Appendix J

Arboricultural Impact Assessment

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Arup Australia Pty Ltd
Kamay Botany Bay National Park
Ferry Wharves Project
Arboricultural Impact Assessment

19 April 2021

Assessment and Report prepared by:

Sita Bresnihan
Consulting Arborist

Tom Axford
AQF Level 8

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19 April 2021

Bronte Linkhorn
Environmental Consultant
Arup Australian Pty Ltd
Level 5, 151 Clarence Street
Sydney NSW 2000

Arboricultural Impact Assessment Report regarding eighty-eight (88) trees located within the vicinity of the proposed Kamay Ferry Wharves project at Kamay National Park, Cape Solander Drive, Kurnell

Dear Bronte,

We are pleased to provide you with the following Arboricultural Impact Assessment Report for eighty-eight (88) trees within the grounds of Kamay National Park.

Complete use of this report is authorised under the conditions limiting its use as stated in Appendix A Item 7 of "*Arboricultural Reporting Assumptions and Limiting Conditions*".

Should you have any queries relating to this report, its recommendations, or the options considered please do not hesitate to contact us on 1300 272 671.

Regards,

Sita Bresnihan
Consulting Arborist

Tom Axford
Consulting Arborist
Dip. Hort. (Arb.), AQF Level 8

ArborSafe
TREE CONSULTANCY AND MANAGEMENT SYSTEMS

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1 Executive Summary

1.1.1 The following Arboricultural Impact Assessment (Report) regarding eighty-eight (88) trees located within the grounds of Kamay National Park. The subject site was identified by Arup Australian Pty Ltd (the Client) as possessing trees that may be impacted upon by a proposed development.

1.1.2 In part, the project scope was to nominate subject trees that can be retained, or require removal to facilitate the proposed development, as well as identify and reduce potential conflicts between subject trees and site development. Accurate information on the area required for tree retention and methods/techniques suitable for tree protection during construction have been provided.

1.1.3 Tree retention values have been determined based upon a modified version of the British Standard and which have been prescribed into one of the following four (4) categories, A, B, C and U. Refer to Appendix C for further detail. Generally, relevant consent authorities will consider:

- **A** retention value trees as a site constraint and may require alterations to the proposed development design and/or specific protection measures to allow retention, unless the proposed development outweighs the retention value of the tree.
- **B** retention value trees as a site constraint consideration, lesser changes should be considered to retain such trees.
- **C** retention value trees are not considered a site constraint.
- **U** retention value trees are considered a site opportunity, as such trees are recommended for removal regardless of the proposed development.

1.1.4 Trees impacted by the proposed development:

Category	Description	Total	Removal		Retain	
			located within development footprint	irrespective of future development	with specific protection	with generic protection
A	High retention value trees	26			337, 338, 339, 458, 463, 464, 477, 524	335, 336, 341, 437, 448, 450, 451, 452, 454, 455, 456, 459, 471, 483, 490, 491, 493, 494
B	Moderate retention value trees	22	460		326, 466, 467, 469, 479, 481, 495, 496	449, 472, 473, 474, 475, 478, 484, 485, 487, 489, 492, 520, 526
C	Low retention value trees	27	513, 514, 515, 516	497	325, 480, 525	327, 457, 482, 486, 488, 498, 500, 501, 502, 503, 504, 508, 509, 510, 511, 518, 519, 521, 522
U	Trees to be removed irrespective of proposed development	13	517	340, 453, 465, 468, 470, 499, 523, 527		505, 506, 507, 512

2 Introduction

2.1.1 ArborSafe Australia Pty Ltd was engaged by Bronte Linkhorn on behalf of the Client to complete an Arboricultural Impact Assessment Report on eighty-eight (88) trees located within or adjacent to the Kamay National Park at Cape Solander Drive, Kurnell.

2.1.2 The project is located within the Kamay Botany Bay National Park at Kurnell. The key features of the project include wharves, reconfigured car parking and utilities installation.

2.1.3 The report has been requested as part of the preparations of an Environmental Impact Statement on behalf of Transport for NSW for the Kamay Ferry Wharves Project. The proposed development has been reviewed and in summary consists of:

- the addition of a common service trench along the shoreline walking track.
- the construction of updated wharves at the Jetty site to the west of the captain cook landing monument.
- an access road to facilitate the movement of goods and machinery during the construction, running along the line of trees flanking the open space area to the south-east of the coastline.

2.1.4 The report was intended to provide information on site trees and how they may be impacted upon by the proposed development. Report findings and recommendations provided are based upon guidance provided within Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.

2.1.5 Observations and recommendations provided within this report are based upon information provided by the Client and an arborist site visit.

3 Scope

3.1.1 Carry out a visual examination of the nominated trees located within the vicinity of the proposed development at Kamay Botany Bay National Park (Figure 1).

3.1.2 Provide an objective appraisal of the subject trees in relation to their species, estimated age, health, structural condition, useful life expectancy (ULE) and viability within the landscape.

3.1.3 Based on the findings of this investigation, provide independent recommendations on the retention value of the trees.

3.1.4 Nominate subject trees that can be retained or require removal to facilitate the development.

3.1.5 Identify and reduce potential conflicts between subject trees and site development by providing accurate information on the area required for tree retention and methods/techniques suitable for tree protection during construction.

3.1.6 Provide information on restricted activities within the area nominated for tree protection, as well as suitable construction methods to be adopted during demolition and/or construction.

4 Methodology

4.1 Data Collection

4.1.1 Tom Axford of ArborSafe Australia Pty Ltd carried out a site inspection of the subject trees on 19 January 2021.

4.1.2 Trees that are the subject of this report (Figure 3) were identified during discussions with the Client, reviewing relevant supplied development documentation and reviewing the description of a non-exempt 'Tree' as identified within the Sutherland Shire Development Control Plan 2015 (SSDCP 2015) and the Sutherland Shire Local Environmental Plan 2015 (SSLEP 2015).

4.1.3 The subject trees were inspected from the ground using the initial component of Visual Tree Assessment (VTA) (Matthek, 1994). No foliage or soil samples were taken and no aerial, underground or internal investigations were undertaken.

4.1.4 Tree height and canopy width were estimated. Trunk diameter at breast height (DBH) and trunk diameter at the root crown (DRB) were measured with a diameter tape and provided to the nearest centimetre.

4.1.5 Encroachment calculations have been made based on CAD plans supplied by the client with the relevant TPZ and encroachments shown in CAD overlayed by the client for ArborSafe to interpret.

4.1.6 Environmental and Heritage information may be sourced from SEED NSW. The source of all information has been referenced accordingly.

4.1.7 Data collected on site was analysed by Sita Bresnihan and Tom Axford, collated into report format, and relevant recommendations were formulated.

4.1.8 Tree protection zones (TPZ) and structural root zones (SRZ) were calculated in accordance with the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites* (refer to Section 7.6).

4.1.9 Retention values have been determined based upon a modified version of the British Standard BS 5837–2012: *Trees in Relation to Design, Demolition and Construction* (refer to Appendix C).

4.1.10 All photographs were taken at the time of the site inspections by the author and have not been altered for brightness or contrast, nor have they been cropped.

4.1.11 Updated plans of the existing site and of the proposed Kurnell Wharf development were provided to ArborSafe on 12 April 2021:

- Landside – Detail Finishes and Planting Plan, Drg No. KFW01-ARUP-KNL-AR-DRG-762501, Issue A, 1 Apirl 2021
- Utilities Plan, Drg No. KFW01-ARUP-KNL-UT-DRG-768401, Issue A, 1 April 2021
- Utilities Plan, Drg No. KFW01-ARUP-KNL-UT-DRG-768402, Issue A, 1 April 2021
- Tree Protection Plan, Drg No. KFW01-ARUP-KNL-AR-DRG-762111, Issue A, 1 April 2021

4.1.12 Proposed underground service locations have been reviewed in the preparation of this report, based on plans provided.

Figure 1. Excerpt Kurnell project captures showing project boundary. (Arup, January 2021).

5 Observations

5.1 Location

5.1.1 The site was located within the grounds of Kamay National Park (Figure 2). Specifically, the area designated in this report, was located along the coastline running from west at Captain Cook Drive to north-east to the existing jetty.

5.1.2 The site was located within the Sutherland Shire Local Government Area (LGA) and is under the care, control and management of National Parks and Wildlife Services (NPWS), NSW.

5.1.3 Usage surrounding the site was a mixture of National Park recreation area, historical memorial site, cafes and other amenities on the south-west side of Captain Cook Drive opposite the site.

5.1.4 To the east of the site was National Park bushland area and to the west was Silver Beach and Botany Bay. The area to the north was Silver Beach, shoreline walking track and bushland, and to the south were cafes, shops and other amenities. Kamay Botany Bay National Park comprises an area of approximately 492 ha on the north and south sandstone headlands to Botany Bay. It is located approximately 14 km from the centre of Sydney. The listing boundary also includes Towra Point Nature Reserve, a 386.4 ha peninsula located to the south-west of Kurnell village in Botany Bay (Towra Point Nature Reserve Plan of Management).

Figure 2. Whole site image (location). Red lines delineate the site and area containing the subject trees that are to be impacted by the proposed development. (SIX Maps, January 2021).

5.2 Site Trees

5.2.1 The subject trees (Figure 3) have been numbered in line with the existing ArborSite tree numbering system. Trees can be identified on site using white tree tags which are typically located at approximately 2.0m from ground level on the trunk. Trees located on neighbouring properties not under the care control and management of NPWS have not been tagged.

5.2.2 The majority of the subject trees form part of a previous survey undertaken for the entire site. Additional trees, both within the site and on neighbouring land, were added at the end of the existing number range for the site. As such the number range of trees within the report is not continuously sequential and are numbered within the range of Tree 325 and Tree 527.

5.2.3 Eighty-eight (88) trees were inspected and are the subject of this report. The trees were found to be a mixture of *Ficus rubiginosa, Eucalyptus* sp., *Araucaria* sp., *Casuarin*a sp., *and Banksia* sp., in various ranges of health and structural condition, the site contains sixty-six (66) Heritage listed trees. Complete attributes for each tree can be found in Appendix E – Tree Assessment Data.

5.2.4 Subject trees form part of the existing ArborSite Tree Management System for the entire Kamay Botany Bay site and as such have been tagged, positioned on aerial imagery and visually assessed annually since 2015.

Figure 3. Site map showing subject trees. Note that icon colour indicates trees current risk rating (not Retention Value). Tree attributes are to be obtained from Appendix E – Tree Assessment Data. (ArborSite, January 2021).

5.3 Tree Retention Values

5.3.1 Retention values were determined based upon a modified version of the British Standard BS 5837–2012: *Trees in Relation to Design, Demolition and Construction*. This standard categorises tree retention value based upon assessment of the tree's quality (health and structure), and life expectancy. Other criteria such as its physical dimensions, age class, location and its Amenity, Heritage and Environmental significance are also considered. A breakdown of attributes required for each category can be obtained from Appendix C – Tree Retention Values.

Category	Tree numbers
A	335, 336, 337, 338, 339, 341, 437, 448, 450, 451, 452, 454, 455, 456, 458, 459, 463, 464, 471, 477, 483, 490, 491, 493, 494, 524
B	326, 449, 460, 466, 467, 469, 472, 473, 474, 475, 478, 479, 481, 484, 485, 487, 489, 492, 495, 496, 520, 526
C	325, 327, 457, 480, 482, 486, 488, 497, 498, 500, 501, 502, 503, 504, 508, 509, 510, 511, 513, 514, 515, 516, 518, 519, 521, 522, 525
U	340, 453, 465, 468, 470, 499, 505, 506, 507, 512, 517, 523, 527

5.4 Heritage / Environment Status

5.4.1 Heritage Status

5.4.2 The proposed development site has sixty-seven (67) trees identified as being of local and state heritage significance.

5.4.3 The site is within the grounds of Kamay Botany Bay National Park, which is considered to have significant, State, National and Aboriginal heritage value (Figure 4). The reserve is listed within the State Heritage and National Heritage Inventory as identified below:

5.4.4 Detailed reports can be found in the extensive feasibility study carried out by the NSW Department of transport. The report can be found here: 2017 ferry-wharves-la-perouse-kurnell-feasibility-study-report.pdf

Heritage Listing	Listing Title	Listing Number	Gazette Date	Gazette Number	Gazette Page
Heritage Act - State Heritage Register	Kamay Botany Bay National Park (North and South) and Towra Point Nature Reserve	01918	29 Nov 13	162	5397 & 539
Nominated National Heritage	Kamay Botany Bay	Place ID 106162			

Figure 4. Heritage detail. Subject site highlighted in yellow. (Heritage NSW, February 2021).

Figure 5. Location of Heritage listed trees. (ArborSite, February 2021).

6 Discussion

6.1 Proposed Construction

6.1.1 The proposed development has been reviewed and in summary consists of wharves that will likely consist of two main components discussed below:

- A wharf head that is utilised for vessel berthing/mooring and passenger transfer (seaward side for large vessels, landward side for smaller craft)
- A jetty/trestle structure connecting the shoreline to the wharf head. The addition of subterranean infrastructure along the shoreline walking track. An access road to facilitate the movement of goods and machinery during the construction, running along the line of trees flanking the open space area to the south east of the coast.

6.1.2 Review of the proposed design has been undertaken in the context of tree retention and removal across the site.

6.1.3 The trees affected by direct conflict with the proposed construction footprint would require removal under the current design. To retain any of these trees a redesign or relocation of the development would be required. Refer to Appendix E for full detail.

6.1.4 The other main development impact which affects trees, but not necessarily to the point of requiring immediate removal, is through significant root damage due to major TPZ encroachment. These can largely be placed into three (3) categories – soil compaction, level changes or direct root severance.

6.1.5 Negative tree impacts can manifest as either a reduction in health and/or vigour due to root loss (absorption and/or transport roots) resulting in a reduction in water and nutrient absorption capability or on tree stability if larger roots are impacted. Ultimately, the outcome for the trees depends on a number of variable factors including species, age, current health, TPZ encroachment percentage, soil type, topography, previous site use and the proposed design and construction methodology.

6.1.6 Compacted soils, especially artificially compacted soils such as those found under driveways or building platforms, have a higher bulk density down to a deeper level of subsoil. Bulk density is the term used for describing the weight of soil per unit volume. The broad engineering thinking is that the higher the density the more stable the road surface due to less soil movement in expansion, contraction, or compression. A higher bulk density is produced by compacting the soil to reduce available pore space between the soil particles.

6.1.7 The effect of compacted soils on plants is somewhat influenced by the soil type but generally a reduction in available pore space reduces the available area for oxygen and water within the soil. A reduction in available soil water and oxygen inhibits root activity within the soil, as they are essential for root elongation and growth, and the lack of these properties is considered a major limiting factor.

6.1.8 A similar reduction in root activity, due to a reduction in pore space, can occur following significant soil level changes across the TPZ, although this generally occurs over a longer time frame than if the roots were directly severed. Root severance has the same effect, reduction in root function and capability, but on an instantaneous time scale where there is no time for the tree to adjust.

6.1.9 The assumption of allowable encroachment and minimal long-term health or structural impacts to the trees rely on a combination of the following being used - root sensitive construction methods being adhered to within the TPZ, minimal excavation within the TPZ to limit root severance (i.e. construction placed outside the TPZ where possible), fill rather than excavation utilised to affect level changes where possible (i.e. to minimise root severance and allow the trees root system time to adjust), no construction occurring within the SRZ, compensatory area being available around the unimpacted aspects of the trees and the enhancement of the existing TPZ area (i.e. mulched, soil conditioning and irrigation when required).

6.1.10 The development will affect seventy-three (73) site trees through encroachment via excavation or having the main access route for the site within their TPZs.

6.2 Determining TPZ Encroachment

6.2.1 **Major encroachment**. As per the Australian Standard AS 4970–2009: *Protection of Trees on Development* Sites, a major encroachment into the TPZ of any tree is considered to occur when it is beyond a theoretical 10% of the total TPZ area. Trees with major encroachment may require removal or, in certain instances, be retained with specific protection requirements throughout the construction stage. Refer to Section 7.3. for specific protection measures.

6.2.2 **Minor encroachment**. Under the aforementioned standard, a minor encroachment is determined as being less than a theoretical 10% of the total TPZ area. Trees with minor encroachment may be retained with specific, generic or no protection requirements throughout the construction stage Refer to Section 7.4 for generic protection measures.

6.2.3 **No encroachment**. Trees with no encroachment may be retained with generic or no protection requirements throughout the construction stage.

6.2.4 For the purposes of this report, trees to be removed or retained have been identified as those:

- Requiring removal due to a level of encroachment into their TPZ that would likely result in a detrimental impact upon their future health and/or stability.
- Recommended for removal due to the existing poor health or structural traits.
  NB: Such trees may not be directly impacted by the proposed development, but are of such poor health or condition they warrant removal regardless of the proposal and were assessed as they formed part of the scope as defined by the client, or NPWS.
- Retainable and requiring specific protection requirements throughout construction (i.e., generic requirements plus arborist supervision and careful construction methods within their TPZ)
- Retainable and requiring generic tree protection measures only (i.e. protective fencing and restriction of activities within the TPZ).

6.3 Trees 335–385

6.3.1 Trees 335–338 are mature *Araucaria heterophylla* (Norfolk Island Araucaria) in good health and good structural condition and have been allocated a Category A retention value. The four (4) trees are Heritage listed, have been planted as an avenue and are significant due to their age and size. The trees have a ULE of greater than 50 years, are 20–30m in height with a canopy spread of 10–15m and trunk DBH between 92–103cm. The TPZ and SRZ ranges for Trees 335–338 is 11.0–12.4m and 3.6–3.8m respectively, measured at a radial distance from the centre of the trunk.

6.3.2 The encroachment of the TPZ of Tree 338 has been calculated as just over the nominally acceptable 10%. The incursion into the TPZ of this tree is technically significant, however with a combination of hand excavation/vacuum truck excavation during the demolition and constriction process, combined with specific tree protection measures such as root protection, the encroachment is considered acceptable and the tree retainable.

Figure 6. View looking north-east at Trees 335–338 *Araucaria heterophylla* in their growing environment. (ArborSafe, January 2021).

6.4 Trees 458, 460, 495 and 496

6.4.1 Tree 458 is a mature *Ficus rubiginosa* (Port Jackson Fig) in fair health and good structural condition and has been allocated a Category A retention value. Tree 458 is Heritage listed, has a ULE of 25–50 years, is 10–15m in height with a canopy spread of 10–15m and a trunk DBH of 93cm. The TPZ and SRZ for Tree 458 is 11.2m and 3.5m respectively, measured at a radial distance from the centre of the trunk.

6.4.2 Tree 458 will be impacted by both the proposed common service trench and the proposed construction site access road. Refer to Section 7.3. for specific retention measures regarding trenching.

6.4.3 Tree 460 is a mature *Olea africana* (African Olive) in good health and poor structural condition and has been allocated a Category B retention value. Tree 460 is Heritage listed, has a ULE of 15–25 years, is 10–15m in height with a canopy spread of 15–20m and a trunk DBH of 91cm. The TPZ and SRZ for Tree 460 is 10.9m and 3.7m respectively, measured at a radial distance from the centre of the trunk.

6.4.4 Although Tree 460 is a Heritage listed tree, direction has been received from client on behalf of the property manager (NPWS) requesting that it be removed during this project due to it being an undesirable species in this location and its poor structure.

6.4.5 Tree 495 is a semi-mature *Ficus rubiginosa* (Port Jackson Fig) in good health and fair structural condition and has been allocated a Category B retention value. Tree 495 is Heritage listed, has a ULE of greater than 50 years, is 5–10m in height with a canopy spread of 5–10m and a trunk DBH of 51cm. The TPZ and SRZ for Tree 495 is 6.1m and 2.7m respectively, measured at a radial distance from the centre of the trunk.

6.4.6 Tree 496 is a semi-mature *Ficus rubiginosa* (Port Jackson Fig) in good health and fair structural condition and has been allocated a Category B retention value. Tree 496 is Heritage listed, has a ULE of 15–25 years is 5–10m in height with a canopy spread of 10-15m and a trunk DBH 81cm. The TPZ and SRZ for Tree 496 is 9.7m and 3.4m respectively, measured at a radial distance from the centre of the trunk.

6.4.7 Both Trees 495 and 496 will be impacted by the proposed common service trench. Specific tree protection measures and specialised trenching measures will be required to retain the structural integrity of the root systems of these trees. Refer to Section 7.3. for specific retention measures regarding trenching.

Figure 7. View looking south at Tree 458 *Ficus rubiginosa* in its growing environment. (ArborSafe, January 2021).

Figure 8. View looking south at Tree 460 *Olea africana* in its growing environment. (ArborSafe, January 2021).

Figure 9. Kamay Ferry Wharves Plan supplied showing construction access route in green. (Arup, February 2021).

6.5 Trees 479 and 481

6.5.1 Tree 479 is a mature *Eucalyptus botryoides* (Southern Mahogany) in good health and fair structural condition and has been allocated a Category B retention value. Tree 479 is Heritage listed, has a ULE of 15–25 years, is 10–15m in height with a canopy spread of 15–20m and a trunk DBH 100cm. The TPZ and SRZ for Tree 479 is 12m and 3.5m respectively, measured at a radial distance from the centre of the trunk.

6.5.2 Tree 481 is a mature *Eucalyptus botryoides* (Southern Mahogany) in fair health and good structural condition and has been allocated a Category B retention value. Tree 481 is Heritage listed, has a ULE of 15–25 years, is 10–15m in height with a canopy spread of 10–15m and a trunk DBH of 69cm. The TPZ and SRZ for Tree 481 is 8.2m and 3.4m respectively, measured at a radial distance from the centre of the trunk.

6.5.3 Both Tree 479 and 481 will be impacted by the proposed construction site access road due to significant encroachment of their TPZ. Refer to Section 7.3 for specific protection measures to minimise compaction and disturbance from heavy machinery in the root zones of these trees.

Figure 10. View looking north-east at Trees 479 and 481 *Eucalyptus botryoides* in their growing environment. (ArborSafe, January 2021).

6.6 Trees 463, 464, 466, 467, 469 and 525

6.6.1 Trees 463, 464, 466, 467 and 469 constitute mixed species of mature and semi-mature trees along the open space area.

6.6.2 All trees are Heritage listed. The group comprises two (2) Category A trees (Trees 463 and 464), three (3) Category B trees (Trees 466, 467 and 469) and one (1) Category C tree (Tree 525).

6.6.3 These trees will be impacted by the proposed construction site access road due to significant encroachment of their TPZ. Refer to Section 7.3 for specific protection measures to minimise compaction and disturbance from heavy machinery in the root zones of these trees.

6.6.4 The proposed access track is to be directed away from the TPZ areas of these trees and concentrated in the open space area where the root zones of these important trees can be protected from the damaging effects of root desiccation by the impact of heavy machinery.

Figure 11. View looking east of tree line showing Trees 464–469 (S-N) and 494 in their growing environment. (ArborSafe, January 2021).

Figure 12. Kamay Ferry Wharves project access route shown in green. (Arup, February 2021).

7 Tree Protection and Management Recommendations

7.1 Tree Removal

7.1.1 Based on the supplied design proposal, a total of six (6) trees will require removing to allow for the proposed development to proceed.

7.1.2 A further nine (9) trees have been recommended to be removed irrespective of the proposed development based on their assessed poor health and/or structure, or as has been requested by NPWS.

Recommendation	Category A High retention value		Category B Moderate retention value		Category C Low Retention value		Category U No retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Remove for development	0		1	460	4	513, 514, 515, 516	1	517
Remove irrespective of development	0		0		1	497	8	340, 453, 465, 468, 470, 499, 523, 527

Figure 13. Trees assessed as requiring removal. (ArborSite, March 2021).

7.2 Tree Retention

7.2.1 Seventy-three (73) trees were recommended for retention and require either specific or generic protection measures during construction to ensure they remain viable following the completion of works.

Recommendation	Category A High retention value		Category B Moderate retention value		Category C Low Retention value		Category U No retention value	
	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers	Qty	Tree numbers
Retain with **specific** protection requirements	8	337, 338, 339, 458, 463, 464, 477, 524	8	326, 466, 467, 469, 479, 481, 495, 496	3	325, 480, 525	0	
Retain with **generic** protection requirements	18	335, 336, 341, 437, 448, 450, 451, 452, 454, 455, 456, 459, 471, 483, 490, 491, 493, 494	13	449, 472, 473, 474, 475, 478, 484, 485, 487, 489, 492, 520, 526	19	327, 457, 482, 486, 488, 498, 500, 501, 502, 503, 504, 508, 509, 510, 511, 518, 519, 521, 522	4	505, 506, 507, 512

7.3 Specific Protection Measures

7.3.1 Category A Trees 337, 458 and Category B Trees 495, 496 have proposed excavation or construction activity >10% withing their TPZ and will therefore require supervision in accordance with 7.3.3 – 7.3.6 below.

7.3.2 The remaining Category A Trees 338, 339, 463, 464, 477, 524; Category B Trees 326, 466, 467, 469, 479, 481; Category C Trees 325, 480, 525 (Figure 14) have considerable construction activity >10% within their TPZ requiring specific protection measures in accordance with 7.3.7 below and Figures 16 and 17.

7.3.3 Excavation is to be carried out only under arborist supervision. No excavation should occur within the SRZ of these trees. It was recommended that the proposed excavation commence at the outer extent of the TPZ and move inwards to minimise root damage to the trees.

7.3.4 Works should be undertaken using techniques that are sensitive to tree roots to avoid unnecessary damage. Such techniques include:

- Excavation using a high-pressure water jet and vacuum truck.
- Excavation using an Air Spade with vacuum truck.
- Excavation by hand.

7.3.5 Machine excavation is prohibited within the TPZs of retained trees unless undertaken at the direct consent of the project arborist.

7.3.6 Roots discovered are to be treated with care and minor roots (<40mm diameter) pruned with a sharp, sterile saw or secateurs. All significant roots (>40mm diameter) are to be recorded, photographed, and reported to the project arborist for comment.

7.3.7 Other proposed surfacing within the TPZ is to be installed above the existing grade and be of a permeable nature to allow the passage of air and moisture. If the surfacing is to be load bearing, then it is suggested that a geogrid/web or similar is incorporated to ensure the rooting area below does not become compacted with the installation of the load bearing structure placed on top. Comment from the project arborist is the sought before the installation of such systems to ensure any adverse impacts to trees and root systems are suitably mitigated. Refer to Section 7.6 for diagrammatical guidance.

Figure 14. Site map showing trees requiring specific protection measures. (ArborSite, March 2021).

7.4 Generic Protection and Reporting Measures

7.4.1 All retained trees require generic protection measures (Figure 15). These are Category A Trees 335, 336, 341, 437, 448, 450, 451, 452, 454, 455, 456, 459, 471, 483, 490, 491, 493, 494; Category B Trees 449, 472, 473, 474, 475, 478, 484, 485, 487, 489, 492, 526; Category C Trees 327, 457, 482, 486, 488, 498, 500, 501, 502, 503, 504, 508, 509, 510, 511; and Category U Trees 505, 506, 507, 512. Refer to Section 7.5–7.7 for further detail.

Figure 15. Site map showing tree requiring generic protection measures. (ArborSite, March 2021).

7.4.2 All trees to be retained require protection during the construction stage. Tree protection measures include a range of:

- Activities restricted within the TPZ
- Protective fencing
- Trunk and ground protection
- Tree protection signage
- Involvement from the project arborist
- Project milestones
- Compliance reporting

7.4.3 Activities Prohibited within the TPZ

- Machine excavation including trenching
- Storage
- Preparation of chemicals, including cement products
- Parking of vehicles and plant
- Refuelling
- Dumping of waste
- Wash down and cleaning of equipment
- Placement of fill
- Lighting of fires
- Soil level changes
- Temporary or permanent installation of utilities and signs
- Physical damage to the tree

7.5 Protective Fencing Specification

7.5.1 Protective fencing (Figure 16) is to be installed as far as practicable from the trunk of any retained trees. Fencing should be erected as per the image below before any machinery or materials are brought to site and before commencement of works (including demolition).

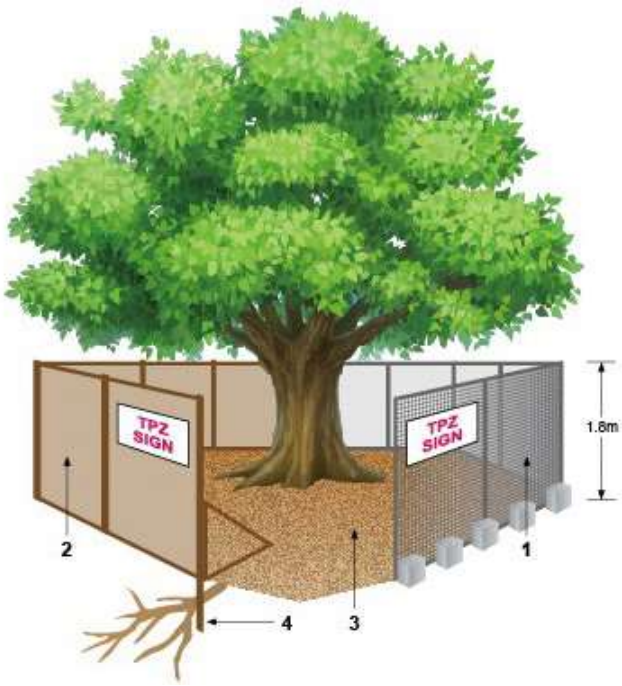
7.5.2 In some areas of the site (i.e. protection of trees on neighbouring properties) existing boundary fencing may be used as an alternative to protective fencing.

7.5.3 Once erected, protective fencing must not be removed or altered without approval from the project arborist. The TPZ fencing should be secured to restrict access.

7.5.4 TPZ fencing is to be a minimum of 1.8m high and mesh or wire between posts must be highly visible. Fence posts and supports should have a diameter greater than 20mm and should ideally be freestanding, otherwise be located clear of the roots. See image below.

7.5.5 Tree protection fencing must remain intact throughout all proposed construction works and must only be dismantled after their conclusion. The temporary dismantling of tree protection fencing must only be done with the authorisation of a consulting arborist and/or the responsible authority.

7.5.6 The subject trees themselves must also not to be used as a billboard to support advertising material. Affixing nails or screws into the trunks of trees to display signs of any type is not a recommended practice in the successful retention of trees.



Legend:
1. Chain wire mesh panels with shade cloth attached (if required), held in place with concrete feet
2. Alternative plywood or wooden paling fence panels. This fencing material also prevents building materials or soil entering the TPZ
3. Mulch installation across surface of TPZ (at discretion of the project arborist). No excavation, construction activity, grade changes, surface treatment or storage materials of any kind are permitted within the TPZ
4. Bracing is permissible within the TPZ. Installation of supports should avoid damaging roots.

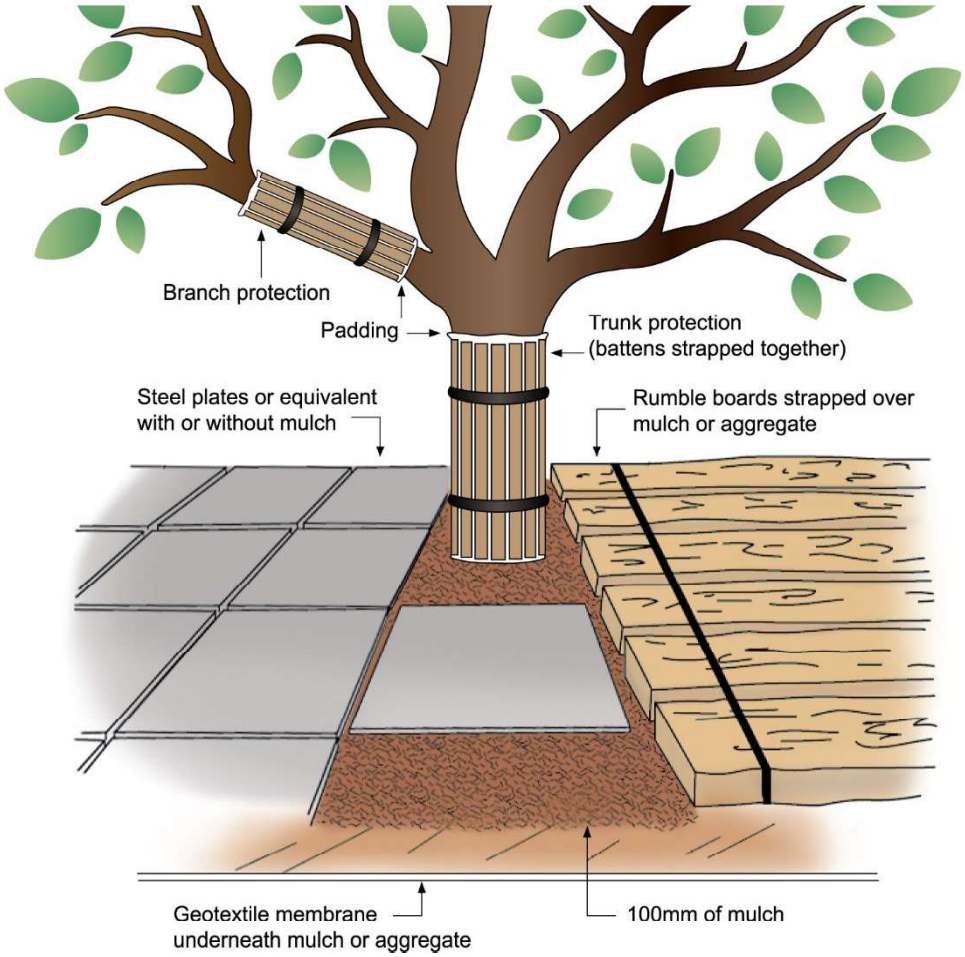
Figure 16. Depicts standard fencing techniques. (AS 4970–2009).

7.6 Trunk and Ground Protection

7.6.1 Given that proposed works are often within the TPZs of retained trees, standard protective fencing may not always be a viable method of protection. In these areas trunk protection and ground protection should be installed prior to the commencement of works and remain in place until after construction works have been completed.

7.6.2 Where construction access into the TPZ of retained trees cannot be avoided, the root zone of each tree must be protected using either steel plates or rumble board strapped over mulch/aggregate until such a time as permanent above ground surfacing (cellular confinement system or similar) is to be installed.

7.6.3 Trunk and ground protection (Figure 17) should be undertaken in line with the Australian Standard AS 4790–2009: *Protection of Trees on Development Sites* as per the image below:



Notes:

1. For trunk and branch protection use boards and padding that will prevent damage to bark. Boards are to be strapped to trees, not nailed or screwed.
2. Rumble boards should be of a suitable thickness to prevent soil compaction and root damage.

Figure 17. Depicts trunk and ground protection techniques. (AS 4970–2009).

7.7 Tree Protection Signs

7.7.1 Signs identifying the TPZ (Figure 18) should be placed at 10m intervals around the edge of the TPZ and should be visible from within the development site.

Figure 18. Depicts standard fencing techniques. (AS 4970–2009).

7.8 Project Arborist

7.8.1 An official "Project Arborist" must be commissioned to oversee the tree protection, any works within the TPZ's and complete regular monitoring compliance certification.

7.8.2 The project arborist must have minimum five (5) years industry experience in the field of arboriculture, horticulture with relevant demonstrated experience in tree management on construction sites, and Diploma level qualifications in arboriculture – AQF Level 5.

7.8.3 Inspections are to be conducted by the project arborist at several key points during the construction in order to ensure that protection measures are being adhered to during construction stages and decline in tree health or additional remediation measures can be identified.

7.9 Project Milestones

7.9.1 The following visits and milestones were recommended as to when on-site tree inspection by the project arborist is required:

Item	Purpose of Visit	Timing of Visit(s)	Prerequisites
1	Pre-start induction	Following sign off from Item 1. Contractor to provide a minimum of five days advance notice for this visit.	Prior to commencement of works. All parties involved in the project to attend.
2	Supervision of works in TPZ's including all regrading and excavations	Whenever there is work planned to be performed within the TPZ's. Contractor to provide a minimum of five days advance notice for such visits.	
3	Regular site inspections	Minimum frequency monthly for the duration of the project.	The checklist must be completed by the Project Arborist at each site inspection and signed by both parties.
4	Final sign off	Following completion of works.	Practical completion of works and prior to tree protection removal.

7.10 Compliance Reporting

7.10.1 Following each inspection, the project arborist shall prepare a report detailing the condition of the trees. These reports should certify whether or not the works have been completed in compliance with the consent relating to tree protection.

7.10.2 These reports should contain photographic evidence where required to demonstrate that the work has been carried out as specified.

7.10.3 Matters to be monitored and included in these reports should include tree condition, tree protection measures and impact of site works which may arise from changes to the approved plans.

7.10.4 The reports and Compliance Statements shall be submitted to the Project Manager (as well as the Clients' nominated representative) following each inspection.

7.10.5 The reports and any Non-Compliance Statements shall be submitted to the Project Manager (as well as the Clients' nominated representative) if tree protection conditions have been breached. Reports should contain clear remedial action specifications to minimise any adverse impact on any subject tree.

7.11 Offset Tree Planting

7.11.1 Offset planting should reflect the number of trees removed and the initial loss of amenity and biomass. New trees should be of long-term potential and sourced from a reputable supplier.

7.11.2 Replacement tree species must suit their location on the site in terms of their potential physical size and their tolerance(s) to the surrounding environmental conditions. To avoid unethical or unprofessional tree selection and/or their placement within the landscape, replacement tree species must be selected in consultation with a consulting arborist, who can also assist in implementing successful tree establishment techniques.

7.11.3 Replacement tree species must have the genetic potential to reach a mature size potential of those trees removed to facilitate the development. As a guide, potential height will be a minimum of 10m (or more) and produce a spreading canopy so as they may provide amenity value to the property and contribute to the tree canopy of the surrounding area in the future.

7.12 Additional Excavation/Trenching within TPZs

7.12.1 In the event additional excavation is required within the TPZs of retained trees identified within this report, or any other site trees, arborist involvement will be required to ensure works are undertaken in accordance with the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites.*

7.12.2 Where excavation or trenching is required to facilitate installation of underground services within the TPZs of any site trees arborist supervision is required. Works should be undertaken using techniques that are sensitive to tree roots to avoid unnecessary damage. Such techniques include:

1. Excavation by hand
2. Excavation using a high-pressure water jet and vacuum truck
3. Excavation using an Air Spade with vacuum truck.

7.12.3 Machine excavation should be prohibited within the TPZs of retained trees unless undertaken at the direct consent from the project arborist and/or the responsible authority.

7.13 Plant Health Care

7.13.1 When managing a tree affected by development incursions within its TPZ, plant tonic and growth stimulant drenching should be undertaken. Plant tonic and growth stimulant drenching is the process of adding diluted products directly to the root area of a tree to promote and assist trees to cope with loss of roots during the development process. They also assist trees to provide better resistance to sap sucking insects and fungal attack/disease and improve the establishment of beneficial microbial populations and nutrient uptake. See Appendix D – Plant Health Care and Mulching

7.14 Irrigation

7.14.1 Regular checks are required to ensure retained trees are receiving the correct amount of water. The majority of a tree's fine water absorbing roots are located in the top 10–30cm of soil. To undertake a basic soil moisture test, dig a small hole to a depth of 40cm at the dripline of the tree. If the soil is moist at this depth, water is not needed. Slow irrigation that provides an even coverage and targets the absorbing roots is the key to successful irrigation and encourages a deeper tree root system. Irrigation near the trunk is unnecessary as for most trees there are generally fewer water absorbing roots in this area. Irrigating the soil from half-way between the trunk and the dripline as well as beyond the dripline will provide water where it will most effectively be used. Preferably, water your trees during the cooler evening and early morning period when temperatures are lower, humidity is higher, and the air is calmer thereby reducing water evaporation from the soil surface. Irrigation in the middle of the day is not harmful to most trees however it is less efficient.

7.15 Mulching

7.15.1 Mulching regulates soil moisture and temperature levels, suppresses weeds, minimises soil compaction and reduces run off during periods of heavy rain. Acquiring wood chip mulch from programmed tree works (and by purchasing it from local tree contractors) would be a proactive way to improve the growing conditions around trees that ultimately will result in improved tree health and vitality.

7.15.2 Mulch should aim to cover an area at least as large as a tree's crown projection (and preferably larger) for it to be effective. It should also be laid at a uniform thickness of 75–100mm. Mulch should also be placed over damp to wet soil and never over dry soil. Application during the cooler months of the year is ideal. In areas where grass exists where you wish to mulch, spray the grass first with a non-selective herbicide and allow it to wilt and die before placement. This practice will negate grass growing up through the mulch over time.

7.15.3 Mulching within the canopy areas of trees not only improves long term tree health but also acts to reduce tree risk by reducing targets that pass and/or congregate under their canopies. This in turn will minimise the likelihood of injury in the event of a branch failure.

8 References

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Plans of the existing site and of the proposed development were provided to ArborSafe on 1 February 2021 and include:

- Kurnell Wharf Utilities Plan, KFW01-ARUP-KNL-CV-DRG-000661, Concept Design Issue, Rev 4, Arup, 23 October 2020
- Kamay Ferry Wharves work in progress plans, Arup, 1 February 2021
- Landside – Detail Finishes and Planting Plan, Drg No. KFW01-ARUP-KNL-AR-DRG-762501, Issue A, 1 Apirl 2021
- Utilities Plan, Drg No. KFW01-ARUP-KNL-UT-DRG-768401, Issue A, 1 April 2021
- Utilities Plan, Drg No. KFW01-ARUP-KNL-UT-DRG-768402, Issue A, 1 April 2021
- Tree Protection Plan, Drg No. KFW01-ARUP-KNL-AR-DRG-762111, Issue A, 1 April 2021

Appendix A. Arboricultural Reporting Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. Any titles and ownership of any property are assumed to be good. No responsibility is assumed for matters legal in character.
2. It is assumed that any property/project is not in violation of any applicable codes, ordinances, statutes or other government regulations.
3. Care has been taken to obtain all information from reliable sources. All data has been verified in so far as possible, however, the consultant can neither guarantee nor be responsible for the accuracy of the information provided by others.
4. The consultant shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services.
5. Loss or alteration of any part of this report invalidates the entire report.
6. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by anyone but the person to whom it is addressed, without the prior written consent of the consultant.
7. Neither all nor any part of the contents of this report, nor any copy thereof, shall be used for any purpose by anyone but the person to whom it is addressed, without the written consent of the consultant. Nor shall it be conveyed by anyone, including the Client, to the public through advertising, public relations, news, sales or other media, without the written consent of the consultant.
8. This report and any values expressed herein represent the opinion of the consultant and the consultant's fee is in no way contingent upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event, nor upon any finding to be reported.
9. Sketches, diagrams, graphs and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys unless expressed otherwise.
10. Information contained in this report covers only those items that were examined and reflect the condition of those items at the time of inspection.
11. Inspection is limited to visual examination of accessible components without dissection, excavation or probing. 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.

Appendix B. Explanation of Tree Assessment Terms

Tree number: Refers to the individual identification number assigned within the ArborSafe software to each assessed tree on the site and the number which appears of the tree's tag.

Tree location: Refers to the easting and northing coordinates assigned to the location of the tree as obtained from the geo-referenced aerial image within the ArborSafe software.

Tree species: Provides the botanic name (genus, species, sub-species, variety and cultivar where applicable) in accordance with the International Code of Botanical Nomenclature (ICBN), and the accepted common name.

Trees in group: The number of trees encompassing a collective assessment of more than one tree. Typically grouped trees have similar attributes that can be encompassed within one data record.

Height: The estimated range in metres attributed to the tree from its base to the highest point of the canopy. Where required height will be estimated to the nearest metre.

Diameter at Breast Height (DBH): Refers to the tree's estimated trunk diameter measured 1.4m from ground level for a single trunked tree. These estimates increase in 50mm increments. Where required DBH will be measured to give an accurate measurement for single trunked trees, trees with multiple trunks, significant root buttressing, bifurcating close to ground level or trunk defects and will be measured as per the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites*.

Tree Protection Zone (TPZ): A specified area above and below ground and at a given distance measured radially away from the centre of the tree's trunk and which is set aside for the protection of its roots and crown. It is the area required to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by development. The radius of the TPZ is calculated by multiplying its DBH by 12. TPZ radius = DBH × 12. (Note "Breast Height" is nominally measured as 1.4m from ground level).TPZ is a theoretical calculation and can be influenced by existing physical constraints such as buildings, drainage channels, retaining walls, etc. (Standards Australia, 2009).

Structural Root Zone (SRZ): The area close to the base of a tree required for the tree's anchorage and 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. SRZ radius = $(D \times 50)^{0.42 \times 0.64}$ (Standards Australia, 2009).

Canopy spread: The estimated range in metres attributed to the spread of the tree's canopy on its widest axis. Where required crown spread will be estimated to the nearest metre.

Origin: Refers to the origin of the species and its type.

Category	Description
Locally Endemic	Occurs naturally in the local area and is native to a given region or ecosystem.
NSW Native	Occurs naturally within NSW but is not indigenous.
Australian Native	Occurs naturally within Australia and its territories but is not a NSW native or indigenous.
Exotic Evergreen	Occurs naturally outside of Australia and its territories and typically retains its leaves throughout the year.
Exotic Deciduous	Occurs naturally outside of Australia and its territories and typically loses its leaves at least once a year.

Health: Refers to the health and vigour of the tree.

Category	Description
Excellent	Canopy full with even foliage density throughout, leaves are entire and are of an excellent size and colour for the species with no visible pathogen damage. Excellent growth indicators, e.g. seasonal extension growth. Exceptional specimen.
Good	Canopy full with minor variations in foliage density throughout, leaves are entire and are of good size and colour for the species with minimal or no visible pathogen damage. Good growth indicators, none or minimal deadwood.
Fair	Canopy with moderate variations in foliage density throughout, leaves not entire with reduced size and/or atypical in colour, moderate pathogen damage. Reduced growth indicators, visible amounts of deadwood, may contain epicormic growth.
Poor	Canopy density significantly reduced throughout, leaves are not entire, are significantly reduced in size and/or are discoloured, significant pathogen damage. Significant amounts of deadwood and/or epicormic growth, noticeable dieback of branch tips, possibly extensive.
Dead	No live plant material observed throughout the canopy, bark may be visibly delaminating from the trunk and/or branches.

Age: Refers to the life cycle of the tree.

Category	Description
Young	Newly planted small tree not fully established may be capable of being transplanted or easily replaced.
Juvenile	Tree is small in terms of its potential physical size and has not reached its full reproductive ability.
Semi-mature	Tree in active growth phase of life cycle and has not yet attained an expected maximum physical size for its species and/or its location.
Mature	Tree has reached an expected maximum physical size for the species and/or location and is showing a reduction in the rate of seasonal extension growth.
Senescent	Tree is approaching the end of its life cycle and is exhibiting a reduction in vigour often evidenced by natural deterioration in health and structure.

Structure: Refers to the structure of the tree from roots to crown.

Category	Description
Good	Sound branch attachments with no visible structural defects, e.g. included bark or acute angled unions. No visible wounds to the trunk and/or root plate. No fungal pathogens present.
Fair	Minor structural defects present, e.g. apical leaders sharing common union(s). Minor damage to structural roots. Small wounds present where decay could begin. No fungal pathogens present.
Poor	Moderate structural defects present, including bifurcations with included bark with union failure likely within 0–5 years. Wounding evident with cavities and/or decay present. Damage to structural roots.
Hazardous	Significant structural defects with failure imminent (3–6 months). Defects may include active splits and/or partial branch or root plate failures. Tree requires immediate arboricultural works to alleviate the associated risk.

Useful Life Expectancy (ULE): Useful life expectancy refers to an expected period of time the tree can be retained within the landscape before its amenity value declines to a point where it may detract from the appearance of the landscape and/or presents a greater risk and/or more hazards to people and/or property. ULE values consider tree species, current age, health, structure and location. ULE values are based on the tree at the time of assessment and do not consider future changes within the tree's location and environment which may influence the ULE value.

Category
0 Years
<5 Years
5–10 Years
10–15 Years
15–25 Years
25–50 Years
>50 Years

Defects: Visual observations made of the presenting defects of the tree and its growing environment that are, or have the capacity to impact upon, the health, structural condition and/or the useful life expectancy of the tree. Defects may include adverse physical traits or conditions, signs of structural weaknesses, plant disease and/or pest damage, tree impacts to assets or soil related issues.

Tree Significance: Includes environmental, social or historical reasons why the tree is significant to the site. The tree may also be rare under cultivation or have a rare or localised natural distribution.

Arborist Actions: A list of arboricultural and/or plant health care works that are aimed at maintaining or improving the tree's health, structural condition or form. Actions may also directly or indirectly reduce the risk potential of the tree such as via the removal of a particular branch or the moving of infrastructure from under its canopy.

Appendix C. Tree Retention Values

Based upon a modified version of the British Standard BS 5837–2012: *Trees in relation to design, demolition and construction* – recommendations.

Category and definition	Criteria (including sub-categories where appropriate)		
Category U			
Trees in such a condition that they cannot realistically be retained as viable trees in the context of the current land use for longer than 5 years.	• Trees that have a severe structural defect that are not remediable such that their failure is expected within 12 months. • Trees that will become unviable after removal of other Category U trees (e.g. 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 • Low quality trees suppressing adjacent trees of better quality. • Noxious weeds or species categorised as weeds within the local area. **Note:** Category U trees can have existing or potential conservation value* which might make it desirable to preserve.		
	1. Arboricultural Qualities	**2. Landscape qualities**	**3. Cultural and environmental values**
Category A			
Trees of High Quality with an estimated remaining life expectancy of at least 25 years and of dimensions and prominence that it cannot be readily replaced in <20 years.	Trees that are particularly good examples of their species, especially if rare or unusual (in the wild or under cultivation); or those that are important components of groups or avenues.	Trees or groups of significant visual importance as arboricultural and/or landscape features. (e.g. feature and landmark trees).	Trees, groups or plant communities of significant conservation, historical, commemorative or other value (e.g. remnant trees, aboriginal scar trees, critically endangered plant communities, trees listed specifically within a Heritage statement of significance).
Category B			
Trees of Moderate Quality with an estimated remaining life expectancy of 15–25 years and of dimensions and prominence that cannot be readily replaced within 10 years.	Trees that might be included within Category A but are downgraded because of diminished condition such that they are unlikely to be suitable for retention beyond 25 years.	Trees that are visible from surrounding properties and/or the street but make little visual contribution to the wider locality.	Trees with conservation or other cultural value (trees within conservation areas or landscapes described within a statement of significance, locally indigenous species).
Category C			
Trees of Low Quality with an estimated remaining life expectancy of 5–15 years, or young trees that are easily replaceable.	Trees of very limited value or such impaired condition that they do not qualify in higher categories.	Trees offering low or only temporary/transient landscape benefits.	Trees with no material conservation or other cultural value.

*Where trees would otherwise be categorised as U, B or C but have significant identifiable conservation, heritage or landscape value even though only for the short term, they may be upgraded, although they might be suitable for retention only.

Tree Quality

		Health**			
		Excellent/ Good	Fair	Poor	Dead
Structure	Good	A	B	C	U
	Fair	B	B	C	U
	Poor	C	C	U	U
	Hazard*	U	U	U	U

* Structural hazard that cannot be remediated through mitigation works to enable safe retention.

** Trees of short term reduced health that can be remediated via basic, low cost plant health care works (e.g. mulching, irrigation etc.) may be designated in a higher health rating to ensure correct retention value nomination.

Category A	Typically trees in this category are of high quality with an estimated remaining life expectancy of at least 25 years and of dimensions and prominence that it cannot be readily replaced in <20 years. The tree may make significant amenity contributions to the landscape and may make high environmental contributions. In some cases, trees within this category may not meet the above criteria, however possess significant heritage or ecological value. Trees of this retention value warrant design consideration and amendment to ensure their viable retention.
Category B	Typically trees in this category are of moderate quality with an estimated remaining life expectancy of 15–25 years and prominence of size dimensions that cannot be readily replaced within 10 years. They may make moderate amenity contributions to the landscape and make low/moderate environmental contributions. Trees with this retention value warrant lesser design consideration in an attempt to allow for their retention.
Category C	Trees in this category are of low quality with an estimated remaining life expectancy of 5–15 years, or young trees that are easily replaceable, may have poor health and/or structure, are easily replaceable, or are of undesirable species and do not warrant design consideration.
Category U	Trees in this category are found to be in such a condition that they cannot realistically be retained as viable trees in the context of the current land use for longer than five years. These trees may be dead and/or of a species recognised as a weed that resulted in them being unretainable.

Appendix D. Plant Health Care and Mulching

Guide to plant health tonics and root growth stimulants

Considering the varying sizes of trees in common urban landscapes, it is suggested that an application volume of combined water and product solution of 80–150L for small to medium sized trees (5-10m height), 150–250L for medium to large sized trees (10-20m height) and 250–400L for large to very large sized trees (+20m height). Note: a lesser volume of total mixed product could be used if a more concentrated mix is drenched and water irrigation used to further drench the area and therefore dilute the stronger mix application.

The following product recommendations have been based on previous successful works undertaken by ArborSafe. The information provided is to be used as a general guide only, depending on your tree species, health or location. We recommend you always refer to the manufacturers label before applying any product. You may need to further consult with ArborSafe or your Project Arborist to develop a more specific program for your tree needs.

- **Soil Conditioner** concentrate such as Kelpro, Seasol or similar 600–800mL/100L of water. A concentration of beneficial nutrients stimulating plant growth and root establishment, ideal for trees under stress.
- **Nitrogen Boost** concentrate such as Nitrosol liquid plant food or similar 300mL/100L of water. A general-purpose fertilizer that contains a nitrogen boost (the most abundantly used element for tree growth). NB: Care must be taken when applying general fertilizer, particularly where plants can be affected Phosphorus toxicity.
- **Root Biostimulant** concentrate such as Auxinone or similar 400mL/100L of water. A scientific blend of hormone root growth stimulants and vitamins assisting in the regeneration of roots.
- **Microbial Formulation** concentrate such as Noculate Liquid or similar 500mL/100L of water. Generally containing strains of beneficial soil microorganisms, humic acid, kelp, essential amino acids, vitamins, biotin, folic acid and natural sugars designed to enhance the establishment of beneficial microbial populations.
- **Carbohydrate Energy Source** such as Molasses 500-800mL/100L of water. Molasses is the by-product of sugar refining. It contains all the nutrients from the raw sugarcane plant and is a carbohydrate energy source that feeds soil microorganisms and increases microbial activity.
- **Surfactant/Wetting Agent** (optional) such as Dispatch (Liquid) 200–300ml/100L of water. Improves the infiltration and penetration of applied water and irrigation.

We recommend you always refer to the manufacturers label before applying any product using the above as a guide only.

Guide to mulching and maintenance for established trees

Whether a tree is a newly planted young tree, or a well-established mature tree, the area around its base is a key factor in its long-term retention and viability. Maintaining a soil environment that is conducive to tree root development is vital for trees of all ages. This guide provides information on appropriate maintenance practices around the base of trees including mulching and the restriction of activities that may cause harm to tree roots or trunks.

1. Why mulch?

Mulching is a plant health care action which can be undertaken to improve plant and soil health (Figure 19), as well as overall landscape aesthetics. Placing an organic (or sometimes inorganic) material on the soil surface reduces the level of direct sunlight contact. Mulching should not be confused with composting which involves incorporating organic matter such as composts or manures into the soil profile. All plants in their natural ecologies (except for some arid and coastal ecologies) are naturally mulched by the falling of leaves, bark, flowers and other organic material.

This action is of great importance in successful cultivation of plants as it:

- assists in the regulation of soil moisture and temperature levels
- helps to suppress weeds
- minimises soil compaction
- reduces run-off during periods of heavy rain
- adds organic matter to the soil, and
- improves overall structure, nutrition and water holding composition.

Mulch is best comprised of organic materials such as wood chips, leaf litter, straw or hay as these will degrade over time. Long-term mulching improves soil health and structure as it encourages the activities of earthworms, microflora and beneficial fungi. Inorganic materials such as stones and gravel can be moderately effective as mulch but will not provide the ongoing improvements to soil health.

Figure 19. An excellent example of how to mulch a young tree. (Lachlan Andrews, September 2015).

2. How to mulch

- Apply mulch to damp soil, as placing over dry soil makes it difficult to rehydrate. Applying during the cooler months of the year is an ideal time.
- If mulching on top of a pre-existing grass area, grass or weeds must first be hand weeded and/or sprayed with a non-selective herbicide and left to wilt and die before applying mulch.
- Mulch should be applied at a uniform thickness of 75–100mm and re-applied approximately every 12 months. Do not place mulch up against the trunk of a tree as the damp mulch can cause bark to decay.
- Apply over a wide area, at least as large as a tree's crown projection (preferably larger), within and outside the current root mass to encourage lateral root development and expansion.
- Wood chip mulch (such as that generated from wood chippers) is considered an ideal mulch for landscape use as it contains a wide variety of materials that are of different sizes (such as bark, foliage and timber), is relatively cheap to purchase, and can be obtained in large quantities. Stockpiling of mulch after tree contractors have conducted works at a site is a way of generating 'free' mulch and ensuring that plant material from tree pruning and/or removals is recycled on site, not imported from external suppliers, saving costs and making the site more self-sustaining.
- The use of mulch made from pine bark or red gum chips are discouraged as they seldom degrade and therefore do not add nutrition to the soil profile. The uniform particle size and resin content can provide an impervious layer to water as well as retarding gaseous exchange.
- Mulching within the canopy areas of larger trees (Figure 20) can not only improve long-term tree health but can also act to reduce tree risk by decreasing the number of targets that pass and/or congregate under their canopies. This in turn will minimise the likelihood of injury in the event of a branch failure.
- When using wood chip mulch, ensure that if it has been made from live plant material that is stored and allowed to compost for between 3 and 6 months prior to use. Never apply fresh, 'green' mulch around trees as this can induce what is called the nitrogen drawdown, which can result in the removal of nitrogen from the soil resulting in plants with nutrient deficiencies.

For further information refer to the Australian Standard AS 4454–2012: *Composts, Soil Conditioners and Mulches*.

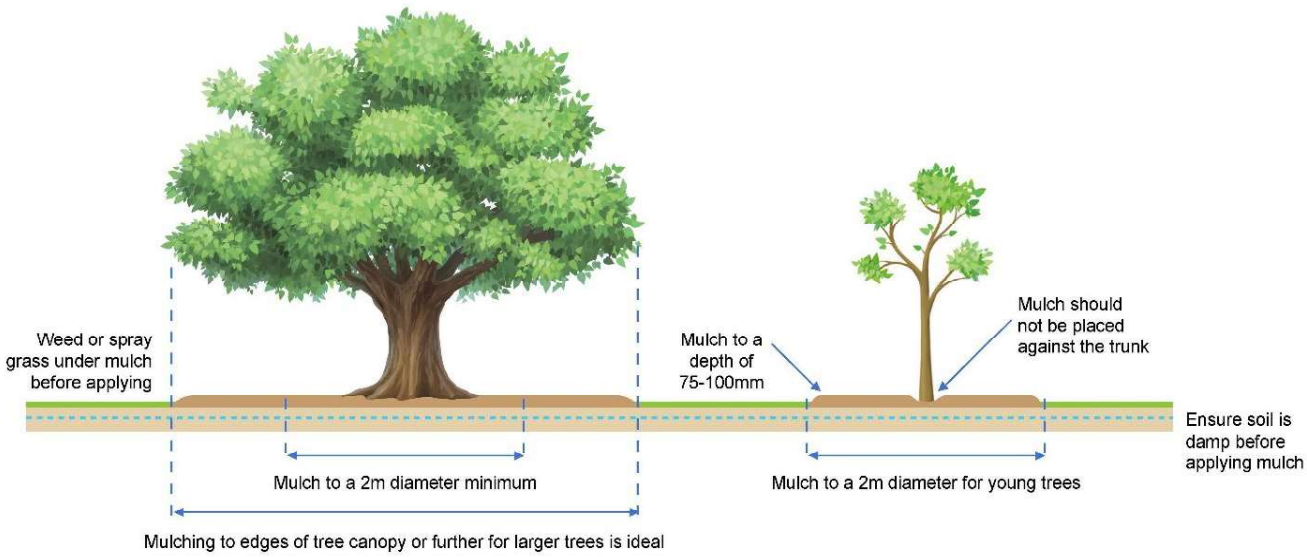

Figure 20. Mulching established and young trees (ArborSafe Australia, 2020).

3. Root and trunk damage

The function of tree roots is primarily to provide water and nutrient uptake for the tree, provide stability through structural roots that anchor it to the ground and as a means of food and nutrient storage. Damage to tree roots can lead to a reduction to any or all of these functions.

Damage to tree roots (Figure 21 and Figure 22) and the lower portion of a tree's trunk is a common and often unnecessary occurrence that can lead to the entry of decay fungi into a tree's structural framework. Once present, decay may develop in larger structural roots and/or the base of the trunk, which can result in a reduction in tree health and in severe cases even compromise stability.

Works such as trenching and excavation are often the cause of root damage to trees. Refer to ArborSafe's Guide – Tree protection during construction or the Australian Standard AS 4970–2009: *Protection of Trees on Development Sites* for things to consider when performing construction activities near trees.

Everyday activities such as grass cutting via mowing or brush cutters can result in serious root damage or wounding to the lower trunk. Young trees with their trunks damaged by machinery often need replacing, while damage to the trunks and/or surface roots of established trees is not only detrimental to tree health but can also result in costly repairs to machinery.

Another advantage to mulching around the trunk and root crown is that it limits damage to both parts from mowing equipment. This in turn reduces mechanical damage and compaction.

Figure 21. An example of damage to tree roots caused via mowing. (Luke Dawson, June 2017).

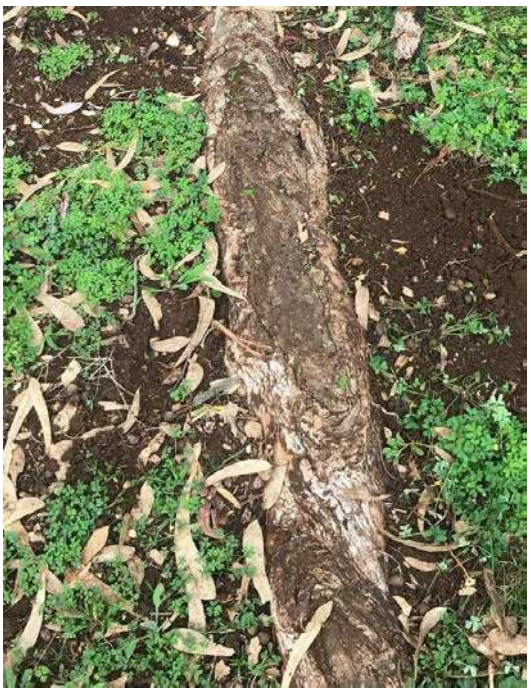

Figure 22. Image showing wound caused to upper portion of surface root by mower. (Luke Dawson, June 2017).

4. How to avoid root and trunk damage

The following points serve to highlight ways to avoid damage to tree roots and trunks caused via grass cutting activities:

- Mulching around young and established trees negates the need for brush cutter and/or lawn mower use around the base of a tree. Mulching therefore not only creates a barrier between tree roots and trunk that are susceptible to damage, it improves soil condition, minimises soil compaction and decreases the total area required for mowing.
- Where mulching is not feasible, raising the cutting height of mowers and maintaining grass at a greater height can avoid unnecessary 'scalping' of roots and damage to mowers/blades.
- Where surface roots are located away from the trunk and in a location where neither the application of mulch nor the raising of mower height is inappropriate, it may be possible to raise the soil grade directly around the root/s to minimise damage. It is important that the application of new material does not result in significant changes to the soil profile that may inadvertently damage roots. Material applied should be permeable and allow the development of turf which will protect the roots. Coarse sand or a planting mix with a high sand to organic matter ratio (e.g. 80/20 mix) spread at a depth of 75–100mm could suitably protect the surface root from damage, while allowing turf to redevelop within the area.
- ArborSafe is able to answer any questions regarding the material, depth and method of application to be used to ensure the tree/s remain viable for the long-term.

Appendix E. Tree Assessment Data

Tree no.	Botanical Name	Common Name	Trees in group	DBH Total (cm)	DRB (cm)	Radial TPZ (m)	TPZ area (m2)	Radial SRZ (m)	Tree Height (m)	Canopy (m)	Health	Structure	Age	TLE (Yrs.)	Defects	Significance	Action (irrespective of development)	Arborist comments	Tree Quality Score	Tree Retention value subcategory	Recommendation
325	*Ficus rubiginosa*	Port Jackson Fig	1	82	92	9.8	304.19	3.2	10-15	15-20	Good	Poor	Mature	5-10	Co-dominant stems; Deadwood/stubs > 30mm; Decay; Disease pathogens; Epicormic growth; Fungal fruiting body(s); Wound(s);	Amenity value/shade; Attractive landscape feature; Heritage listed;	Further reporting/testing; Monitor;	19-01-2021 : Tom Axford : C92194. 19-01-2021 : Tom Axford : Tree assessed. Rapid cambium decline lower western trunk groom ground level to ~2m occupies ~40% circumference. Obtain sample and sent to RBG to identify pathogen. 08-06-2016 : Tom Axford : Deadwood located over natural area. No works recommended.	C	1	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
326	*Eucalyptus botryoides*	Southern Mahogany	1	58	64	7.0	152.18	2.7	5-10	10-15	Good	Fair	Mature	15-25	Co-dominant stems; Crossing/rubbing branches; Deadwood/stubs > 100mm; Decay; Epicormic growth; Fungal fruiting body(s); Resin exudation/kino; Suppressed; Wound(s);	Amenity value/shade; Attractive landscape feature; Heritage listed;	Remove deadwood/stubs > 30mm; Remove selective branches;	19-01-2021 : Tom Axford : C92194. 19-01-2021 : Tom Axford : Tree assessed. ~50 cent coin diameter fungal fruiting body lower southern leader. Selectivity prune branch fungal fruiting bode to prevent spread of pathogen.	B	2	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
327	*Eucalyptus botryoides*	Southern Mahogany	1	98	128	11.8	438.82	3.7	10-15	15-20	Fair	Poor	Senescent	5-10	Borers/termites; Cavity(s); Co-dominant stems; Deadwood/stubs > 100mm; Dieback; Epicormic growth; Previous failure(s); Wound(s);	Amenity value/shade; Attractive landscape feature; Particularly old/venerable; Heritage listed;	Monitor; Remove deadwood/stubs > 30mm;	30-03-2021 : Located on a rise. Topography is on a higher level than proposed excavation and therefore unlikely to be affected. 19-01-2021 : Tom Axford : C92194. Located in an elevated position. Affects of propsed construction unlikley to significantly impact tree longeverty. 18-06-2020 : Jesse Tree : Tree assessed. Live canopy is at 60% density. 25-06-2019 : Kane Hollstein : Tree assessed. Remove deadwood within fall distance of structure only. Remaining crown over dense garden area. Tree health unchanged. 08-06-2016 : Tom Axford : Large diameter (>100mm) deadwood throughout canopy. Senescent tree in decline, monitor tree health.	C	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
335	*Araucaria heterophylla*	Norfolk Island Araucaria	1	92	124	11.0	382.90	3.6	20-30	10-15	Good	Good	Mature	>50		Amenity value/shade; Attractive landscape feature; Significant due to age/size; Dominant landscape feature; Suitable to site conditions; Avenue tree; Heritage listed;		19-01-2021 : Tom Axford : C92194. 18-06-2020 : Jesse Tree : Tree assessed.	A	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
336	*Araucaria heterophylla*	Norfolk Island Araucaria	1	93	128	11.2	391.27	3.7	20-30	10-15	Good	Good	Mature	>50	Deadwood/stubs < 30mm; Mechanical damage to root(s); Poor pruning;	Amenity value/shade; Attractive landscape feature; Significant due to age/size; Dominant landscape feature; Avenue tree; Suitable to site conditions; Heritage listed;		19-01-2021 : Tom Axford : C92194. 18-06-2020 : Jesse Tree : Tree assessed.	A	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
337	*Araucaria heterophylla*	Norfolk Island Araucaria	1	103	136	12.4	479.94	3.8	20-30	10-15	Good	Good	Mature	>50	Deadwood/stubs > 60mm;	Amenity value/shade; Attractive landscape feature; Significant due to age/size; Dominant landscape feature; Suitable to site conditions; Avenue tree; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 18-06-2020 : Jesse Tree : Tree assessed.	A	1	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
338	*Araucaria heterophylla*	Norfolk Island Araucaria	1	95	131	11.4	408.28	3.7	20-30	10-15	Good	Good	Mature	>50	Deadwood/stubs < 30mm;	Amenity value/shade; Attractive landscape feature; Significant due to age/size; Avenue tree; Dominant landscape feature; Suitable to site conditions; Heritage listed;		30-03-2021 : Client has a desire to retain the tree during this project. Incursion into TPZ is still significant, however with hand excavation/vacuum truck and significant design alterations the tree may be retained. However, retention of this tree can only be determined once the further excavation and design changes are complete and the impacts assessed. 19-01-2021 : Tom Axford : C92194. 18-06-2020 : Jesse Tree : Tree assessed.	A	1	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
339	*Araucaria columnaris*	Cook Araucaria	1	33	43	4.0	49.27	2.3	5-10	<5	Good	Good	Semi-Mature	>50		Amenity value/shade; Attractive landscape feature; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-01-2021 : Tom Axford : Tree assessed.	A	1	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
340	*Eucalyptus botryoides*	Southern Mahogany	1	45	98	5.5	93.33	3.3	<5	5-10	Poor	Poor	Semi-Mature	<5	Cavity(s); Co-dominant stems; Decay; Dieback; Epicormic growth; Excessive thinning; Uncharacteristic form; Wound(s);	Amenity value/shade; Heritage listed;	Removal - poor specimen;	19-01-2021 : Tom Axford : C92194. 19-01-2021 : Tom Axford : Tree assessed. Canopy density ~5%. 08-06-2016 : Tom Axford : Two trees that consist entirely of epicormic regrowth from previously removed trees. Remove.	U		Remove tree irrespective of future development.
341	*Araucaria columnaris*	Cook Araucaria	1	88	103	10.6	350.33	3.4	20-30	5-10	Good	Good	Mature	>50	Deadwood/stubs < 30mm; Dieback;	Amenity value/shade; Attractive landscape feature; Significant due to age/size; Suitable to site conditions; Heritage listed;		19-01-2021 : Tom Axford : C92194. 18-06-2020 : Jesse Tree : Tree assessed.	A	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
437	*Araucaria heterophylla*	Norfolk Island Araucaria	1	110	128	13.2	547.39	3.7	20-30	10-15	Good	Good	Mature	>50	Cavity(s); Deadwood/stubs > 30mm;	Amenity value/shade; Attractive landscape feature; Significant due to age/size; Particularly old/venerable; Dominant landscape feature; Suitable to site conditions; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. Cavity in sinus at North base.	A	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
448	*Araucaria heterophylla*	Norfolk Island Araucaria	1	120	142	14.4	651.44	3.8	30-50	10-15	Good	Good	Mature	>50	Deadwood/stubs > 30mm; Mechanical damage to root(s);	Significant due to age/size; Attractive landscape feature; Amenity value/shade; Suitable to site conditions; Dominant landscape feature; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Multiple small hangers throughout crown.	A	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
449	*Araucaria heterophylla*	Norfolk Island Araucaria	1	89	108	10.7	358.34	3.4	20-30	10-15	Fair	Fair	Mature	15-25	Deadwood/stubs > 60mm; Previous failure(s); Wound(s);	Significant due to age/size; Attractive landscape feature; Amenity value/shade; Suitable to site conditions; Dominant landscape feature; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Upper crown has previously failed or died back.	B	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
450	*Cupaniopsis anacardioides*	Tuckaroo	1	40	55	4.8	73.51	2.6	5-10	5-10	Good	Fair	Mature	10-15	Deadwood/stubs > 100mm; Poor pruning; Wound(s);	Amenity value/shade;	Remove deadwood/stubs > 100mm;	19-06-2020 : Jesse Tree : Tree assessed.	A		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
451	*Araucaria columnaris*	Cook Araucaria	1	70	82	8.4	221.67	3.0	20-30	5-10	Good	Good	Mature	>50	Co-dominant stems;	Amenity value/shade; Attractive landscape feature; Significant due to age/size; Suitable to site conditions; Dominant landscape feature; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	A	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
452	*Casuarina glauca*	Swamp she-oak	1	60	92	7.2	162.86	3.2	10-15	5-10	Good	Good	Mature	25-50	Co-dominant stems; Decay; Previous failure(s);	Amenity value/shade; Heritage listed;	Remove selective branches;	19-01-2021 : Tom Axford : C92194. 08-06-2016 : Jamie Oates : Minor decay on failed north eastern limb at 5m. Prune out decayed portion.	A		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
453	*Eucalyptus robusta*	Swamp Mahogany	1	24	80	2.9	25.65	3.0	5-10	5-10	Dead	Poor	Mature	0	Deadwood/stubs > 100mm; Decay; Epicormic growth; Excessive thinning; Pests./insects; Previous failure(s); Wound(s);	Heritage listed;	Removal;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Tree now predominantly dead. Poor specimen remains. 08-06-2016 : Jamie Oates : Tree has been previously reduced to stump height and allowed to reshoot. Remove regrowth and stump.	U		Remove tree irrespective of future development.
454	*Casuarina glauca*	Swamp she-oak	1	72	97	8.6	234.52	3.3	10-15	5-10	Good	Good	Mature	25-50	Co-dominant stems; Deadwood/stubs > 60mm; Previous failure(s);	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	A		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
455	*Lophostemon confertus*	Queensland Box	1	53	59	6.4	127.08	2.7	10-15	5-10	Good	Good	Semi-Mature	>50	Deadwood/stubs > 30mm; Mechanical damage to root(s);	Amenity value/shade;	Remove deadwood/stubs > 30mm;	19-06-2020 : Jesse Tree : Tree assessed.	A		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
456	*Ficus rubiginosa*	Port Jackson Fig	1	95	131	11.4	407.60	3.7	10-15	15-20	Good	Good	Mature	>50	Co-dominant stems; Crossing/rubbing branches; Deadwood/stubs > 60mm; Epicormic growth; Hanger(s); Mechanical damage to root(s); Previous failure(s);	Amenity value/shade; Significant due to age/size; Attractive landscape feature; Suitable to site conditions; Dominant landscape feature; Heritage listed;	Remove deadwood/stubs > 30mm; Remove hanging limb(s);	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Multiple deadwood hangers throughout crown.	A	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
457	*Casuarina glauca*	Swamp she-oak	1	66	66	7.9	197.06	2.8	10-15	5-10	Good	Poor	Mature	5-10	Crack(s)/split(s); Decay; Previous failure(s); Uncharacteristic form; Weak union(s); Wound(s);	Amenity value/shade; Heritage listed;	Removal;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. Crack is approximately 10mm wide, 100mm deep and 500mm long at 2m. Despite relatively good response growth, structural condition renders tree ill-suited for long term retention. 08-06-2016 : Jamie Oates : Previous failures have resulted in poor structure. Remove tree.	C	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
458	*Ficus rubiginosa*	Port Jackson Fig	1	93	118	11.2	391.27	3.5	10-15	10-15	Fair	Good	Mature	25-50	Deadwood/stubs < 30mm; Epicormic growth; Previous failure(s); Wound(s);	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	A		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
459	*Ficus rubiginosa*	Port Jackson Fig	1	120	118	14.4	651.44	3.5	10-15	10-15	Fair	Fair	Mature	15-25	Co-dominant stems; Decay; Dieback; Epicormic growth; Mechanical damage to root(s); Previous failure(s); Wound(s);	Amenity value/shade;		19-06-2020 : Jesse Tree : Tree assessed. Previously recommended pruning has been satisfactorily completed.	A		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
460	*Olea africana*	African Olive	1	91	127	10.9	371.41	3.7	10-15	15-20	Good	Poor	Mature	15-25	Cavity(s); Co-dominant stems; Deadwood/stubs > 100mm; Decay; Dieback; Previous failure(s); Undesirable species; Wound(s);	Amenity value/shade; Weed species;	End weight reduction; Remove deadwood/stubs > 30mm;	30-01-2021 : Direction received from client on behalf of the property manager (NPWS) requesting the tree be removed during this project due to it being an undesirable species in this location and its poor structure. 22-01-2021 : Tom Axford : Retention value based on forming part of the State Listed Heritage site. 19-01-2021 : Tom Axford : C92194. 08-06-2016 : Jamie Oates : Major stems have wounds with decay on tension side. Undertake 15% terminal weight reduction throughout crown to reduce loading on wound defects. Medium sized diameter deadwood (2-10cm dia.) throughout crown, over picnic table and grassed area.	B		Remove - direction received from client to remove tree due to poor structure.
463	*Ficus rubiginosa*	Port Jackson Fig	1	87	103	10.4	342.41	3.4	15-20	15-20	Good	Good	Mature	25-50	Crossing/rubbing branches; Deadwood/stubs > 30mm; Epicormic growth; Previous failure(s); Wound(s);	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Deadwood over bushland only.	A	12	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
464	*Ficus rubiginosa*	Port Jackson Fig	1	82	96	9.8	304.19	3.3	10-15	10-15	Good	Good	Mature	>50	Co-dominant stems;	Amenity value/shade; Attractive landscape feature; Suitable to site conditions; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	A		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).

Tree no.	*Botanical Name*	Common Name	Trees in group	DBH Total (cm)	DRB (cm)	Radial TPZ (m)	TPZ area (m2)	Radial SRZ (m)	Tree Height (m)	Canopy (m)	Health	Structure	Age	TLE (Yrs.)	Defects	Significance	Action (irrespective of development)	Arborist comments	Tree Quality Score	Tree Retention value subcategory	Recommendation
465	*Eucalyptus robusta*	Swamp Mahogany	2	58	63	**6.9**	150.06	**2.7**	10-15	10-15	Poor	Poor	Semi-Mature	<5	Co-dominant stems; Deadwood/stubs > 100mm; Dieback; Excessive thinning; Pests/insects; Poor pruning; Previous failure(s); Uncharacteristic form; Wound(s);	Amenity value/shade; Within group; Heritage listed;	Removal;	19-01-2021 : Tom Axford : C92194. 19-01-2021 : Tom Axford : Tree assessed. Two trees in advanced decline.	U		Remove tree irrespective of future development.
466	*Eucalyptus microcorys*	Tallowwood	1	62	75	**7.4**	173.90	**2.9**	15-20	10-15	Good	Good	Mature	25-50	Deadwood/stubs > 60mm; Hanger(s); Previous failure(s);	Amenity value/shade; Attractive landscape feature; Suitable to site conditions; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Deadwood/hangers over bushland only.	B		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
467	*Eucalyptus microcorys*	Tallowwood	1	75	88	**9.0**	254.47	**3.1**	15-20	15-20	Good	Good	Mature	>50	Deadwood/stubs > 60mm;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Deadwood over bushland only.	B		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
468	*Dead Tree*	Dead tree	1	52	61	**6.2**	122.33	**2.7**	10-15	10-15	Dead	Poor	Mature	0	Deadwood/stubs > 100mm;	Heritage listed;	Remove selective branches;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Dead tree on bushland fringe. Remove dead branches within fall distance of maintained grass only.	U		Remove tree irrespective of future development.
469	*Eucalyptus botryoides*	Southern Mahogany	1	33	42	**4.0**	49.27	**2.3**	5-10	5-10	Fair	Fair	Semi-Mature	10-15	Dieback; Epicormic growth; Suppressed;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	B		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
470	*Eucalyptus botryoides*	Southern Mahogany	1	51	62	**6.1**	117.67	**2.7**	10-15	5-10	Dead	Poor	Mature	0	Deadwood/stubs > 100mm; Excessive thinning; Pests/insects; Wound(s);	Heritage listed;	Removal;	19-01-2021 : Tom Axford : C92194. 19-01-2021 : Tom Axford : Tree assessed. Specimen has expired.	U		Remove tree irrespective of future development.
471	*Eucalyptus botryoides*	Southern Mahogany	1	84	91	**10.1**	319.21	**3.2**	15-20	10-15	Good	Good	Mature	25-50	Deadwood/stubs > 100mm; Previous failure(s);	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Deadwood over bushland only.	A		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
472	*Eucalyptus botryoides*	Southern Mahogany	1	51	72	**6.1**	116.35	**2.9**	10-15	10-15	Good	Fair	Mature	15-25	Deadwood/stubs > 100mm; Epicormic growth; Suppressed; Wound(s);	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Deadwood over bushland only.	B		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
473	*Eucalyptus microcorys*	Tallowwood	1	46	58	**5.5**	95.73	**2.6**	10-15	10-15	Fair	Good	Mature	15-25	Deadwood/stubs > 60mm; Dieback; Epicormic growth; Resin exudation/kino; Wound(s);	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. Remove deadwood over managed grassy area. 26-06-2019 : Kane Hollstein : Tree assessed. Deadwood over bushland only.	B		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
474	*Eucalyptus microcorys*	Tallowwood	1	44	54	**5.3**	87.58	**2.6**	10-15	5-10	Good	Good	Mature	15-25	Co-dominant stems; Deadwood/stubs > 60mm; Dieback; Epicormic growth; Suppressed; Wound(s);	Heritage listed; Amenity value/shade;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Deadwood over bushland only.	B		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
475	*Eucalyptus microcorys*	Tallowwood	1	54	57	**6.5**	131.92	**2.6**	10-15	10-15	Good	Fair	Mature	15-25	Co-dominant stems; Deadwood/stubs > 60mm; Wound(s);	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Remove deadwood within fall distance of maintained grass and monument only.	B		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
477	*Eucalyptus botryoides*	Southern Mahogany	1	65	68	**7.8**	192.90	**2.8**	10-15	15-20	Good	Good	Mature	25-50	Deadwood/stubs > 60mm; Pests/insects; Previous failure(s);	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	A		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
478	*Eucalyptus robusta*	Swamp Mahogany	1	62	74	**7.4**	173.90	**2.9**	10-15	10-15	Fair	Good	Mature	15-25	Deadwood/stubs > 100mm; Dieback; Epicormic growth; Pests/insects;	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	B	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
479	*Eucalyptus botryoides*	Southern Mahogany	1	100	116	**12.0**	452.39	**3.5**	10-15	15-20	Good	Fair	Mature	15-25	Canker(s); Deadwood/stubs > 30mm; Decay; Fungal fruiting body(s); Mechanical damage to root(s); Pests/insects; Wound(s);	Amenity value/shade; Attractive landscape feature; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. Insect damage throughout canopy. Fungal fruiting body remains inactive. 26-06-2019 : Kane Hollstein : Tree assessed. Tree responding favourably to canker wound on lower trunk and stem wound at ~4m with inactive fungal fruiting.	B	1	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
480	*Cupaniopsis anacardioides*	Tuckaroo	1	17	33	**2.0**	13.07	**2.1**	<5	<5	Fair	Fair	Semi-Mature	10-15	Decay; Dieback; Poor pruning; Wound(s);	Heritage listed; Amenity value/shade;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	C		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
481	*Eucalyptus botryoides*	Southern Mahogany	1	69	106	**8.2**	212.31	**3.4**	10-15	10-15	Fair	Good	Mature	15-25	Co-dominant stems; Deadwood/stubs > 100mm; Mechanical damage to root(s); Pests/insects; Previous failure(s);	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm; Remove selective branches;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Jamie Oates : Prune to remediate previous failure stubs to collars.	B	12	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
482	*Ficus rubiginosa*	Port Jackson Fig	1	25	40	**3.1**	29.36	**2.3**	<5	5-10	Good	Fair	Juvenile	>50	Co-dominant stems; Crossing/rubbing branches;	Amenity value/shade; Heritage listed;	Formative pruning;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
483	*Araucaria heterophylla*	Norfolk Island Araucaria	1	72	87	**8.6**	234.52	**3.1**	15-20	10-15	Good	Good	Mature	>50		Amenity value/shade; Attractive landscape feature;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Jamie Oates : Council tree located outside property boundary.	A	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
484	*Eucalyptus botryoides*	Southern Mahogany	1	66	66	**7.9**	197.06	**2.8**	10-15	10-15	Fair	Fair	Mature	15-25	Co-dominant stems; Deadwood/stubs > 60mm; Dieback; Epicormic growth; Pests/insects; Previous failure(s); Suckers; Wound(s);	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm; Trim suckers;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	B	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
485	*Eucalyptus botryoides*	Southern Mahogany	1	85	122	**10.2**	326.85	**3.6**	15-20	15-20	Fair	Fair	Mature	10-15	Cavity(s); Co-dominant stems; Deadwood/stubs > 100mm; Decay; Dieback; Epicormic growth; Fungal fruiting body(s); Pests/insects; Previous failure(s); Wound(s);	Amenity value/shade; Significant habitat - nests/hollows; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. Severe insect damage throughout canopy. New Fungal fruiting body developing in wound. 26-06-2019 : Kane Hollstein : Tree assessed. Tree responding favourably to northern lower stem wound with fungal fruiting body consistent with Phellinus sp sounding indicated minor decay. Remove deadwood retaining hollow bearing parts.	B	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
486	*Eucalyptus robusta*	Swamp Mahogany	1	64	58	**7.7**	185.30	**2.6**	5-10	5-10	Fair	Poor	Mature	5-10	Deadwood/stubs > 60mm; Decay; Dieback; Epicormic growth; Suppressed; Wound(s);	Amenity value/shade; Heritage listed;	Removal - poor specimen;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Jamie Oates : Heavily suppressed. Trunk decay evident. Remove tree.	C	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
487	*Eucalyptus botryoides*	Southern Mahogany	1	66	74	**7.9**	194.80	**2.9**	10-15	10-15	Fair	Fair	Mature	15-25	Co-dominant stems; Deadwood/stubs > 100mm; Dieback; Pests/insects;	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Jamie Oates : Large diameter deadwood (>10cm dia.) throughout crown over grassed area.	B	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
488	*Eucalyptus botryoides*	Southern Mahogany	1	66	76	**7.9**	197.06	**2.9**	5-10	5-10	Fair	Poor	Mature	5-10	Borers/termites; Deadwood/stubs > 30mm; Dieback; Pests/insects; Previous failure(s); Suckers; Suppressed; Wound(s);	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Jamie Oates : Medium sized diameter deadwood (2-10cm dia.) throughout crown over grassed area. Borer damage evident in trunk pruning wound.	C	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
489	*Eucalyptus botryoides*	Southern Mahogany	1	55	55	**6.6**	136.85	**2.6**	5-10	5-10	Fair	Fair	Mature	10-15	Cavity(s); Deadwood/stubs < 30mm; Decay; Dieback; Epicormic growth; Parasitic plant/mistletoe; Wound(s);	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194. Attached Ficus slowly strangling specimen. 26-06-2019 : Kane Hollstein : Tree assessed. Tree responding favourably to lower trunk cavity.	B	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
490	*Araucaria heterophylla*	Norfolk Island Araucaria	1	97	114	**11.6**	425.65	**3.5**	20-30	10-15	Good	Good	Mature	>50		Amenity value/shade; Attractive landscape feature; Significant due to age/size;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Jamie Oates : Council tree located outside property boundary.	A	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
491	*Ficus rubiginosa*	Port Jackson Fig	1	84	112	**10.1**	319.21	**3.5**	5-10	10-15	Good	Good	Semi-Mature	>50	Co-dominant stems; Crossing/rubbing branches; Deadwood/stubs < 30mm; Mechanical damage to root(s); Previous failure(s); Wound(s);	Amenity value/shade; Attractive landscape feature; Heritage listed;	Mulching;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Tom Axford : Apply and maintain mulch at 5m radius from the trunk of the tree, at a depth of 75mm, to improve growing conditions and prevent further root damage.	A	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
492	*Banksia integrifolia*	Coast Banksia	1	74	64	**8.9**	247.82	**2.7**	5-10	5-10	Good	Fair	Mature	25-50	Co-dominant stems; Included bark; Resin exudation/kino;	Amenity value/shade; Attractive landscape feature; Heritage listed;		19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed.	B	12	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
493	*Ficus rubiginosa*	Port Jackson Fig	1	68	82	**8.2**	209.18	**3.0**	5-10	10-15	Good	Fair	Semi-Mature	>50	Co-dominant stems; Crossing/rubbing branches; Dieback; Mechanical damage to root(s); Previous failure(s); Wound(s);	Amenity value/shade; Attractive landscape feature; Heritage listed;	Mulching;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Tom Axford : Apply and maintain mulch at 4m radius from the trunk of the tree, at a depth of 75mm, to improve growing conditions and prevent further root damage.	A	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
494	*Ficus rubiginosa*	Port Jackson Fig	1	102	146	**12.2**	470.67	**3.9**	5-10	10-15	Good	Fair	Mature	>50	Cavity(s); Co-dominant stems; Included bark; Mechanical damage to root(s); Previous failure(s); Wound(s);	Amenity value/shade; Attractive landscape feature; Heritage listed;	Mulching;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. 08-06-2016 : Tom Axford : Apply and maintain mulch at 5m radius from the trunk of the tree, at a depth of 75mm, to improve growing conditions and prevent further root damage.	A	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
495	*Ficus rubiginosa*	Port Jackson Fig	1	51	64	**6.1**	117.67	**2.7**	5-10	5-10	Good	Fair	Semi-Mature	>50	Co-dominant stems; Mechanical damage to root(s); Previous failure(s); Wound(s);	Amenity value/shade; Attractive landscape feature; Heritage listed;	Mulching;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Tom Axford : Apply and maintain mulch at 2m radius from the trunk of the tree, at a depth of 75mm, to improve growing conditions and prevent further root damage.	B	1	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).

Tree no.	*Botanical Name*	Common Name	Trees in group	DBH Total (cm)	DRB (cm)	Radial TPZ (m)	TPZ area (m2)	Radial SRZ (m)	Tree Height (m)	Canopy (m)	Health	Structure	Age	TLE (Yrs.)	Defects	Significance	Action (irrespective of development)	Arborist comments	Tree Quality Score	Tree Retention value subcategory	Recommendation
496	*Ficus rubiginosa*	Port Jackson Fig	1	81	103	**9.7**	296.81	**3.4**	5-10	10-15	Good	Fair	Semi-Mature	15-25	Cavity(s); Co-dominant stems; Crossing/rubbing branches; Deadwood/stubs > 60mm; Decay; Excessive end weight; Included bark; Mechanical damage to root(s); Poor pruning; Previous failure(s); Wound(s);	Amenity value/shade; Attractive landscape feature; Heritage listed;	Mulching; Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 26-06-2019 : Kane Hollstein : Tree assessed. Tree responding favourably to previous failure wounds and cavities.	B	1	Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
497	*Ficus rubiginosa*	Port Jackson Fig	1	46	52	**5.5**	95.73	**2.5**	5-10	10-15	Fair	Poor	Semi-Mature	10-15	Co-dominant stems; Deadwood/stubs > 30mm; Decay; Dieback; Included bark; Mechanical damage to root(s); Previous failure(s); Uncharacteristic form; Wound(s);	Amenity value/shade; Heritage listed;	Removal;	19-01-2021 : Tom Axford : C92194. 19-06-2020 : Jesse Tree : Tree assessed. 08-06-2016 : Tom Axford : Significant previous failure at 1.3m, and decay forming in eastern leader, have reduced tree life expectancy. Remove and replace with same species.	C	1	Remove tree irrespective of future development.
498	*Eucalyptus botryoides*	Southern Mahogany	1	18	20	**2.2**	14.66	**1.7**	<5	<5	Poor	Fair	Juvenile	5-10	Dieback; Epicormic growth; Weak union(s);	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. Central upper canopy very thin.	C	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
499	*Eucalyptus botryoides*	Southern Mahogany	1	14	54	**2.0**	12.57	**2.6**	<5	<5	Good	Poor	Mature	<5	Decay; Epicormic growth; Poor pruning; Uncharacteristic form; Wound(s);	Heritage listed;	Removal - poor specimen;	19-01-2021 : Tom Axford : C92194. Sprouting lopped stump. Specimen located on boundary liny but assumed to be within site.	U		Remove tree irrespective of future development.
500	*Eucalyptus sp.*	Eucalypt	1	2	2	**2.0**	12.57	**1.5**	<5	<5	Good	Fair	Juvenile	5-10	Suppressed;			19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. Insufficient reproductive material available at time of assessment for positive species ID.	C	1	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
501	*Eucalyptus sp.*	Eucalypt	1	4	5	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50		Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. Insufficient reproductive material available at time of assessment for positive species ID.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
502	*Cupaniopsis anacardioides*	Tuckaroo	1	3	4	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50	Co-dominant stems;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
503	*Eucalyptus sp.*	Eucalypt	1	3	4	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50		Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
504	*Eucalyptus sp.*	Eucalypt	1	10	13	**2.0**	12.57	**1.5**	<5	<5	Good	Fair	Juvenile	25-50	Co-dominant stems; Included bark;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. Insufficient reproductive material available at time of assessment for positive species ID.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
505	*Banksia integrifolia*	Coast Banksia	1	8	14	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50	Co-dominant stems; Included bark;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned.	U		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
506	*Eucalyptus sp.*	Eucalypt	1	11	14	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50	Co-dominant stems; Included bark;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned.	U		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
507	*Banksia integrifolia*	Coast Banksia	1	5	7	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50	Co-dominant stems; Included bark;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned.	U		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
508	*Eucalyptus sp.*	Eucalypt	1	3	4	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50	Co-dominant stems; Included bark;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. Insufficient reproductive material available at time of assessment for positive species ID.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
509	*Cupaniopsis anacardioides*	Tuckaroo	1	4	5	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50	Co-dominant stems;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
510	*Eucalyptus sp.*	Eucalypt	1	9	12	**2.0**	12.57	**1.5**	<5	<5	Good	Fair	Juvenile	25-50	Included bark;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. Insufficient reproductive material available at time of assessment for positive species ID.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
511	*Cupaniopsis anacardioides*	Tuckaroo	1	9	12	**2.0**	12.57	**1.5**	<5	<5	Good	Fair	Juvenile	25-50	Co-dominant stems; Included bark;	Amenity value/shade;		19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
512	*Banksia integrifolia*	Coast Banksia	1	4	5	**2.0**	12.57	**1.5**	<5	<5	Good	Poor	Juvenile	<5	Previous failure(s); Uncharacteristic form;			19-01-2021 : Tom Axford : C92194. Tree outside fence line likely to be Council owned. Snapped at ~0.3m	U		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ). As per direction from client, car park has been removed from the project.
513	*Casuarina glauca*	Swamp she-oak	1	10	13	**2.0**	12.57	**1.5**	<5	<5	Good	Good	Juvenile	25-50		Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	C		Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
514	*Casuarina glauca*	Swamp she-oak	1	23	60	**2.7**	22.94	**2.7**	5-10	<5	Good	Fair	Juvenile	15-25	Co-dominant stems; Included bark; Uncharacteristic form;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	C		Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
515	*Casuarina glauca*	Swamp she-oak	1	12	12	**2.0**	12.57	**1.5**	5-10	<5	Good	Good	Juvenile	25-50		Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	C		Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
516	*Casuarina glauca*	Swamp she-oak	1	9	11	**2.0**	12.57	**1.5**	5-10	<5	Good	Good	Juvenile	>50		Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	C		Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
517	*Ficus rubiginosa*	Port Jackson Fig	1	20	30	**2.4**	18.41	**2.0**	5-10	5-10	Good	Fair	Juvenile	25-50	Co-dominant stems; Crossing/rubbing branches;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	U		Remove - tree located within proposed development footprint or has major encroachment into its TPZ.
518	*Banksia integrifolia*	Coast Banksia	1	11	14	**2.0**	12.57	**1.5**	<5	<5	Good	Fair	Juvenile	15-25	Poor pruning;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
519	*Banksia integrifolia*	Coast Banksia	1	14	19	**2.0**	12.57	**1.6**	5-10	<5	Good	Good	Juvenile	25-50	Poor pruning;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
520	*Banksia integrifolia*	Coast Banksia	1	29	32	**3.5**	38.05	**2.1**	5-10	5-10	Good	Good	Semi-Mature	25-50	Suppressed;	Amenity value/shade; Heritage listed;	Shape from infrastructure;	19-01-2021 : Tom Axford : C92194.	B	2	Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
521	*Banksia integrifolia*	Coast Banksia	1	16	27	**2.0**	12.57	**1.9**	5-10	<5	Good	Good	Juvenile	25-50	Suppressed;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
522	*Banksia integrifolia*	Coast Banksia	1	18	23	**2.2**	14.66	**1.8**	5-10	<5	Good	Good	Semi-Mature	25-50	Suppressed;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	C		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
523	*Eucalyptus botryoides*	Southern Mahogany	1	23	55	**2.8**	24.97	**2.6**	5-10	5-10	Poor	Poor	Mature	<5	Deadwood/stubs > 100mm; Dieback; Epicormic growth; Excessive thinning; Poor pruning; Uncharacteristic form; Weak union(s); Wound(s);	Heritage listed;	Removal - poor specimen;	19-01-2021 : Tom Axford : C92194. 19-01-2021 : Tom Axford : Tree assessed, Tree consists entirely of regrowth.	U		Remove tree irrespective of future development.
524	*Ficus rubiginosa*	Port Jackson Fig	1	86	114	**10.3**	334.59	**3.5**	10-15	15-20	Good	Good	Mature	25-50	Co-dominant stems; Crossing/rubbing branches;	Amenity value/shade; Attractive landscape feature; Significant due to age/size; Suitable to site conditions; Heritage listed;		19-01-2021 : Tom Axford : C92194.	A		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
525	*Eucalyptus botryoides*	Southern Mahogany	1	28	51	**3.4**	35.92	**2.5**	5-10	5-10	Fair	Fair	Semi-Mature	5-10	Co-dominant stems; Deadwood/stubs > 100mm; Decay; Epicormic growth; Fungal fruiting body(s); Suppressed; Wound(s);	Amenity value/shade; Heritage listed;	Remove deadwood/stubs > 30mm;	19-01-2021 : Tom Axford : Tree assessed. Fungal fruiting bodies isolated to deadwood. 19-01-2021 : Tom Axford : C92194.	C		Retain tree with specific protection requirements (i.e. Generic measures plus supervision of works within the TPZ and/or use of root sensitive construction techniques).
526	*Angophora costata*	Smooth-barked Apple Myrtle	1	41	62	**4.9**	76.05	**2.7**	5-10	5-10	Good	Good	Semi-Mature	25-50	Suppressed;	Amenity value/shade; Heritage listed;		19-01-2021 : Tom Axford : C92194.	B		Retain tree with generic protection requirements (i.e. protective fencing and restriction of activities within the TPZ).
527	*Cupaniopsis anacardioides*	Tuckaroo	1	58	61	**7.0**	152.18	**2.7**	<5	<5	Good	Poor	Senescent	<5	Epicormic growth; Poor pruning; Uncharacteristic form; Wound(s);	Heritage listed;	Removal;	19-01-2021 : Tom Axford : C92194. 19-01-2021 : Tom Axford : Tree assessed. Specimen consists entirely of epicormic regrowth.	U		Remove tree irrespective of future development.

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For further information
Telephone 1300 272 671
Email info@arborsafe.com.au
www.arborsafe.com.au

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