TREE SURVEY
ARBORICULTURAL CONSULTANTS

ARBORICULTURAL IMPACT ASSESSMENT & TREE PROTECTION PLAN

54 Bardo Road, Newport

Version 1

Prepared for:

Built Property

3 September 2020

Document information

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Document status

Document status	Date	Revision description
Version 1	03/09/20	Final version

Abbreviations

Abbreviation	Description
AQF	Australian Qualifications Framework
AS	Australian Standards
DBH	Diameter at Breast Height
Id	Identification
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

Contents

1 Background

1.1 Introduction

Tree Survey was commissioned by Built Property to prepare an Arboricultural Impact Assessment (AIA) and Tree Protection Plan (TPP) for a proposed development at 54 Bardo Road, Newport.

The purpose of this report is to:

- Identify the trees within and adjacent to the proposed disturbance footprint.
- Assess the current health and condition of the subject trees.
- Assess the potential impacts of the development on the subject trees.
- Evaluate the significance of the subject trees and assess their suitability for retention.

1.2 The proposal

The key features of the proposal are summarised as follows:

- Construction of six (6) proposed dwellings (seniors housing).
- Basement car parking and associated landscaping.

1.3 Site conditions

The subject site comprises approximately 1220m^2 of residential property. The site is located on sandy-loam soils with locally native trees, introduced shrubs, and ground covers. The site has a steady gradient of approximately 5-10 degrees and slopes towards the south (south aspect).

1.4 Documents and plans referenced

The conclusions and recommendations of this report are based on the Australian Standard, AS 4970-2009, Protection of Trees on Development Sites, the findings from the site inspections, and analysis of the following documents/plans:

- Site Survey Plan prepared by C & A Surveyors, dated 06/08/20.
- Architectural Plans prepared by Giles Tribe, dated 01/09/20.
- Stormwater Plan prepared by LOKA Consulting Engineers, dated 01/09/20.

The site plan and survey plan have been used as map layers in the **Arboricultural Impact Assessment** and **Tree Protection Plan**.

1.5 The subject trees

The subject trees were inspected on the 27th of August 2020. A total of **17** trees were assessed and included in this report. The subject trees were assessed in accordance with a visual tree assessment (VTA) as formulated by Mattheck & Breloer (1994)[1], and practices consistent with modern arboriculture. The following limitations apply to this methodology:

- Trees were inspected from ground level, without the use of any invasive or diagnostic tools and testing. Trees within adjacent properties or restricted areas were not subject to a complete visual inspection (i.e., defects and abnormalities may be present but not recorded).
- Diameter at breast height (DBH) has been accurately measured using a diameter tape. Tree height and canopy spread were estimated unless otherwise stated.
- Tree protection zones have been calculated in accordance with Australian Standard, AS 4970-2009, Protection of Trees on Development Sites using the DBH measurements.

A tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Aboriculturalists (IACA) Significance of a Tree, Assessment Rating System (see **Appendix I**). Further information, observations, and measurements specific to each of the subject trees can be found in **Chapter 3**.

1.6 Council tree preservation

All trees contained within this report are protected under the conditions prescribed within the Pittwater Council - Development Control Plan (DCP) 2014.

[1] VTA is an internationally recognised practice in the visual assessment of trees as formulated by Mattheck & Breloer (1994). Principle explanations and illustrations are contained within the publication, Field Guide for Visual Tree Assessment by Mattheck, C., and Breloer, H. Arboricultural Journal, Vol 18 pp 1-23 (1994).

2 Arboricultural Impact Assessment (AIA)

2.1 Impact assessment

There are two types of zones (as defined by AS 4970-2009) that need to be considered when undertaking an arboricultural impact assessment:

- **Tree protection zone (TPZ):** The TPZ is the optimal combination of crown and root area (as defined by AS 4970-2009) that requires protection during the construction process so that the tree can remain viable. The TPZ is calculated by measuring the diameter at breast height (DBH) and multiplying it by twelve (12). The resulting value is applied as a radial measurement from the centre of the trunk to delineate the TPZ.
- **Structural root zone (SRZ):** The SRZ is the area of the root system used for stability, mechanical support, and anchorage of the tree.

Encroachment within the TPZ is acceptable, providing that the arborist can demonstrate that the tree will remain viable. There are three (3) levels of encroachment (as defined by AS 4970-2009):

- **No encroachment (0%): No encroachment within the TPZ.**
- **Minor encroachment (<10%): The encroachment is less than 10% of the TPZ.**
- **Major encroachment (>10%): The encroachment is greater than 10% of the TPZ.**

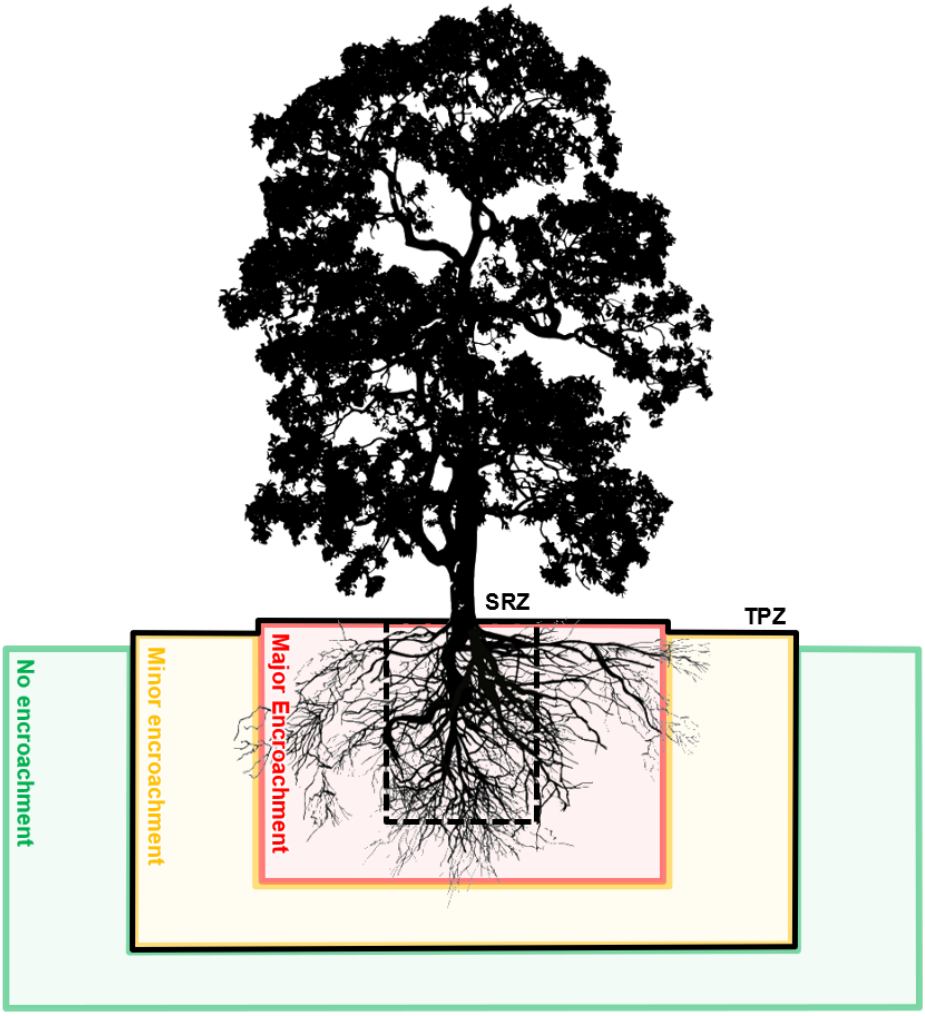


Figure 1: Indicative zones of encroachment within the TPZ

2.2 Mitigating the impacts

Encroachment within the TPZ should be compensated with a range of mitigation measures to ensure that impacts to the subject tree(s) are reduced or restricted wherever possible. Mitigation should be increased relative to the level of encroachment within the TPZ to ensure the subject tree(s) remain viable. The table below outlines requirements under AS 4970-2009, and mitigation measures required within each category of encroachment. These mitigation measures will only apply if trees are proposed to be retained.

Table 1: Mitigation measures

Encroachment	Mitigation Measures
No encroachment (0%)	• N/A
Minor encroachment (<10%)	• The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • Detailed root investigations should not be required. • Tree protection must be installed.
Major encroachment (>10%)	• The project arborist must demonstrate the tree(s) would remain viable. • Root investigation by non-destructive methods may be required for any trees proposed for retention. • Consideration of relevant factors, including root location and distribution, tree species, condition, site constraints, and design factors. • The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • The project arborist will be required to supervise any works within the TPZ. • Tree protection must be installed.

3 Results

Table 2 shows the results of the arboricultural assessment. Key points are:

3.1 Trees proposed for retention

No encroachment (0%): No likely or foreseeable encroachment within the TPZ:

- A total of **5** trees **(Tree 2, 3, 10, 16, 17)** are located outside of the proposed construction footprint. No impacts on these trees are foreseeable under the current proposal.

Minor encroachment (<10%): The proposed encroachment is less than 10% of the TPZ:

- No trees will be subject to a minor encroachment of less than 10% within the TPZ.

Major encroachment (>10%): The proposed encroachment is greater than 10% of the TPZ:

- A total of **4** trees **(Tree 4, 11, 12, 13)** will be subject to an encroachment greater than 10% within the TPZ. These trees are recommended for retention under the current proposal:
    - **Tree 4** will be subject to an encroachment of **22%** within the TPZ. The encroachment is caused by one conflict in the north-western quadrant of the TPZ. This conflict will have a negligible impact on the SRZ and overall TPZ. Several mitigations for this encroachment have been outlined in **Chapter 4**. Under the current proposal, this tree can be successfully retained.
    - **Tree 11, 12, 13** will be subject to encroachments between **28%** and **48%** within the TPZ. The encroachment is primarily a result of the conflict between the basement parking and the TPZ. All three trees are located in the central rear portion of the block. The location of the trees and the size of the TPZ has significantly restricted basement layout options that would allow for the viable retention of the trees. The currently proposed design has incorporated several mitigations and design modifications that will significantly reduce impacts on the subject trees:
        - The basement floor plan has been set back a considerable distance beyond the SRZ, ensuring that no excavations or impacts will occur within the structural root zone of the trees.
        - The ground floor slab that extends beyond the basement floor into the TPZ will utilise a suspended slab design. This will minimise soil disturbance and impacts on the roots of the trees.
        - All pathways within the TPZ will be installed at or above the existing grade and utilise a tree-sensitive design such as suspended timber decking or permeable materials.

      Several additional site-specific tree protection measures are outlined in **Chapter 4** to ensure these trees remain viable. Through implementing these mitigations, these trees can be successfully retained.

3.2 Trees proposed for removal

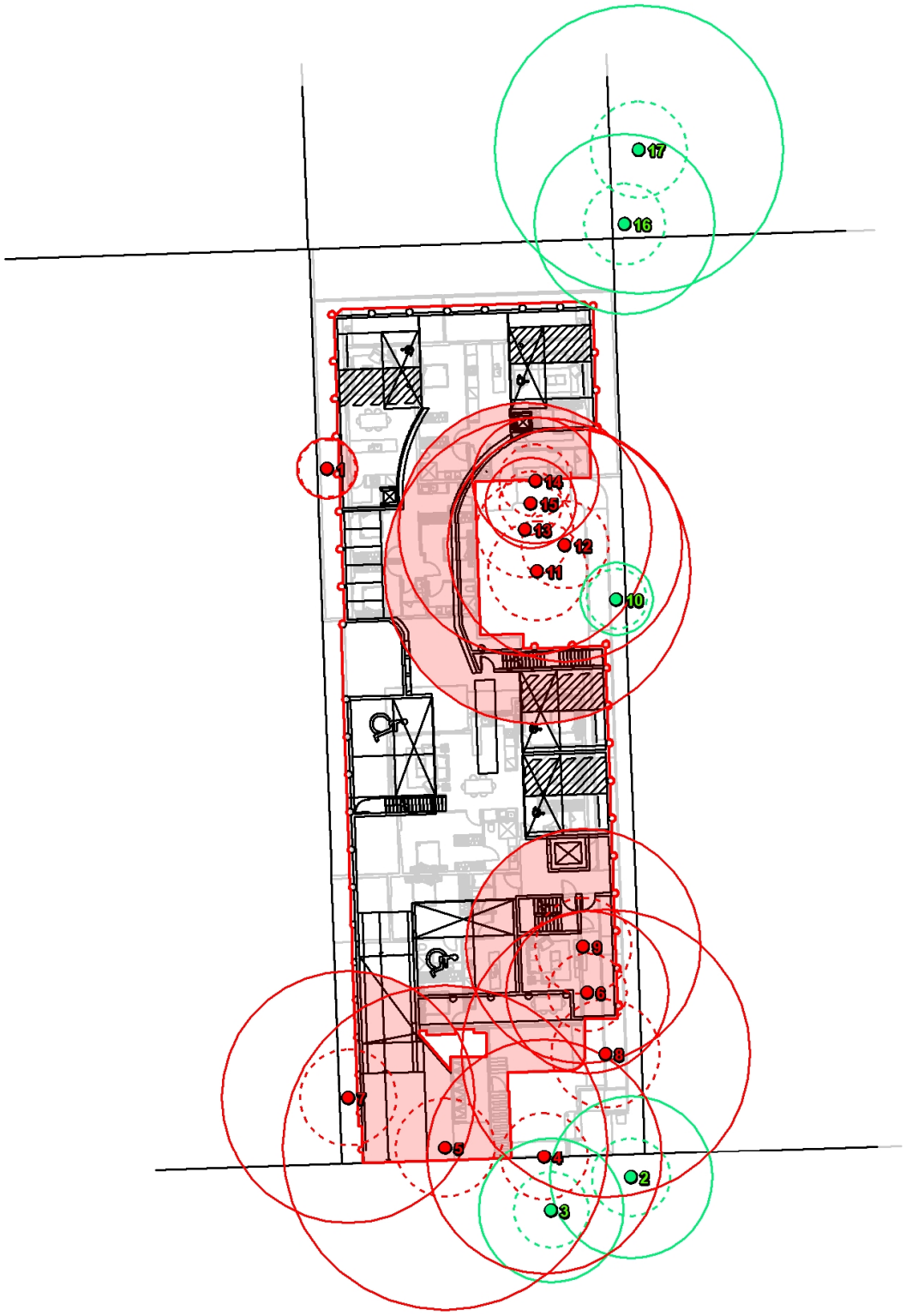
Major encroachment (>10%): The proposed encroachment is greater than 10% of the TPZ:

- A total of **8** trees **(Tree 1, 5, 6, 7, 8, 9, 14, 15)** will be subject to an encroachment of greater than 20% within the TPZ. These trees are located within or directly adjacent to the proposed construction footprint and cannot be retained under the current proposal.

Table 2: Results of the arboricultural assessment

Id.	Botanical name	Height (metres)	Spread (metres diameter)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (millimetres diameter)	DBH 2 (millimetres diameter)	DBH 3 (millimetres diameter)	DBH Combined (millimetres diameter)	DRB (millimetres diameter)	TPZ (metres radius)	SRZ (metres radius)	Encroachment	% Encroachment within TPZ	Other notes	Proposal
1	*Fraxinus griffithii*	4	4	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	250	2.0	1.9	**Major**	**26%**		**Remove**
2	*Syncarpia glomulifera*	12	6	Good	Good	Mature	High	Medium	High	450	-	-	450	550	5.4	2.6	**No**	**0%**		**Retain**
3	*Eucalyptus crebra*	14	8	Good	Fair	Mature	Medium	Medium	High	400	-	-	400	500	4.8	2.5	**No**	**0%**	Tree is growing on a lean	**Retain**
4	*Eucalyptus punctata*	24	16	Good	Good	Mature	High	Medium	High	650	-	-	650	750	7.8	2.9	**Major**	**22%**		**Retain**
5	*Syncarpia glomulifera*	16	12	Good	Good	Mature	High	Medium	High	450	750	-	900	1000	10.8	3.3	**Major**	**33%**		**Remove**
6	*Acer palmatum*	5	7	Good	Good	Semi-mature	Low	Medium	Low	450	-	-	450	550	5.4	2.6	**Major**	**64%**		**Remove**
7	*Syncarpia glomulifera*	16	16	Good	Good	Mature	High	Medium	High	400	600	-	700	900	8.4	3.2	**Major**	**36%**		**Remove**
8	*Syncarpia glomulifera*	22	14	Good	Good	Mature	High	Medium	High	400	450	600	800	1200	9.6	3.6	**Major**	**32%**		**Remove**
9	*Eucalyptus botryoides*	16	16	Good	Good	Mature	High	Medium	High	650	-	-	650	900	7.8	3.2	**Major**	**64%**		**Remove**
10	*Banksia serrata*	4	5	Fair	Fair	Semi-mature	Low	Medium	Low	200	-	-	200	300	2.4	2.0	**No**	**0%**	Tree is growing on a lean	**Retain**
11	*Syncarpia glomulifera*	16	16	Good	Good	Mature	High	Medium	High	850	-	-	850	1000	10.2	3.3	**Major**	**48%**		**Retain**
12	*Eucalyptus botryoides*	28	16	Good	Good	Mature	High	Medium	High	650	-	-	650	750	7.8	2.9	**Major**	**22%**		**Retain**
13	*Syncarpia glomulifera*	20	16	Good	Good	Mature	High	Medium	High	700	-	-	700	900	8.4	3.2	**Major**	**45%**		**Retain**
14	*Syncarpia glomulifera*	10	7	Good	Fair	Semi-mature	Low	Medium	Low	350	-	-	350	450	4.2	2.4	**Major**	**48%**	The tree has developed a suppressed canopy and significant lean.	**Remove**
15	*Syncarpia glomulifera*	10	7	Good	Fair	Semi-mature	Low	Medium	Low	250	-	-	250	350	3.0	2.1	**Major**	**19%**	The tree has developed a suppressed canopy and significant lean.	**Remove**
16	*Eucalyptus botryoides*	30	12	Good	Good	Mature	High	Medium	High	500	-	-	500	600	6.0	2.7	**No**	**0%**		**Retain**
17	*Eucalyptus crebra*	32	20	Good	Good	Mature	High	Medium	High	800	-	-	800	900	9.6	3.2	**No**	**0%**		**Retain**

Arboricultural Impact Assessment



Legend

The subject trees
- No encroachment
- Minor encroachment
- Major encroachment

Protection zones
- TPZ (continuous line)
- SRZ (dashed line)
- Encroachment (shaded area)

Other items
- Basement plan
- Ground floor plan
- Disturbance footprint

0 3.5 7 14 Meters

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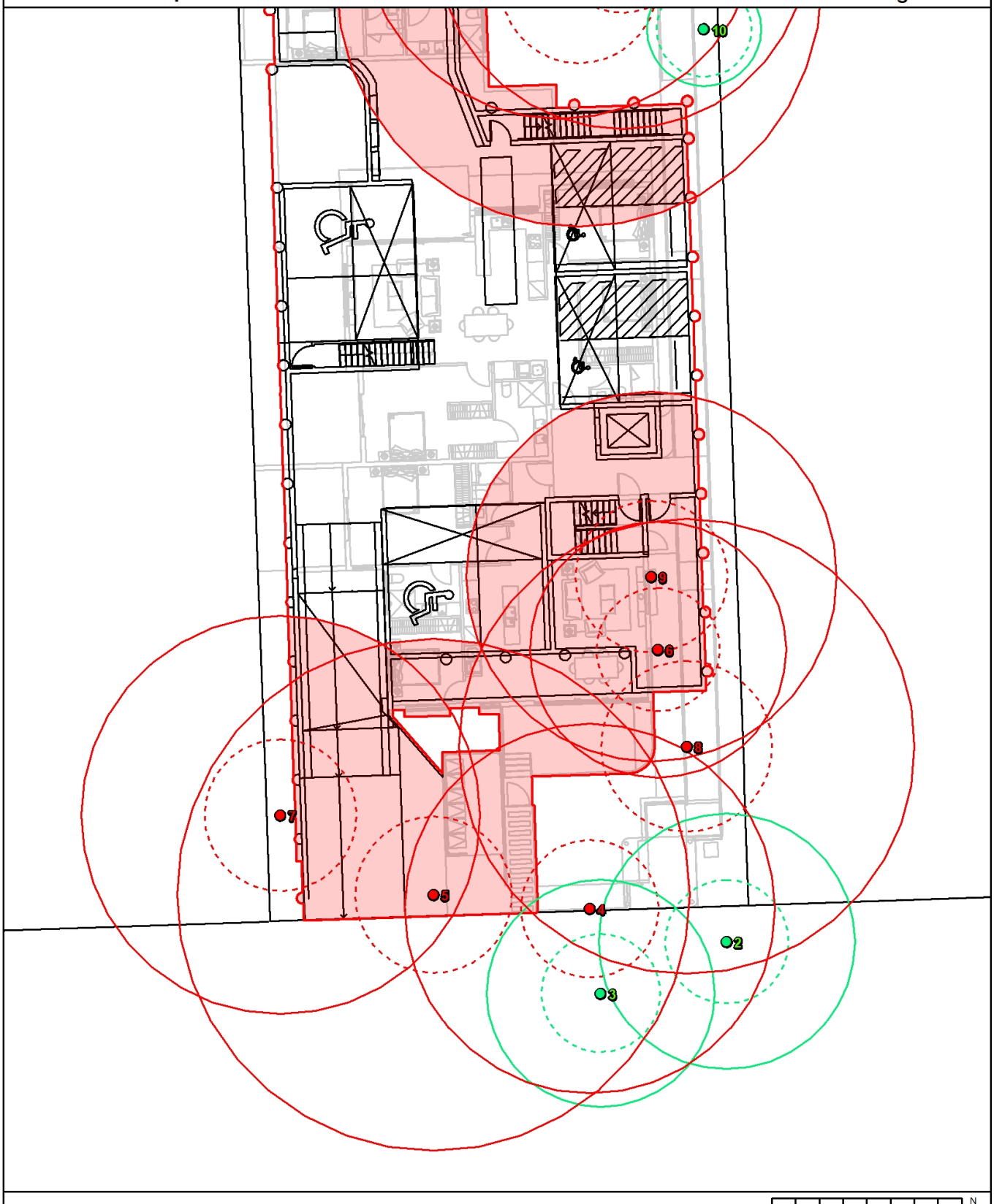
Arboricultural Impact Assessment



Legend

The subject trees
- No encroachment
- Minor encroachment
- Major encroachment

Protection zones
- TPZ (continuous line)
- SRZ (dashed line)
- Encroachment (shaded area)

Other items
- Basement plan
- Ground floor plan
- Disturbance footprint

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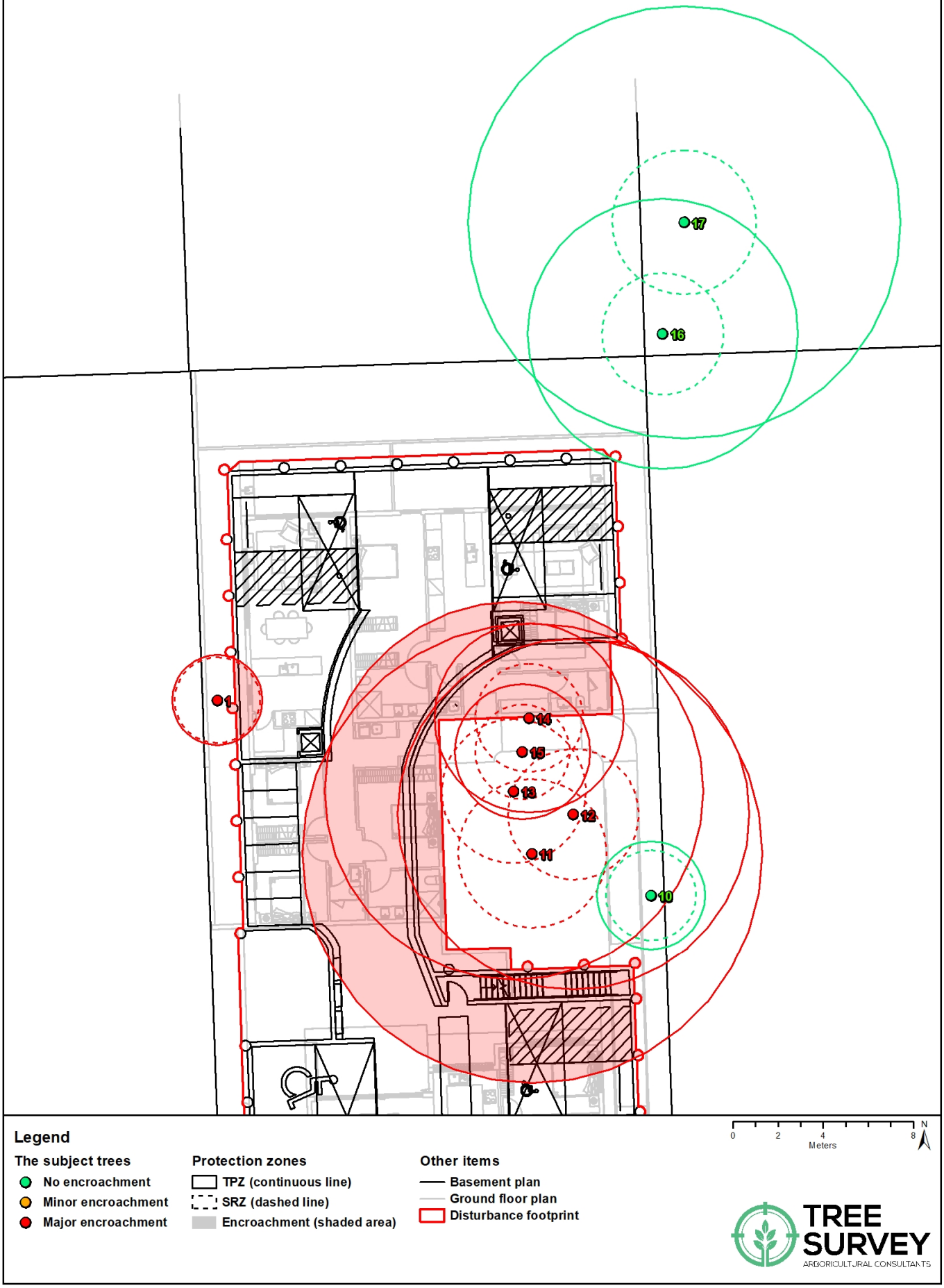
Arboricultural Impact Assessment



Legend

The subject trees
- No encroachment
- Minor encroachment
- Major encroachment

Protection zones
- TPZ (continuous line)
- SRZ (dashed line)
- Encroachment (shaded area)

Other items
- Basement plan
- Ground floor plan
- Disturbance footprint

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4 Tree Protection Plan (TPP)

4.1 Standard tree protection measures

Trees proposed for retention: A total of **9** trees are proposed for retention. The following recommendations apply to these trees:

- **Tree protection fencing:** Tree protection fencing must be established at the locations shown in the tree protection plan. Existing fencing, site hoarding, or structures (such as a wall or building) may be used as tree protection fencing, providing the TPZ remains isolated from the construction footprint. Specifications for the tree protection fencing are as follows:
  - Temporary mesh panel fencing (minimum height 1.8m).
  - Installed prior to site establishment and remain intact until the completion of works.
  - Protective fencing must not be removed or altered without the approval of the project arborist.
  - Prominently signposted with 300mm x 450mm boards stating, “NO ACCESS - TREE PROTECTION ZONE.”
  - Certified and inspected by the project arborist.

  Where approved works are required within the TPZ, fencing may be setback to provide construction access. Trunk, branch, and ground protection shall be installed and must comply with Australian Standard, AS 4970-2009, Protection of Trees on Development Sites. Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist.
- **Trunk protection:** Trunk protection must be installed on trees, as shown in the tree protection plan. Trunk protection shall be installed to avoid accidental mechanical damage. Specifications for trunk protection are as follows:
  - A thick layer of carpet underfelt, geotextile fabric, or similar wrapped around the trunk to a minimum height of 2m.
  - 1.8m lengths of softwood timbers aligned vertically and spaced evenly around the trunk (with a small gap of approximately 50mm 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.
  - Certified and inspected by the project arborist.
- **Site inspections:** In accordance with the Australian Standard, AS 4970-2009, Protection of Trees on Development Sites, inspections must be conducted by the project arborist at the following key project stages:
  - **Prior to construction:** Prior to any work commencing on-site (including demolition, earthworks, or site clearing) and following the installation of tree protection.
  - **During construction:** A minimum of once per month during the construction phase.
  - **After construction:** After all major construction has ceased, following the removal of tree protection.

4.2 Site-specific tree protection measures

The following tree protection measures relate specifically to **Tree 4, 11, 12, 13:**

- **Arborist supervision:** Excavation within the tree protection zone of **Tree 4, 11, 12, 13** should be carried out under the supervision of the project arborist (see **Tree Protection Plan**).
- **Pedestrian pathways:** All pathways within the TPZ must be installed at or above the existing grade and utilise a tree-sensitive design such as suspended timber decking or permeable materials (such as permeable paving, porous asphalt, crushed sandstone, or rock). Porous material will allow oxygen and water to access the root system of the tree, increasing gaseous exchange, and uptake of solutes. Grading within the TPZ must be limited to 50mm below the existing grade.
- **Excavations:** No over-excavation, battering, or benching shall be undertaken beyond the footprint of any structure unless approved by the project arborist.

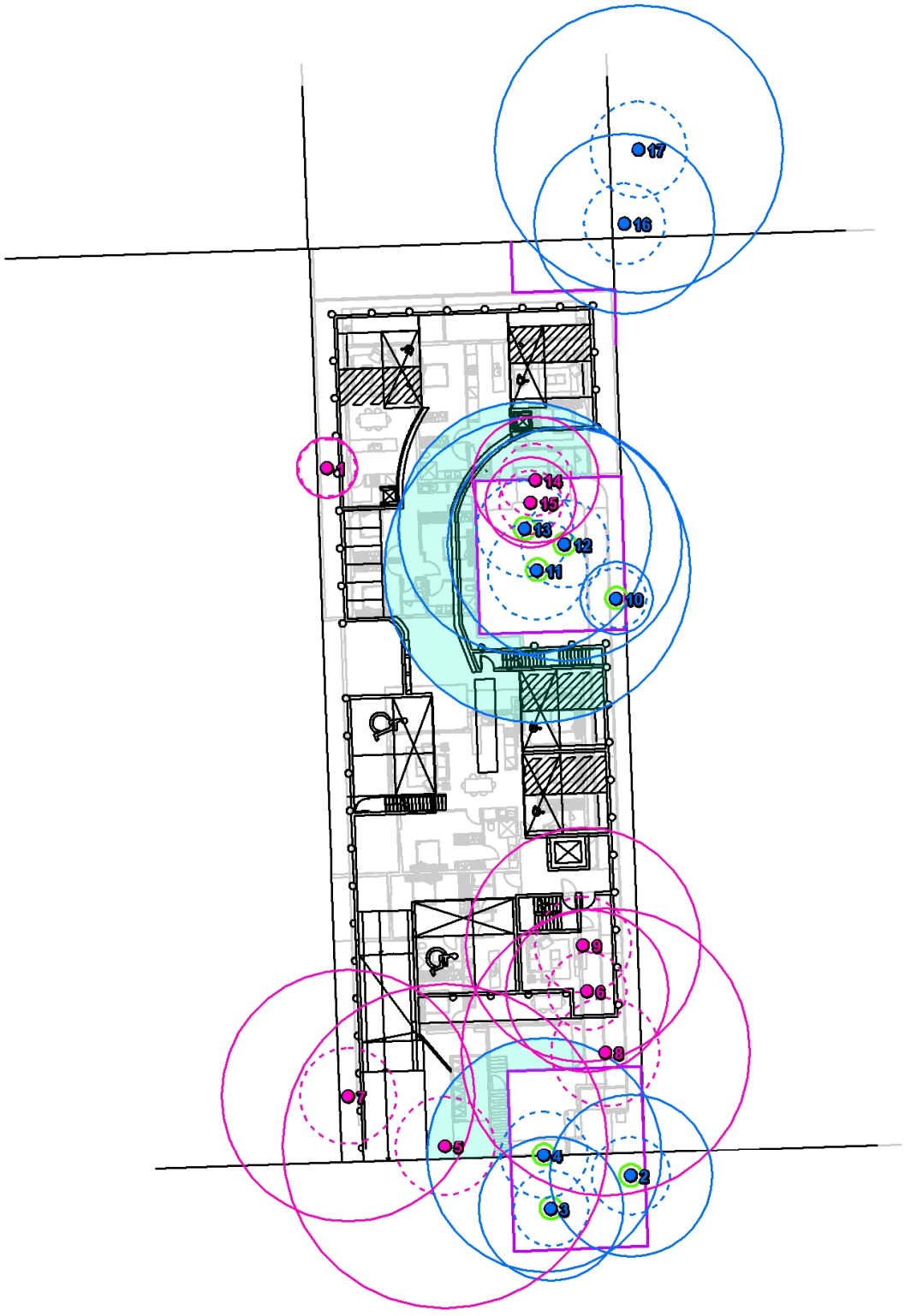
4.3 Trees proposed for removal

Trees proposed for removal: A total of **8** trees are proposed for removal. Any loss of trees should be offset with replacement planting at a ratio of 1:1, or as recommended by Northern Beaches Council. Examples of suitable replacement species are included below:

- *Acmena smithii* (Lillypilly)
- *Angophora hispida* (Dwarf Apple)
- *Banksia integrifolia* (Coastal Banksia)
- *Banksia serrata* (Old Man Banksia)
- *Callicoma serratifolia* (Black Wattle)
- *Callistemon salignus* (Willow Bottlebrush)
- *Ceratopetalum apetalum* (Coachwood)
- *Ceratopetalum gummiferum* (Christmas Bush)
- *Elaeocarpus reticulatus* (Blueberry Ash)
- *Melaleuca linariifolia* (Snow in Summer)
- *Melaleuca stylphelioides* (Prickly-leaved Paperbark)
- *Syzygium paniculatum* (Magenta Cherry)
- *Tristaniopsis laurina* (Water Gum)

All tree removal work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture, in accordance with Australian Standard AS 4373-2007, Pruning of Amenity Trees, the Work Health and Safety Act 2011, and Work Health and Safety Regulations 2017.

Tree Protection Plan



Legend

The subject trees
- Retain
- Remove

Protection zones
- TPZ (continuous line)
- SRZ (dashed line)

Tree protection mitigation
- Arborist supervision
- Trunk protection
- Tree protection fence

Other items
- Basement plan
- Ground floor plan

0 3.5 7 14 Meters

N

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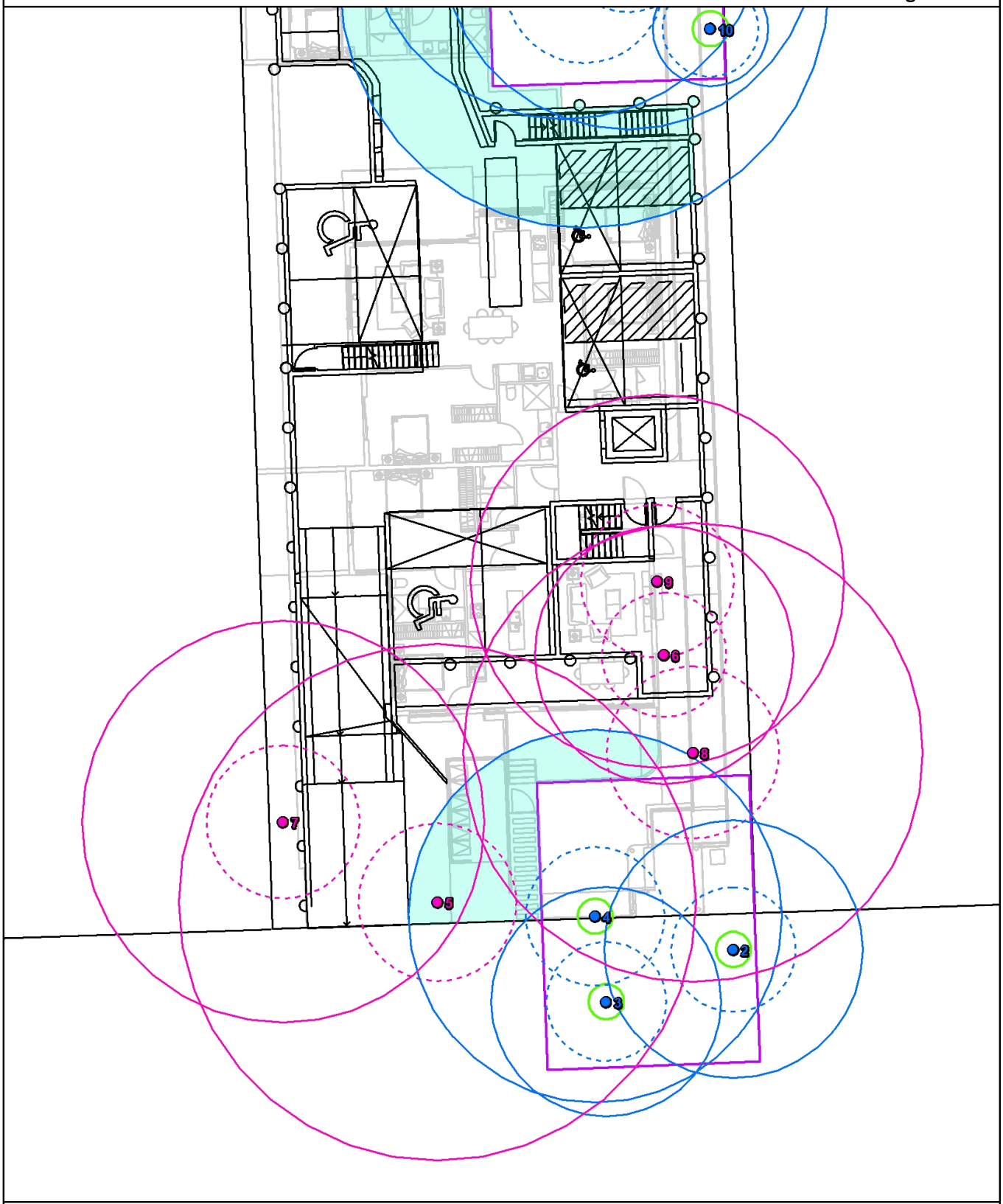
Tree Protection Plan



Legend

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- Remove

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- Tree protection fence

Other items
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- Ground floor plan

0 2 4 8 Meters N

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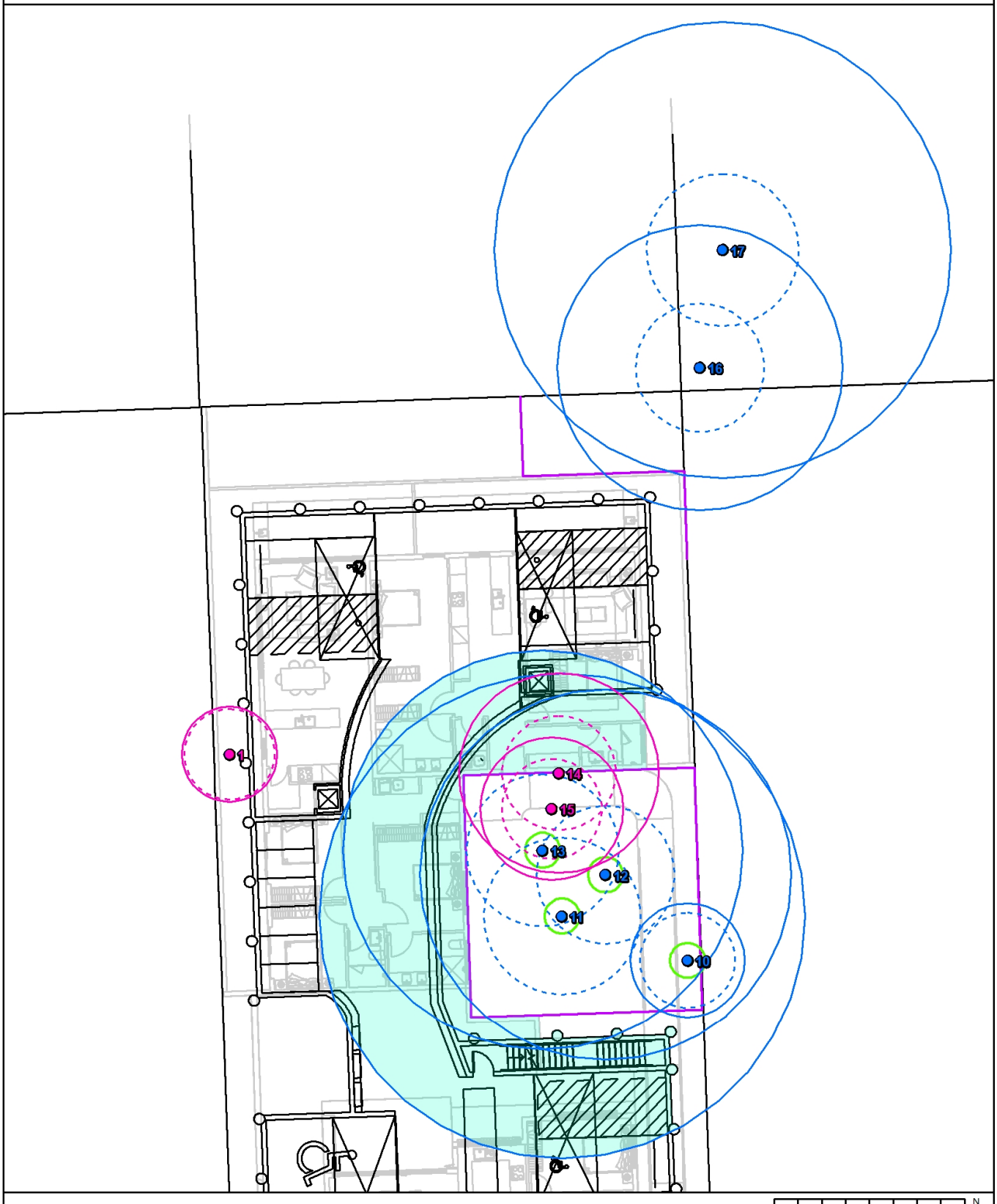
Tree Protection Plan



Legend

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Tree protection mitigation
- Arborist supervision
- Trunk protection
- Tree protection fence

Other items
- Basement plan
- Ground floor plan

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Appendix I **- STARS© assessment matrix**

The retention value of a tree or group of trees is determined using a combination of environmental, cultural, physical, and social values.

- **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 affecting the proposed building/works, and all other alternatives have been considered and exhausted.
- **High:** These trees are considered important for retention 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, AS4970-2009 Protection of trees on development sites.

This tree retention assessment has been undertaken in accordance with the Institute of Australian Consulting Aboriculturalists (IACA) Significance of a Tree, Assessment Rating System (STARS). The system uses a scale of High, Medium, and Low significance in the landscape. Once the landscape significance of a tree has been defined, the retention value can be determined. Each tree must meet a minimum of three (3) assessment criteria to be classified within a category.

Tree Significance - Assessment Criteria

Low Significance	Medium Significance	High Significance
The tree is in fair-poor condition and good or low vigour. The tree has form atypical of the species The tree is not visible or is partly visible from the surrounding properties or obstructed by other vegetation or buildings The tree provides a minor contribution or has a negative impact on the visual character and amenity of the local area 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'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 is listed as exempt under the provisions of the local Council Tree Preservation Order or similar protection mechanisms The tree has a wound or defect that has the potential to become structurally unsound.	The tree is in fair to good condition The tree has form typical or atypical of the species The tree is a planted locally indigenous or a common species with its taxa commonly planted in 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 provides a fair contribution to the visual character and amenity of the local area 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 is in good condition and good vigour The tree has a form typical for the species 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 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 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 supports social and cultural sentiments or spiritual associations, reflected by the broader population or community group, or has commemorative values. 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.
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.		

Useful Life Expectancy - Assessment Criteria			
Remove	**Short**	**Medium**	**Long**
Trees with a high level of risk that would need removing within the next 5 years. Dead trees. Trees that should be removed within the next 5 years. Dying or suppressed or declining trees through disease or inhospitable conditions. Dangerous trees through instability or recent loss of adjacent trees. Dangerous trees through structural defects, including cavities, decay, included bark, wounds, or poor form. Damaged trees that considered unsafe to retain. Trees that could live for more than 5 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting. Trees that will become dangerous after removal of other trees for the reasons.	Trees that appear to be retainable with an acceptable level of risk for 5-15 years. Trees that may only live between 5 and 15 more years. Trees that may live for more than 15 years but would be removed to allow the safe development of more suitable individuals. Trees that may live for more than 15 years but would be removed during the course of normal management for safety or nuisance reasons. Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Trees that appear to be retainable with an acceptable level of risk for 15-40 years. Trees that may only live between 15 and 40 more years. Trees that may live for more than 40 years but would be removed to allow the safe development of more suitable individuals. Trees that may live for more than 40 years but would be removed during the course of normal management for safety or nuisance reasons. Storm damaged or defective trees that require substantial remedial work to make safe and are only suitable for retention in the short term.	Trees that appear to be retainable with an acceptable level of risk for more than 40 years. Structurally sound trees located in positions that can accommodate future growth. Storm damaged or defective trees that could be made suitable for retention in the long term by remedial tree surgery. Trees of special significance for historical, commemorative, or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

Tree Significance

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

Legend for Matrix Assessment

	Priority for retention (High): These trees are considered important for retention and should be retained and protected. Design modification or re-location of building/s 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): These trees may be retained and protected. These are considered less critical; however, their retention should remain priority with the removal considered only if adversely affecting the proposed building/works, and all other alternatives have been considered and exhausted.
	Consider for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.
	Priority for removal (Low): These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

Reference

IACA, 2010, IACA Significance of a Tree, Assessment Rating System (STARS)
Institute of Australian Consulting Arboriculturists
Australia, www.iaca.org.au