St Leonards South, Berry Rd & Holdsworth Ave Arboricultural Impact Assessment

Aqualand St Leonard Development 3 Pty Ltd atf Aqualand St Leonard Development 3 Unit Trust

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Template 2.8.1

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Abbreviations

Abbreviation	Description
AQF	Australian Qualifications Framework
AS	Australian Standards
DAB	Diameter at Base
DBH	Diameter at Breast Height
ELA	Eco Logical Australia
GIS	Geographic Information Systems
m	Metre
mm	Millimetre
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
SP	Species
SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment

1. Background

This Arboricultural Impact Assessment (AIA) was prepared for Aqualand in relation to two proposed residential towers located at St Leonards. The address of the subject site, along with additional information is detailed in Table 1, with the location of the subject site mapped in Figure 1. The purpose of this report is to:

- Identify the trees within the site that are likely to be affected by the proposed works
- Undertake a visual tree assessment of the subject trees
- Assess the current overall health and condition of the subject trees
- Evaluate the retention value of the subject trees
- Identify trees to be removed, retained or transplanted
- Determine the likely impacts on trees to be retained
- Recommend tree protection measures to minimise adverse impacts.

The study area is comprised of 10 lots, as tabulated below.

Table 1: Study area

Criteria	Description
Street address, lot and DP	12 Berry Road, St Leonards (Lot 33 DP7259) 14 Berry Road, St Leonards (Lot 32 DP7259) 16 Berry Road, St Leonards (Lot 31 DP7259) 18 Berry Road, St Leonards (Lot A DP110452) 20 Berry Road, St Leonards (Lot B DP110452) 11 Holdsworth Ave (Lot 10 DP7259) 13 Holdsworth Ave (Lot 11 DP7259) 15 Holdsworth Ave (Lot 12 DP7259) 17 Holdsworth Ave (Lot 13 DP7259) 119 Holdsworth Ave (Lot 14 DP7259)
Local Government Area	Lane Cove Council
General land use	R4 High Density Residential zone

The description of the proposed activity in Table 2 is based on information available at the time of preparing this report.

Table 2: Proposed activity

Activities that can impact trees	Description of proposed activities
Clearing vegetation	Yes, 47 trees are proposed to be cleared
Pruning vegetation	No

Activities that can impact trees	Description of proposed activities
Earthworks including regrading, excavation and trenching	Yes, the two residential towers
Compaction	Yes, all onsite parking, temporary site compounds, storage of materials, installing of structures, stockpiling fill or materials will be positioned outside of the TPZ of trees to be retained.
Refuelling and chemical use (e.g. herbicides)	Yes, all onsite chemicals will be positioned outside of the TPZ of trees to be retained and all vehicle wash downs will be completed off site
Erection of scaffolding	Yes, erection of scaffolding for the construction of buildings will be positioned within the impact area outlined in Appendix C.
Vehicle movements	Yes, access for construction machinery will be positioned within the impact area outlined in Appendix C.
Changes to stormwater management	Yes, as shown in Figure 10, Appendix F. Stormwater impacts outside the study area have not been assessed and it is recommended that the stormwater alignment and mitigation measures are discussed with Council and the Project Arborist to minimise impacts to street trees.
Landscaping	Yes, landscaping works will consist of excavation into the green spine and other landscaped areas to achieved levels as shown in Figure 10, Appendix F.

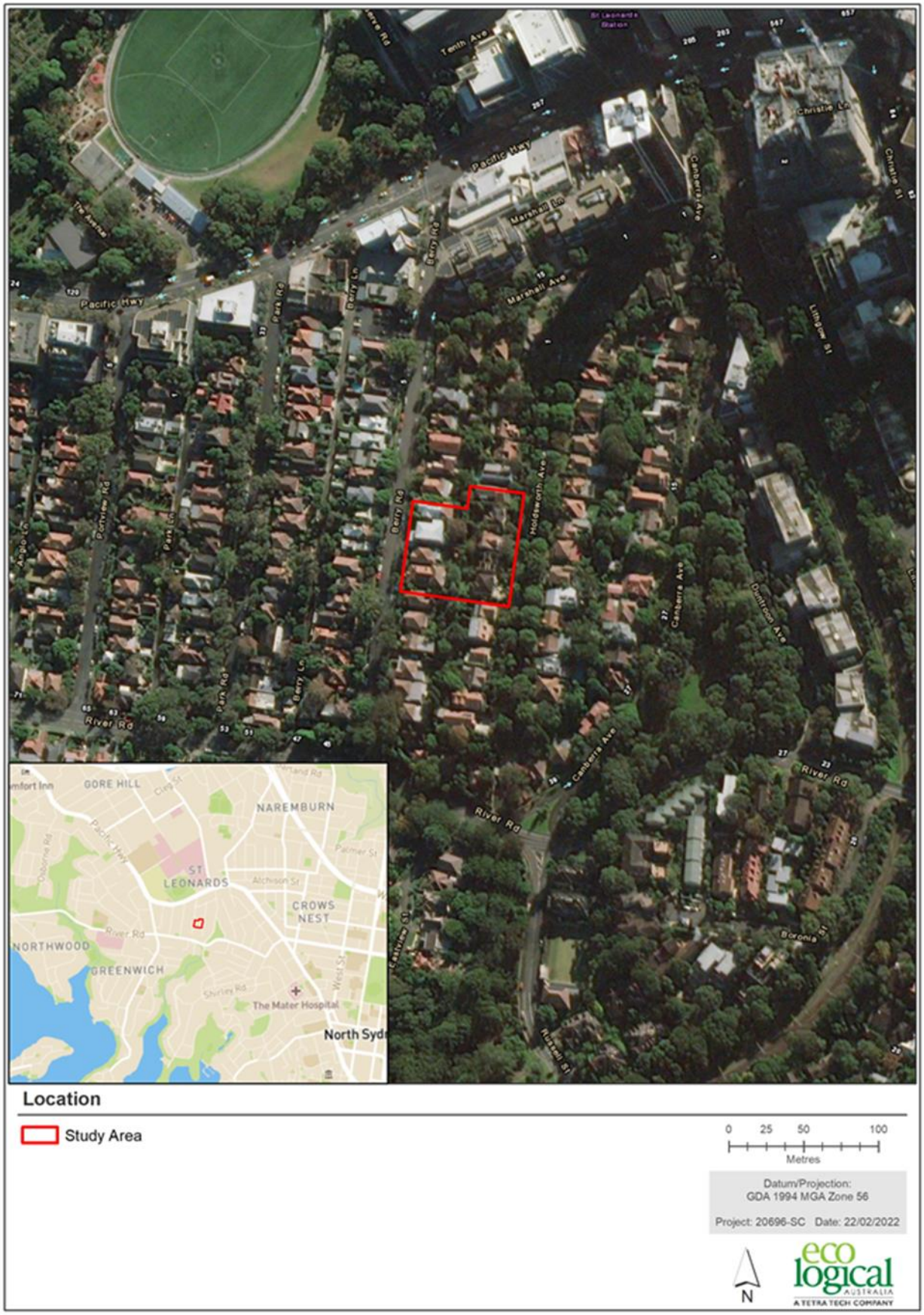

Figure 1: Location of study area

2. Method

2.1 Definition of a tree

A tree is defined under the Australian Standard, *AS 4970-2009, Protection of Trees on Development Sites* as a long lived woody perennial plant greater than (or usually greater than) 3 m in height with one or relatively few main stems or trunks.

For the purpose of this report, Council's definition of a tree as defined in Lane Cove Council Development Control Plan (2010) was also considered:

'*any tree, whether indigenous or exotic, which has BOTH a height exceeding 4 metres and trunk diameter greater than 150 mm (measured 1 m above the ground); and trees in bushland which are not subject to an approved plan of management.'*

2.2 Visual tree assessment

The health and condition of the subject trees were assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck and Breloer (1994) and practices consistent with modern arboriculture.

A total of **66 trees** were inspected on Thursday 17 February 2022 by AQF Level 5 Consulting Arborist, David Bidwell.

The following limitations apply to this methodology:

- Tree height was measured using a laser clinometer.
- Diameter at breast height (DBH) and diameter at base (DAB) was measured using DBH tape.
- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing.
- Trees were inspected within limits of site access.
- The locations of the subject trees were recorded by ELA in the field using hand-held GPS units. Tree locations were subsequently matched to the SDG survey (2016) where possible. The remaining tree survey locations were matched to Near map (2021) aerial imagery using geographic information systems (GIS) techniques.
- Tree canopy was measured by stepping out the distance within the dripline
- No aerial inspections or root mapping was undertaken.
- Tree identification was based on broad taxonomical features present and visible from ground level at the time of inspection
- The subject trees have not been assessed for ecological or environmental value.

2.3 Retention value & landscape significance

The retention value or importance of a tree or group of trees, is determined in accordance with the Institute of Australian Consulting Arborists (IACA) Significance of a Tree Assessment Rating System (STARS©), which is summarised in Appendix A. The method considers the Safe Useful Life Expectancy (SULE) and landscape significance of a tree. Trees are provided one of the following ratings:

- **High - priority for retention:** These trees are considered important and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by Australian Standard *AS 4970–2009 Protection of trees on development sites.*
- **Medium - consider for retention:** These trees are moderately important for retention. Their removal should only be considered if adversely affected by the proposed works and all other alternatives have been considered and exhausted.
- **Low - consider for removal:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Priority for removal:** These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

2.4 Protection zones

2.4.1 Tree protection zone (TPZ)

The TPZ is a specific radius area above and below ground and at a distance from the trunk set aside for the protection of a tree's roots and crown to provide for the viability and stability of a tree to be retained where it is potentially subject to damage by the development. The TPZ (as defined by AS 4970-2009) requires restriction of access during the development process. Groups of trees with overlapping TPZs may be included within a single protection area. Tree sensitive measures must be implemented if works are to proceed within the TPZ. The TPZ radius is determined by multiplying its DBH by 12 however, the TPZ of palms and monocots should not be less than 1 m outside the crown projection.

2.4.2 Structural root zone (SRZ)

The SRZ is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support and anchorage of the tree. It is critical for the support and stability of trees. Severance of roots within the SRZ is not recommended as it may lead to the destabilisation and/or decline of the tree. The SRZ does not apply for palms and monocots (as outlined in AS 4970-2009).

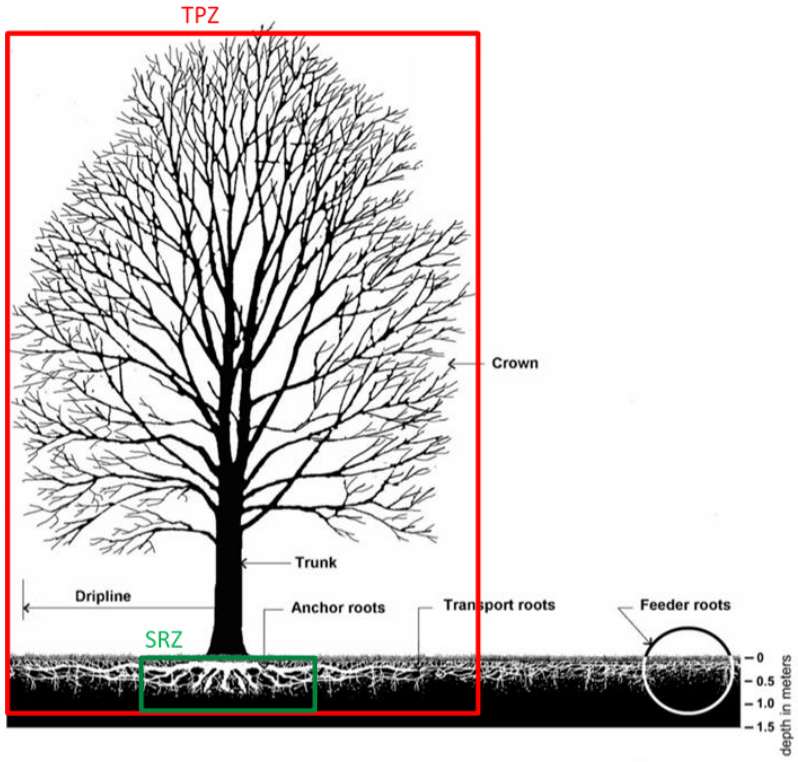

Figure 2: Representative tree structure and indicative TPZ and SRZ

2.5 Potential impacts

Trees may be impacted by physical or chemical damage to roots or above tree parts. Examples include impacts associated with site grading, soil compaction, excavation, stock piling within TPZ as well as changes in site hydrology, changes in soil level and site contamination. The extent of encroachment to the TPZ and SRZ determines the level of potential impact. AS 4970-2009 defines types of encroachment as follows and as illustrated in Appendix B:

- **Major encroachment** - If the proposed encroachment is greater than 10% of the TPZ or inside the SRZ, the project arborist must demonstrate that the tree(s) would remain viable. The location and distribution of roots may be determined through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), Air Spade or manual extraction. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.
- **Minor encroachment** – If the proposed encroachment is less than 10% of the TPZ, and outside of the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere and contiguous with the TPZ.

For the purposes of this Arboricultural Impact Assessment, impacts were calculated using GIS techniques and defined as follows:

- **High impact:** The SRZ is directly affected, or the proposed encroachment is greater than 20% of the TPZ. Trees may not remain viable if they are subject to high impact. These trees cannot be retained unless the proposal is changed.
- **Medium impact:** If the proposed encroachment is greater than 10% of the TPZ (but less than 20% of the TPZ) and outside of the SRZ, the project arborist may require detailed root investigation to demonstrate that the tree(s) would remain viable. These trees may be retained subject to further investigation and mitigation measures.
- **Low impact:** If the proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ, detailed root investigations should not be required. These trees can be retained.
- **No impact:** No likely or foreseeable encroachment within the TPZ. These trees can be retained.

Impacts are calculated using GIS techniques.

2.6 Proposed action

The proposed actions to either retain or remove each tree are determined by the impact from the proposed design footprint, conversations of intent with the client and corresponding mitigation measures. The following are the definition of these actions:

- **Remove:** Trees that are to be impacted by the proposed development to the extent whereby retention is not suitable and / or incompatible if the current plans are approved. All tree removal must comply with guidelines specified in section 4 of this report and subject to regulatory approval.
- **Retain:** Trees that are suitable for retention granted they follow the specific mitigation measures discussed in section 3 and / or the tree protection measures outlined in section 4 and / or the tree protection guidelines outlined in Appendix E.
- **Potential to be retained:** Prior to construction, the project team will need to consult with the Project Arborist in order to confirm the viability of tree retention depending on proposed construction methods.

3. Results and discussion

Results of the arboricultural assessment are summarised in Table 3. Detailed results are included in Appendices C and D. Tree protection guidelines are provided in Appendix E and the site plans are outlined in Appendix F. Medium retention value and priority for removal trees are illustrated in Appendix G.

Table 3: Summary of tree retention values and impacts

	Proposed for Removal	Potential to be Retained	Proposed to Retain		Total
Retention Value	**High Impact**	**Medium Impact**	**Low Impact**	**No Impact**	**Total**
High – priority for retention	-	-	-	-	**0**
Medium – consider for retention	13	4	4	7	**28**
Low -consider for removal	34	-	1	2	**37**
Priority for removal	-	-	-	1	**1**
Total	**47**	**4**	**5**	**10**	**66**

3.1 Trees proposed for removal (High Impact)

A total of **47** trees are proposed to be removed. These trees will be subject to high impact (>20% TPZ encroachment) from the proposed development. Tree IDs and retention values are as follows:

- **Medium retention: 13** medium retention value trees (Trees 6, 12, 20, 21, 50, 51, 54, 55, 61, 62, 63, 64 and 66)
- **Low retention: 34** low retention value trees (Trees 13 to 19, 22 to 37, 47, 48, 49, 52, 53, 56, 57, 58, 59, 60 and 65).

Any loss of trees should be offset with replacement planting in accordance with the relevant offset policy.

3.2 Trees potential to be retained subject to mitigation measures (Medium impact)

A total **four medium retention value trees** (Trees 40, 41, 43 and 44) have potential to be retained subject to further investigation. These trees will be subject to medium impact (<20% TPZ but >10% TPZ encroachment) from the proposed works and have potential to be retained subject to further investigation (i.e., root mapping) and mitigation measures.

3.3 Trees proposed to be retained (Low/no impact)

A total of **15 trees** are proposed to be retained. Of these, five trees will be subject to low impact (<10% TPZ encroachment) and 10 trees will be subject to no impact (0% TPZ encroachment) from the proposed works. Specific impacts and Tree IDs are outlined below.

LOW IMPACT (<10% TPZ ENCROACHMENT)

- **Medium retention value: four** trees (Trees 5, 8, 42 and 45)
- **Low retention value: one** tree (Tree 7)

NO IMPACT (0% TPZ ENCROACHMENT)

- **Medium retention value: seven** trees (Trees 1, 9, 10, 11, 38, 39 and 46)
- **Low retention value: two** trees (Trees 3 and 4)
- **Priority for removal: one** tree (Tree 2)

4. Tree protection plan

- All tree pruning and removal is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture.
- All tree work must be in accordance with Australian Standard *AS 4373-2007, Pruning of Amenity Trees* and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998).
- Permission must be granted from the relevant consent authority prior to removing or pruning of any of the subject trees. Approved tree works should not be carried out before the installation of tree protection measures.
- Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist and must comply with *AS 4970-2009 - Protection of trees on development sites.*

Tree protection measures are summarised in Table 4 and further information is in Appendix E.

Table 4: Summary of tree protection measures

Type	More details	Comment
Signage	Appendix E1	Prominently sign posted with 300 mm x 450 mm boards stating, “NO ACCESS - TREE PROTECTION ZONE”.
Tree protection fencing	Appendix E1	Protective cyclone chain wire link fence to be erected around the TPZ to protect and isolate retained trees from the construction works. Existing boundary fencing may be used.
Crown protection	Appendix E2	Where required, crown protection may include the installation of a physical barrier, pruning selected branches to establish clearance, or the tying/bracing of branches.
Trunk and branch protection	Appendix E3	When fencing is not practical or prior to any activities within the TPZ, trunk protection is required and consist of a layer geotextile fabric or similar followed by 1.8 m lengths of softwood timbers spaced evenly around the trunk and secured with a galvanised hoop strap.
Ground protection	Appendix E4	Install and maintain 100mm thick layer of mulch around tree in TPZ. For machine or vehicle access within TPZ geotextile fabric beneath crushed rock or rumble boards may be required.
Soil moisture		Soil moisture levels should be regularly monitored by the project arborist. Temporary irrigation or watering may be required within TPZ.
Root protection and investigation	Appendix E5	If incursions/excavation within the TPZ are unavoidable, root investigation may be needed to determine the extent and location of roots within the area of construction activity using non-destructive excavation (NDE) methods.
Underground services	Appendix E6	All underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they should be installed using horizontal directional drilling (HDD), non-destructive excavation (NDE) methods such as hydro-vacuum, Air Spade or manually excavated trenches.

5. Hold points, inspection and certification

A Project Arborist (AQF Level 5 Consulting Arborist) needs to be engaged to supervise work within the TPZ of trees to be retained, provide advice regarding tree protection and monitor compliance. Once each stage is reached, the work will be inspected and certified by the project arborist and the next stage may commence. Alterations to this schedule may be required due to necessity, however, this shall be through consultation with the Project Arborist only.

A copy of this report must be available on-site prior to the commencement of works, and throughout the entirety of the project. Hold points have been specified in the schedule of works below to ensure trees are adequately protected during construction. It is the responsibility of the principal contractor to complete each of the tasks.

Pre-construction

Prior to any construction, an onsite meeting should be conducted with attendee's subject but not limited to the project arborist (AQF Level 5 Consulting Arborist), site manager and construction personnel team to walkthrough the tree protection measures requirements. All trees approved for removal are to be indicated clearly with spray paint on trunks.

Stormwater impacts outside the study area have not been assessed and it is recommended that the stormwater alignment and mitigation measures are discussed with Council and the Project Arborist to minimise impacts to street trees.

To ensure the viable retention of the four medium retention value trees ((Trees 40, 41, 43 and 44) marked as 'potential to be retained,' construction methods will need to be determined in consultation with the Project Arborist (AQF Level 5) prior to construction. The Project Arborist may request further investigations to be completed i.e. root mapping.

During construction

Monthly inspection of trees to be retained by the Project Arborist (or other timing as agreed with the Project Arborist) to inspection tree protection measures. All works to be completed within the TPZ of trees approved to be retained are to be under the supervision of the Project Arborist.

Post-construction

Final inspection of trees by Project Arborist after all major construction has ceased and following the removal of tree protection measures.

6. References

6.1 General references

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Robinson L, 2003. *Field Guide to the Native Plants of Sydney*, 3rd ed, Kangaroo Press, East Roseville NSW

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Standards Australia 2009. *Australian Standard: Protection of trees on development sites, AS 4970 (2009)*. Standards Australia, Sydney.

6.2 Project specific references

BG&E 2022. *Siteworks and Drainage Ground Floor*. Proj no. S21268, dwg no. CI-0201, revision C dated 16 June 2022

Lane Cove Council 2010. *Lane Cove Development Control Plan, Part J – Landscaping 2.2 Tree Preservation.* Adopted 22 February 2010, amended 2-9 December 2011, page 10.

SDG Land Development Solutions 2016. *Detail and Level Survey.* REF7025, Issue C, Plan A1 dated 14/04/2016.

Silvester Fuller 2022. *Preliminary Design*. Proj no. 152, dated 21/04/2022

Appendix A Tree retention assessment method

A1 Tree Significance Assessment Criteria - STARS©

The tree is to have a minimum of three criteria in a category to be classified in that group.

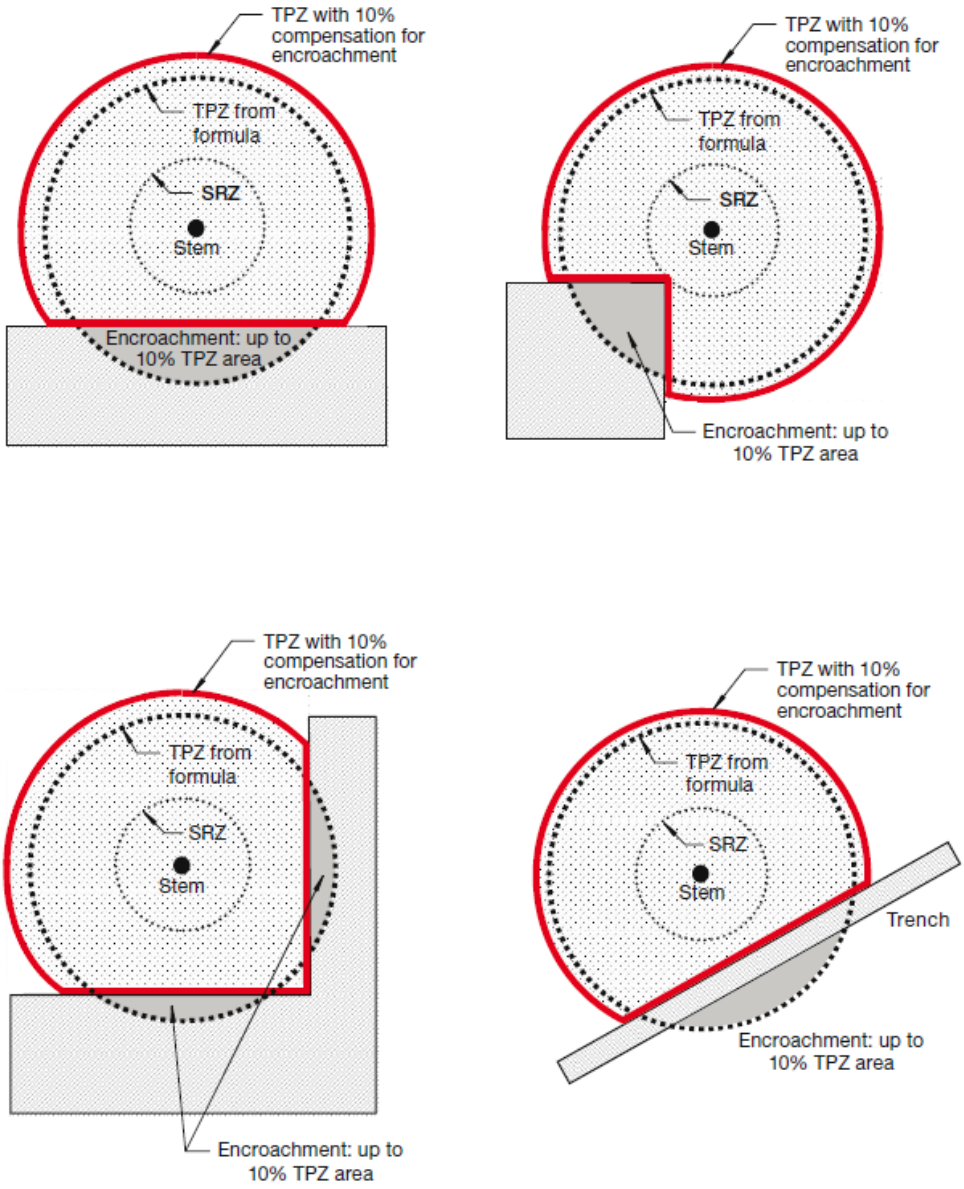
Low	Medium	High
The tree is in fair-poor condition and good or low vigour.	The tree is in fair to good condition and good or low vigour	The tree is in good condition and good vigour
The tree has form atypical of the species	The tree has form typical or atypical of the species	The tree has a form typical for the species
The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings	The tree is a planted locally indigenous or a common species with its taxa commonly planted in the local area	The tree is a remnant or is a planted locally indigenous specimen and/or is rare or uncommon in the local area or of botanical interest or of substantial age.
The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area	The tree is visible from surrounding properties, although not visually prominent as partially obstructed by other vegetation or buildings when viewed from the street	The tree is listed as a heritage item, threatened species or part of an endangered ecological community or listed on Council's significant tree register
The tree is a young specimen which may or may not have reached dimensions to be protected by local Tree Preservation Orders or similar protection mechanisms and can easily be replaced with a suitable specimen	The tree provides a fair contribution to the visual character and amenity of the local area	The tree is visually prominent and visible from a considerable distance when viewed from most directions within the landscape due to its size and scale and makes a positive contribution to the local amenity.
The tree's growth is severely restricted by above or below ground influences, unlikely to reach dimensions typical for the taxa in situ – tree is inappropriate to the site conditions	The tree's growth is moderately restricted by above or below ground influences, reducing its ability to reach dimensions typical for the taxa in situ	The tree supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group or has commemorative values.
The tree is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms		The tree's growth is unrestricted by above and below ground influences, supporting its ability to reach dimensions typical for the taxa in situ – tree is appropriate to the site conditions.
The tree has a wound or defect that has the potential to become structurally unsound.		
Environmental Pest / Noxious Weed The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties. The tree is a declared noxious weed by legislation.		
Hazardous /Irreversible Decline The tree is structurally unsound and / or unstable and is considered potentially dangerous. The tree is dead, or is in irreversible decline, or has the potential to fail or collapse in full or part in the immediate to short term.		

A2 Matrix assessment - STARS©

		Tree significance				
		High	Medium	Low		
		Significance in Landscape	Significance in Landscape	Significance in Landscape	Environmental Pest/Noxious Weed Species	Hazardous/ Irreversible Decline
Useful Life Expectancy	Long >40 years					
	Medium 15-40 years					
	Short <1-15 years					
	Dead					

	Priority for retention (High): Tree considered important so should be retained and protected. Design modification or re-location of structure should be considered to accommodate the setbacks as prescribed by the *Australian Standard AS4970 Protection of trees on development sites*. Tree sensitive construction measures must be implemented if works are to proceed within the Tree Protection Zone.
	Consider for retention (Medium): Tree considered less important; however, retention should remain priority. Removal considered only if adversely affecting the proposed building/works and all other alternatives have been considered and exhausted.
	Consider for removal (Low): Tree not considered important for retention, nor requiring special works or design modification to be implemented for their retention.
	Priority for removal: These trees are considered hazardous, or in irreversible decline, or weeds and should be removed irrespective of development.

Appendix B Encroachment into tree protection zones - AS 4970-2009



Appendix C Maps

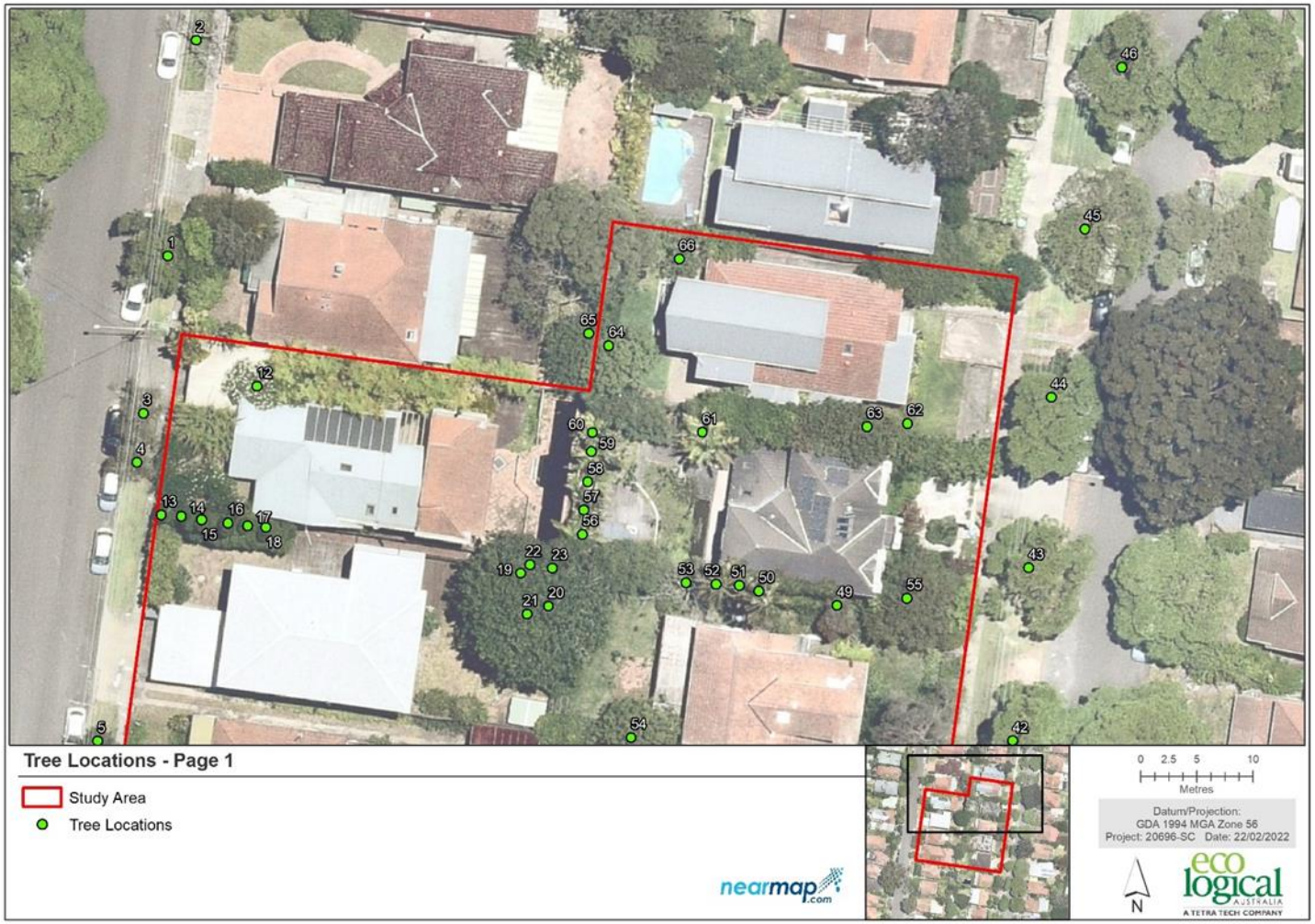


Figure 3: Tree locations, page 1

Figure 4: Tree locations, page 2

Figure 5: Retention values, page 1

Figure 6: Retention values, page 2

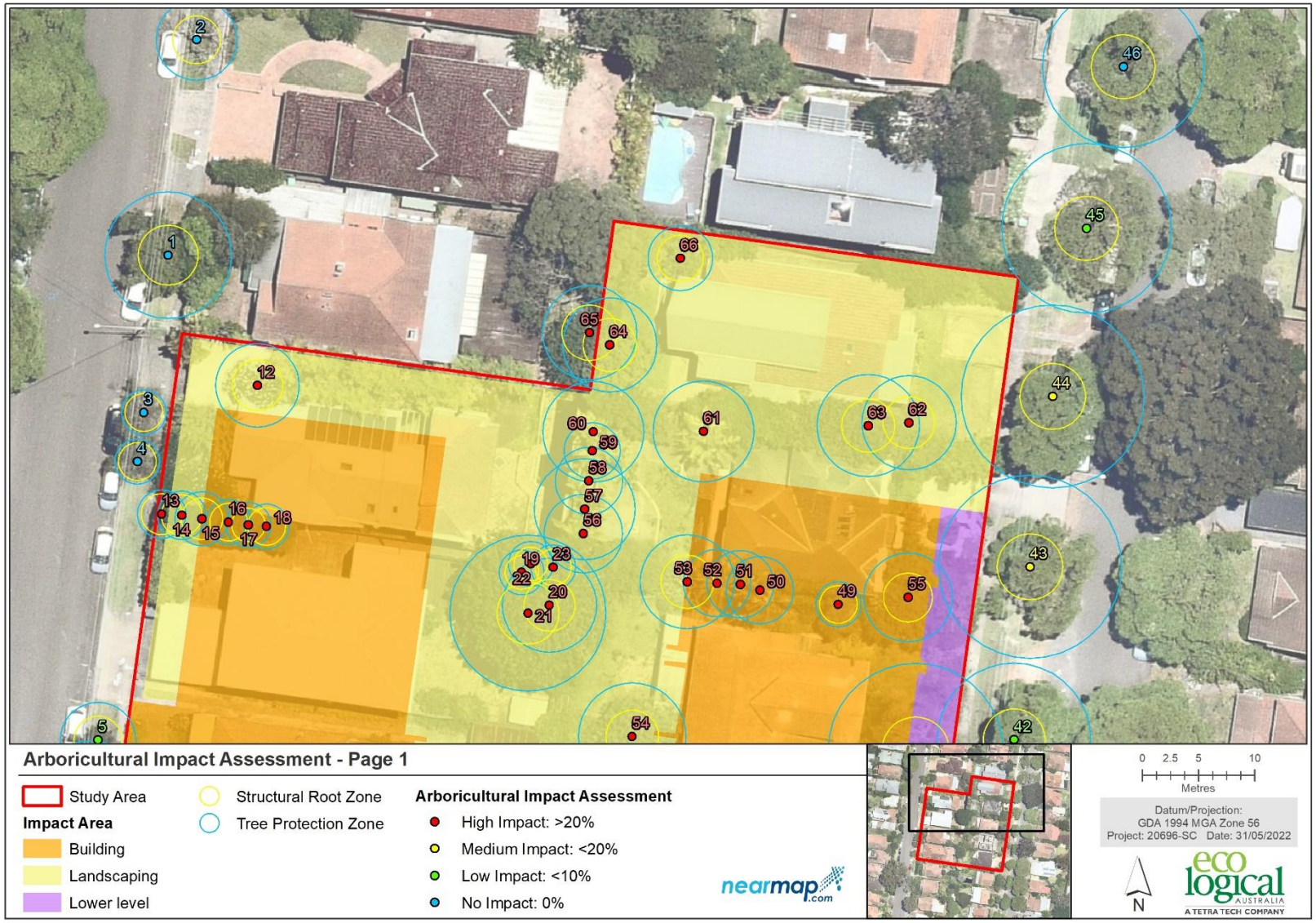


Figure 7: Arboricultural impact assessment, page 1

Figure 8: Arboricultural impact assessment, page 2

Appendix D Tabulated results of arboricultural assessment

Tree	Survey ID	Botanical name	Location	Height (m)	Spread (m)	Health	Structure	DHB (mm)	DAB (mm)	TPZ (m)	SRZ (m)	ULE	Retention value	SRZ encroached	TPZ% encroachment	Impact	Proposed action	Notes
1	41	*Podocarpus elatus*	SDG Survey (2016)	8	7	Good	Good	470	600	5.6	2.7	Medium (15-40 years)	Medium	No	0	No Impact: 0%	Retain	Street tree, not tagged
2	40	Dead tree	Nearmap 2021	5	6	Poor	Fair	300	350	3.6	2.1	Remove (<5 years)	Remove	No	0	No Impact: 0%	Retain	Street tree, dead, not tagged
3	42	*Callistemon viminalis*	SDG Survey (2016)	4	5	Fair	Fair	150	200	2.0	1.7	Medium (15-40 years)	Low	No	0	No Impact: 0%	Retain	Street tree, not tagged
4	43	*Callistemon viminalis*	SDG Survey (2016)	4	4	Fair	Fair	150	200	2.0	1.7	Medium (15-40 years)	Low	No	0	No Impact: 0%	Retain	Street tree, not tagged
5	45	*Podocarpus elatus*	SDG Survey (2016)	5	4	Fair	Good	280	350	3.4	2.1	Medium (15-40 years)	Medium	No	8	Low Impact: <10%	Retain	Street tree, not tagged
6	44	*Eucalyptus sp.*	SDG Survey (2016)	10	9	Fair	Fair	480	750	5.8	2.9	Medium (15-40 years)	Medium	Yes	25	High Impact: >20%	Remove	
7	46	*Photinia robusta*	SDG Survey (2016)	5	6	Fair	Good	230	260	2.8	1.9	Medium (15-40 years)	Low	No	1	Low Impact: <10%	Retain	Street tree not tagged
8	49	*Podocarpus elatus*	SDG Survey (2016)	7	6	Fair	Good	400	550	4.8	2.6	Medium (15-40 years)	Medium	No	8	Low Impact: <10%	Retain	Street tree, not tagged
9	48	*Callistemon viminalis*	Nearmap 2021	6	8	Fair	Fair	450	550	5.4	2.6	Medium (15-40 years)	Medium	No	0	No Impact: 0%	Retain	Street tree, not tagged
10	47	*Podocarpus elatus*	Nearmap 2021	5	3	Fair	Poor	300	350	3.6	2.1	Medium (15-40 years)	Medium	No	0	No Impact: 0%	Retain	Street tree, not tagged
11	-	*Callistemon viminalis*	Nearmap 2021	7	10	Fair	Fair	300	400	3.6	2.3	Medium (15-40 years)	Medium	No	0	No Impact: 0%	Retain	Street tree, not tagged
12	38	*Plumeria rubra*	SDG Survey (2016)	5	6	Fair	Fair	310	400	3.7	2.3	Medium (15-40 years)	Medium	Yes	98	High Impact: >20%	Remove	
13	1	*Cupressus sempervirens 'Stricta'*	Nearmap 2021	8	1.5	Good	Good	180	240	2.2	1.8	Medium (15-40 years)	Low	Yes	32	High Impact: >20%	Remove	Planted as part of screen
14	70	*Cupressus sempervirens 'Stricta'*	Nearmap 2021	9	1.5	Good	Good	180	240	2.2	1.8	Medium (15-40 years)	Low	Yes	83	High Impact: >20%	Remove	Planted as part of screen
15	71	*Cupressus sempervirens 'Stricta'*	Nearmap 2021	10	1.5	Good	Good	200	250	2.4	1.8	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	Planted as part of screen
16	72	*Cupressus sempervirens 'Stricta'*	Nearmap 2021	9	1.5	Good	Good	140	200	2.0	1.7	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	Planted as part of screen
17	73	*Cupressus sempervirens 'Stricta'*	Nearmap 2021	8	1.5	Good	Good	100	150	2.0	1.5	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	Planted as part of screen
18	74	*Cupressus sempervirens 'Stricta'*	Nearmap 2021	10	1.5	Good	Good	150	200	2.0	1.7	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	Planted as part of screen
19	3	*Syzygium australe*	SDG Survey (2016)	8	4	Good	Fair	120	150	2.0	1.5	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	
20	69	*Syzygium paniculatum*	SDG Survey (2016)	10	10	Fair	Fair	350	420	4.2	2.3	Medium (15-40 years)	Medium	Yes	100	High Impact: >20%	Remove	Bifurcated stem

Tree	Survey ID	Botanical name	Location	Height (m)	Spread (m)	Health	Structure	DHB (mm)	DAB (mm)	TPZ (m)	SRZ (m)	ULE	Retention value	SRZ encroached	TPZ% encroachment	Impact	Proposed action	Notes
21	2	*Liquidambar styraciflua*	SDG Survey (2016)	13	13	Good	Good	580	650	7.0	2.8	Long (>40 years)	Medium	Yes	100	High Impact: >20%	Remove	
22	4	*Syzygium luehmannii*	SDG Survey (2016)	3	3	Fair	Fair	60	100	2.0	1.5	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	
23	5	*Syzygium paniculatum*	SDG Survey (2016)	4	3	Fair	Fair	100	180	2.0	1.6	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	
24	-	*Melia azedarach*	Nearmap 2021	5	5	Fair	Fair	120	150	2.0	1.5	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	Bifurcated stem, weed species
25	75	*Pittosporum cv.*	Nearmap 2021	5	2	Fair	Fair	150	180	2.0	1.6	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	
26	26	*Pittosporum cv.*	SDG Survey (2016)	5	2	Fair	Fair	150	180	2.0	1.6	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	
27	77	*Pittosporum cv.*	SDG Survey (2016)	7	4	Fair	Fair	180	200	2.2	1.7	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	
28	78	*Pittosporum cv.*	SDG Survey (2016)	7	5	Fair	Fair	200	250	2.4	1.8	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	
29	79	*Pittosporum cv.*	SDG Survey (2016)	9	6	Fair	Fair	180	220	2.2	1.8	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	
30	80	*Pittosporum cv.*	SDG Survey (2016)	5	1	Fair	Fair	100	100	2.0	1.5	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	Variegated form, planted as a screen. Not tagged, no access
31	81	*Pittosporum sp.*	SDG Survey (2016)	5	1	Fair	Fair	100	100	2.0	1.5	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	Variegated form, planted as a screen. Not tagged, no access
32	82	*Pittosporum cv.*	SDG Survey (2016)	5	1	Fair	Fair	100	100	2.0	1.5	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	Variegated form, planted as screen. Not tagged, no access
33	83	*Pittosporum cv.*	SDG Survey (2016)	5	1	Fair	Fair	100	100	2.0	1.5	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	Variegated form, planted as a screen. Not tagged, no access
34	84	*Pittosporum cv.*	SDG Survey (2016)	5	1	Fair	Fair	100	100	2.0	1.5	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	Variegated form, planted as a screen. Not tagged, no access
35	85	*Pittosporum cv.*	SDG Survey (2016)	5	1	Fair	Fair	100	100	2.0	1.5	Short (5-15 years)	Low	Yes	100	High Impact: >20%	Remove	Variegated form, planted as a screen. Not tagged, no access
36	86	*Pittosporum cv.*	SDG Survey (2016)	5	1	Fair	Fair	100	100	2.0	1.5	Short (5-15 years)	Low	Yes	97	High Impact: >20%	Remove	Variegated form, planted as a screen. Not tagged, no access
37	87	*Pittosporum cv.*	SDG Survey (2016)	5	1	Fair	Fair	100	100	2.0	1.5	Short (5-15 years)	Low	Yes	77	High Impact: >20%	Remove	Variegated form, planted as a screen. Not tagged, no access
38	-	*Lophostemon confertus*	SDG Survey (2016)	12	13	Fair	Fair	720	820	8.6	3.0	Medium (15-40 years)	Medium	No	0	No Impact: 0%	Retain	Street tree, not tagged. Lopped around power lines
39	32	*Lophostemon confertus*	SDG Survey (2016)	13	13	Fair	Fair	520	650	6.2	2.8	Medium (15-40 years)	Medium	No	0	No Impact: 0%	Retain	Street tree, not tagged. Lopped around power lines
40	33	*Lophostemon confertus*	SDG Survey (2016)	10	12	Fair	Fair	640	800	7.7	3.0	Medium (15-40 years)	Medium	No	16	Medium Impact: <20%	Potential to be retained	Street tree, not tagged. Lopped around power lines
41	34	*Lophostemon confertus*	SGS Survey (2016)	12	13	Fair	Fair	600	750	7.2	2.9	Medium (15-40 years)	Medium	No	11	Medium Impact: <20%	Potential to be retained	Street tree, not tagged. Lopped around power lines

Tree	Survey ID	Botanical name	Location	Height (m)	Spread (m)	Health	Structure	DHB (mm)	DAB (mm)	TPZ (m)	SRZ (m)	ULE	Retention value	SRZ encroached	TPZ% encroachment	Impact	Proposed action	Notes
42	35	*Lophostemon confertus*	Nearmap 2021	10	9	Fair	Poor	570	650	6.8	2.8	Medium (15-40 years)	Medium	No	6	Low Impact: <10%	Retain	Street tree, not tagged. Lopped around power lines
43	36	*Lophostemon confertus*	SDG Survey (2016)	11	10	Poor	Poor	680	750	8.2	2.9	Medium (15-40 years)	Medium	No	16	Medium Impact: <20%	Potential to be retained	Street tree, not tagged. Lopped around power lines
44	37	*Lophostemon confertus*	SDG Survey (2016)	13	12	Fair	Poor	680	750	8.2	2.9	Medium (15-40 years)	Medium	No	17	Medium Impact: <20%	Potential to be retained	Street tree, not tagged. Lopped around power lines
45	-	*Lophostemon confertus*	Nearmap 2021	12	11	Poor	Poor	630	700	7.6	2.8	Medium (15-40 years)	Medium	No	<1	Low Impact: <10%	Retain	Street tree, not tagged. Lopped around power lines
46	-	*Lophostemon confertus*	Nearmap 2021	14	10	Fair	Fair	600	700	7.2	2.8	Medium (15-40 years)	Medium	No	0	No Impact: 0%	Retain	Street tree, not tagged. Lopped around power lines
47	-	*Ligustrum lucidum*	Nearmap 2021	7	5	Good	Good	300	400	3.6	2.3	Short (5-15 years)	Low	Yes	60	High Impact: >20%	Remove	Weed species, not tagged, no access.
48	14	*Eucalyptus nichollii*	Nearmap 2021	16	12	Poor	Poor	650	800	7.8	3.0	Short (5-15 years)	Low	Yes	76	High Impact: >20%	Remove	Tree appears to be dying
49	15	*Ceratopetalum gummiferum*	SDG Survey (2016)	7	3	Fair	Fair	160	200	2.0	1.7	Medium (15-40 years)	Low	Yes	100	High Impact: >20%	Remove	
50	16	*Howea forsteriana*	SDG Survey (2016)	18	4	Fair	Good	170	250	3.0	0.0	Medium (15-40 years)	Medium	n/a	100	High Impact: >20%	Remove	
51	19	*Howea forsteriana*	SDG Survey (2016)	10	4	Fair	Good	140	180	3.0	0.0	Medium (15-40 years)	Medium	n/a	100	High Impact: >20%	Remove	
52	18	*Howea forsteriana*	SDG Survey (2016)	6	4	Fair	Good	120	150	3.0	0.0	Medium (15-40 years)	Low	n/a	100	High Impact: >20%	Remove	
53	17	*Dead tree*	SDG Survey (2016)	6	10	Poor	Poor	350	450	4.2	2.4	Remove (<5 years)	Low	Yes	100	High Impact: >20%	Remove	
54	20	*Lagerstroemia indica*	SDG Survey (2016)	10	8	Fair	Good	400	450	4.8	2.4	Medium (15-40 years)	Medium	Yes	100	High Impact: >20%	Remove	Multi stemmed
55	21	*Acer palmatum*	SDG Survey (2016)	6	9	Fair	Fair	330	370	4.0	2.2	Medium (15-40 years)	Medium	Yes	100	High Impact: >20%	Remove	Moderate decay in trunk
56	-	*Archontophoenix cunninghamiana*	Nearmap 2021	8	5	Good	Good	250	300	3.5	0.0	Medium (15-40 years)	Low	n/a	100	High Impact: >20%	Remove	Multi stemmed
57	-	*Strelitzia nicholai*	Nearmap 2021	5	7	Good	Good	300	350	4.5	0.0	Medium (15-40 years)	Low	n/a	100	High Impact: >20%	Remove	Multi stemmed
58	-	*Archontophoenix cunninghamiana*	Nearmap 2021	8	4	Good	Good	130	200	3.0	0.0	Medium (15-40 years)	Low	n/a	100	High Impact: >20%	Remove	
59	-	*Archontophoenix cunninghamiana*	Nearmap 2021	5	3	Good	Good	120	150	2.5	0.0	Medium (15-40 years)	Low	n/a	100	High Impact: >20%	Remove	Multi stemmed
60	-	*Strelitzia nicholai*	Nearmap 2021	6	7	Good	Good	300	350	4.5	0.0	Medium (15-40 years)	Low	n/a	97	High Impact: >20%	Remove	Multi stemmed
61	23	*Archontophoenix cunninghamiana*	SDG Survey (2016)	11	7	Good	Good	350	600	4.5	0.0	Medium (15-40 years)	Medium	n/a	100	High Impact: >20%	Remove	Multi stemmed
62	-	*Lagerstroemia indica*	Nearmap 2021	9	6	Fair	Good	350	420	4.2	2.3	Medium (15-40 years)	Medium	Yes	100	High Impact: >20%	Remove	

Tree	Survey ID	Botanical name	Location	Height (m)	Spread (m)	Health	Structure	DHB (mm)	DAB (mm)	TPZ (m)	SRZ (m)	ULE	Retention value	SRZ encroached	TPZ% encroachment	Impact	Proposed action	Notes
63	22	*Lagerstroemia indica*	Nearmap 2021	9	5	Fair	Good	380	450	4.6	2.4	Medium (15-40 years)	Medium	Yes	100	High Impact: >20%	Remove	Wounds and die back on trunk, multi stemmed
64	64	*Lagerstroemia indica*	SDG Survey (2016)	9	6	Fair	Fair	350	450	4.2	2.4	Medium (15-40 years)	Medium	Yes	67	High Impact: >20%	Remove	Multi stemmed
65	-	*Yucca sp.*	Nearmap 2021	6	4	Good	Good	350	500	4.2	2.5	Medium (15-40 years)	Low	Yes	38	High Impact: >20%	Remove	Twin stemmed
66	66	*Dracaena marginata*	SDG Survey (2016)	5	4	Fair	Fair	240	320	2.9	2.1	Medium (15-40 years)	Medium	Yes	97	High Impact: >20%	Remove	Multi stemmed

Appendix E Tree protection guidelines

The following tree protection guidelines must be implemented during the construction period if no tree-specific recommendations are detailed.

E1 Tree protection fencing

The TPZ is a restricted area delineated by protective fencing or the use of an existing structure (such as a wall or fence).

Trees that are to be retained must have protective fencing erected around the TPZ (or as specified in the body of the report) to protect and isolate it from the construction works. Fencing must comply with the Australian Standard, AS 4687-2007, Temporary fencing and hoardings.

Tree protection fencing must be installed prior to site establishment and remain intact until completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist.

If the protective fencing requires temporary removal, trunk, branch and ground protection must be installed and must comply with *AS 4970-2009, Protection of Trees on Development Sites*.

Tree protection fencing shall be:

- Enclosed to the full extent of the TPZ (or as specified in the Recommendations and Tree Protection Plan).
- Cyclone chain wire link fence or similar, with lockable access gates.
- Certified and Inspected by the Project Arborist.
- Installed prior to any machinery or material are brought to site and before the commencement of works.
- Prominently sign posted with 300 mm x 450 mm boards stating, “NO ACCESS - TREE PROTECTION ZONE”.

E2 Crown protection

Tree crowns/canopy may be injured or damaged by machinery such as; excavators, drilling rigs, trucks, cranes, plant and vehicles. Where crown protection is required, it will usually be located at least one meter outside the perimeter of the crown.

Crown protection may include the installation of a physical barrier, pruning selected branches to establish clearance, or the tying/bracing of branches.

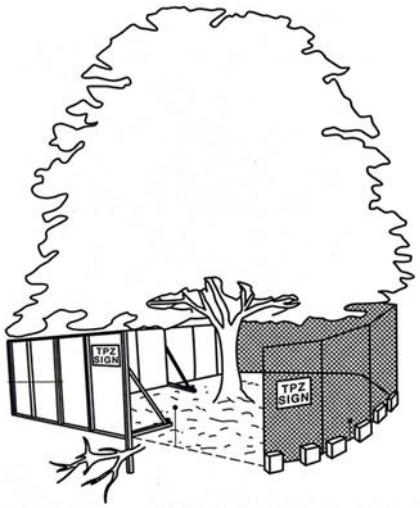
E3 Trunk protection

Where provision of tree protection fencing is impractical or must be temporarily removed, trunk protection shall be installed for the nominated trees to avoid accidental mechanical damage.

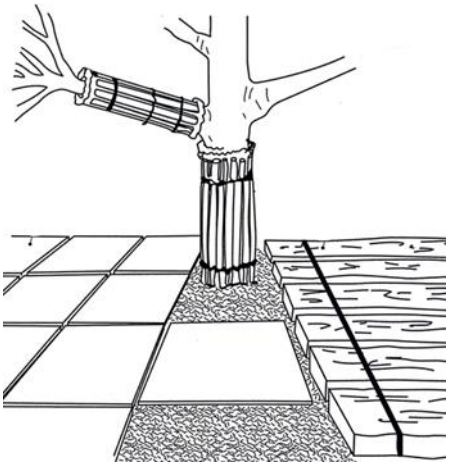
The removal of bark or branches allows the potential ingress of micro-organisms which may cause decay. Furthermore, the removal of bark restricts the trees' ability to distribute water, mineral ions (solutes), and glucose.

Trunk protection shall consist of a layer of either carpet underfelt, geotextile fabric or similar wrapped around the trunk, followed by 1.8 m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with an approx. 50 mm gap between the timbers).

The timbers must be secured using galvanised hoop strap (aluminium strapping). The timbers shall be wrapped around the trunk but not fixed to the tree, as this will cause injury/damage to the tree.



Tree protection fencing



Trunk protection fencing

E4 Ground protection

Tree roots are essential for the uptake/absorption of water, oxygen and mineral ions (solutes). It is essential to prevent the disturbance of the soil beneath the dripline and within the TPZ of trees that are to be retained. Soil compaction within the TPZ will adversely affect the ability of roots to function correctly.

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Maintain a thick layer of mulch around all retained trees to a depth of 100 mm using coarse pine bark or wood chip material that complies with AS 4454. Where the existing landscape within the TPZ is to remain unaltered (e.g. garden beds or turf) mulch may not be required.

For heavy vehicle access within TPZ, ground protection may include a permeable membrane such as geotextile fabric beneath a layer of crushed rock or rumble boards.

If the grade is to be raised within the TPZ, the material should be coarser or more porous than the underlying material.

E5 Root protection and investigation

If incursions/excavation within the TPZ are unavoidable, root investigation may be needed to determine the extent and location of roots within the area of construction activity. The location and distribution of roots are found through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), air spade and manual excavation. Root investigation does not guarantee the retention of the tree.

If the project arborist identifies conflicting roots that requiring pruning, they must be pruned with a sharp implement such as; secateurs, pruners, handsaws or a chainsaw back to undamaged tissue. The final cut must be a clean cut.

E6 Underground services

All underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they should be installed using horizontal directional drilling (HDD), non-destructive excavation (NDE) methods such as hydro-vacuum, Air Spade or manually excavated trenches. The horizontal drilling/boring must be at minimum depth of 600 mm below grade. Trenching for services is to be regarded as “excavation”. The project arborist should assess the likely impacts of boring and bore pits on retained trees.

Appendix F Site plan

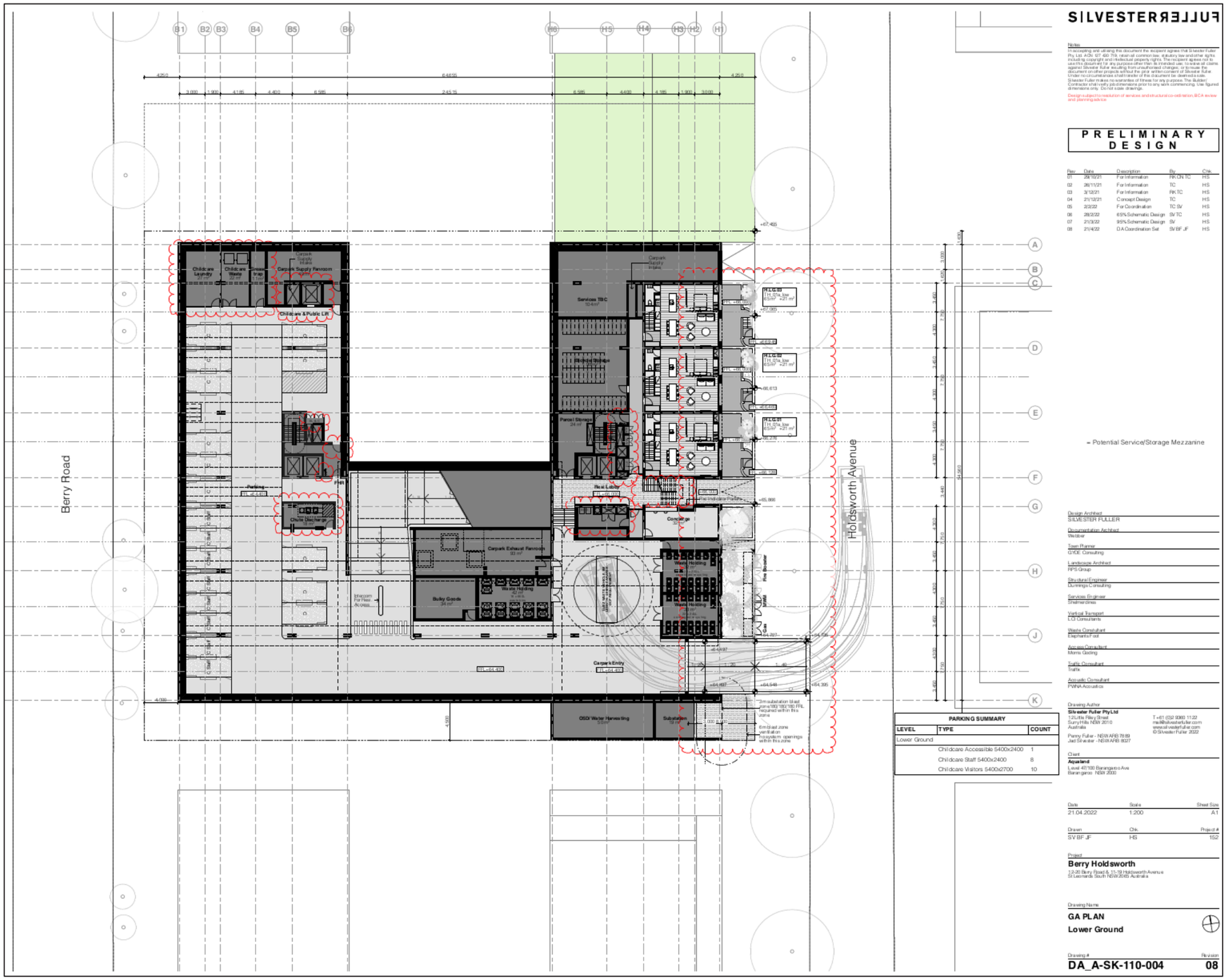


Figure 9: Lower ground level GA Plan (Silvester Fuller 2022)

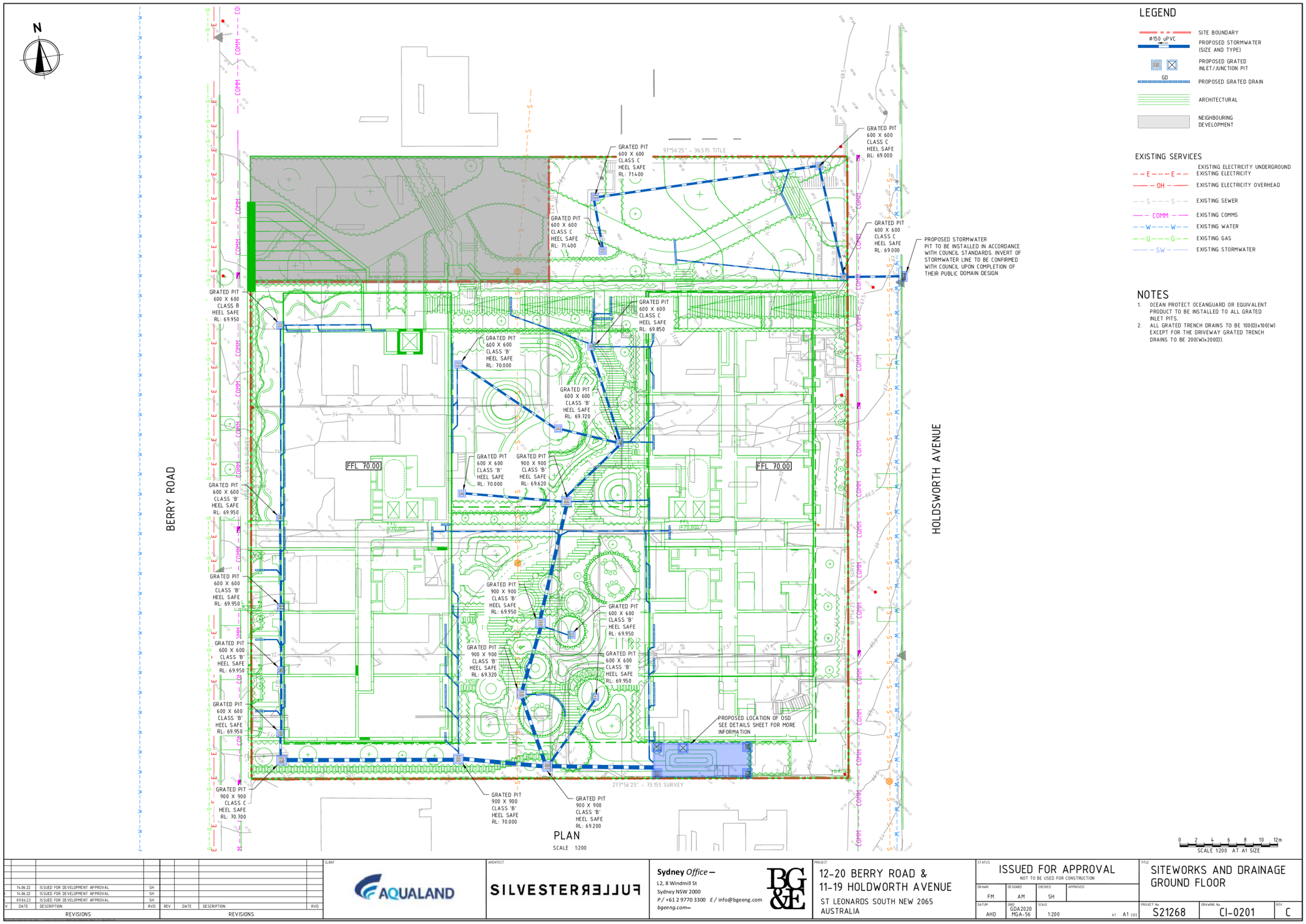


Figure 10: Siteworks and drainage ground floor (BG&E 2022)

Appendix G Site photos

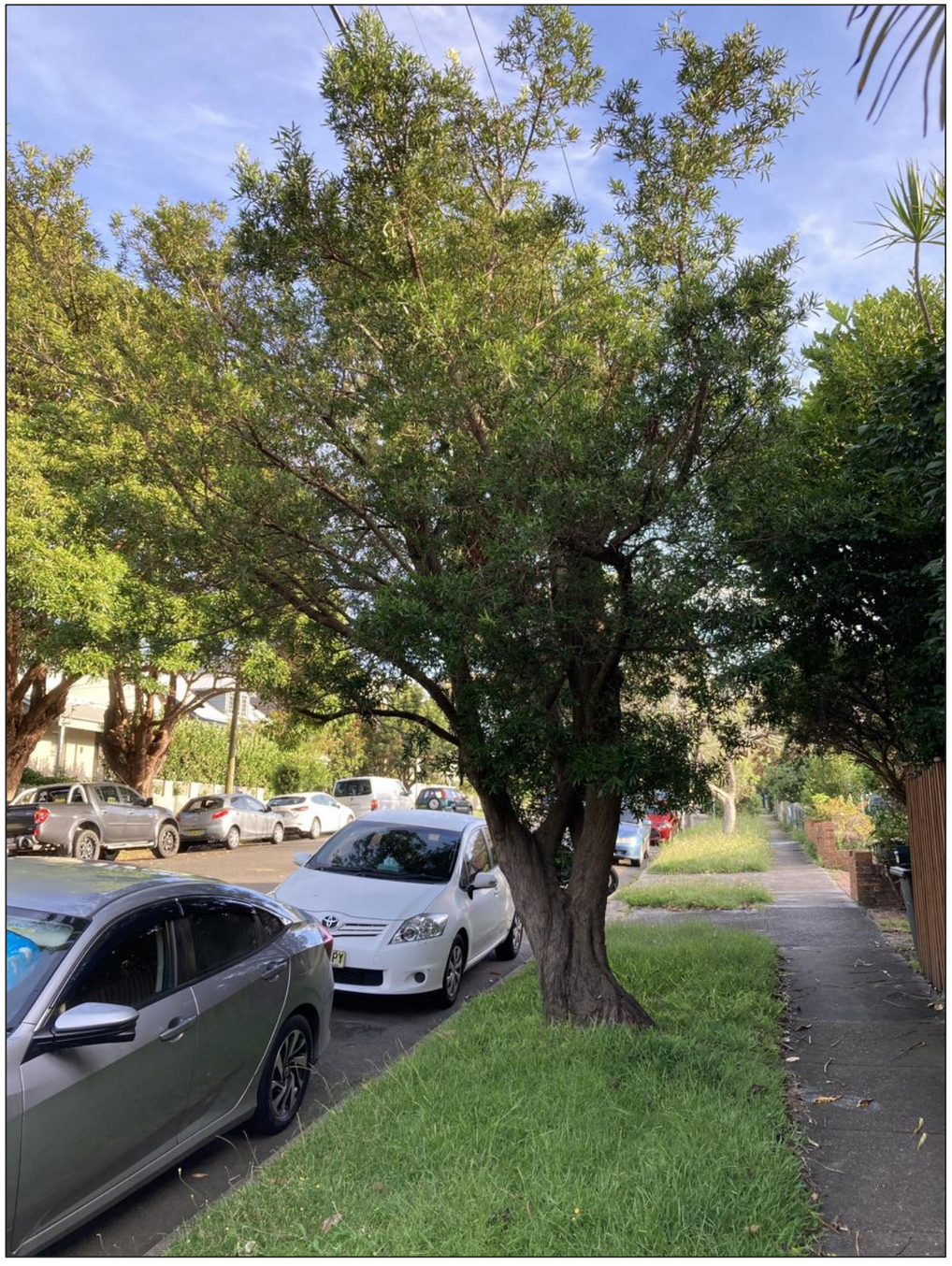


Figure 11: Medium retention value tree 1

Figure 12: Dead tree 2

Figure 13: Medium retention value tree 5

Figure 14: Medium retention value tree 6

Figure 15: Medium retention value tree 8

Figure 16: Medium retention value tree 9

Figure 17: Medium retention value tree 10

Figure 18: Medium retention value tree 11

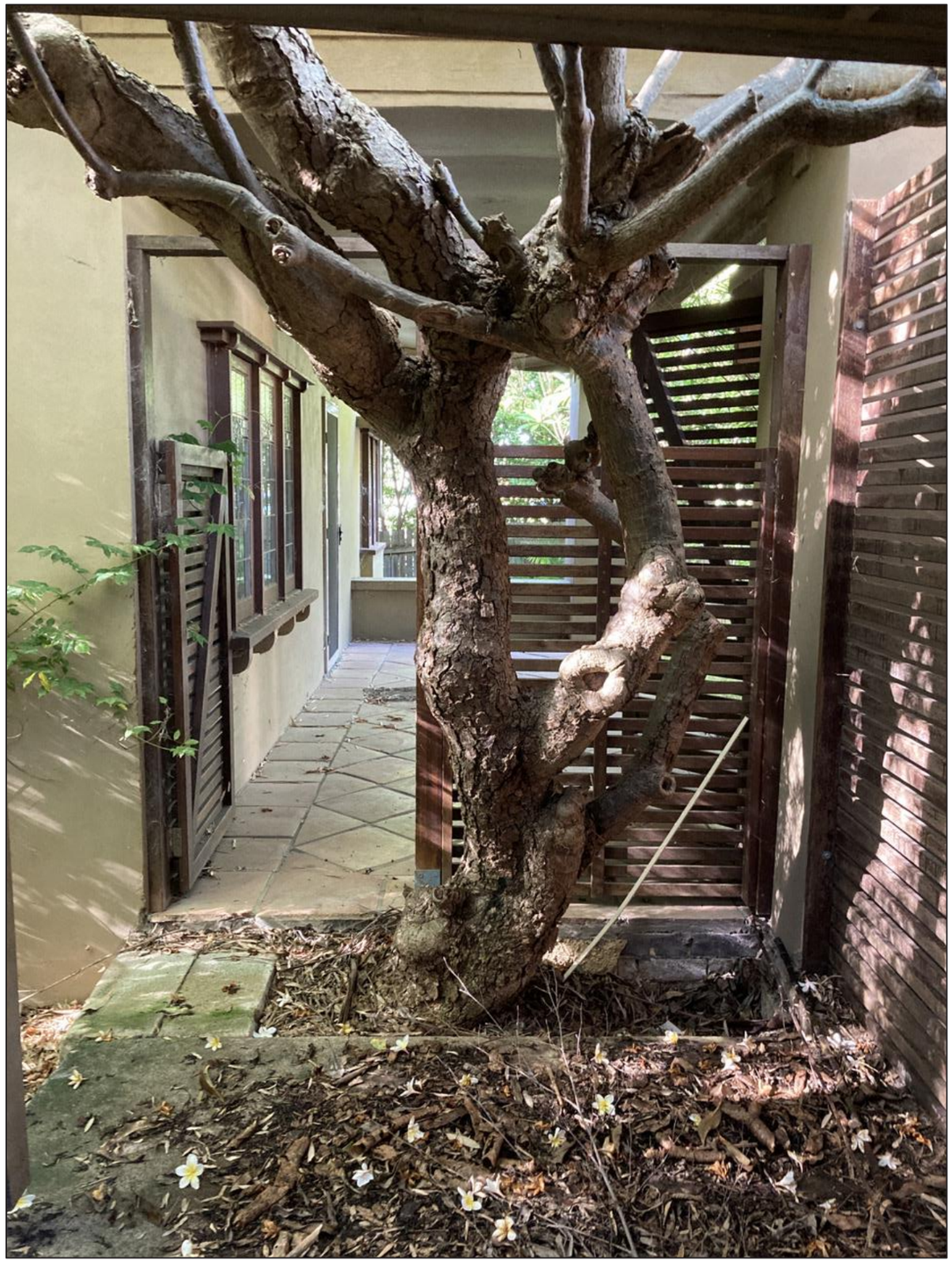


Figure 19: Medium retention value tree 12 close up

Figure 20: Medium retention value tree 12

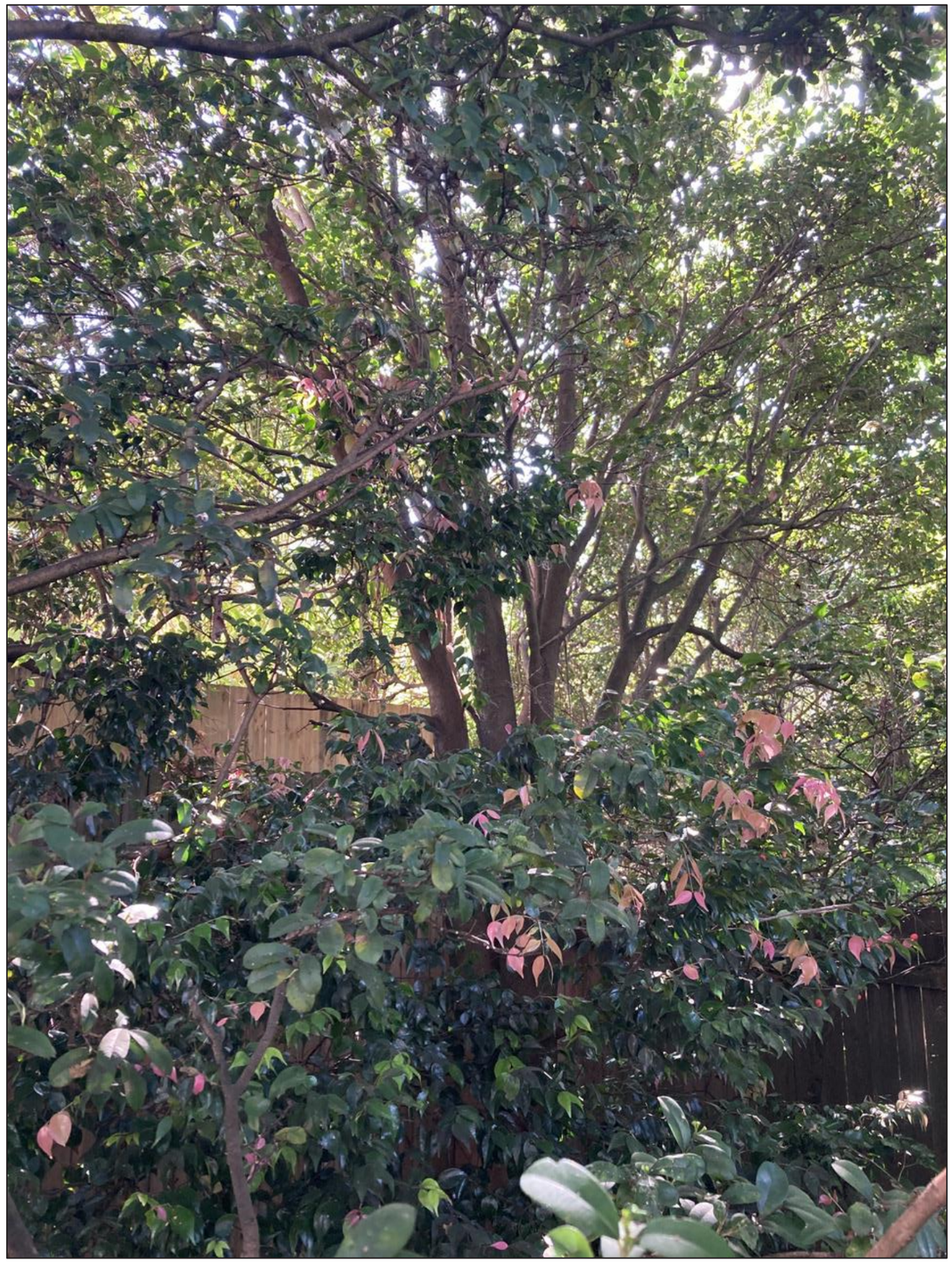


Figure 21: Medium retention value tree 20

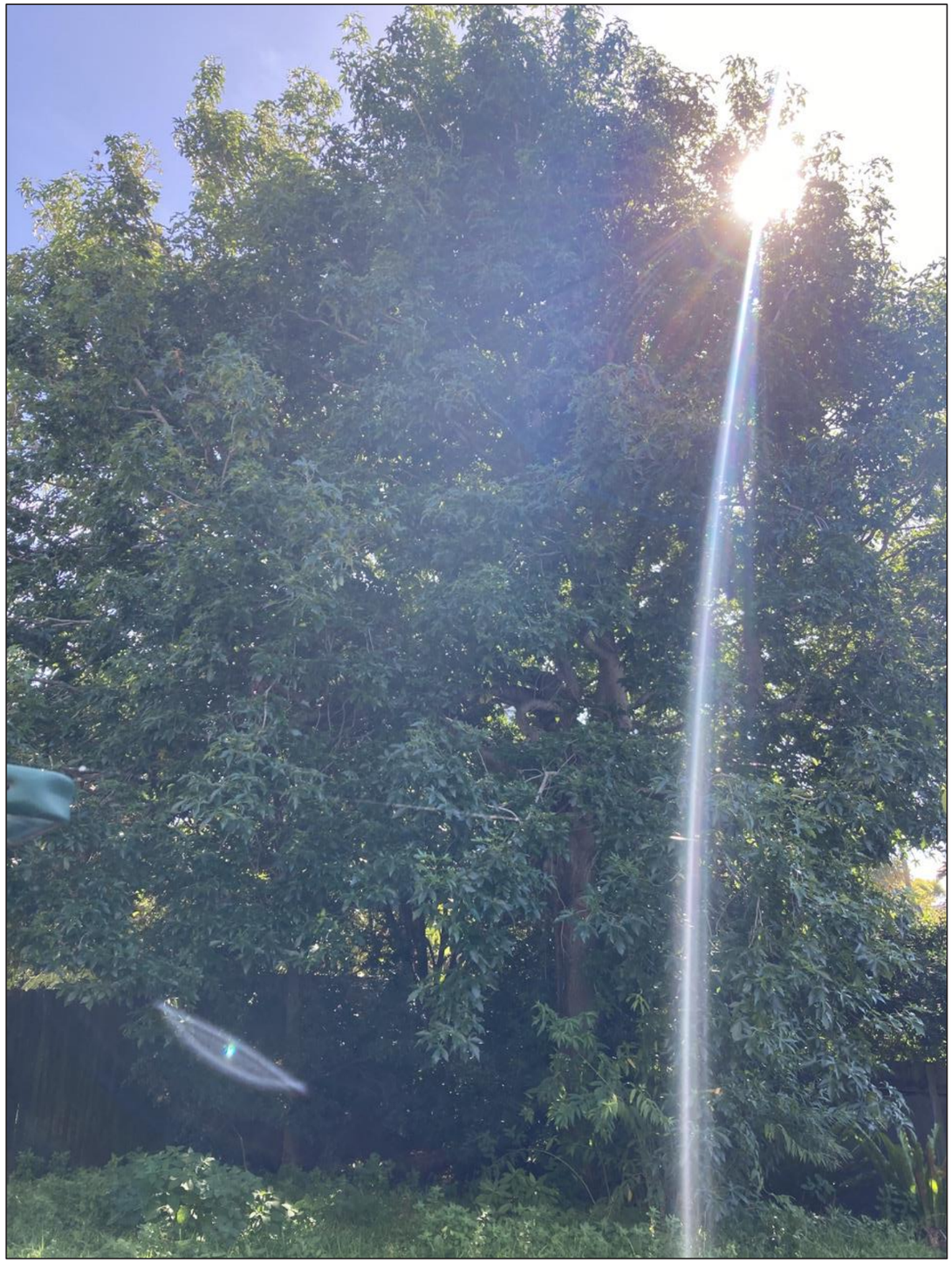


Figure 22: Medium retention value tree 21

Figure 23: Medium retention value tree 38

Figure 24: Medium retention value tree 39

Figure 25: Medium retention value tree 40

Figure 26: Medium retention value tree 41

Figure 27: Medium retention value tree 42

Figure 28: Medium retention value tree 43

Figure 29: Medium retention value tree 44

Figure 30: Medium retention value tree 45

Figure 31: Medium retention value tree 46

Figure 32: Medium retention value tree 50

Figure 33: Medium retention value tree 51

Figure 34: Medium retention value tree 54

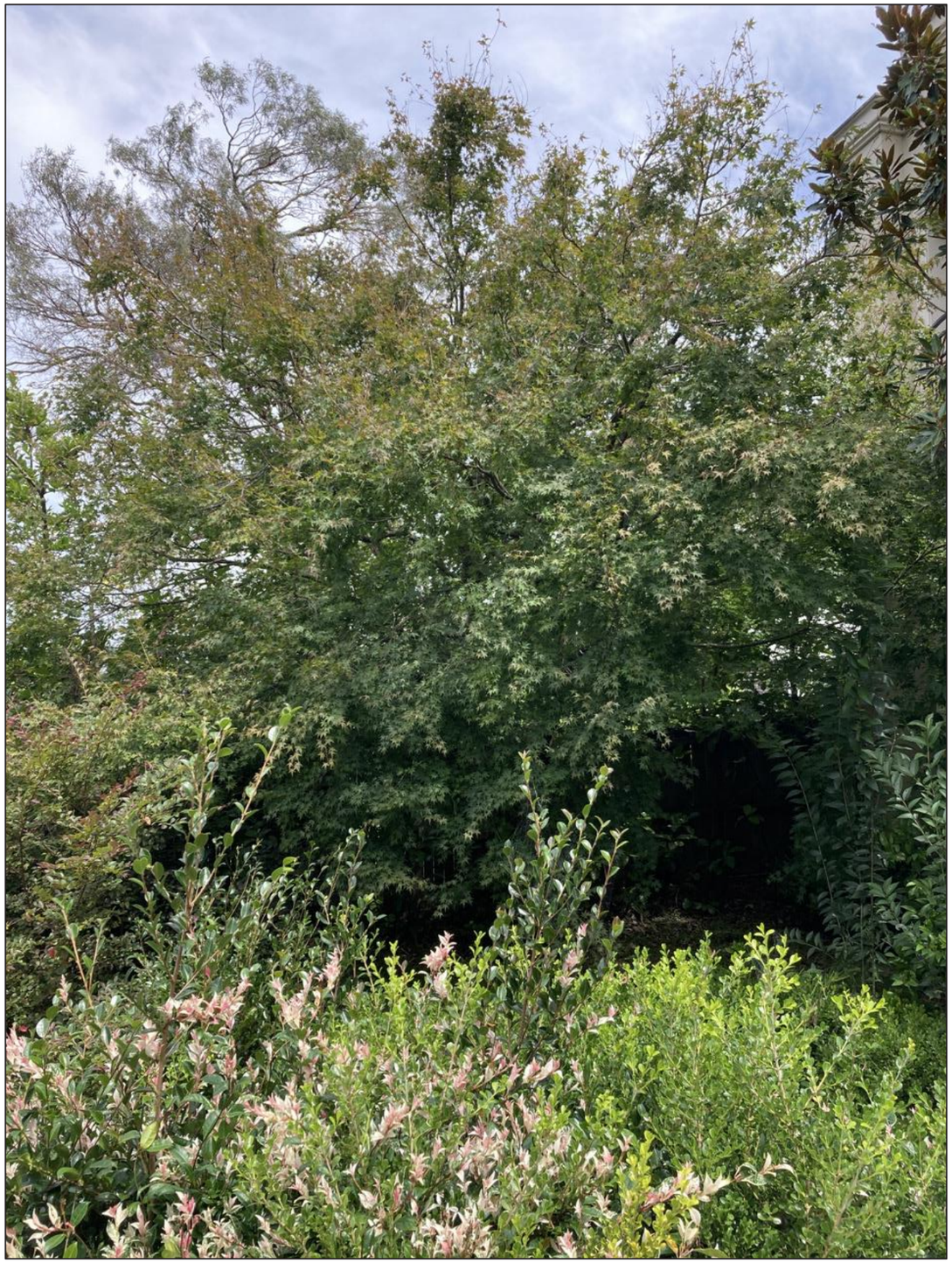


Figure 35: Medium retention value tree 55

Figure 36: Medium retention value tree 61

Figure 37: Medium retention value tree 62

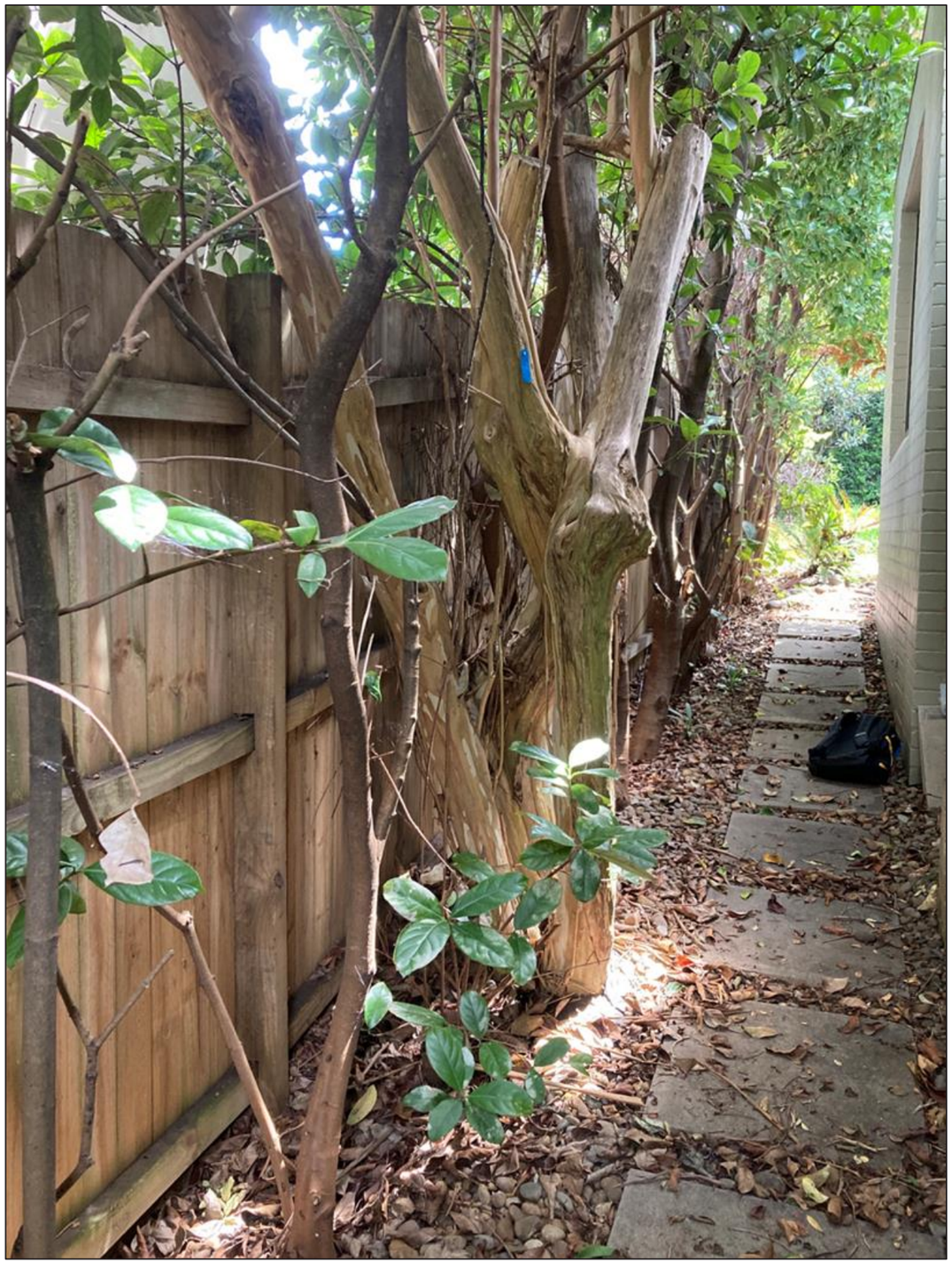


Figure 38: Medium retention value tree 63

Figure 39: Medium retention value tree 64

Figure 40: Medium retention value tree 66

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