NSW GOVERNMENT

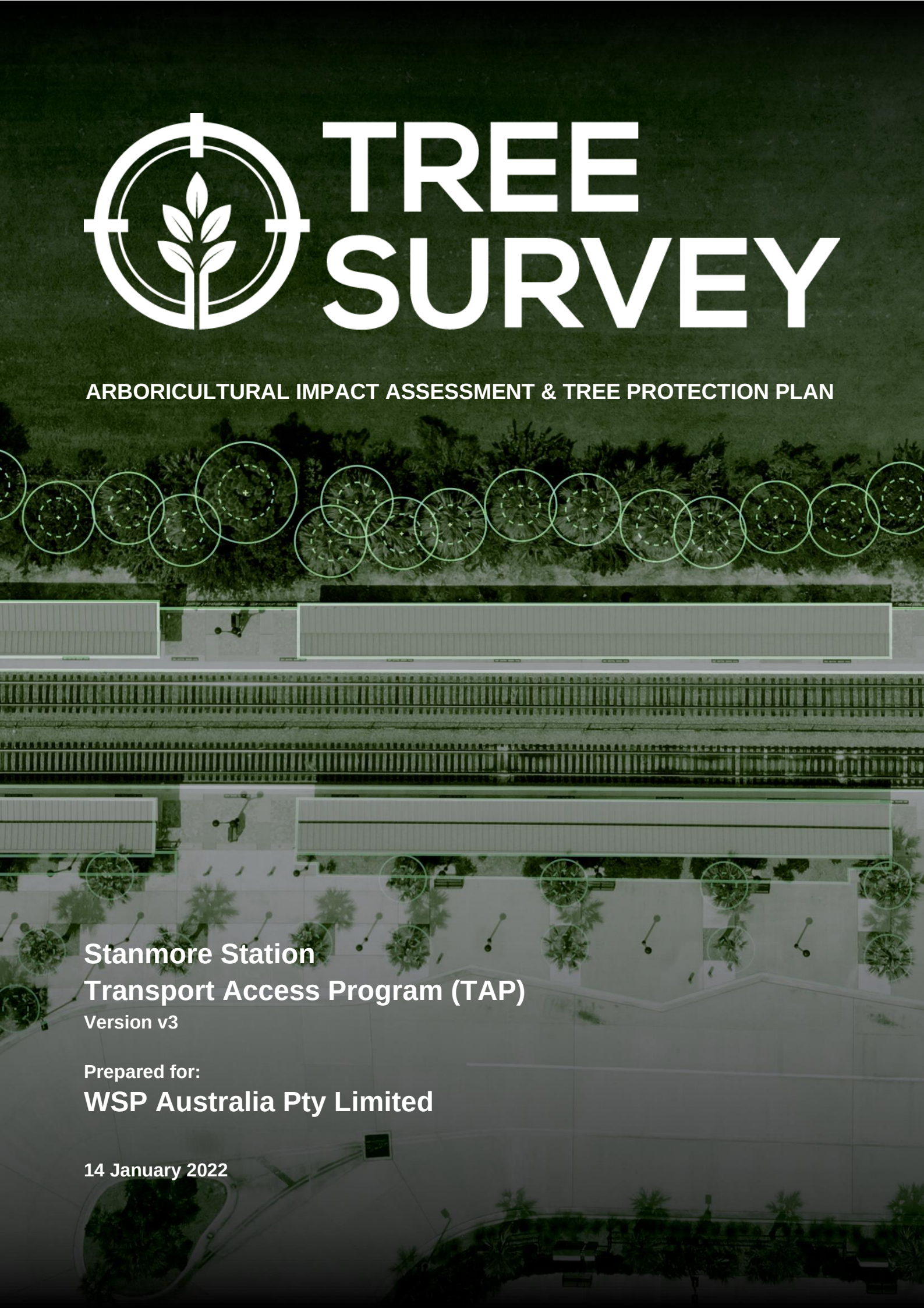
Transport Access Program

Stanmore Station Upgrade

Arboricultural Impact Assessment

Artist's impression of the proposed Stanmore Station Upgrade, subject to detailed design

January 2022



TREE SURVEY

ARBORICULTURAL IMPACT ASSESSMENT & TREE PROTECTION PLAN

Stanmore Station
Transport Access Program (TAP)
Version v3

Prepared for:
WSP Australia Pty Limited

14 January 2022

Document information

Title:	Stanmore Station (TAP)
Report type:	Arboricultural Impact Assessment (AIA) & Tree Protection Plan (TPP)
Prepared by:	 **Phil Witten** Principal Arboricultural Consultant Registered Consulting Arborist No. 2458 AQF 5 | ISA | SRA-ANZ | AA | TRAQ | Adv.QTRA
Contact details:	☎ 0425 536 670 ✉ phil@treesurvey.com.au 💻 www.treesurvey.com.au

Document status

Document status	Date	Revision description
Draft v1	10/11/21	Draft version
Version 1	19/11/21	Updates following TfNSW review
Version 2	07/12/21	Updates following TfNSW review
Version 3	14/01/22	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 WSP Australia Pty Limited to prepare an Arboricultural Impact Assessment (AIA) and Tree Protection Plan (TPP) for the proposed upgrade of Stanmore Station. The upgrade is part of the Transport Access Program (TAP). 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 NSW Government is improving accessibility at Stanmore Station. This project is being delivered as part of the Transport Access Program, a NSW Government Initiative to provide a better experience for public transport customers by delivering accessible, modern secure, and integrated transport infrastructure.

As part of this program, the Stanmore Station Upgrade (the Proposal) would aim to provide a station precinct that is accessible to those with a disability, limited mobility, parents/carers with prams, and customers with luggage.

The Proposal would provide:

- two new lifts to provide access between the existing station underpass and the platforms
- reconfiguration of the existing bathrooms on Platform 1/2 to accommodate:
    - a new family accessible toilet
    - male and female ambulant toilets
    - a cleaners room
- provision of new canopy on Platform 1/2 to connect to the existing platform building awning and provide continuous canopy coverage between the new lift, boarding assistance zone, and family accessible toilet
- provision of a new canopy on Platform 3 around the new lift to cover the lift opening and boarding assistance zone
- upgrade of the existing stairs to include new handrails, tactile ground surface indicators (tactiles), and nosings
- reinstate glazed panels to the eastern screens of the existing staircase on Platform 1/2 which faces the new lift opening
- regrading and resurfacing of the existing platform and underpass surfaces as required to provide accessible paths of travel from the new lifts to the station amenities, including the family accessible toilet and waiting rooms
- provision of a new ramp into the waiting room on Platform 2
- provision of new ramp and stairs, and regrading of the Trafalgar Street entry to Platform 3
- removal of three trees to accommodate the new lift on Platform 3 and the DDA parking space and kiss and ride bay

- station interchange upgrades including:
    - a new DDA car parking space and a new kiss and ride bay on Douglas Street
    - upgrade of the existing footpaths and underpass of the Douglas Street entry forecourt to provide an accessible path of travel from a new DDA car parking space and a new kiss and ride bay.
    - minor upgrade works including four new bicycle hoops at the Douglas Street entrance to replace existing bicycle racks, modification of underpass walls and ceilings, upgrade of station landscaping, adjustments to station lighting, relocation of electronic ticketing (Opal readers), relocation or replacement of existing customer facilities (vending machine, waste and recycling bins and seating), public domain works, improvement to station communications systems (including CCTV cameras), hearing loops, wayfinding signage and installation of yellow lines and tactiles on all platforms.

Transport for NSW is the government agency responsible for the delivery of major transport infrastructure projects in NSW and is the proponent for the Proposal.

1.3 Documents and plans referenced

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

- Architectural Drawings prepared by DesignInc, dated 20/10/21.

1.4 The subject trees

A total of **61** items of vegetation (trees and shrubs) 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 where access to the tree was available. Tree height and canopy spread were estimated unless otherwise stated.
- Tree protection zones have been calculated in accordance with 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 (**Appendix I**). Further information, observations, and measurements specific to each of the subject trees can be found in **Chapter 3**.

[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):

- **Nil 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.**

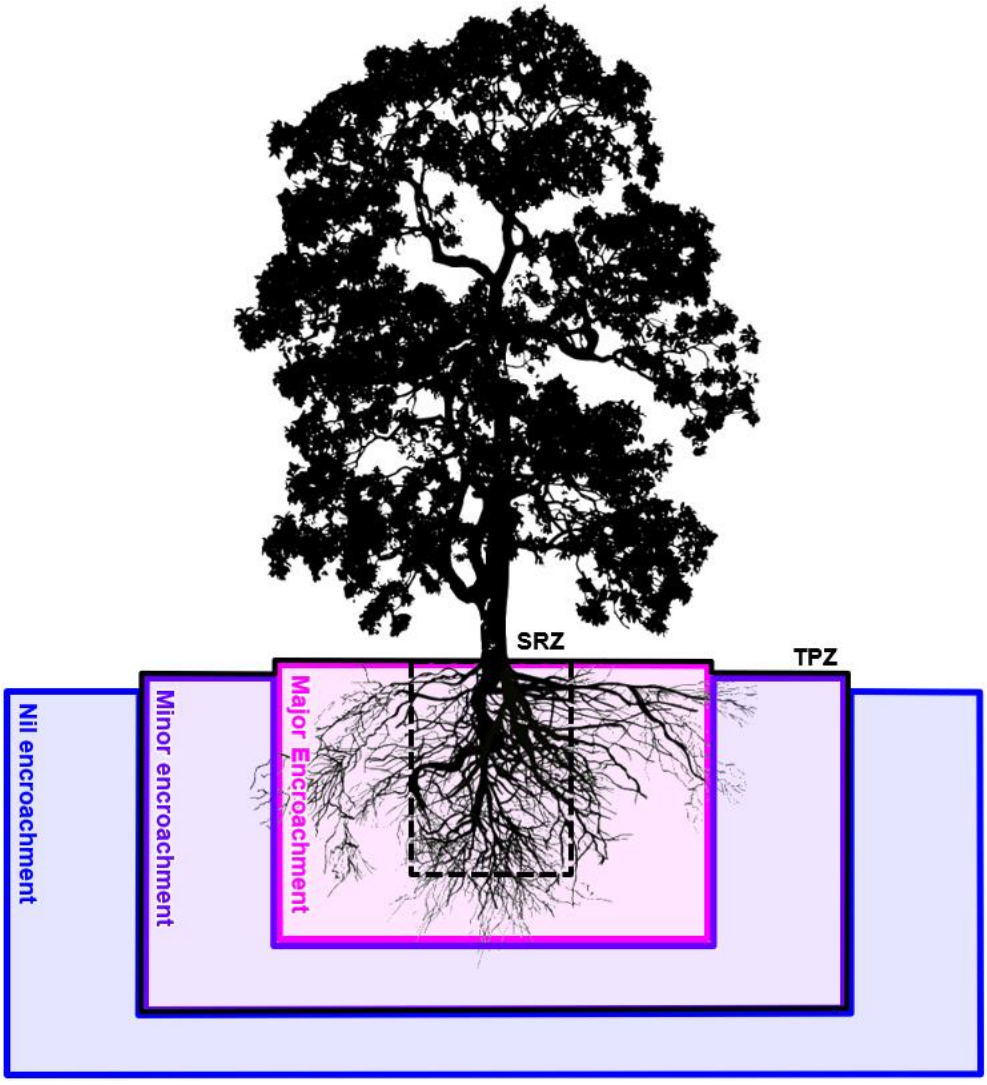


Figure 1: Three (3) levels of encroachment

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 2: Mitigation measures

Encroachment	Mitigation Measures
Nil 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 Encroachment within the TPZ

A summary of vegetation impacted directly by the proposed construction footprint are outlined below:

- **Nil encroachment (0%):** A total of **41** items of vegetation are located outside the construction footprint.
- **Minor encroachment (<10%):** A total of **10** items of vegetation will be subject to a minor encroachment.
- **Major encroachment (>10%):** A total of **10** items of vegetation will be subject to a major encroachment.

Plans that display this data can be found in **Chapter 4**.

3.2 Vegetation removal and retention

A summary of the total proposed vegetation removal is outlined below :

- **Retain:** A total of **53** items of vegetation are proposed for retention.
  - **29** of the items are trees.
  - **24** of the items are shrubs.
- **Remove:** A total of **8** items of vegetation are proposed for removal.
  - **3** of the items are trees.
  - **5** of the items are shrubs.

Plans that display this data can be found in **Chapter 5**.

4 Discussion

4.1 Nil encroachment

A total of **41** items of vegetation will be subject to no encroachment within the TPZ:

- **Retain:** A total of **41** items of vegetation are located outside of the proposed construction footprint. No impacts on these items are foreseeable under the current proposal.
- **Remove:** No items of vegetation within the category of “nil encroachment” are proposed for removal.

4.2 Minor encroachment

A total of **10** items of vegetation will be subject to a minor encroachment of less than 10% within the TPZ:

- **Retain:** A total of **10** items of vegetation will be subject to a minor encroachment of less than 10% within the TPZ. The encroachment will not impact the SRZ and is highly unlikely to impact the overall health or condition of the tree. Under the current proposal, these items can be successfully retained.
- **Remove:** No items of vegetation within the category of “minor encroachment” are proposed for removal.

4.3 Major encroachment

A total of **10** items of vegetation will be subject to a major encroachment of greater than 10% within the TPZ:

- **Retain:** A total of **2** items of vegetation will be subject to a major encroachment of less than 20% within the TPZ. Encroachment of up to 20% on one side of the tree (linear excavation) can be achieved without significantly impacting the health or stability of the tree (Roberts, Jackson and Smith 2006, p.295[2]; Costello, Watson and Smiley 2017, p.21[3]). Several site-specific mitigations for these encroachments have been outlined in the Tree Protection Plan. Under the current proposal, these items can be successfully retained.
- **Remove:** A total of **8** items of vegetation will be subject to a major encroachment of greater than 20% within the TPZ. Encroachment of greater than 20% can begin to impact the structural root zone (SRZ) and is more likely to compromise tree stability” (Costello, Watson, and Smiley (2017, p.21). Impacts within the SRZ are not recommended as it may lead to the destabilisation and/or decline of the tree. These items are located within, or directly adjacent to the proposed construction footprint and cannot be retained under the current proposal.

[2] Roberts, J., Jackson, N. and Smith, D. (2006). Tree roots in the built environment.

[3] Costello, L., Watson, G. and Smiley, E., 2017. Root Management. International Society of Arboriculture.

4.4 Site compound and material laydown

A site compound and material laydown area will be established within the rail corridor 350m east of Stanmore Station (within the down and up cess). These areas are cleared and should not require additional tree removal or pruning for site establishment. Images of the site compound and laydown areas are included below.

Figure 2: Aerial view of the proposed site compound and laydown area

Figure 3: View of laydown area (up side)

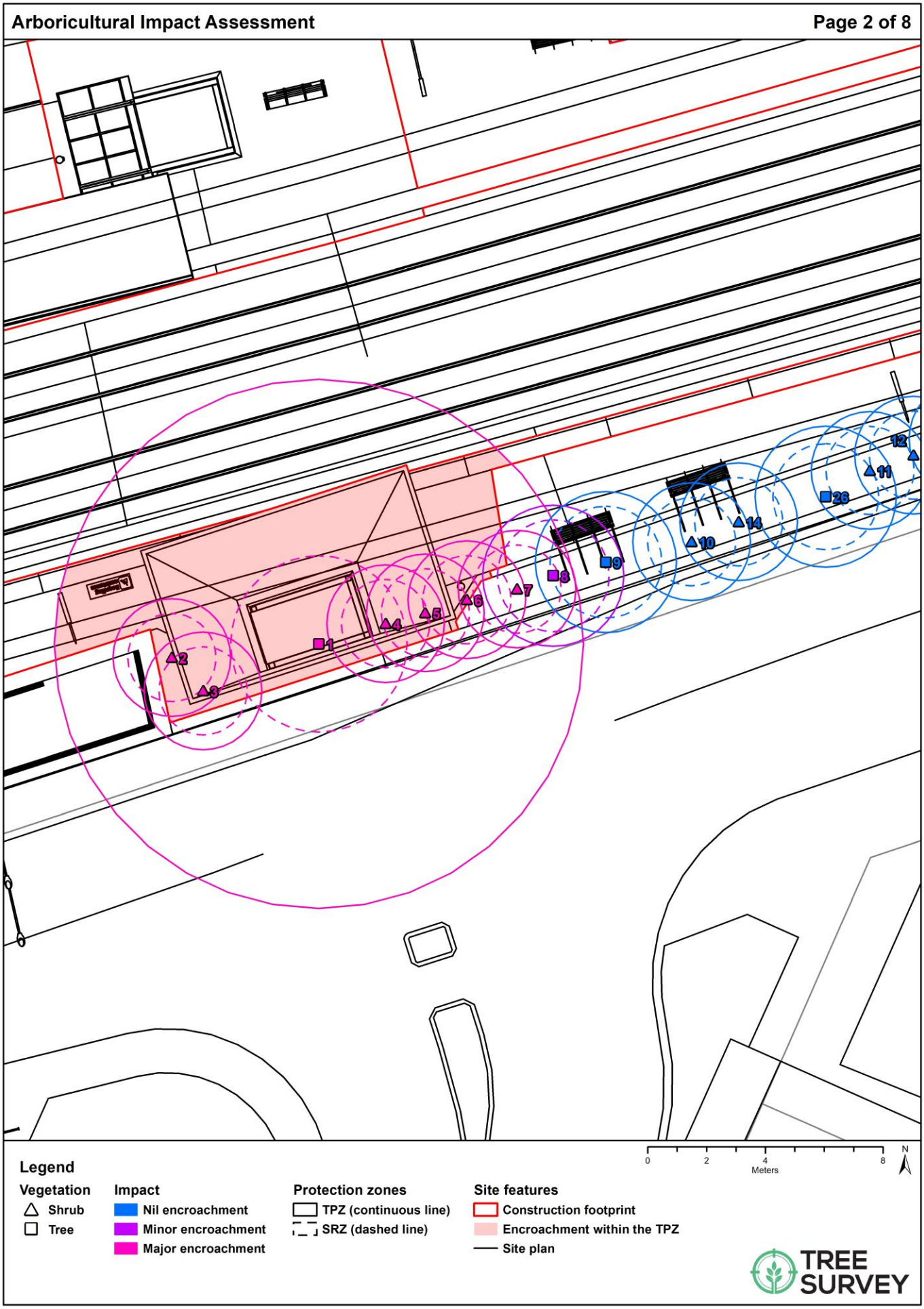
Figure 4: View of laydown area (down side)

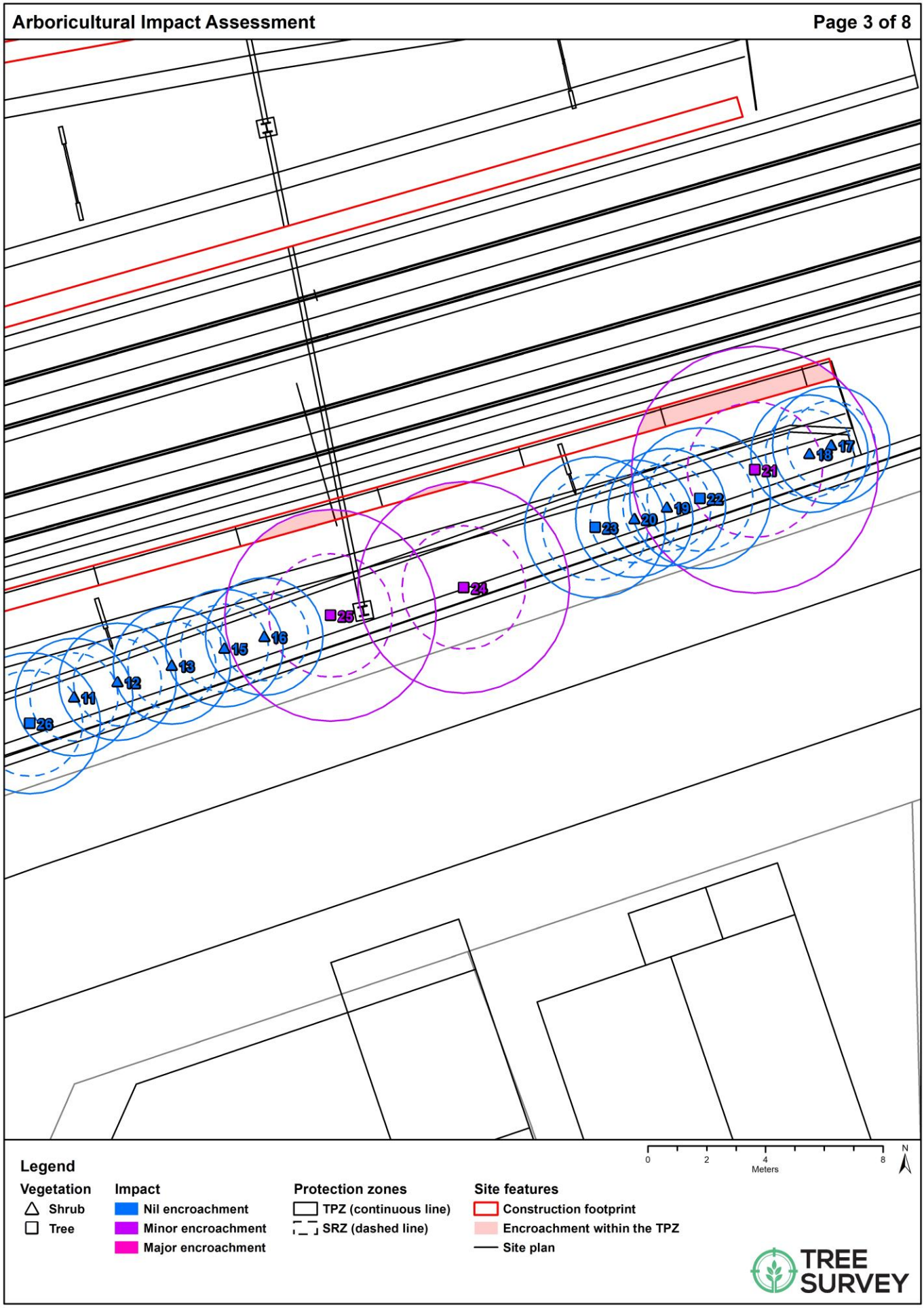
Table 2: Results of the arboricultural assessment

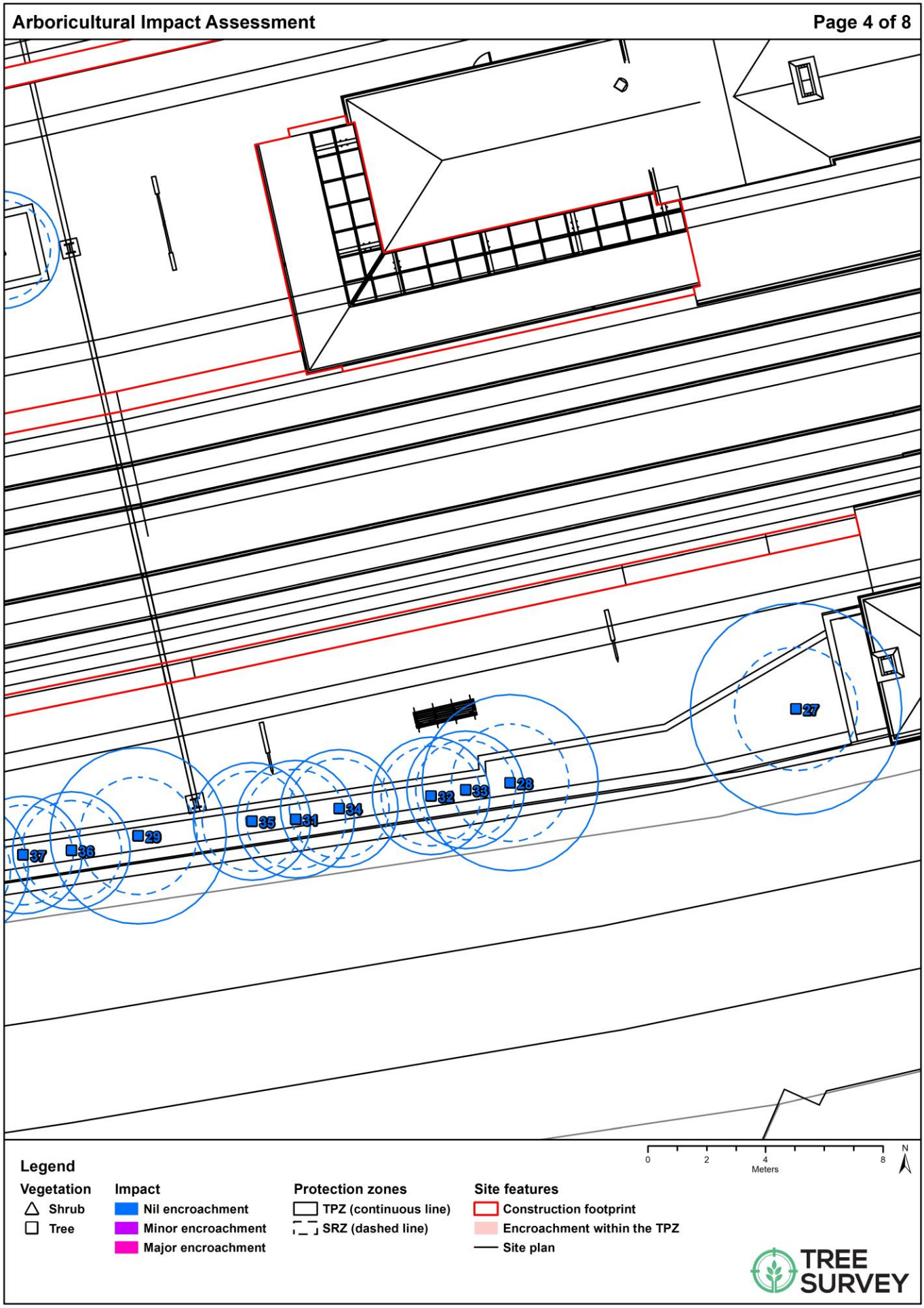
Id.	Botanical name	Vegetation type	Height (metres)	Spread (metres diameter)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (millimetres diameter)	DBH 2 (millimetres diameter)	DBH 3 (millimetres diameter)	DBH Combined (millimetres diameter)	DRB (millimetres diameter)	TPZ (metres radius)	SRZ (metres radius)	Encroachment by proposal footprint	% Encroachment within TPZ	Other notes	Proposal
1	*Syzygium paniculatum*	Tree	20	16	Good	Good	Mature	Medium	Medium	High	750	-	-	750	800	9.0	3.0	**Major**	**31%**	Tree is located adjacent to the proposed construction footprint	**Remove**
2	*Murraya paniculata*	Shrub	2	2	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.5	**Major**	**72%**	Shrub is located within the proposed construction footprint	**Remove**
3	*Murraya paniculata*	Shrub	2	2	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.5	**Major**	**62%**	Shrub is located within the proposed construction footprint	**Remove**
4	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Semi-mature	Low	Short	Low	150	-	-	150	150	2.0	1.5	**Major**	**79%**	Shrub is located within the proposed construction footprint	**Remove**
5	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Semi-mature	Low	Short	Low	150	-	-	150	150	2.0	1.5	**Major**	**71%**	Shrub is located within the proposed construction footprint	**Remove**
6	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Semi-mature	Low	Short	Low	150	-	-	150	150	2.0	1.5	**Major**	**53%**	Shrub is located within the proposed construction footprint	**Remove**
7	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Semi-mature	Low	Short	Low	150	-	-	150	150	2.0	1.5	**Major**	**16%**	Shrub is located adjacent to the proposed construction footprint	**Retain**
8	*Cupaniopsis anacardioides*	Tree	10	8	Good	Good	Semi-mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.9	**Minor**	**4%**	Tree is located adjacent to the proposed construction footprint	**Retain**
9	*Cupaniopsis anacardioides*	Tree	10	8	Good	Good	Semi-mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.9	**Nil**	**0%**	-	**Retain**
10	*Vibernum tinus*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
11	*Vibernum tinus*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
12	*Vibernum tinus*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
13	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
14	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
15	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
16	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
17	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
18	*Murraya paniculata*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
19	*Vibernum tinus*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
20	*Vibernum tinus*	Shrub	1	1	Fair	Fair	Juvenile	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
21	*Celtis australis*	Tree	9	8	Good	Fair	Mature	Medium	Medium	Medium	350	-	-	350	400	4.2	2.3	**Minor**	**8%**	Tree is located adjacent to the proposed construction footprint	**Retain**
22	*Cupaniopsis anacardioides*	Tree	9	6	Good	Fair	Mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	**Nil**	**0%**	-	**Retain**
23	*Cupaniopsis anacardioides*	Tree	9	6	Good	Fair	Mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	**Nil**	**0%**	-	**Retain**
24	*Cupaniopsis anacardioides*	Tree	9	6	Good	Fair	Mature	Medium	Medium	Medium	300	-	-	300	350	3.6	2.1	**Minor**	**1%**	Tree is located adjacent to the proposed construction footprint	**Retain**
25	*Cupaniopsis anacardioides*	Tree	9	6	Good	Fair	Mature	Medium	Medium	Medium	300	-	-	300	350	3.6	2.1	**Minor**	**3%**	Tree is located adjacent to the proposed construction footprint	**Retain**
26	*Cupaniopsis anacardioides*	Tree	9	6	Good	Fair	Mature	Medium	Medium	Medium	200	-	-	200	250	2.4	1.8	**Nil**	**0%**	-	**Retain**
27	*Cupaniopsis anacardioides*	Tree	7	6	Good	Fair	Mature	Medium	Medium	Medium	300	-	-	300	350	3.6	2.1	**Nil**	**0%**	-	**Retain**
28	*Cupaniopsis anacardioides*	Tree	7	6	Good	Fair	Mature	Medium	Medium	Medium	250	-	-	250	300	3.0	2.0	**Nil**	**0%**	-	**Retain**
29	*Cupaniopsis anacardioides*	Tree	7	6	Good	Fair	Mature	Medium	Medium	Medium	250	-	-	250	300	3.0	2.0	**Nil**	**0%**	-	**Retain**
30	*Callistemon viminalis*	Tree	4	3	Good	Fair	Semi-mature	Low	Medium	Medium	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
31	*Callistemon viminalis*	Tree	4	3	Good	Fair	Semi-mature	Low	Medium	Medium	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**

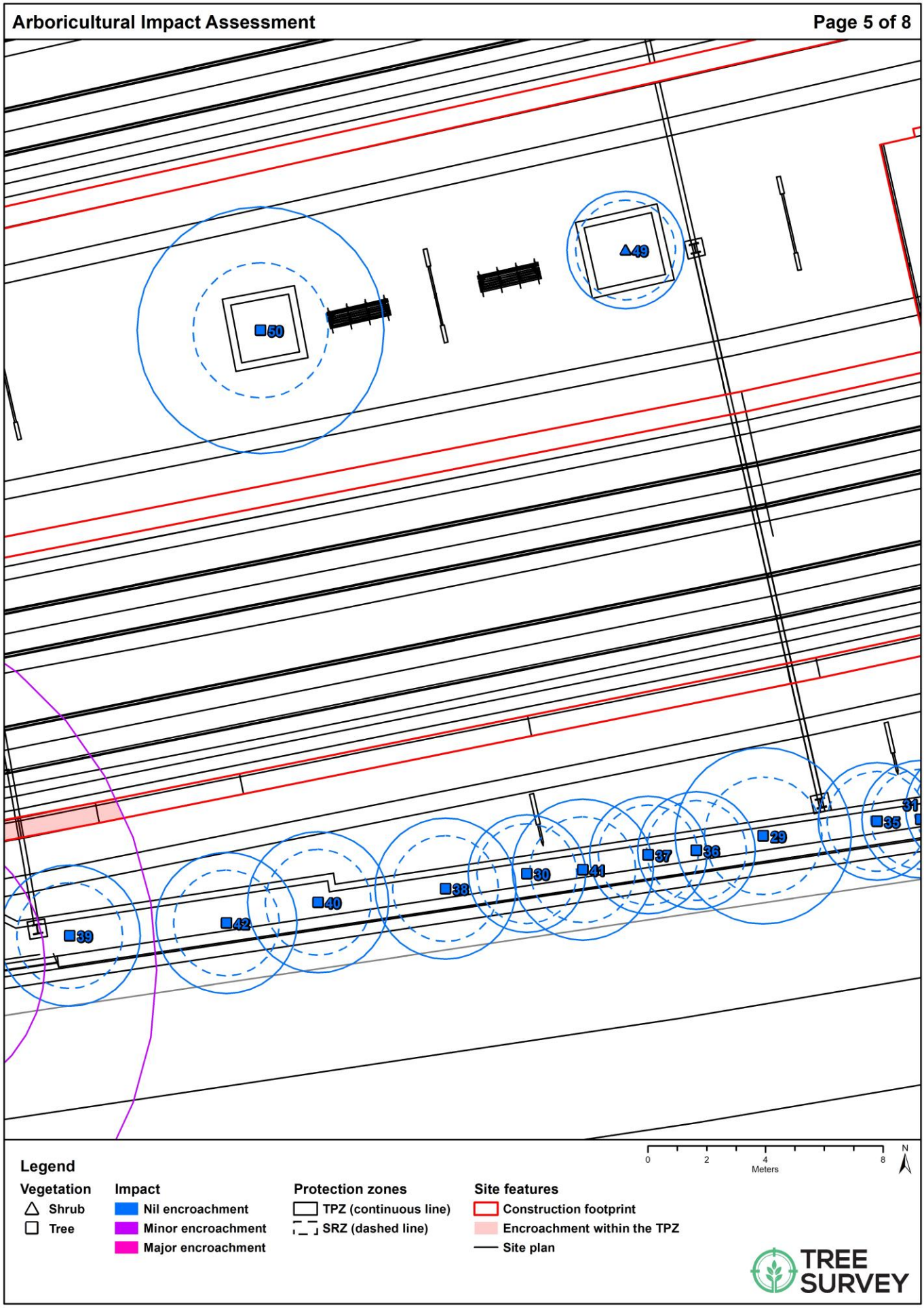
Id.	Botanical name	Vegetation type	Height (metres)	Spread (metres diameter)	Health	Structure	Age class	Tree significance	Useful life expectancy	Priority for retention	DBH 1 (millimetres diameter)	DBH 2 (millimetres diameter)	DBH 3 (millimetres diameter)	DBH Combined (millimetres diameter)	DRB (millimetres diameter)	TPZ (metres radius)	SRZ (metres radius)	Encroachment by proposal footprint	% Encroachment within TPZ	Other notes	Proposal
32	*Callistemon viminalis*	Tree	4	3	Good	Fair	Semi-mature	Low	Medium	Medium	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
33	*Cupaniopsis anacardioides*	Tree	5	3	Good	Fair	Semi-mature	Low	Medium	Medium	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
34	*Cupaniopsis anacardioides*	Tree	5	3	Good	Fair	Semi-mature	Low	Medium	Medium	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
35	*Cupaniopsis anacardioides*	Tree	5	3	Good	Fair	Semi-mature	Low	Medium	Medium	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
36	*Cupaniopsis anacardioides*	Tree	5	3	Good	Fair	Semi-mature	Low	Medium	Medium	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
37	*Cupaniopsis anacardioides*	Tree	5	3	Good	Fair	Semi-mature	Low	Medium	Medium	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
38	*Cupaniopsis anacardioides*	Tree	6	4	Good	Fair	Semi-mature	Low	Medium	Medium	200	-	-	200	250	2.4	1.8	**Nil**	**0%**	-	**Retain**
39	*Cupaniopsis anacardioides*	Tree	6	4	Good	Fair	Semi-mature	Low	Medium	Medium	200	-	-	200	250	2.4	1.8	**Nil**	**0%**	-	**Retain**
40	*Cupaniopsis anacardioides*	Tree	6	4	Good	Fair	Semi-mature	Low	Medium	Medium	200	-	-	200	250	2.4	1.8	**Nil**	**0%**	-	**Retain**
41	*Cupaniopsis anacardioides*	Tree	6	4	Good	Fair	Semi-mature	Low	Medium	Medium	200	-	-	200	250	2.4	1.8	**Nil**	**0%**	-	**Retain**
42	*Cupaniopsis anacardioides*	Tree	6	4	Good	Fair	Semi-mature	Low	Medium	Medium	200	-	-	200	250	2.4	1.8	**Nil**	**0%**	-	**Retain**
43	*Vibernum tinus*	Shrub	2	2	Fair	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
44	*Vibernum tinus*	Shrub	2	2	Fair	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
45	*Vibernum tinus*	Shrub	2	2	Fair	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
46	*Vibernum tinus*	Shrub	2	2	Fair	Fair	Semi-mature	Low	Medium	Low	100	-	-	100	100	2.0	1.5	**Nil**	**0%**	-	**Retain**
47	*Schefflera actinophylla*	Tree	12	9	Good	Good	Mature	Low	Medium	Low	400	-	-	400	450	4.8	2.4	**Minor**	**5%**	Tree is located adjacent to the proposed construction footprint	**Retain**
48	*Harpephyllum caffrum*	Tree	16	16	Fair	Fair	Mature	Medium	Medium	Medium	1100	-	-	1100	1150	13.2	3.5	**Minor**	**3%**	Tree is located adjacent to the proposed construction footprint	**Retain**
49	*Celtis australis*	Shrub	2	3	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
50	*Pyrus calleryana*	Tree	7	6	Fair	Fair	Semi-mature	Low	Medium	Low	350	-	-	350	400	4.2	2.3	**Nil**	**0%**	-	**Retain**
51	*Murraya paniculata*	Shrub	2	1	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.7	**Major**	**18%**	Shrub is located adjacent to the proposed construction footprint	**Retain**
52	*Murraya paniculata*	Shrub	2	1	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
53	*Murraya paniculata*	Shrub	2	1	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
54	*Murraya paniculata*	Shrub	2	1	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.7	**Minor**	**5%**	Shrub is located adjacent to the proposed construction footprint	**Retain**
55	*Murraya paniculata*	Shrub	2	1	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
56	*Murraya paniculata*	Shrub	2	1	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.7	**Nil**	**0%**	-	**Retain**
57	*Murraya paniculata*	Shrub	2	1	Fair	Fair	Semi-mature	Low	Medium	Low	150	-	-	150	150	2.0	1.7	**Minor**	**2%**	Shrub is located adjacent to the proposed construction footprint	**Retain**
58	*Syzygium paniculatum*	Tree	16	12	Good	Good	Mature	Medium	Medium	High	400	-	-	400	450	4.8	2.4	**Minor**	**3%**	Tree is located adjacent to the proposed construction footprint	**Retain**
59	*Syzygium paniculatum*	Tree	16	12	Good	Good	Mature	Medium	Medium	High	400	-	-	400	450	4.8	2.4	**Minor**	**7%**	Tree is located adjacent to the proposed construction footprint	**Retain**
60	*Corymbia ficifolia*	Tree	4	2	Good	Good	Semi-mature	Medium	Medium	Medium	150	-	-	150	150	2.0	1.7	**Major**	**65%**	Tree is located within the proposed construction footprint	**Remove**
61	*Corymbia ficifolia*	Tree	4	2	Good	Good	Semi-mature	Medium	Medium	Medium	150	-	-	150	150	2.0	1.7	**Major**	**82%**	Tree is located within the proposed construction footprint	**Remove**

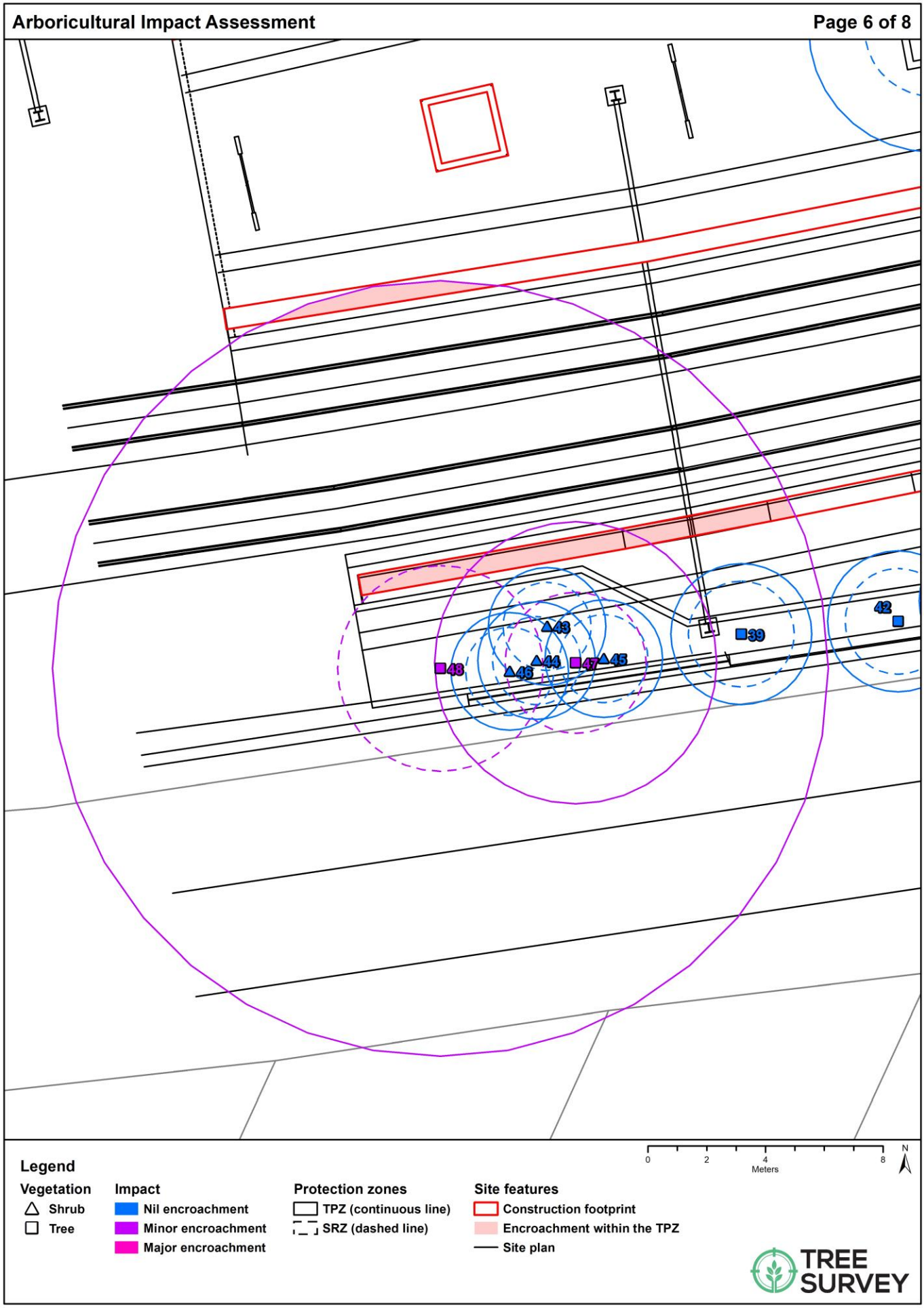

Arboricultural Impact Assessment
Page 1 of 8
0
12.5
25
50
Meters
N
Legend
Vegetation
Shrub
Tree
Impact
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Construction footprint
Encroachment within the TPZ
Site plan
TREE SURVEY

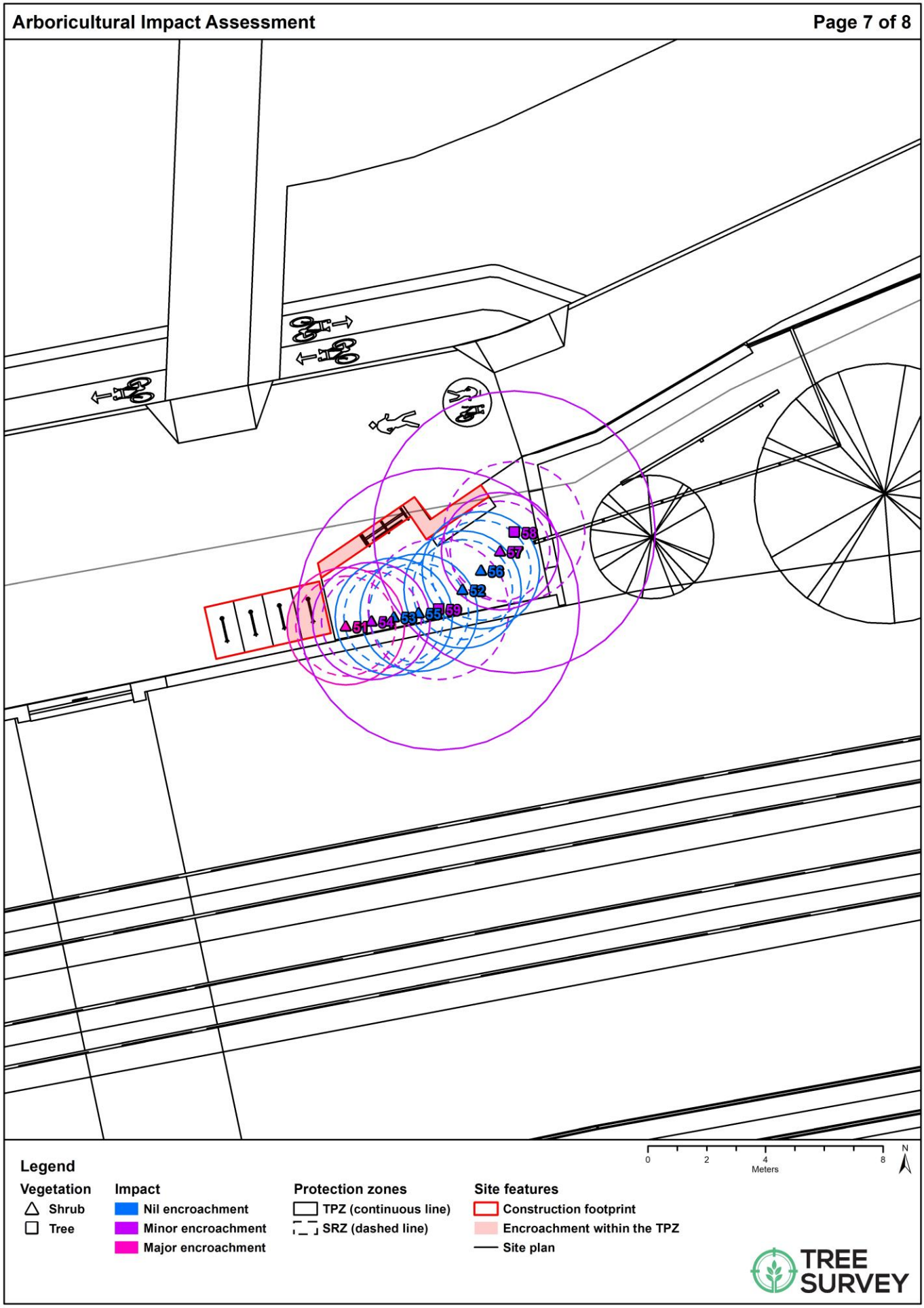

Arboricultural Impact Assessment
Page 2 of 8
1
2
3
4
5
6
7
8
9
10
11
12
26
0
2
4
8
Meters
N
Legend
Vegetation
Shrub
Tree
Impact
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Construction footprint
Encroachment within the TPZ
Site plan
TREE SURVEY

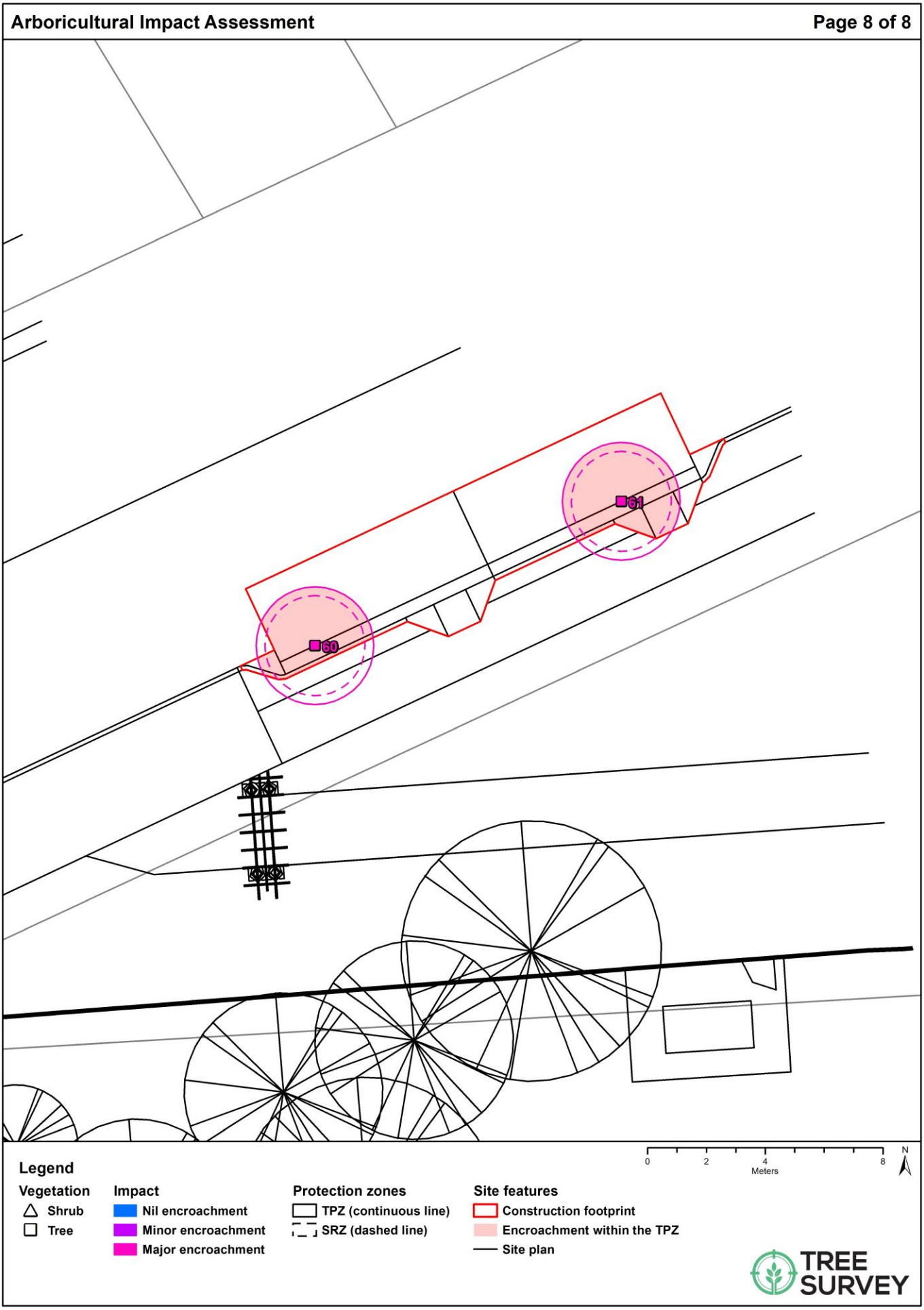

Arboricultural Impact Assessment
Page 3 of 8
11
12
13
15
16
17
18
19
20
21
22
23
24
25
26
0
2
4
8
Meters
N
Legend
Vegetation
Shrub
Tree
Impact
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Construction footprint
Encroachment within the TPZ
Site plan
TREE SURVEY


Arboricultural Impact Assessment
Page 4 of 8
37
36
29
35
31
34
32
33
28
27
0
2
4
8
Meters
N
Legend
Vegetation
Shrub
Tree
Impact
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Construction footprint
Encroachment within the TPZ
Site plan
TREE SURVEY


Arboricultural Impact Assessment
Page 5 of 8
49
50
39
42
40
38
30
41
37
36
29
35
31
0
2
4
8
Meters
N
Legend
Vegetation
Shrub
Tree
Impact
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Construction footprint
Encroachment within the TPZ
Site plan
TREE SURVEY


Arboricultural Impact Assessment
Page 6 of 8
43
39
42
48
44
47
45
46
0
2
4
8
Meters
N
Legend
Vegetation
Shrub
Tree
Impact
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Construction footprint
Encroachment within the TPZ
Site plan
TREE SURVEY


Arboricultural Impact Assessment
Page 7 of 8
58
57
56
52
51
54
53
55
59
0
2
4
8
Meters
N
Legend
Vegetation
Shrub
Tree
Impact
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Construction footprint
Encroachment within the TPZ
Site plan
TREE SURVEY


Arboricultural Impact Assessment
Page 8 of 8
61
60
0
2
4
8
Meters
N
Legend
Vegetation
Shrub
Tree
Impact
Nil encroachment
Minor encroachment
Major encroachment
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Site features
Construction footprint
Encroachment within the TPZ
Site plan
TREE SURVEY

5 Tree Protection Measures

The following section provides measures that are to be adopted in site establishment, construction, and following construction.

5.1 Vegetation removal and retention

A summary of the total proposed vegetation removal is outlined below :

- **Retain:** A total of **53** items of vegetation are proposed for retention.
  - **29** of the items are trees.
  - **24** of the items are shrubs.
- **Remove:** A total of **8** items of vegetation are proposed for removal.
  - **3** of the items are trees.
  - **5** of the items are shrubs.

5.2 Trees proposed for removal

A total of **8** trees will require offsetting in accordance with the Transport for NSW Vegetation Offset Guide (DMS-SD-087). A summary of the single tree offsets required for this site is outlined below:

- **Small** (DBH <150mm): A total of **7** small trees/shrubs to be removed (14 trees for offset).
- **Medium** (DBH 150-600mm): A total of **0** medium trees to be removed (0 trees for offset).
- **Large** (DBH >600mm): A total of **1** large tree to be removed (8 trees for offset).
- **Total trees:** A total of **24** replacement trees are required to be planted.

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.

5.3 Tree pruning

Minor vegetation trimming may be required to accommodate site access and construction clearances. Pruning specifications for these areas are outlined below:

- Pruning must not exceed 10% of the overall canopy volume.
- No limbs greater than 150mm in diameter are to be removed.
- The final pruning cut shall be at the branch collar in accordance with AS4373-2007.
- All tree pruning 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, and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998).

If proposed vegetation trimming does not meet the specifications outlined above, the project arborist must undertake an assessment of impacts on a case-by-case basis.

5.4 Tree protection fencing

Tree protection fencing must be established at the locations shown in the tree protection plan (see Plans below referenced Pages 1 to 8). 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. Tree protection fencing must be installed prior to site establishment and remain intact until the completion of works. Once erected, protective fencing must not be removed or altered without the approval of the project arborist. Specifications for the tree protection fencing are as follows:

- Temporary mesh panel fencing (minimum height of 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 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.

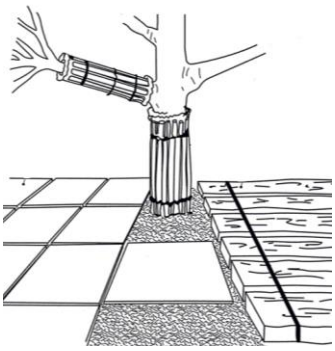
5.5 Restricted activities within the TPZ

The TPZ is an area that is isolated from the work zone to ensure no disturbance or encroachment occurs in this zone. Activities generally excluded from the TPZ (unless otherwise approved under the planning approval) include, but are not limited to:

- Machine excavation and trenching.
- Ripping or cultivation of the soil.
- Storage of building materials, waste, and waste receptacles.
- Disposal of waste materials and chemicals including paint, solvents, cement slurry, fuel, oil, and other toxic liquids.
- Movement and storage of plant, equipment, and vehicles.
- Soil level changes, including the placement of fill material.
- Mechanical removal of vegetation.
- Affixing of signage or hoardings to trees.
- Other physical damage to the trunk or root system.
- Any other activity that is likely to cause damage to the tree.

5.6 Trunk protection

Trunk protection fencing must be established at the locations shown in the tree protection plan. Where the provision of tree protection fencing is impractical or must be temporarily removed, 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.

5.7 Ground protection

Trunk protection fencing must be established at the locations shown in the tree protection plan. If temporary access for vehicle, plant, or machinery is required within the TPZ ground protection shall be installed. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Where possible, areas of the existing pavement shall be used as ground protection.

Specifications for light traffic access (<3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- A layer of mulch or crushed rock (at a minimum depth of 100mm)

Specifications for heavy traffic access (>3.5 tonne) are as follows:

- Permeable membrane such as geotextile fabric.
- A layer of lightly compacted road base (at a minimum depth of 200mm)
- Geotextile fabric shall extend a minimum of 300mm beyond the edge of the road base.

Pedestrian, vehicular, and machinery access within the TPZ shall be restricted solely to areas where ground protection has been installed.

5.8 Mulch

The area within the TPZ should be mulched (where practicable) with good quality composted wood chip/leaf mulch that complies with AS 4454-2012, Composts, soil conditioners, and mulches, and should be maintained at a depth of 150mm-200mm. Mulching around the base of the tree will provide nutrients and organic matter to the soil as it breaks down, improving and maintaining the overall health of the trees.

5.9 Demolition

The demolition of all existing structures inside or directly adjacent to the TPZ of trees to be retained must be undertaken in consultation with the project arborist. Any machinery is to work from inside the footprint of the existing structures or outside the TPZ, to minimise soil disturbance and compaction. If it is not feasible to locate demolition machinery outside the TPZ of trees to be retained, ground protection will be required. The demolition should be undertaken inwards into the footprint of the existing structures, sometimes referred to as the 'top-down, pull back' method.

5.10 Excavations

The project arborist must supervise and certify that all excavations and root pruning are in accordance with AS4373-2007 and AS4970-2009. All excavations (including root investigations) within the TPZ must be carried out using tree-sensitive methods under the supervision of the project arborist (see **Tree Protection Plan**). These methods may include:

- **Manual excavation:** Use of hand tools such as spades, trowels, brushes.
- **Air spade:** Use of a pressurised air device that blows the soil away and leaves roots intact.
- **Hydro-vacuum excavation:** Use of pressurised water to remove soil from around roots.

The recommended techniques for common types of excavations have been outlined below:

- **Continuous strip footings:** Manual excavation, air spade, or hydro-vacuum is utilised excavation lines within the TPZ prior to the commencement of mechanical excavation. Excavation should be a depth of 1 metre (or to unfavourable root growth conditions such as bedrock or heavy clay, if agreed by the project arborist). Any conflicting roots shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears. All root pruning must be documented and carried out by the project arborist. After all root pruning is completed, machine excavation is permitted within the footprint of the structure.
- **Post or pier footings:** Manual excavation, air spade, or hydro-vacuum is utilised at the location of pier footings within the TPZ. Any conflicting roots shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears. All root pruning must be documented and carried out by the project arborist. After all root pruning is completed, machine excavation is permitted within the footprint of the structure.

No over-excavation, battering, or benching shall be undertaken beyond the footprint of any structure unless approved by the project arborist.

5.11 Underground services

Where possible, underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they must be installed using tree-sensitive excavation methods under the supervision of the project arborist. Alternatively, boring methods such as horizontal directional drilling (HDD) may be used for underground service installation, providing the installation is at a minimum depth of 800mm below grade. Excavations for entry/exit pits must be located outside the TPZ.

5.12 Root pruning

Any conflicting roots (<50mm in diameter) identified during the supervised excavations shall be pruned using clean, sharp secateurs or a pruning saw to ensure a clean cut, free from tears. All root pruning must be documented and carried out by the project arborist.

5.13 Site Inspections

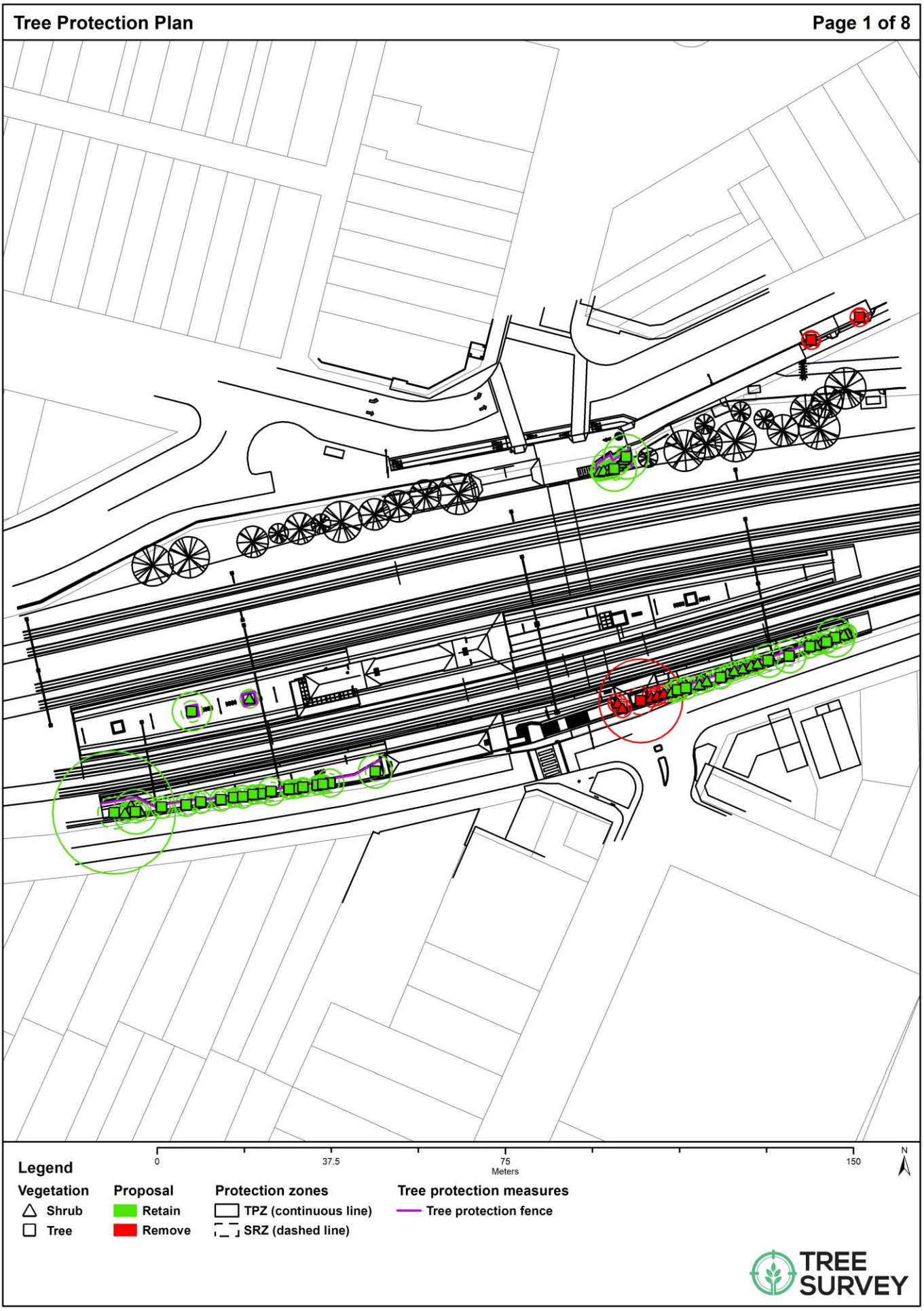
In accordance with AS 4970-2009, Protection of Trees on Development Sites, inspections must be conducted by the project arborist at the following key project stages:

- Prior to any work commencing on-site (including demolition, earthworks, or site clearing) and following the installation of tree protection.
- During any excavations, building works, and any other activities carried out within the TPZ of any tree to be retained & protected.
- A minimum of once per 8 weeks (every 2 months) during the construction phase for trees with a major encroachment within the TPZ.
- After all major construction has ceased, following the removal of tree protection.

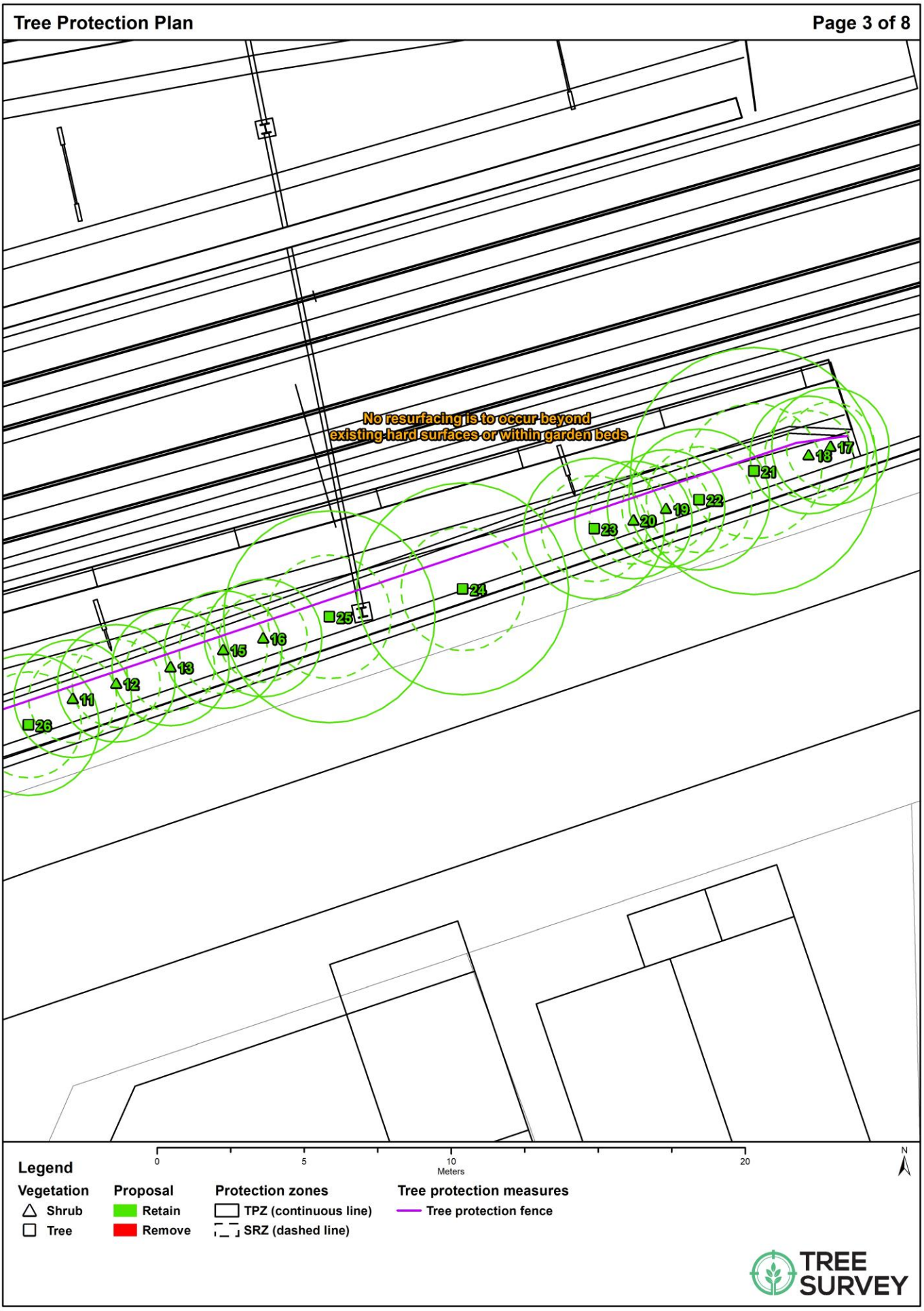
It shall be the responsibility of the project manager to notify the project arborist prior to any works within the TPZ of any protected tree at a minimum of 48 hours' notice. To ensure the tree protection plan is implemented, hold points have been specified in the schedule of work (**Table 4**).

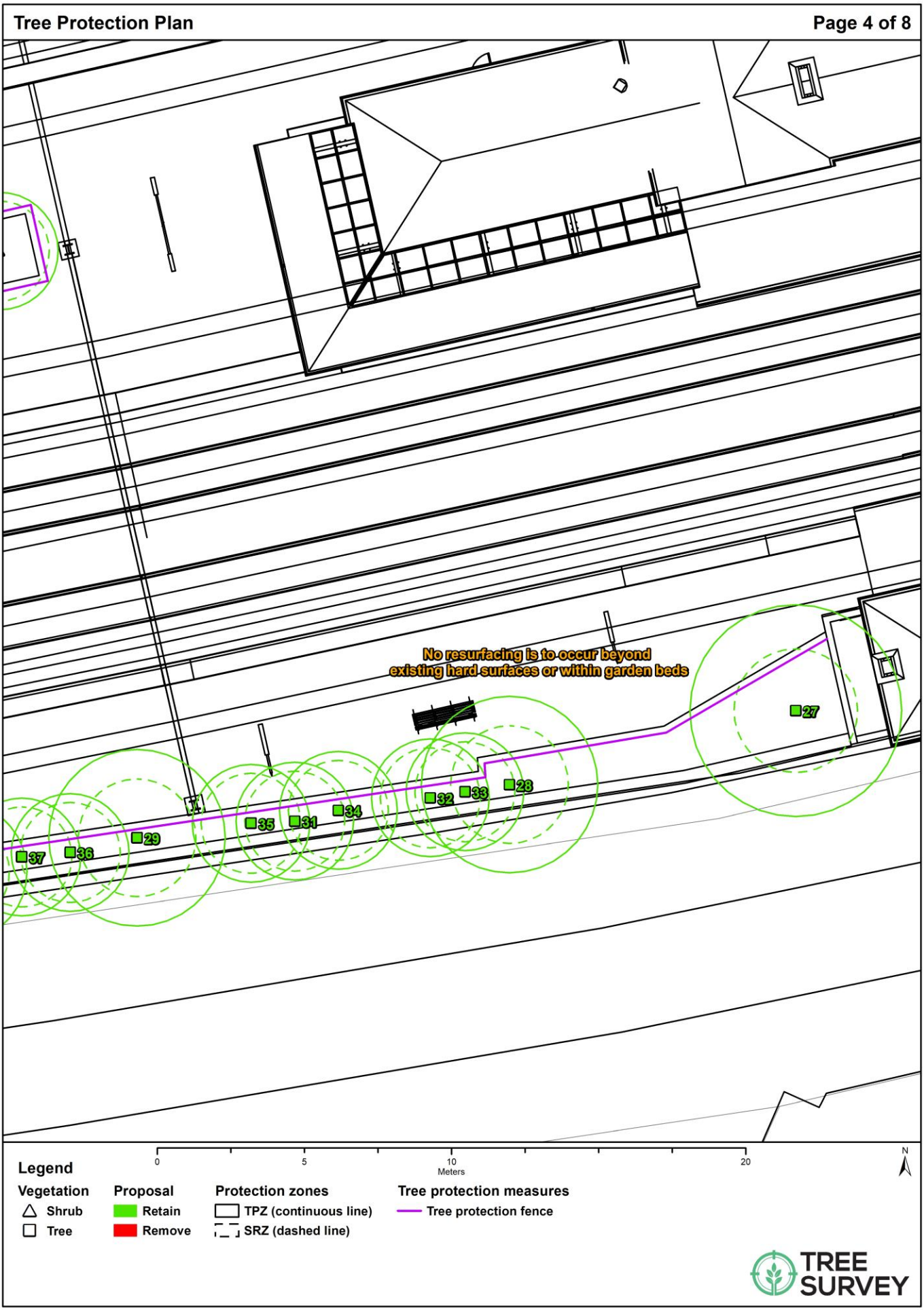
Table 4: Schedule of work

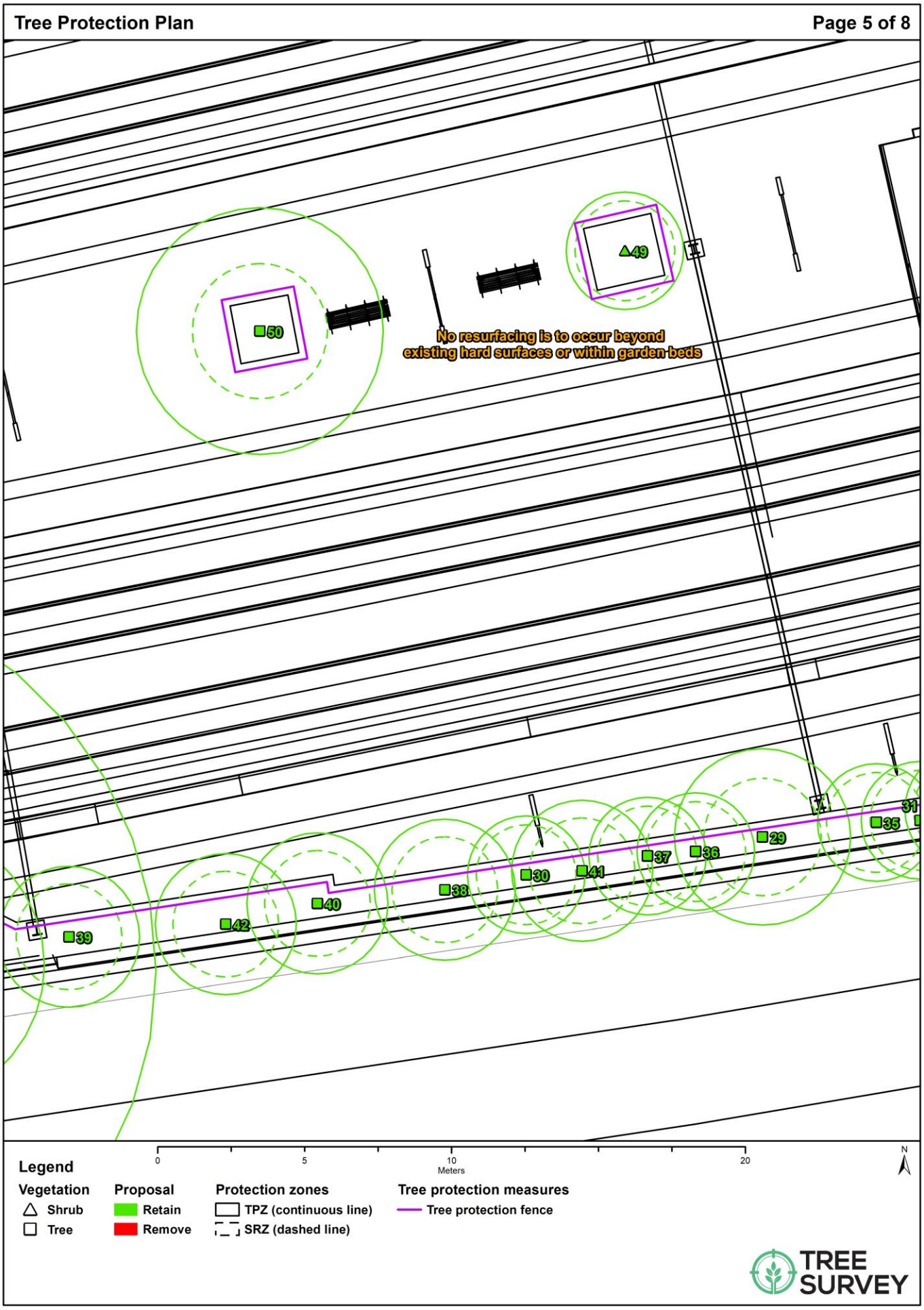
Construction stage	Hold point	Description
Pre-construction	1	Prior to demolition and/or site establishment, indicate clearly (with spray paint on trunks) trees marked for removal only.
	2	Tree protection (for trees that will be retained) shall be installed prior to demolition and site establishment. This may include the mulching of areas within the TPZ. The project arborist shall inspect and certify tree protection.
During Construction	3	Scheduled inspection of trees by the project arborist should be undertaken every 8 weeks (2 months) during the construction period.
	4	Project arborist to supervise and document all works carried out within the TPZ of trees to be retained.
	5	Inspection of trees by project arborist after all major construction has ceased, following the removal of tree protection measures.
Post Construction	6	Final inspection of trees by project arborist.

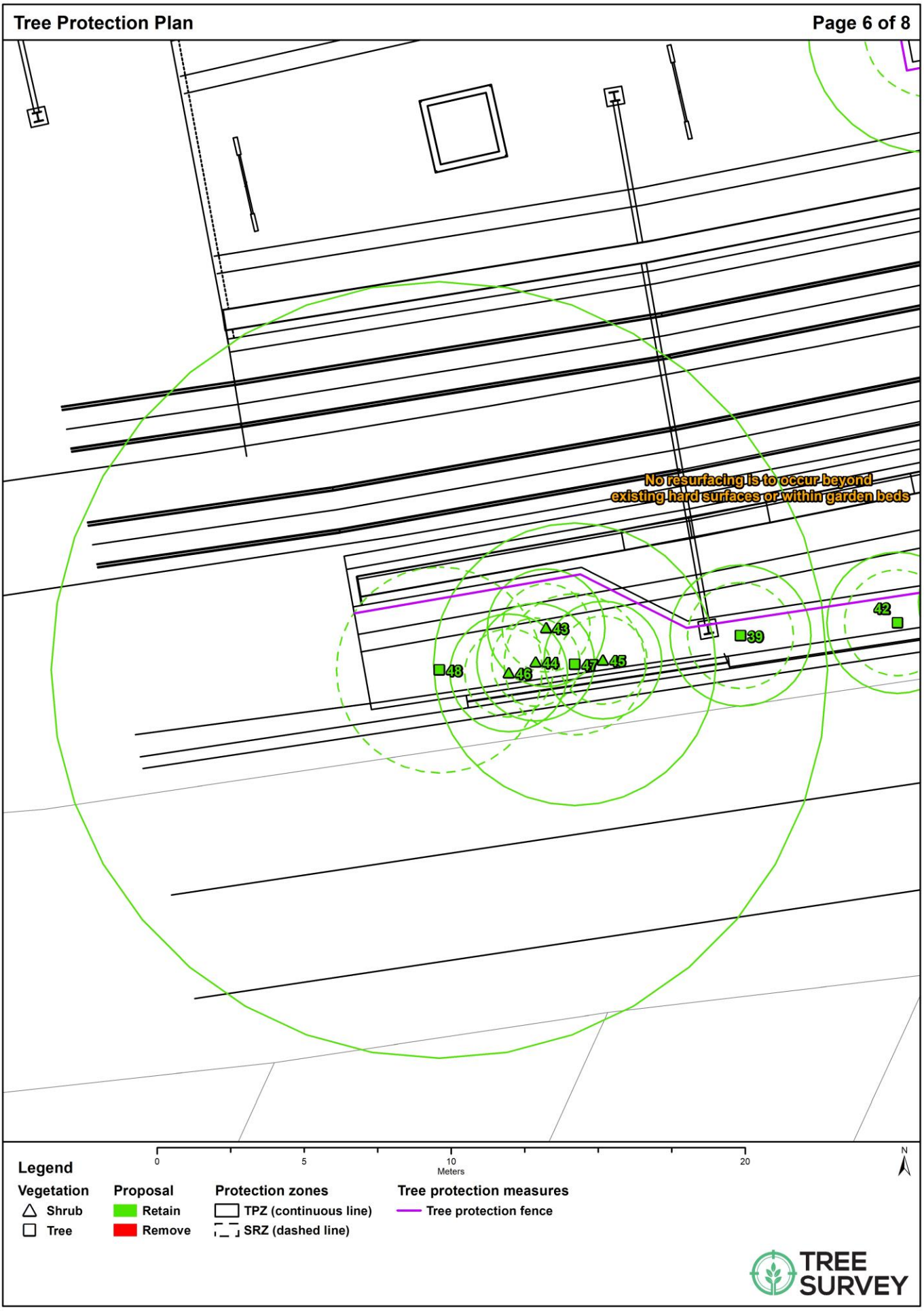

Tree Protection Plan
Page 1 of 8
Legend
Vegetation
Shrub
Tree
Proposal
Retain
Remove
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Tree protection measures
Tree protection fence
0
37.5
75
Meters
150
N
TREE SURVEY

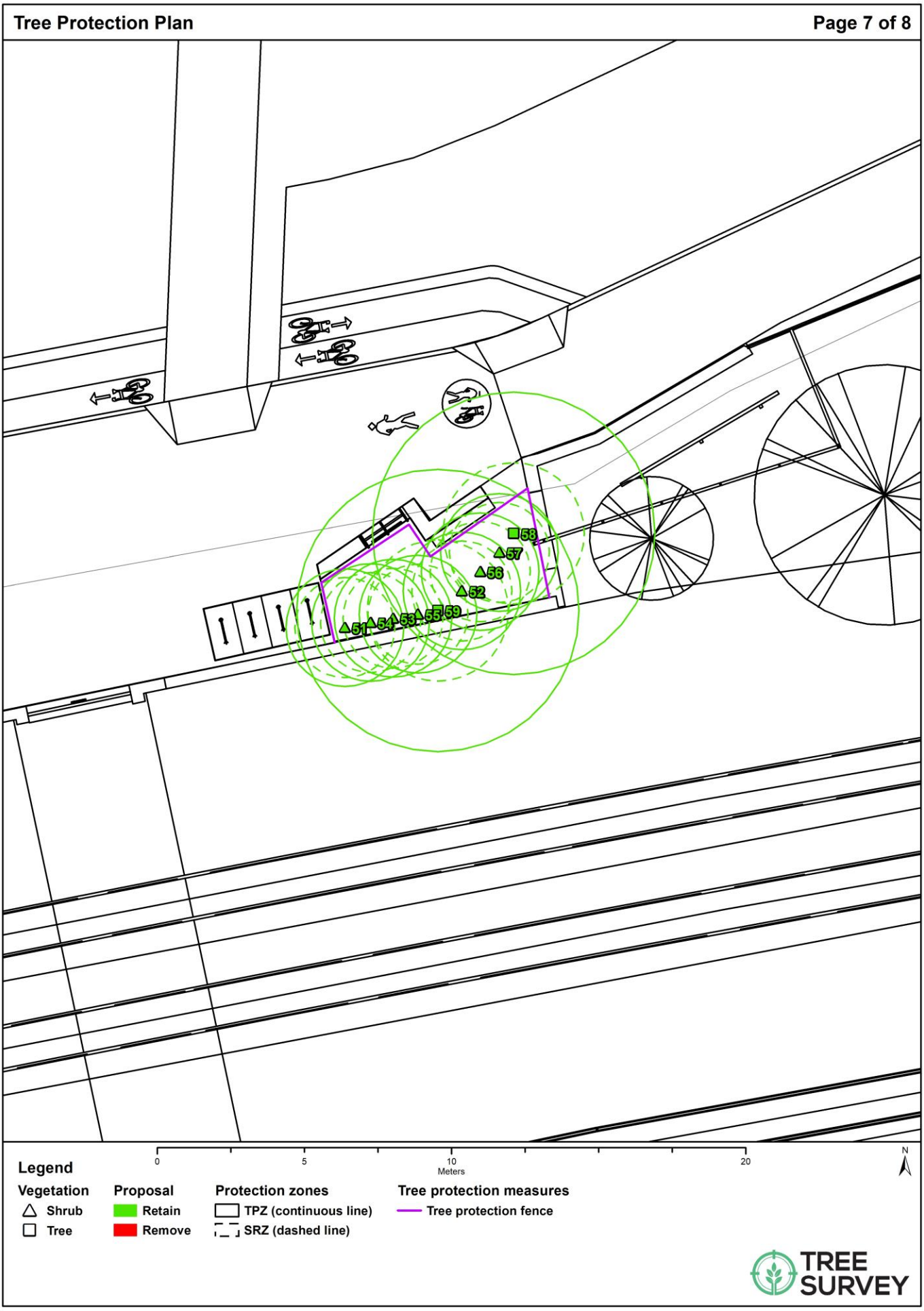

Tree Protection Plan
Page 2 of 8
No resurfacing is to occur beyond existing hard surfaces or within garden beds
1
2
3
4
5
6
7
8
9
10
11
12
14
26
Legend
Vegetation
Shrub
Tree
Proposal
Retain
Remove
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Tree protection measures
Tree protection fence
0
5
10
20
Meters
N
TREE SURVEY

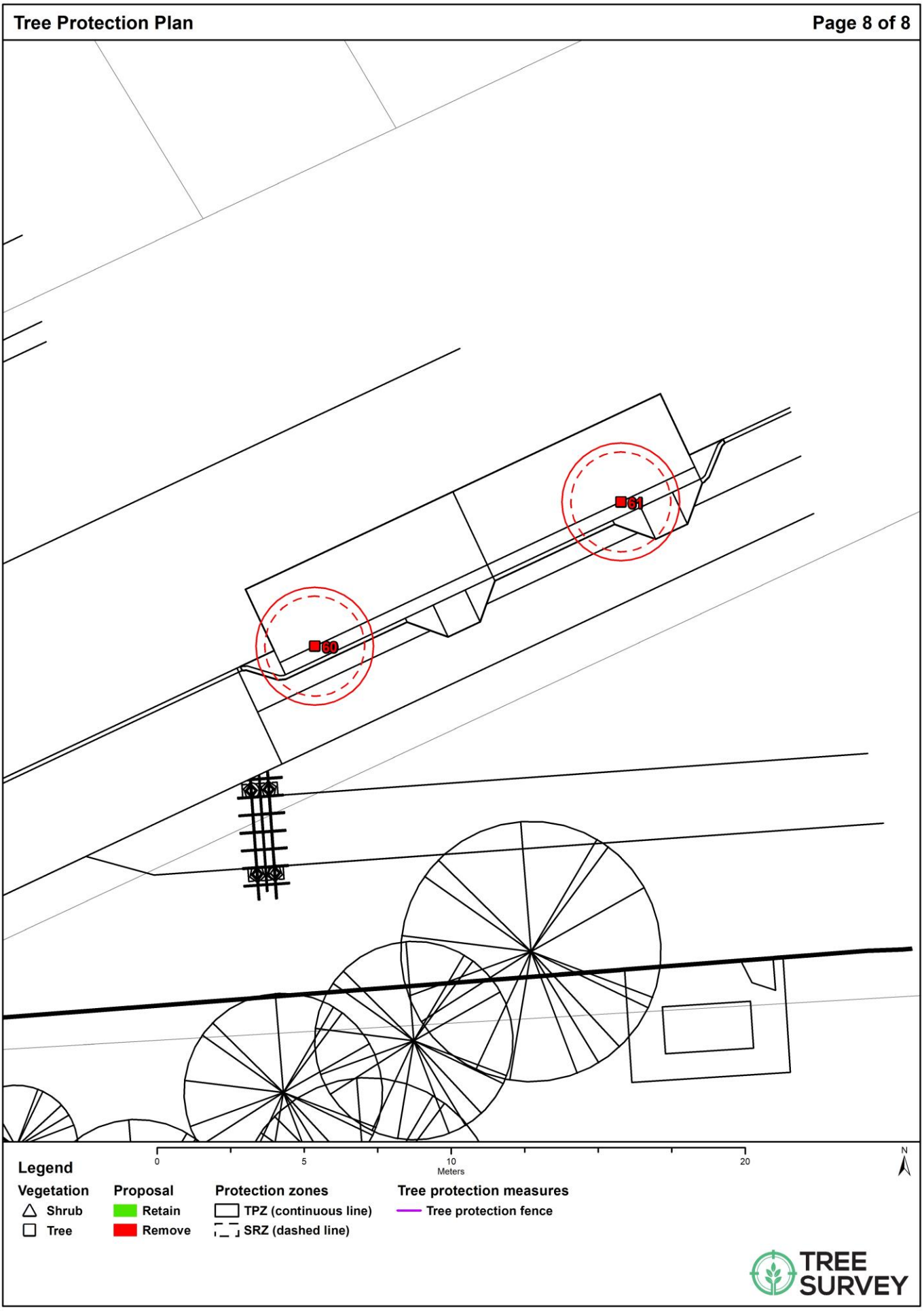

Tree Protection Plan
Page 3 of 8
No resurfacing is to occur beyond existing hard surfaces or within garden beds
11
12
13
15
16
17
18
19
20
21
22
23
24
25
26
0
5
10
20
Meters
N
Legend
Vegetation
Shrub
Tree
Proposal
Retain
Remove
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Tree protection measures
Tree protection fence
TREE SURVEY


Tree Protection Plan
Page 4 of 8
No resurfacing is to occur beyond existing hard surfaces or within garden beds
37
36
29
35
31
34
32
33
28
27
Legend
0
5
10
20
Meters
N
Vegetation
Shrub
Tree
Proposal
Retain
Remove
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Tree protection measures
Tree protection fence
TREE SURVEY


Tree Protection Plan
Page 5 of 8
50
49
No resurfacing is to occur beyond
existing hard surfaces or within garden beds
39
42
40
38
30
41
37
36
29
35
31
0
5
10
20
Meters
N
Legend
Vegetation
Shrub
Tree
Proposal
Retain
Remove
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Tree protection measures
Tree protection fence
TREE SURVEY


Tree Protection Plan
Page 6 of 8
No resurfacing is to occur beyond existing hard surfaces or within garden beds
43
39
42
48
46
44
47
45
0
5
10
20
Meters
N
Legend
Vegetation
Shrub
Tree
Proposal
Retain
Remove
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Tree protection measures
Tree protection fence
TREE SURVEY


Tree Protection Plan
Page 7 of 8
58
57
56
52
51
54
53
55
59
Legend
0
5
10
Meters
20
N
Vegetation
Shrub
Tree
Proposal
Retain
Remove
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Tree protection measures
Tree protection fence
TREE SURVEY


Tree Protection Plan
Page 8 of 8
61
60
0
5
10
20
Meters
N
Legend
Vegetation
Shrub
Tree
Proposal
Retain
Remove
Protection zones
TPZ (continuous line)
SRZ (dashed line)
Tree protection measures
Tree protection fence
TREE SURVEY

6 References

Australian Standard, AS 4970-2009, Protection of Trees on Development Sites

Australian Standard, AS 4373-2007, Pruning of Amenity Trees.

Costello, L., Watson, G. and Smiley, E., 2017. Root Management. International Society of Arboriculture.

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

Mattheck, C. (2007). Updated field guide for visual tree assessment. Karlsruhe: Forschungszentrum Karlsruhe.

Mattheck, C., Bethge, K. and Weber, K. (2015). The body language of trees. Karlsruhe: Karlsruher Inst. fuÌˆr Technologie.

Mattheck, C., Lonsdale, D. and Breloer, H. (1994). The body language of trees. London: H.M.S.O.

Roberts, J., Jackson, N. and Smith, D. (2006). Tree roots in the built environment.

Transport for NSW (TfNSW) Vegetation Offset Guide (DMS-SD-087).

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 AS 4970-2009 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 AS 4970 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