centre upon which this advice was founded;
- The uses of this advice in circumstances or situations other than the specific subject of this advice;
- Failure by the Client to follow this advice;
- The action(s) or inaction(s) of the Client or any other party that gives rise to loss or damage to the subject of this advice;
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