600 – 660 Elizabeth Street, Redfern (Redfern Place) – Arboricultural Impact Assessment

Bridge Housing

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Template 2.8.1

Contents

List of Figures

List of Tables

Abbreviations

Abbreviation	Description
AQF	Australian Qualifications Framework
AS	Australian Standards
CoS	City of Sydney
DBH	Diameter at Breast Height
ELA	Eco Logical Australia
m	Metre
mm	Millimetre
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
SP	Species
SEAR	Secretary's Environmental Assessment Requirements
SRZ	Structural Root Zone
SSDA	State Significant Development Application
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment

1. Introduction

This report accompanies a detailed State Significant Development Application that seeks approval for a mixed-use development at 600-660 Elizabeth Street, Redfern (Redfern Place). The development proposes four buildings comprising community facilities, commercial/office, affordable/social/specialist disability housing apartments and new public links and landscaping.

The project site comprises Lot 1 in DP 1249145. It has an area of approximately 10,850m^2. Part of the site currently accommodates the existing Police Citizens Youth Club (PCYC) (to be demolished and replaced). The remaining portion of the site is vacant with remnant vegetation.

The State Significant Development Application (SSDA) seeks approval for redevelopment of the site, including:

- Demolition of existing buildings.
- Tree removal.
- Bulk earthworks including excavation.
- Construction of a community facility building known as Building S1.
- Construction of two residential flat buildings (known as Buildings S2 and S3) up to 14 and 10 storeys respectively, for social and affordable housing.
- Construction of a five-storey mixed use building (known as Building S4) comprising commercial uses on the ground level and Social and Specialist Disability Housing above.
- Construction of one basement level below Buildings S2, S3 and part of S4 with vehicle access from Kettle Street.
- Site-wide landscaping and public domain works including north-south and east-west pedestrian through-site link.

1.1 SEARs requirements

Secretary's Environmental Assessment Requirements (SEARs) were issued in December 2022 for Redfern Place. Table 1 below outlines the SEARs requirements relevant to this report, and the corresponding sections to which the requirement is addressed.

Table 1: SEARs requirements

Item	SEARs requirement	Relevant Section of the Report
8	*Assess the number, location, condition and significance of trees to be removed and retained and note any existing canopy coverage to be retained on-site.*	Section 3, Appendix A and B.

Therefore, the purpose of this report is to:

- 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

1.2 Subject Land

The address of the Subject Land, along with additional information is detailed in Table 2. The subject land is mapped in Figure 1.

Table 2: Development site

Criteria	Description
Street address	600-660 Elizabeth Street, Redfern
Lot and DP	Lot 1 DP1249145
Local Government Area	City of Sydney (CoS)
General land use	R1 General Residential

The description of the proposed activity in Table 3 is based on information available at the time of preparing this report and is predominately based on the masterplan shown in Figure 2. The impact area used in this assessment is assumed to consist of the entire subject land, comprised of basement level and ground level construction, as well as hard and soft landscaping.

Street trees are present adjacent to the site on all four main boundaries. As many street trees may have roots that are growing in the site, potential impacts on adjacent street trees are also assessed in this AIA.

Table 3: Proposed activity

Activities that can impact trees	Description of proposed activities
Clearing vegetation	Yes, a total of 57 trees are proposed to be removed*.
Cut and fill earthworks	Yes
Compaction • Vehicle access and parking • Stockpiling of fill and storage of materials	Yes, however, construction vehicle access routes have not been assessed in this report. If any access, parking or stockpiling is proposed within Tree Protection Zones (TPZ), then further impact assessment and approval will be required. No information about the proposed construction vehicles has been provided. Ten street trees will be removed for the proposed works. This will provide satisfactory areas for site access and parking, away from retained street trees.
Refuelling and chemical use (e.g., herbicides)	No
Erection of scaffolding	Yes
Vehicle movements	Yes
Changes to stormwater management	Yes
Landscaping	Yes
Sewer works	Yes, however, these works have been excluded from the impact calculations in this report, under the assumption that trenching is undertaken using manual or hydro excavation, and is performed under arborist supervision, as mentioned in the sewer diversion concept plans (Sydney Water 2024)

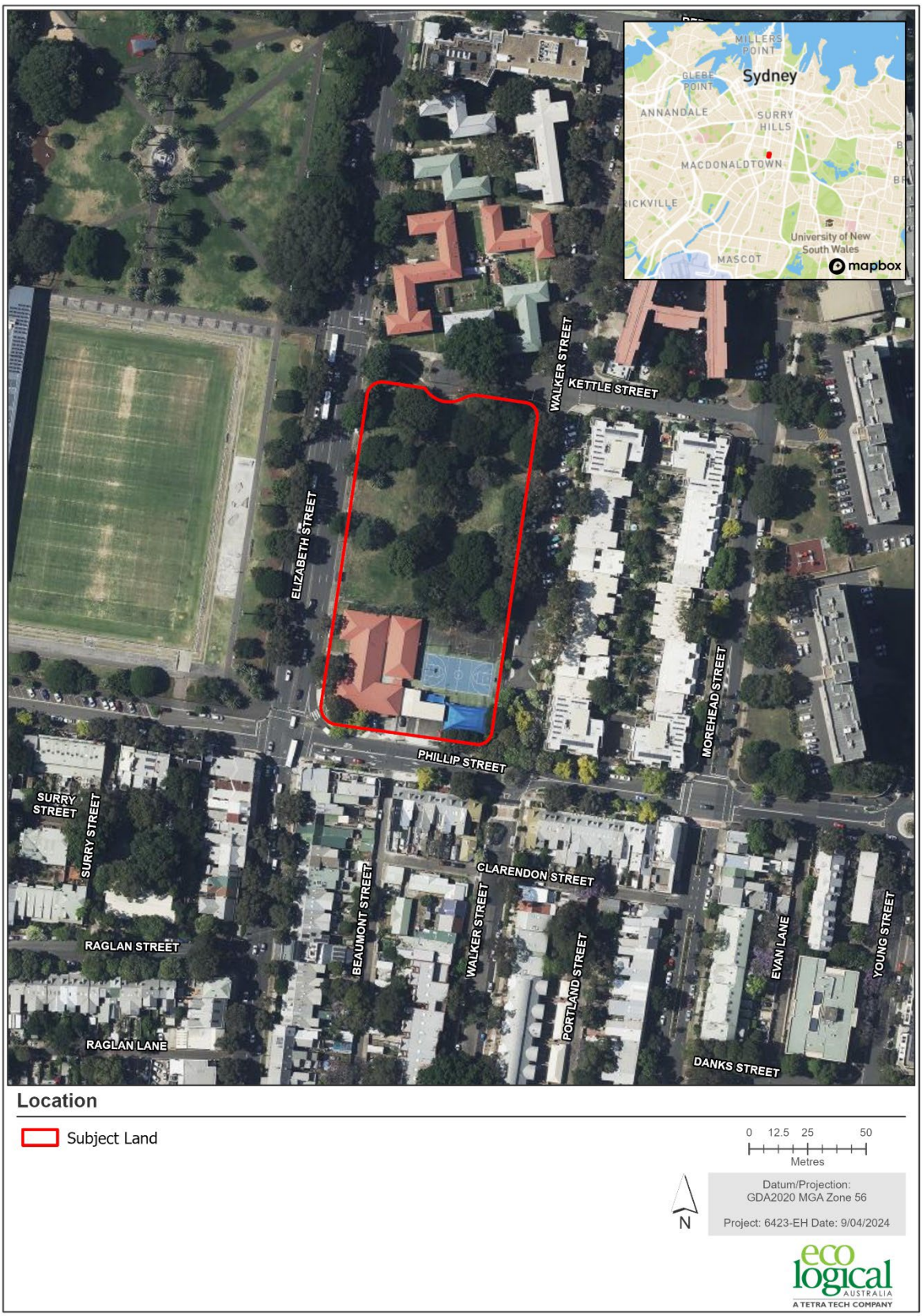

Figure 1: Subject Land

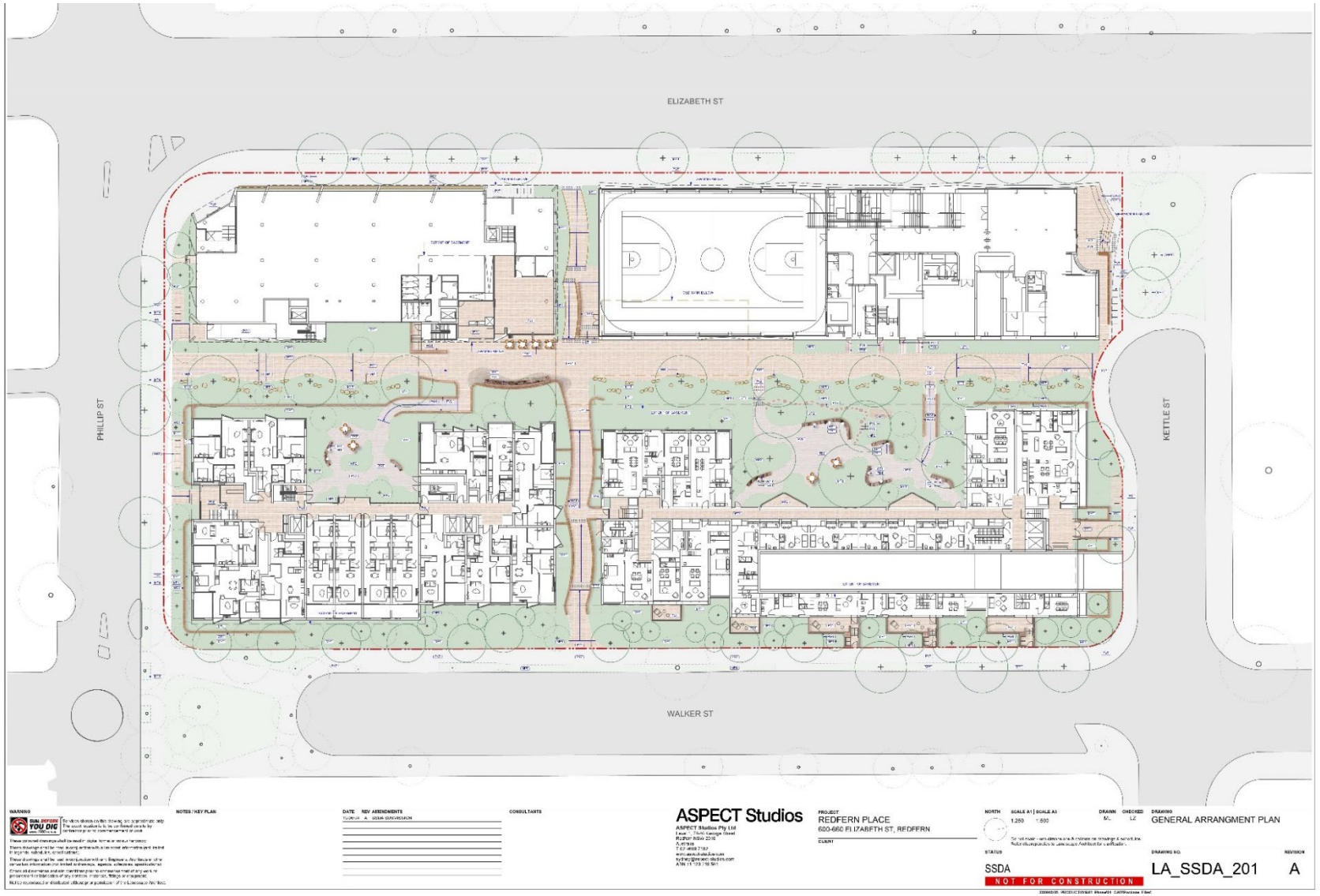

Figure 2: Masterplan (Hayball 2024)

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.

Under the City of Sydney (CoS) Development Control Plan (DCP) 2012 (Section 3, Chapter 3.5.3), the City of Sydney defines a tree as:

(a) a height of 5m or more; or
(b) a canopy spread of over 5m; or
(c) a trunk diameter of more than 300mm, measured at ground level.

2.2 Visual tree assessment

The health and structure of the subject trees was assessed in accordance with a stage one visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994), and practices consistent with modern arboriculture. Measurements to determine the tree protection zone (TPZ) and the structural root zone (SRZ) were carried out in accordance with Clause 3.2 and 3.3.5 of AS4970-2000 Protection of Trees on Development Sites (Standards Australia 2009).

A total of **67** subject trees were inspected on 2 July 2018 by Australian Qualification Framework (AQF) Level 5 Consulting Arborist, Elizabeth Hannon, and reassessed on 18 October 2023 by AQF Level 5 Consulting Arborist, Daniel McDonald (Project Arborist). Since these inspections, Tree 110 has been identified for removal by Council (Figure 9). Since removal has not yet occurred, this tree will continue to be shown on the plans in this report, however, it is noted this tree will not be impacted by Redfern Place works, as it will have been removed.

The following applies to the field method:

- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing.
- Only trees that met the (CoS) definition of a tree were recorded.
- No aerial inspections or root mapping was undertaken.
- Tree heights and canopy were estimated, unless otherwise stated.
- The diameter at breast height (DBH) was measured by placing a diameter tape around the trunk of the tree at 1.4 metres above ground and recording the measurement. The DBH measurements were used to determine the area for the tree protection zone (which also incorporates the structural root zone).
- Tree locations were tagged and recorded using hand-held GPS units. Where available, these tree locations were aligned to a tree survey, using the drawing titled '*230125-DT-01[B]-ACAD.dwg*'.

2.3 Retention value

The retention value/importance of a tree is determined using a combination of environmental, cultural, physical and social values. This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Arboriculturists (IACA) *Significance of a Tree, Assessment Rating System (STARS©)*. The following categories were used:

- **Low**: These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
- **Medium**: 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.
- **High**: 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 AS4970 – Protection of trees on development sites (AS4970-2009). Street trees/trees on privately owned property are automatically assigned a high retention value.

Further details and assessment criteria are in Appendix C.

2.4 Protection zones

2.4.1 Tree protection zone (TPZ)

The Tree Protection Zone (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 (Figure 3). 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. As outlined in AS4970-2009, the minimum allowable TPZ is 2 m, while the maximum is 15 m. Therefore, values above or below these limits were adjusted accordingly.

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.

2.4.2 Structural root zone (SRZ)

The Structural Root Zone (SRZ) is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support and anchorage of the tree (Figure 3). 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). As outlined in AS4970-2009, the minimum SRZ must be 1.5 m. Therefore, values below this minimum were adjusted to 1.5 m.

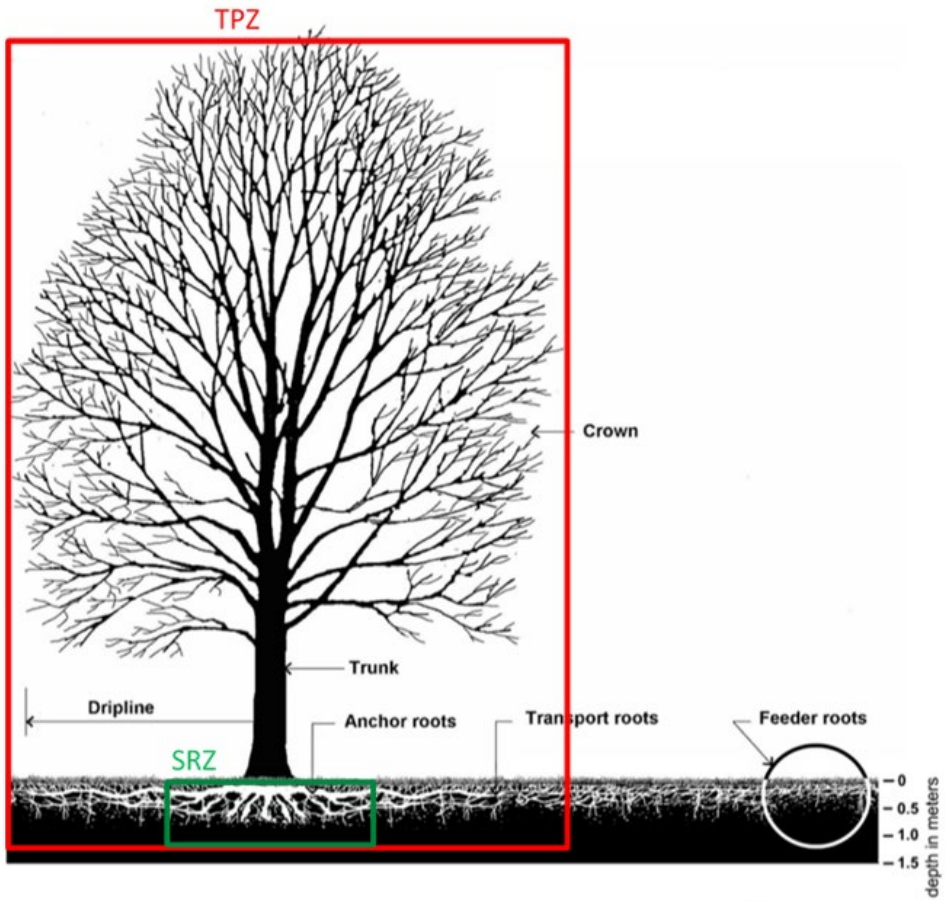

Figure 3: Indicative TPZ and SRZ

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, excavation, soil compaction, construction, stock piling within TPZ as well as changes in site hydrology, major changes in landscaping and site contamination. Impacts on the tree protection zones are determined by the percentage of the area that the development incurs into the TPZ and/or SRZ. The following are the definition of these impacts:

- **High impact**: Trees with TPZ encroachment greater than 20%, and/or SRZ encroachment. Trees may not remain viable if they are subject to high impact.
- **Medium impact:** Trees with TPZ encroachment greater than 10% and outside of the SRZ. The proposed action for trees subject to medium impact relies on individual characteristics of the tree, largely the retention value, and the specific methodologies and materials of proposed works within the TPZ. Proposed action for these trees is subject to determination by the Project Arborist, and mitigation measures must be applied if retention is recommended.
- **Low impact:** Trees with TPZ encroachment less than 10% (total area), and outside of the SRZ. Trees subject to low impact are viable for retention without mitigation measures.
- **No impact:** No likely or foreseeable encroachment within the TPZ. Trees subject to no impact are viable for retention without mitigation measures.

3. Results and discussion

Detailed results of the arboricultural assessment are tabulated in Appendix B and mapped in Appendix A**.** A summary of the proposed actions for each tree is shown in Figure 4 and counts are provided in Table 4.

Table 4: Summary of tree retention value and impact

	Proposed for removal		Proposed for retention with mitigation measures	Proposed for retention		
Retention Value	High Impact: >20%	Medium Impact: <20%	Medium Impact: <20%	Low Impact: <10%	No Impact: 0%	**TOTAL***
High Retention	12	1	2	1	6	**22**
Medium Retention	15	-	-	-	-	**15**
Low Retention	29	-	-	-	-	**29**
Total	**56**	**1**	**2**	**1**	**6**	**66**

*Tree 110 is not included in the above table, as this tree is identified for removal by Council for risk reasons, unrelated to these works.

3.1 Trees proposed for removal

A total of **57** trees are recommended for removal. Of these trees, 56 are recommended for removal due to high impact (>20% TPZ encroachment and/or SRZ encroachment) from the proposed works. An additional tree, Tree 53, is subject to medium impact (>10% TPZ encroachment and no SRZ encroachment) from the proposed works, however, is recommended for removal as the tree was assessed as dead during the last site visit. Tree IDs and specific encroachment percentages are detailed in Appendix B.

Tree management plans and recommendations for arborist supervision during the removal of these trees have been included in Section 4 of this report, to ensure adjacent trees to be retained are not damaged during removal works.

3.1.1 Street trees proposed for removal

Of the 57 trees recommended for removal, a total of **ten** trees (Tree 43, 44, 45, 46, 47, 48, 49, 52, 53 and 54) are street trees. It is understood that consent will be sought to remove these trees as part of the SSDA.

3.2 Trees proposed for retention with mitigation measures

A total of **two** street trees (Tree 50 and 51) are subject to medium impact (10- 20% TPZ encroachment and no SRZ encroachment) from the proposed works, with high retention values, and are recommended for retention with specific mitigation measures. These mitigation measures are outlined in Section 4.

Tree 110 was initially assessed as subject to medium impact from the proposed works, however, this Tree is subject to removal by Council due to risk reasons, unrelated to Redfern Place.

3.3 Trees proposed for retention

A total of **seven** street trees (Tree 41, 42, 101, 103, 105, 108, and 109) are recommended for retention, as they are subject to either low or no impact from the proposed works. Tree management, including the tree protection plan for those trees to be retained, along with hold points, inspection schedules and arborist certification are outlined in Section 4 of this report.

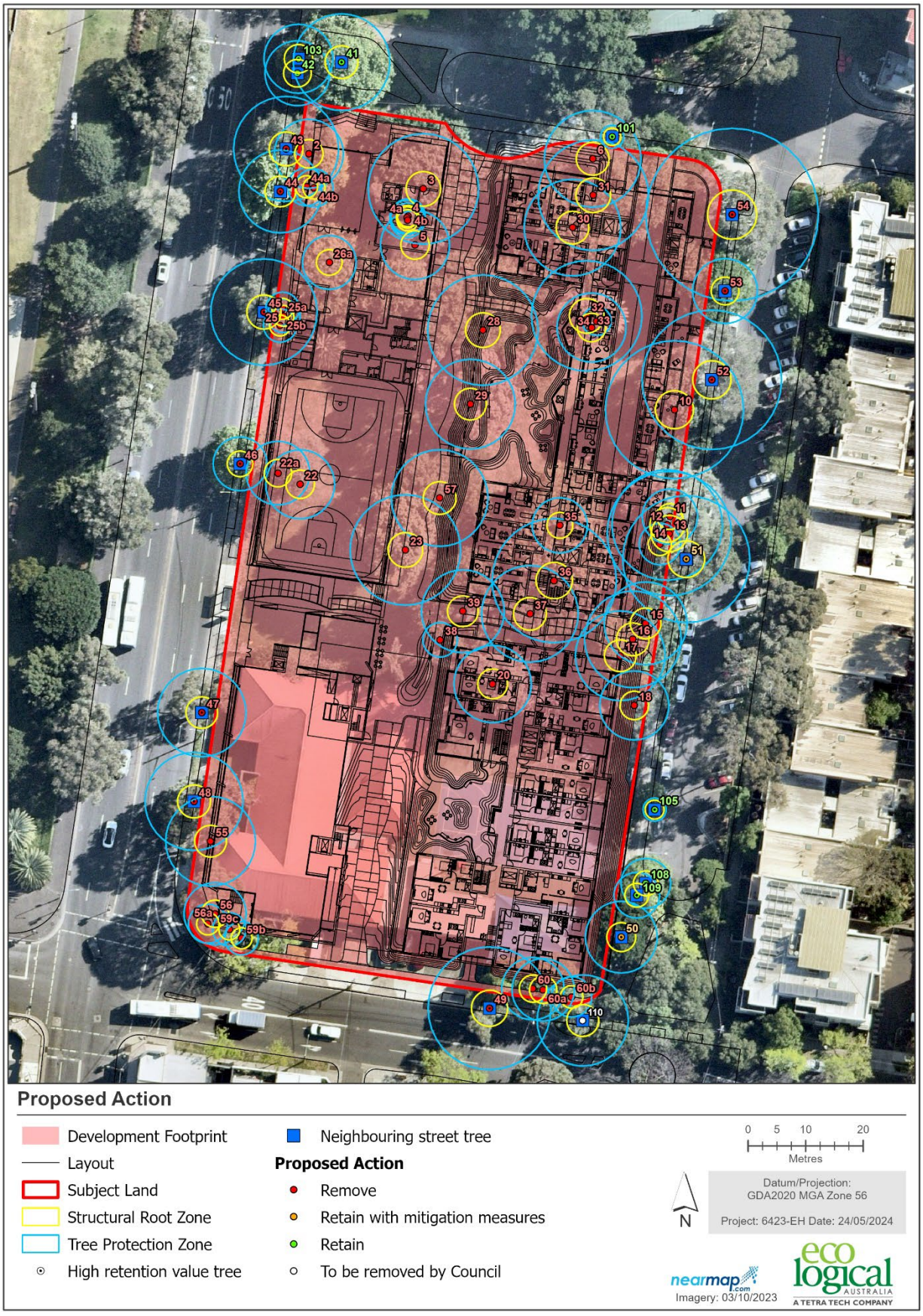

Figure 4: Proposed action

Figure 5: Proposed actions - street trees

4. Tree protection plan

An AQF Level 5 Consulting Arborist must be engaged for the supervision of tree work within the TPZ of trees to be retained, to provide advice regarding tree protection and monitor compliance. The Project Arborist appointed to undertake this monitoring, is required to ensure all tree protection measures are implemented, as outlined in this plan, along with any other measures conditioned by the consenting authority or deemed necessary during works. All tree protection measures applicable are summarised in Table 5 and further information is provided in Appendix D.

4.1 Qualifications and Consent

- Permission in the form of permits or a consent must be granted from CoS prior to removing any of the subject trees. Approved tree works should not be carried out before the installation of tree protection measures.
- As per the CoS DCP (2012) a permit must also be obtained to prune trees, however, is not required provided the pruning:
    - Provides clearances consistent with the Guideline for tree pruning, and where the branch size is less than the diameter sizes detailed in Table 3.4 of Section 3 of the DCP; and
    - Does not remove more than 5% of a trees canopy; and
    - Does not damage or affect the health or structural stability of the tree; and
    - Is undertaken in accordance with the relevant Australian Standard for the Pruning of Amenity, using a qualified Arborist (minimum Australian Qualification Framework (AQF) Level 2 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).
- 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.*
- If any additional trees are proposed to be removed during the construction phase that are not identified for removal in this AIA (i.e., those in the 'retain' or 'retain if possible' categories), this will require approval by CoS.
- 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*.

4.2 Hold points, inspection and certification

A Project Arborist must be engaged to provide advice regarding tree protection and to monitor compliance throughout the project. If staged, 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.

4.2.1 Pre-construction

4.2.1.1 Approvals

Approvals for removal of any trees is to be attained from the relevant consent authority prior to construction, including any conditions of consent for trees to be retained.

4.2.1.2 Tree Marking

Trees that are approved for removal must be indicated clearly on site with spray paint on trunks. Trees identified for removal must not be removed until tree protection measures for retained trees are installed and deemed to be in accordance with *AS 4970 Protection of Trees on Development Sites* by the Project Arborist. The pre-commencement meeting outlined below must also be utilised to discuss with the Project Arborist whether supervision is recommended during the removal of these trees.

4.2.1.3 Pre-commencement Meeting

Prior to any construction, an onsite meeting must be conducted with, but not limited to the Project Arborist (AQF Level 5 Consulting Arborist), site manager and construction personnel team. The meeting is to discuss the general tree protection measures required for trees to be retained. This meeting must also be conducted to assess the three trees to be *retained with mitigation measures*; and to determine whether further measures in addition to those outlined in this report are required.

4.2.2 During construction

4.2.2.1 Monthly Tree Protection Inspections

Monthly inspection of trees by the Project Arborist (or other timing as agreed with the Project Arborist) is recommended to be completed on trees to be retained for the length of construction.

4.2.2.2 Supervision of TPZ Works

The Project Arborist must supervise all works to be completed within the TPZ of trees to be retained and provide advice regarding tree protection and monitor compliance.

4.2.3 Post-construction

4.2.3.1 Final Sign-off Inspection

A final inspection of trees to be retained must be undertaken by Project Arborist after all major construction has ceased and following the removal of tree protection measures.

4.2.4 Reporting

The Project Arborist is to provide brief summary reports throughout works (i.e., following pre-construction stage, following monthly inspections, and at final sign-off), detailing tree protection measures and providing recommendations for further work or rectification of measures (if required).

4.3 Replacement planting

Any loss of trees must be offset with replacement planting in accordance with the relevant offset policy and in consultation with CoS.

Table 5: Mitigation measures

AS4970 Section	AS4970 Specifications	ELA Comment	Timing	Project Arborist role
5.3.1	**Tree Marking** Trees for removal or transplanting must be marked onsite as per the approved tree protection plan. Before removal, the Project Arborist must confirm that all marked trees correspond with those shown on the schedule or plan.	Indicate clearly (with spray paint on trunks) trees marked for removal.	To be conducted after appropriate approval/permits are obtained from CoS, and prior to commencement of work and removal of any trees. Applicable to all trees approved to be removed.	Arborist pre-construction inspection report
4.3	**Protective Fencing** Fencing must be erected before any machinery or materials are brought onto the site and before the commencement of works including demolition. Once erected, protective fencing must not be removed or altered without approval by the Project Arborist. The TPZ must be secured to restrict access. AS4687 specifies applicable fencing requirements. Shade cloth or similar should be attached to reduce the transport of dust, other particulate matter and liquids onto the protected area. Fence posts and supports must have a diameter greater than 20 mm and be located clear of roots. Existing perimeter fencing and other structures may be suitable as part of 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*. Groups of trees which have overlapping TPZs may share a single fence. 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. • Signage erected as per AS4970.	All tree protection fencing to be erected prior to works commencing. Applicable to all trees to be retained.	Arborist pre-construction inspection report
4.4	**Signs** Signs identifying the TPZ must be placed around the edge of the TPZ and be visible from within the development site. The lettering on the sign must comply with AS 1319.	Fencing is to be prominently sign posted with 300 mm x 450 mm boards stating, “NO ACCESS - TREE PROTECTION ZONE”.	All signage is to be erected prior to works commencing. Applicable to all trees to be retained.	Arborist pre-construction inspection report
3.3.6	**Crown Protection** Tree crowns may be injured by machinery such as excavators, drilling rigs, cranes, trucks, hoarding installation, and scaffolding. The TPZ may need to include additional protection of the above ground parts of the tree. Where crown protection is required, it will usually be located at least one metre outside the perimeter of the crown. The erection of scaffolding may require an additional setback from the edge of the crown. Crown protection may include pruning, tying-back of branches or other measures. If pruning is required, requirements are specified in AS 4373 and should be undertaken before the establishment of the TPZ.	As per AS4970 Section 3.3.6.	As required, under direction of Project Arborist.	During construction inspection report
4.5.2	**Trunk and branch protection** Where necessary, install protection to the trunk and branches of trees. The materials and positioning of protection are to be specified by the Project Arborist. A minimum height of 2 m is recommended. Do not attach temporary powerlines, stays, guys and the like to the tree. Do not drive nails into the trunks or branches to attach wood battens or other tree protection materials.	Where provision of tree protection fencing is impractical or must be temporarily removed, trunk and branch protection shall be installed for the nominated trees to avoid accidental mechanical damage.	All trunk and branch protection is to be erected prior to works commencing.	Arborist pre-construction inspection report

AS4970 Section	AS4970 Specifications	ELA Comment	Timing	Project Arborist role
		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.	As required, under direction of Project Arborist.	
4.5.3	**Ground protection** If temporary access for machinery is required within the TPZ, ground protection measures will be required. The purpose of the ground protection is to prevent root damage and soil compaction within the TPZ. Measures may include a permeable membrane such as geotextile fabric beneath a layer of mulch or crushed rock below rumble boards. These measures may be applied to root zones beyond the TPZ.	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.	All ground protection is to be erected prior to works commencing (and during works) as required and specified by the Project Arborist	Arborist pre-construction and during construction inspection report/s
4.5.4	**Root protection during works within the TPZ** Some approved works within the TPZ, such as regrading, installation of piers or landscaping may have the potential to damage roots. If the grade is to be raised the material should be coarser or more porous than the underlying material. Depth and compaction should be minimized. Manual excavation must be carried out under the supervision of the Project Arborist to identify roots critical to tree stability. Relocation or redesign of works may be required. Where the Project Arborist identifies roots to be pruned within or at the outer edge of the TPZ, and relevant approval is obtained, they should be pruned with a final cut to undamaged wood. Pruning cuts should be made with sharp tools such as secateurs, pruners, handsaws or chainsaws. Pruning wounds should not be treated with dressings or paints. It is not acceptable for roots within the TPZ to be 'pruned' with machinery such as backhoes or excavators. Where roots within the TPZ are exposed by excavation, temporary root protection must be installed to prevent them drying out. This may include jute mesh or hessian sheeting as multiple layers over exposed roots and excavated soil profile, extending to the full depth of the root zone. Root protection sheeting must be pegged in place and kept moist during the period that the root zone is exposed. Other excavation works in proximity to trees, including landscape works such as paving, irrigation and planting can adversely affect root systems. Seek advice from the Project Arborist.	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, and relevant approvals are obtained, 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. The pre commencement meeting must be utilised to identify whether any of the three trees recommended for retention with mitigation measures require root investigation.	Decided during the pre-commencement meeting, or at any time during works. Applicable to the trees to be retained subject to mitigation measures.	Arborist during construction inspection reports (and root investigation reports if necessary)
4.5.5	**Installing underground services with TPZ** All services should be routed outside the TPZ. If underground services must be routed within the TPZ, they should be installed by directional drilling or in manually excavated trenches. The directional drilling bore should be at least 600 mm deep. The Project Arborist should assess the likely impacts of boring and bore pits on retained trees. For manual excavation of trenches the Project Arborist must advise on roots to be retained and must monitor the works. Manual excavation may include the use of pneumatic and hydraulic tools.	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 must assess the likely impacts of boring and bore pits on retained trees.	As required throughout the project as specified by the Project Arborist.	Arborist during construction inspection reports
4.6.1	**Maintaining the TPZ – Mulching**	As per AS4970 Section 4.6.1.	All mulching within TPZs to be completed prior to works commencing.	Arborist pre-construction inspection report

AS4970 Section	AS4970 Specifications	ELA Comment	Timing	Project Arborist role
	The area within the TPZ must be mulched. The mulch must be maintained to a depth of 50–100 mm using 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.		Applicable to all trees to be retained.	
4.6.2	**Maintaining the TPZ – Watering** Soil moisture levels must be regularly monitored by the Project Arborist. Temporary irrigation or watering may be required within the TPZ. An above-ground irrigation system should be installed and maintained by a competent individual.	As per AS4970 Section 4.6.2.	As required under instruction of Project Arborist. Applicable to all trees to be retained.	During construction inspection reports
4.6.3	**Maintaining the TPZ – Weed Removal** All weeds should be removed by hand without soil disturbance or should be controlled with appropriate use of herbicide.	As per AS4970 Section 4.6.3.	As required under instruction of Project Arborist. Applicable to all trees to be retained.	During construction inspection reports

5. References

5.1 General references

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5.2 Project specific references

City of Sydney Council *Sydney Development Control Plan 2012 Section 3 – General Provisions*

Appendix A Maps

Figure 6: Location of subject trees

Figure 7: Retention values

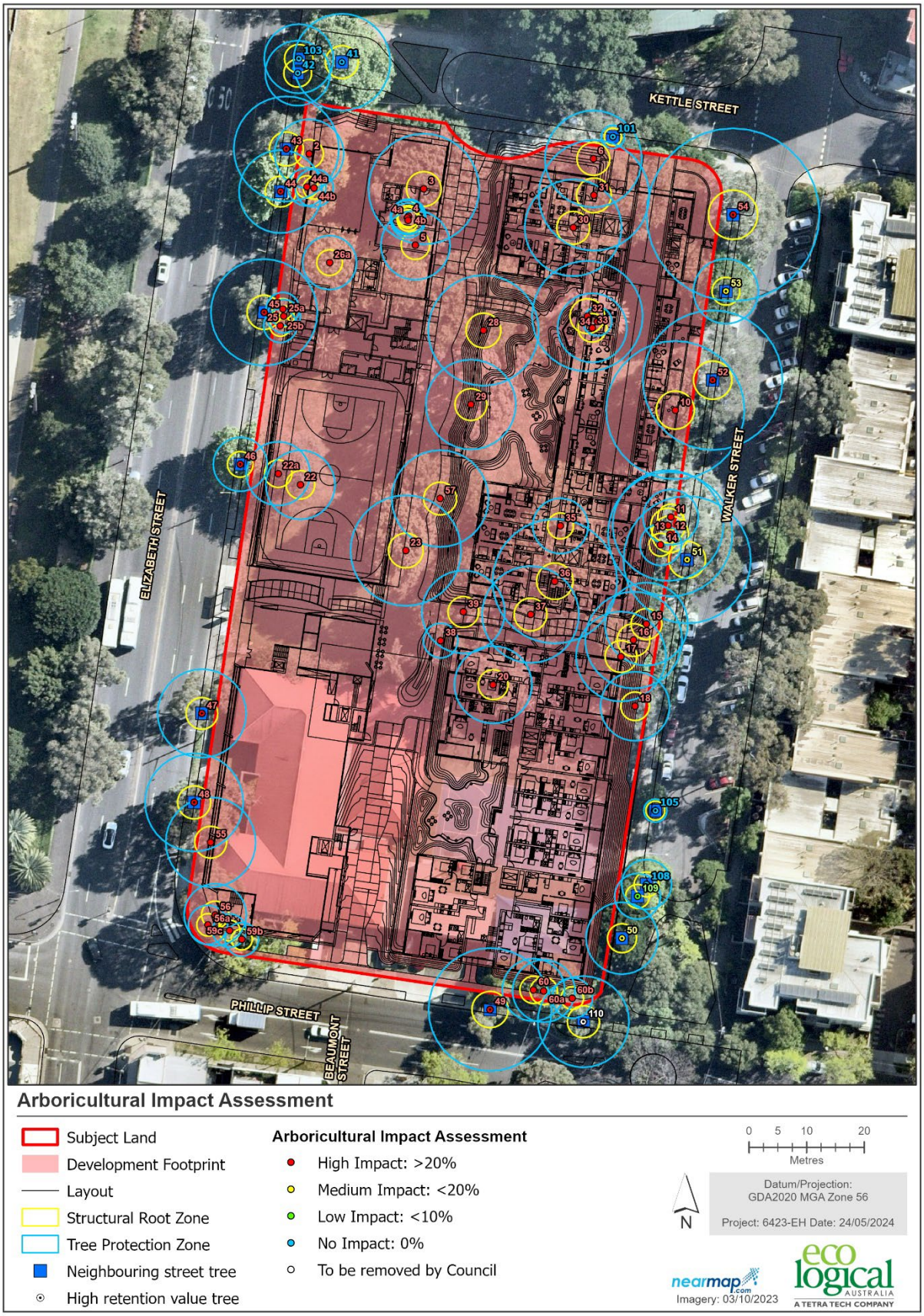


Figure 8: Arboricultural Impact Assessment

Appendix B Tabulated results

Tree ID	Botanical Name	Height (m)	Spread (m)	Diameter at Breast Height (DBH)	Health	Structure	Retention Value	Street Tree	TPZ	SRZ	TPZ encroachment (%)	SRZ encroachment (Y/N)	Impact		Proposed Action	Comment
2	*Cupressus sempervirens*	7	3	500	Fair	Poor	Low		6.00	2.47	68.09	yes	High >20%	Impact:	Remove	
3	*Ficus benjamina*	7	6	800	Good	Fair	Medium		9.60	3.01	100.00	yes	High >20%	Impact:	Remove	
4	*Casuarina glauca*	8	2	250	Fair	Poor	Low		3.00	1.85	100.00	yes	High >20%	Impact:	Remove	
4a	*Casuarina glauca*	8	2	250	Fair	Poor	Low		3.00	1.85	100.00	yes	High >20%	Impact:	Remove	
4b	*Casuarina glauca*	8	2	250	Fair	Poor	Low		3.00	1.85	100.00	yes	High >20%	Impact:	Remove	
5	*Casuarina cunninghamiana*	7	3	500	Fair	Fair	Low		6.00	2.47	100.00	yes	High >20%	Impact:	Remove	
6	*Eucalyptus botryoides*	12	6	700	Fair	Fair	Medium		8.40	2.85	66.48	yes	High >20%	Impact:	Remove	Streetside lowest branch is approximately 8m above ground.
10	*Afrocarpus falcata*	10	8	1000	Good	Good	High		12.00	3.31	57.19	yes	High >20%	Impact:	Remove	
11	*Melaleuca quinquenervia*	14	3	400	Good	Fair	Medium		4.80	2.25	30.80	yes	High >20%	Impact:	Remove	
12	*Melaleuca quinquenervia*	13	6	800	Good	Fair	High		9.60	3.01	40.10	yes	High >20%	Impact:	Remove	
13	*Melaleuca quinquenervia*	12	7	900	Good	Fair	High		10.80	3.17	38.13	yes	High >20%	Impact:	Remove	
14	*Melaleuca quinquenervia*	13	6	300	Fair	Good	Medium		3.60	2.00	41.21	yes	High >20%	Impact:	Remove	
15	*Casuarina glauca*	15	6	600	Good	Fair	Medium		7.20	2.67	58.19	yes	High >20%	Impact:	Remove	
16	*Afrocarpus falcata*	12	7	700	Good	Fair	Medium		8.40	2.85	72.70	yes	High >20%	Impact:	Remove	
17	*Liquidambar styraciflua*	12	7	650	Good	Fair	Low		7.80	2.76	90.13	yes	High >20%	Impact:	Remove	
18	*Agonis flexuosa*	7	4	500	Poor	Poor	Low		6.00	2.47	61.36	yes	High >20%	Impact:	Remove	Bracket fungi present.
20	*Casuarina glauca*	13	7	560	Fair	Good	Medium		6.72	2.59	100.00	yes	High >20%	Impact:	Remove	

Tree ID	Botanical Name	Height (m)	Spread (m)	Diameter at Breast Height (DBH)	Health	Structure	Retention Value	Street Tree	TPZ	SRZ	TPZ encroachment (%)	SRZ encroachment (Y/N)	Impact		Proposed Action	Comment
22	*Cedrus deodara*	7	6	500	Fair	Fair	Low		6.00	2.47	100.00	yes	High >20%	Impact:	Remove	
22a	*Allocasuarina gymnanthera*	6	8	461	Poor	Poor	Low		5.53	2.39	95.72	yes	High >20%	Impact:	Remove	Approx. 80 - 90% of branches dead.
23	*Populus nigra*	12	6	800	Poor	Fair	Low		9.60	3.01	100.00	yes	High >20%	Impact:	Remove	
25	*Tristaniopsis laurina*	5	3	241	Fair	Poor	Low		2.89	1.82	74.73	yes	High >20%	Impact:	Remove	
25a	*Tristaniopsis laurina*	5	3	241	Fair	Poor	Low		2.89	1.82	81.52	yes	High >20%	Impact:	Remove	
25b	*Tristaniopsis laurina*	5	3	241	Fair	Poor	Low		2.89	1.82	74.80	yes	High >20%	Impact:	Remove	
26a	*Lagerstroemia indica*	3	3	390	Good	Fair	Low		4.68	2.23	100.00	yes	High >20%	Impact:	Remove	
28	*Celtis australis*	11	6	800	Fair	Poor	Low		9.60	3.01	100.00	yes	High >20%	Impact:	Remove	
29	*Eucalyptus microcorys*	16	5	650	Good	Fair	Medium		7.80	2.76	100.00	yes	High >20%	Impact:	Remove	
30	*Celtis australis*	14	6	700	Fair	Fair	Low		8.40	2.85	100.00	yes	High >20%	Impact:	Remove	
31	*Celtis australis*	14	7	800	Good	Poor	Low		9.60	3.01	98.09	yes	High >20%	Impact:	Remove	
32	*Populus nigra*	14	3	800	Fair	Fair	Low		9.60	3.01	100.00	yes	High >20%	Impact:	Remove	
33	*Jacaranda mimosifolia*	11	6	500	Poor	Poor	Low		6.00	2.47	100.00	yes	High >20%	Impact:	Remove	
34	*Phoenix canariensis*	5	3	450	Poor	Poor	Low		2.50	0.00	100.00		High >20%	Impact:	Remove	Palm (no SRZ)
35	*Celtis australis*	10	5	400	Poor	Poor	Low		4.80	2.25	100.00	yes	High >20%	Impact:	Remove	
36	*Ficus benjamina*	10	5	900	Fair	Poor	Low		10.80	3.17	100.00	yes	High >20%	Impact:	Remove	
37	*Ficus rubiginosa*	11	6	700	Fair	Fair	Medium		8.40	2.85	100.00	yes	High >20%	Impact:	Remove	
38	*Phoenix canariensis*	6	4	600	Fair	Fair	Low		3.00	0.00	100.00		High >20%	Impact:	Remove	Palm (no SRZ)
39	*Celtis australis*	14	6	600	Fair	Poor	Low		7.20	2.67	100.00	yes	High >20%	Impact:	Remove	

Tree ID	Botanical Name	Height (m)	Spread (m)	Diameter at Breast Height (DBH)	Health	Structure	Retention Value	Street Tree	TPZ	SRZ	TPZ encroachment (%)	SRZ encroachment (Y/N)	Impact	Proposed Action	Comment
41	*Platanus x acerifolia*	16	21	700	Good	Good	High	Yes	8.40	2.85	0.00		No Impact: 0%	Retain	
42	*Melaleuca quinquenervia*	11	5	470	Good	Fair	High	Yes	5.64	2.41	0.00		No Impact: 0%	Retain	Co dominant at 1.5m, overshadowed by plane tree. Streetwise lowest branch is approximately 4.5m above ground.
43	*Melaleuca quinquenervia*	13	11	760	Good	Fair	High	Yes	9.12	2.95	32.92	yes	High Impact: >20%	Remove	Multiple branching at 2.5m. Streetside lowest branch is approximately 4.5m above ground.
44	*Platanus x acerifolia*	13	15	600	Good	Good	High	Yes	7.20	2.67	30.61	yes	High Impact: >20%	Remove	Streetside lowest branch is approximately 5m above ground.
44a	*Celtis sinensis*	10	8	275	Good	Fair	Low		3.30	1.92	88.55	yes	High Impact: >20%	Remove	
44b	*Celtis sinensis*	10	8	275	Good	Fair	Low		3.30	1.92	100.00	yes	High Impact: >20%	Remove	
45	*Melaleuca quinquenervia*	12	12	770	Good	Fair	High	Yes	9.24	2.97	36.53	yes	High Impact: >20%	Remove	Co dominant at 2m. Streetside lowest branch is approximately 6m above ground.
46	*Platanus x acerifolia*	10	13	390	Good	Good	High	Yes	4.68	2.23	21.27	yes	High Impact: >20%	Remove	Some internal canopy pruning. Streetside lowest branch is approximately 5m above ground.
47	*Melaleuca quinquenervia*	14	12	640	Good	Fair	High	Yes	7.68	2.74	30.12	yes	High Impact: >20%	Remove	Multismmed at 3m. Large scar pedestrian side at base. Streetside lowest branch is approximately 5m above ground.
48	*Melaleuca quinquenervia*	13	11	710	Good	Fair	High	Yes	8.52	2.87	38.87	yes	High Impact: >20%	Remove	Streetside lowest branch is approximately 5m above ground.

Tree ID	Botanical Name	Height (m)	Spread (m)	Diameter at Breast Height (DBH)	Health	Structure	Retention Value	Street Tree	TPZ	SRZ	TPZ encroachment (%)	SRZ encroachment (Y/N)	Impact		Proposed Action	Comment
49	*Melaleuca quinquenervia*	9	12	890	Good	Fair	High	Yes	10.68	3.15	23.96	yes	High >20%	Impact:	Remove	Co dominant at 1.5m. Streetside lowest branch is approximately 5m above ground.
50	*Cupaniopsis anacardioides*	8	15	520	Good	Fair	High	Yes	6.24	2.51	12.52		Medium <20%	Impact:	Retain with mitigation measures	No overhanging branches. Possum boxes in tree. Fluting of stem. Potential included bark in branch junction at 2m.
51	*Melaleuca quinquenervia*	15	19	920	Good	Fair	High	Yes	11.04	3.20	19.86		Medium <20%	Impact:	Retain with mitigation measures	Scar on pedestrian side at 1m. Streetside lowest branch is approximately 5m above ground.
52	*Melaleuca quinquenervia*	16	21	1010	Good	Fair	High	Yes	12.12	3.32	34.32	yes	High >20%	Impact:	Remove	Two scars at 2m on pedestrian side. Streetside lowest branch is approximately 4.5m above ground.
53	*Melaleuca quinquenervia*	6	12	470	Poor	Fair	High	Yes	5.64	2.41	16.92		Medium <20%	Impact:	Remove	Dead.
54	*Melaleuca quinquenervia*	16	18	1840	Good	Fair	High	Yes	15.00	4.28	32.86	yes	High >20%	Impact:	Remove	Co dominant from base. Fine organic matter at base of trunk, including beetle tunnels. Streetside lowest branch is approximately 5m above ground.
55	*Eucalyptus microcorys*	15	6	650	Good	Fair	Medium		7.80	2.76	69.08	yes	High >20%	Impact:	Remove	
56	*Eucalyptus microcorys*	10	4	450	Good	Fair	Medium		5.40	2.37	89.98	yes	High >20%	Impact:	Remove	
56a	*Celtis sinensis*	5	6	283	Good	Fair	Low		3.40	1.95	43.15	yes	High >20%	Impact:	Remove	
57	*Celtis australis*	12	11	700	Poor	Poor	Low		8.40	2.85	89.13	yes	High >20%	Impact:	Remove	

Tree ID	Botanical Name	Height (m)	Spread (m)	Diameter at Breast Height (DBH)	Health	Structure	Retention Value	Street Tree	TPZ	SRZ	TPZ encroachment (%)	SRZ encroachment (Y/N)	Impact	Proposed Action	Comment
59b	*Syzygium australe*	5	3	242	Good	Fair	Medium		2.90	1.82	100.00	yes	High Impact: >20%	Remove	
59c	*Syzygium australe*	5	3	242	Good	Fair	Medium		2.90	1.82	66.35	yes	High Impact: >20%	Remove	
60	*Syzygium australe*	9	7	452	Good	Fair	Medium		5.42	2.37	50.18	yes	High Impact: >20%	Remove	
60a	*Syzygium australe*	9	7	452	Good	Fair	Medium		5.42	2.37	50.86	yes	High Impact: >20%	Remove	
60b	*Celtis sinensis*	6	6	292	Good	Fair	Low		3.50	1.97	39.71	yes	High Impact: >20%	Remove	
101	*Pistacia chinensis*	5	6	120	Good	Fair	High	Yes	2.00	1.50	0.00		No Impact: 0%	Retain	Co dominant at 1.8m. Tear out on roadside. Streetside lowest branch is approximately 3m above ground.
103	*Melaleuca quinquenervia*	7	5	500	Good	Fair	High	Yes	6.00	2.47	0.00		No Impact: 0%	Retain	Major pruning at 1.8m, suppressed by plane tree. Streetside lowest branch is approximately 4.5m above ground.
105	*Waterhousea floribunda*	6	6	190	Good	Fair	High	Yes	2.00	1.65	0.00		No Impact: 0%	Retain	Minor pruning. Streetside lowest branch is approximately 2.5m above ground.
108	*Fraxinus griffithii*	7	5	360	Good	Fair	High	Yes	4.32	2.15	0.00		No Impact: 0%	Retain	Co dominant at 1m. Streetside lowest branch is approximately 4m above ground.
109	*Fraxinus griffithii*	7	6	330	Good	Fair	High	Yes	3.96	2.08	1.28		Low Impact: <10%	Retain	No branches overhanging street. Surface root damage. Scars on pedestrian side.
110	*Melaleuca styphelioides*	6	8	660	Good	Fair	High	Yes	7.92	2.78	10.20		Medium Impact: <20%	To be removed by Council	Old pruning wound roadside. Large scar roadside 1m up. Co dominant at 1.2m.

Appendix C Tree retention assessment method

C1 Tree Significance Assessment Criteria - STARS©

Low	Medium	High
The tree is in fair-poor condition and good or low vigour.	The tree is in fair to good condition	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.		
The tree is an environmental pest species due to its invasiveness or poisonous/allergenic properties.		
The tree is a declared noxious weed by legislation		

C2 Matrix assessment

		Tree significance				
		High	Medium	Low		
Useful Life Expectancy	Long >40 years					
	Medium 15-40 years					
	Short <1-15 years					
	Dead					

Legend:

	Priority for retention (High): Tree considered important 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.
	Consider for removal (Low): Tree not considered important for retention, nor requiring special works or design modification to be implemented for their retention.

Appendix D Tree protection guidelines

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

D1 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 the commencement of works.
- Prominently signposted with 300mm x 450mm boards stating “NO ACCESS - TREE PROTECTION ZONE”.

D2 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.

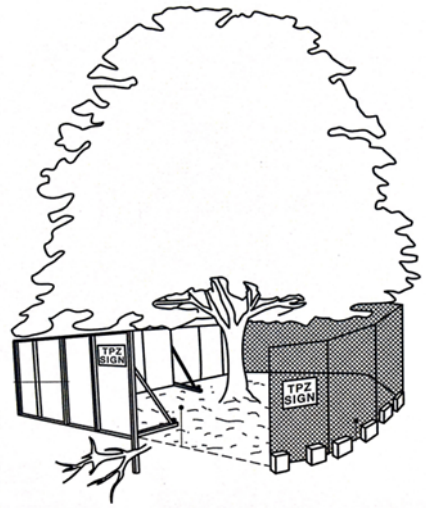
D3 Trunk protection

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

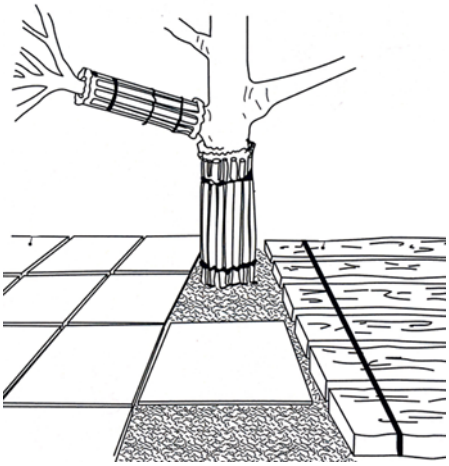
The removal of bark or branches allows the potential ingress of micro-organisms which may cause decay. Furthermore, the removal of bark restricts the trees’ ability to distribute water, mineral ions (solutes), and glucose.

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

D4 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. Ground protection may include a permeable membrane such as geotextile fabric beneath a layer of mulch, 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.

D5 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.

D6 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). The horizontal drilling/boring must be at minimum depth of 600 mm below grade. Trenching for services is to be regarded as "excavation".

Appendix E Site photo

Figure 9. Photo of the tree proposed to be removed by Council.

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