Arboricultural Impact Assessment

Figure 1 Tree 1 *Eucalyptus microcorys*

Site Address: Feeder 9SA/92P Replacement- Waterloo to Surry Hills (W2SH)

Client: Ausgrid

Date: July 2022

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Table of contents

Table of images

1.0 Summary

Accurate Tree Assessment has been commissioned by Ausgrid (the client) to identify areas of encroachment into the Tree Protection Zone of trees located along the proposed route of the Feeder 9SA/92P Replacement- Waterloo to Surry Hills (W2SH). Three hundred and thirty-nine (339) trees have been identified as being subject to potential TPZ/SRZ encroachment from the proposed works.

This report is to read in conjunction with the:

- shared map view and Exel spreadsheet provided to Daniel Halton on 11 and 12 March 2022.
- Proposed Underground Feeder Locality and Key Plan prepared by Ausgrid, included at Annexure A of this report

Conclusions

Small trees and shrubs with DBH less than 0.2 metres along the route have not been considered as they are unlikely to be affected by the proposed works due to their setback from the trench or being in the proposed under-bored sections.

In some cases, larger trees will be exposed to major encroachment of the respective Tree Protection Zones (TPZ) caused by excavation of the electrical services trench. The implementation of specific protection measures detailed in section 7.0 and 7.1 of this report will therefore be required to ensure the viability of trees, and gain compliance with the provisions of AS4970-2009, "*Protection of Trees on Development Sites".*

The *Proposed Underground Feeder Locality and Key Plan* shows the proximity of the proposed trench in relation to the subject trees and other existing underground assets present within the roadway.

Where the structural root zone is proposed to be traversed;

1. non-destructive works within the Tree Protection Zone must document the nature (size of roots) and extent (depth) of root material, providing a preliminary assessment of the likelihood of safely passing through the Structural Root Zone.
2. where it may be considered possible, prior to working within the Structural Root Zone of any tree, ground truthing via means of exploratory non-destructive means (hand-digging, hydro-vac) within the proposed alignment at the direction of a suitably qualified arborist will be required.

This will;

1. determine the presence or absence of any significant tree roots and ultimately whether encroachment of the individual tree's Structural Root Zone to facilitate the proposal is possible.
2. ensure each tree is investigated and assessed to the fullest extent possible so a suitable determination can be made as to whether an individual tree can be retained or ultimately needs to be removed.

Twenty-four (24) trees/groups are subject to major encroachment from the proposed works. Of these thirteen (13) may be retained subject to further investigation during the set out for proposed works.

Eleven (11) trees/groups are subject to encroachment of the Structural Root Zone and will most likely be removed.

Recommendations

That Trees 41, 42-48, 51-57, 63, 183, 200-204, 212, 308, 309, 320 and 334-339 which are subject to encroachment of the Structural Root Zone will require further assessment during the contractor's design process with the aim of retaining the trees.

That further investigation is undertaken during the set out to determine whether Trees 11, 21, 30, 33-36, 40, 62, 129, 185, 225-230, 279-280, 294, 296 and 314-318 subject to major encroachment of the Tree Protection Zone can be accommodated in conjunction with the proposed design by using non-destructive excavation methods.

That prior to the commencement of any works:

- Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) of retained trees are clearly plotted on all plans and marked on-site,

- The trunks of retained trees are to be protected by the erection of protective barriers at the SRZ perimeter to create an individual exclusion zone for the duration of works in the vicinity.

That all roots are to be retained within the SRZ of the subject trees.

That where there is no other option, and subject to inspection by an arborist, roots greater than 40 millimetres diameter may be severed between the SRZ and the TPZ where they conflict directly with the conduits using clean sharp hand-tools to minimise tearing.

That if required minor pruning is carried out in accordance with the Workcover Draft Code of Practice for Tree Works and Australian Standard AS4373-2007, "Pruning of Amenity Trees", and the Workcover Code of Practice for the Amenity Tree Industry, 1998.

2.0 Disclaimer

This report is to be read and considered in its entirety. The subject trees were inspected from the ground using Visual Tree Assessment methodology, no aerial investigations; underground or internal investigations were undertaken. It is the responsibility of the client to implement all recommendations contained in this report.

The assessment is made having regard for the prevailing site conditions; and does not account for the effects that extreme weather events may have on trees.

Information contained in this report reflects the condition of the trees at the time of the inspection. As trees are living organisms their condition will change over time, there is no guarantee that problems or deficiencies of the subject trees may not arise in the future. It must be accepted that living near trees involves some level of risk.

This report is for the use of the client and their contractors to assist in determining the tree protection measures to be undertaken in conjunction with the proposed development. Distribution to other parties is not permitted except with the express permission of the author, Ian Hills. No responsibility is taken by the author for unauthorised use of the information contained in this report.

3.0 Brief

Accurate Tree Assessment has been commissioned by Ausgrid (the client) to identify areas of encroachment into the Tree Protection Zone of trees located along the proposed route of the Feeder 9SA/92P Replacement- Waterloo to Surry Hills (W2SH). Three hundred and thirty-nine (339) trees have been identified as being subject to potential TPZ/SRZ encroachment from the proposed works.

In accordance with the client's specification this report will:

- Identify trees that may be affected by the proposed development
- Provide recommendations for the protection of retained trees based upon the level of encroachment that is expected in accordance with the provisions of AS4970-2009, 'Protection of Trees on Development Sites'

4.0 Method

Site inspections were carried out between 21 – 22 March 2022.

Calculation of tree protection zones was carried out in accordance with the Australian Standard AS4970-2009, "Protection of Trees on Development Sites", based on the trunk diameter (DBH) determined by visual estimation.

Where trees are share similar characteristics, they have been assessed as groups, in this case establishment of the largest TPZ will provide protection to adjacent trees.

Data for trees subject to assessment has collected using a field data collection app, the resulting maps, schedule of trees of trees and identifying photographs will be provided using a shared link.

4.1. Documents

This assessment relies upon the Proposed Underground Feeder Locality and Key Plan prepared by Ausgrid, drawing No 244626 Sheets 1-17, Dated 15 July 2022. (Annexure A)

Concept plans of the proposed route have been provided by the client. (Appendix 10.2)

Shared interactive map available at the following link:
https://www.arcgis.com/home/webmap/viewer.html?url=https://fulcrumapp.io/share/3bde8e0b18401a247653/geoservices/FeatureServer/0

5.0 Tree Assessment

Tree No	Street Address	Species (Common name)	TPZ Radius	SRZ Radius	Height	Spread	Lowest branch above kerb	Dist. behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
1	10- 18 Allen	Eucalyptus microcorys (Tallowwood)	13.2	3.57	14	20	8	0	13.2	M	1a	Appears structurally sound	Nil/retention
2	10-18 Allen	Tristaniopsis laurina (water gum)	3.6	2.25	7	6	4	1	2.6	M	1a	Appears structurally sound	Nil/retention
3	10-18 Allen	Eucalyptus microcorys (Tallowwood)	2.4	2	8	5	4	1	1.4	SM	1a	Appears structurally sound	Nil/retention
4	10 -18 Allen	Eucalyptus microcorys (Tallowwood)	4.8	2.47	13	9	8	1	3.8	M	1a	Appears structurally sound	Nil/retention
5	20-26 Allen	Eucalyptus microcorys (Tallowwood)	6	2.67	15	12	6	0.5	5.5	M	2a	Major asymmetry	Nil/retention
6	20-26 Allen	Eucalyptus microcorys (Tallowwood)	7.2	2.85	18	14	5	0.5	6.7	M	1a	Appears structurally sound	Nil/retention
7	15 Allen	Eucalyptus microcorys (Tallowwood)	8.4	3.01	19	16	5	1	7.4	M	1a	Appears structurally sound	Nil/retention
8	15 Allen	Eucalyptus microcorys (Tallowwood)	8.4	3.01	16	18	6	1	7.4	M	1a	Appears structurally sound	Nil/retention
9	15 Allen	Eucalyptus microcorys (Tallowwood)	7.2	2.67	16	14	6	1	6.2	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
10	25-33 Allen	Eucalyptus microcorys (Tallowwood)	8.4	3.01	20	14	8	0	8.4	M	1a	Appears structurally sound	Nil/retention
11	25-33 Allen	Eucalyptus microcorys (Tallowwood)	6	2.67	14	8	10	0.5	5.5	M	2a	Small deadwood noted, sparse canopy	Major/retention
12	25 -33 Allen	Eucalyptus microcorys (Tallowwood)	2.4	2	7	4	5	1	1.4	SM	1a	Appears structurally sound	Nil/retention
13	25 -33 Allen	Eucalyptus sideroxylon (red ironbark)	3	2.13	7	7	5	1.5	1.5	M	3a	Small deadwood noted, excessive branch die-back noted, sparse canopy	Nil/retention
14	Pitt St	Lophostemon confertus (Brush box)	4.8	2.47	10	8	6	1	3.8	M	1a	Appears structurally sound	Minor/retention

Tree No	Street Address	Species (Common name)	TPZ Radius	SRZ Radius	Height	Spread	Lowest branch above kerb	Dist. behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
15	Pitt	Lophostemon confertus (Brush box)	5.4	2.57	12	8	6	1	4.4	M	1a	Appears structurally sound	Minor/retention
16	258 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	14	8	6	1	2.6	M	1a	Appears structurally sound	Minor/retention
17	258 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	14	7	6	1	2.6	M	1a	Appears structurally sound	Minor/retention
18	258 Pitt	Lophostemon confertus (Brush box)	4.8	2.47	18	10	6	1	3.8	M	1a	Appears structurally sound	Minor/retention
19	258 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	16	9	8	1	2.6	M	1a	Appears structurally sound	Minor/retention
20	258 Pitt	Lophostemon confertus (Brush box)	4.8	2.47	14	10	6	1	3.8	M	1a	Appears structurally sound	Minor/retention
21	258 Pitt	Lophostemon confertus (Brush box)	5.4	2.57	15	10	5	1	4.4	M	1a	Appears structurally sound	Major/retention
22	258 Pitt	Lophostemon confertus (Brush box)	3.6	2 25	14	9	6	1	2.6	M	2a	Small deadwood noted, sparse canopy, decay in trunk	Minor/retention
23	258 Pitt	Lophostemon confertus (Brush box)	4.2	2.37	15	10	8	1	3.2	M	1a	Appears structurally sound	Minor/retention
24	266 Pitt	Lophostemon confertus (Brush box)	3.6	2	14	10	4	0.5	2.9	M	1a	Appears structurally sound, small deadwood noted	Minor/retention
25	Waterloo oval	Lophostemon confertus (Brush box)	4.8	2.47	17	9	8	In roadside blister	4.8	M	1a	Appears structurally sound	Nil/retention
26	Waterloo oval	Lophostemon confertus (Brush box)	3.6	2.47	9	10	6	In roadside blister	3.6	M	1a	Appears structurally sound	Nil/retention
27	Waterloo oval	Lophostemon confertus (Brush box)	3.6	2.25	13	9	6	In roadside blister	3.6	M	1a	Appears structurally sound	Nil/retention

Tree No	Street Address	Species (Common name)	TPZ Radius	SRZ Radius	Height	Spread	Lowest branch above kerb	Dist. behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
28	Waterloo oval	Lophostemon confertus (Brush box)	3.6	2.25	10	8	8	In roadside blister	3.6	M	1a	Appears structurally sound	Nil/retention
29	Waterloo oval	Ficus macrophylla (Moreton Bay fig)	15	3.81	17	24	5	5	10	M	1c	Appears structurally sound	Minor/retention
30	Waterloo Park	Ficus macrophylla (Moreton Bay fig)	8.4	3.01	14	14	3	3	5.4	M	1a	Appears structurally sound	Major/retention
31	Waterloo park	Ficus macrophylla (Moreton Bay fig)	8.4	3.01	20	24	4	5	3.4	M	1c	Appears structurally sound	Nil/retention
32	Waterloo park	Ficus macrophylla (Moreton Bay fig)	7.2	2.47	18	18	7	3	4.2	M	1a	Appears structurally sound	Nil/retention
33	Waterloo park	Ficus macrophylla (Moreton Bay fig)	15	4.03	20	26	3	6	9	M	1c	Appears structurally sound	Major/retention
34	Waterloo park	Ficus macrophylla (Moreton Bay fig)	15	3.81	24	24	6	3	12	M	1c	Appears structurally sound	Major/retention
35	Waterloo park	Ficus macrophylla (Moreton Bay fig)	15	4.03	26	26	4	3	12	M	1c	Appears structurally sound	Major/retention
36	Waterloo park	Grevillea robusta (silky oak)	9.6	3.17	20	15	N/A	5	4.6	M	2a	Small deadwood noted, decay in trunk	Major/retention
37	250 Pitt	Eucalyptus punctata (Grey gum)	7.2	2.85	19	12	N/A	4	3.2	M	2a	Small deadwood noted, decay in trunk	Nil/retention
38	250 Pitt	Ficus microcarpa var. hillii (Hills weeping fig)	9	3.09	15	19	4	4	5	M	1a	Appears structurally sound	Nil/retention
39	240 Pitt	Eucalyptus microcorys (Tallowwood)	7.2	2.85	19	18	8	7	0.2	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
40	Waterloo park	Cupaniopsis anacardiodes (Tuckeroo)	3	2.13	6	4	4	0	3	M	1a	Appears structurally sound	Major/retention
41	Pitt	Eucalyptus botryoides (Bangalay)	5.4	2.57	9	12	8	0	5.4	M	2a	Appears structurally sound, small deadwood noted	Major/assess alternatives

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42-48	Pitt	Robinia pseudoacacia (black locust)	2.4 ea	2.0ea	5	4	3	1	1.4	M	1a	Appears structurally sound	Minor/retention
42-48	Pitt	Robinia pseudoacacia (black locust)	2.4ea	2.0ea	5	4	3	1	1.4	M	1a	Appears structurally sound	Major/assess alternatives
49	232 Pitt	Eucalyptus microcorys (Tallowwood)	8.4	3.01	28	20	12	0	8.4	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
50	232 Pitt	Eucalyptus microcorys (Tallowwood)	7.2	2.85	20	18	8	0	7.2	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
51	Wellington	Tristaniopsis laurina (water gum)	3.6	2	4	3	3	0	3.6	OM	3b	Poor form, declining condition	Major/assess alternatives
52	Wellington	Ficus microcarpa var. hillii (Hills weeping fig)	8.4	3.01	18	19	9	5	3.4	M	1a	Appears structurally sound	Major/assess alternatives
53	Wellington	Ficus microcarpa var. hillii (Hills weeping fig)	10.8	3.31	20	24	9	4	6.8	M	1a	Appears structurally sound	Major/assess alternatives
54	Wellington	Tristaniopsis laurina (water gum)	4.8	2.47	8	6	4	0	4.8	M	1a	Appears structurally sound	Major/assess alternatives
55	Wellington	Tristaniopsis laurina (water gum)	4.8	2.47	9	8	6	0	4.8	M	1a	Appears structurally sound	Major/assess alternatives
56	Wellington	Ficus microcarpa var. hillii (Hills weeping fig)	9.6	3.17	20	20	9	3	6.6	M	1a	Appears structurally sound	Major/assess alternatives
57	Wellington	Ficus microcarpa var. hillii (Hills weeping fig)	9.6	3.31	22	25	10	4	5.6	M	1a	Appears structurally sound	Major/assess alternatives
58	95 Wellington	Podocarpus elatus (plum pine)	10.3	3.24	12	12	7	4	6.3	M	1a	Appears structurally sound	Major/retention
59	Wellington	Melaleuca quinquenervia (broad leaved paperbark)	12	3.44	16	9	6	0	12	M	1a	Appears structurally sound,Small deadwood noted	Major/retention
60	Wellington	Melaleuca quinquenervia (broad leaved paperbark)	12	3.44	16	9	N/A	0	12	M	1a	Appears structurally sound, small deadwood noted	Major/retention
61	113 Wellington	Eucalyptus microcorys (Tallowwood)	7.2	2.85	15	12	8	0	7.2	M	1a	Appears structurally sound	Major/retention

Tree No	Street Address	Species (Common name)	TPZ Radius	SRZ Radius	Height	Spread	Lowest branch above kerb	Dist. behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
62	117 Wellington	Eucalyptus microcorys (Tallowwood)	9.6	3.17	16	20	7	0	9.6	M	1a	Appears structurally sound, small deadwood noted	Major/retention
63	117 Wellington	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	10	8	5	0	8.4	M	1a	Appears structurally sound	Major/assess alternatives
64	289 Wellington	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	11	8	6	0	8.4	M	1a	Appears structurally sound	Nil/retention
65	287 Wellington	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	14	14	8	0	7.2	M	1a	Appears structurally sound	Nil/retention
66	287 Wellington	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	14	14	8	0	8.4	M	1a	Appears structurally sound	Nil/retention
67	Wellington	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	15	13	7	0	8.4	M	1a	Appears structurally sound	Nil/retention
68	Wellington	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	12	12	6	0	8.4	M	1a	Appears structurally sound	Nil/retention
69	Wellington	Melaleuca quinquenervia (broad leaved paperbark)	7.8	2.93	12	8	8	0	7.8	M	1a	Appears structurally sound	Nil/retention
70-78	247 Pitt	Robinia pseudoacacia (black locust)	2.4	2	7	4	5	1	1.4	SM	1a	Appears structurally sound	Nil/retention
70-78	225 Pitt	Robinia pseudoacacia (black locust)	2.4	2	7	4	5	1	1.4	SM	1a	Appears structurally sound	Nil/retention
79-85	200 Pitt	Casuarina glauca (Swamp she oak),Robinia pseudoacacia (black locust)	6	2.67ea	15ea	8ea	N/A	4	2	M	1a	Appears structurally sound	Nil/retention

Tree No	Street Address	Species (Common name)	TPZ Radius	SRZ Radius	Height	Spread	Lowest branch above kerb	Dist. behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
79-85	200 Pitt	Casuarina glauca (Swamp she oak),Robinia pseudoacacia (black locust)	6	2.67ea	15ea	8ea	N/A	4	2	M	1a	Appears structurally sound	Nil/retention
86-91	200 Pitt	Robinia pseudoacacia (black locust)	2.4ea	2.0ea	6ea	4ea	3	0	2.4	SM	1a	Appears structurally sound	Nil/retention
86-91	200 Pitt	Robinia pseudoacacia (black locust)	2.4ea	2.0ea	6ea	4ea	3	0	2.4	SM	1a	Appears structurally sound	Nil/retention
92	180 Pitt	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	10	7	4	0	8.4	M	1a	Appears structurally sound	Nil/retention
93	180 Pitt	Melaleuca quinquenervia (broad leaved paperbark)	6	2.67	10	10	4	0	6	M	1a	Appears structurally sound	Nil/retention
94	180 Pitt	Melaleuca quinquenervia (broad leaved paperbark)	5.4	2.57	12	10	4	0	5.4	M	1a	Appears structurally sound	Nil/retention
95	180 Pitt	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	12	12	6	0	8.4	M	1a	Appears structurally sound, major asymmetry	Nil/retention
96	180 Pitt	Ficus microcarpa var. hillii (Hills weeping fig)	10.8	3.31	19	22	N/A	4	6.8	M	1a	Appears structurally sound	Nil/retention
97	180 Pitt	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	12	9	5	1	6.2	M	1a	Appears structurally sound	Nil/retention
98-107	193-219 Pitt	Robinia pseudoacacia (black locust),Tristaniopsis laurina (water gum)	2.4ea	2.0ea	5-7	4-5	4	1	1.4	SM	1a	Appears structurally sound	Nil/retention
98-107	193-219 Pitt	Robinia pseudoacacia (black locust),Tristaniopsis laurina (water gum)	2.4ea	2.0ea	5-7	4-5	4	1	1.4	SM	1a	Appears structurally sound	Nil/retention

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108	193 Pitt	Glochidion ferdinandi (Cheese tree)	9	3.09	10	7	N/A	4	5	M	1a	Appears structurally sound	Minor/retention
109	183 Pitt	Robinia pseudoacacia (black locust)	6	2.67	10	10	5	0	6	M	2a	Small deadwood noted, sparse canopy	Minor/retention
110	179 Pitt	Syzigium sp (lilly pilly)	3	2.13	5	4	3	1	2	M	1a	Appears structurally sound	Nil/retention
111	177 Pitt	Tristaniopsis laurina (water gum)	3.6	2.25	8	5	4	1	2.6	M	1a	Appears structurally sound	Nil/retention
112	175 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	10	5	5	0.5	3.1	M	1a	Appears structurally sound	Nil/retention
113	171 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	7	5	4	0.5	3.1	SM	1a	Appears structurally sound	Nil/retention
114	167 Pitt	Tristaniopsis laurina (water gum)	3.6	2.25	7	6	3	0.5	3.1	M	1a	Appears structurally sound	Nil/retention
115	161 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	9	4	3	0.5	3.1	M	1a	Appears structurally sound	Nil/retention
116	153 Pitt	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	9	9	4	0	7.2	M	1a	Appears structurally sound	Minor/retention
117	147 Pitt	Lophostemon confertus (Brush box)	4.8	2.47	8	6	4	0	4.8	M	1a	Appears structurally sound	Nil/retention
118	137 Pitt	Callistemon sp	4.8	2.47	6	6	4	0.5	4.3	M	1a	Appears structurally sound	Nil/retention
119	135 Pitt	Lophostemon confertus (Brush box)	3	2.13	6	5	4	0.5	2.5	SM	1a	Appears structurally sound	Nil/retention
120	131 Pitt	Lophostemon confertus (Brush box)	4.2	2.37	10	6	5	0.5	3.7	M	1a	Appears structurally sound	Nil/retention
121	127 Pitt	Platanus sp (plane tree)	4.8	2.47	11	9	4	0	4.8	M	1a	Appears structurally sound	Nil/retention
122	123 Pitt	Platanus sp (plane tree)	9.6	3.17	14	18	2	4	5.6	M	1a	Appears structurally sound	Minor/retention

Tree No	Street Address	Species (Common name)	TPZ Radius	SRZ Radius	Height	Spread	Lowest branch above kerb	Dist. behind kerb	TPZ over road	Age class	SULE	Comments	Encroachment /Proposal
123	119	Platanus sp (plane tree)	8.4	3.01	14	15	2	6	2.4	M	1a	Appears structurally sound	Minor/retention
124	111 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	8	6	4	2	1.6	M	1a	Appears structurally sound	Nil/retention
125	107 Pitt	Lophostemon confertus (Brush box)	3	2.13	7	5	3	1	2	SM	1a	Appears structurally sound	Nil/retention
126-128	97-101 Pitt	Tristaniopsis laurina (water gum)	3.0ea	2.13ea	6ea	4ea	3	0.5	2.5	SM	1a	Appears structurally sound	Nil/retention
126-128	97-101 Pitt	Tristaniopsis laurina (water gum)	3.0ea	2.13ea	6ea	4ea	3	0.5	2.5	SM	1a	Appears structurally sound	Nil/retention
129	95 Pitt	Melaleuca quinquenervia (broad leaved paperbark)	9.6	3.17	12	12	6	0	9.6	M	1a	Appears structurally sound	Major/retention
130	93 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	8	6	5	1	2.6	M	1a	Appears structurally sound	Nil/retention
131	94 Pitt	Lophostemon confertus (Brush box)	3.6	2.25	8	6	5	0.5	3.1	M	1a	Appears structurally sound	Nil/retention
132	102 Pitt	Tristaniopsis laurina (water gum)	3.6	2.25	5	5	3	0.5	3.1	M	1a	Appears structurally sound	Nil/retention
133	114 Pitt	Fraxinus sp	3.6	2.25	5	6	5	0.5	3.1	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
135	126 Pitt	Melaleuca quinquenervia (broad leaved paperbark)	4.8	2.47	5	5	3	0.5	4.3	M	1a	Appears structurally sound	Nil/retention
136-144	146-152 Pitt	Tristaniopsis laurina (water gum)	2.4	2	5	4	3	0.5	1.9	SM	1a	Appears structurally sound	Nil/retention
136-144	146-152 Pitt	Tristaniopsis laurina (water gum)	2.4	2	5	4	3	0.5	1.9	SM	1a	Appears structurally sound	Nil/retention
145	Redfern	Liquidambar styrachiflua (sweet gum)	4.8	2.47	14	8	5	1	3.8	M	1a	Appears structurally sound	Nil/retention

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146	Redfern	Liquidambar styrachiflua (sweet gum)	6	2.67	12	10	5	0.5	5.5	M	2a	Small deadwood noted	Nil/retention
147	110 Redfern	Liquidambar styrachiflua (sweet gum)	6	2.67	12	10	4	0.5	5.5	M	1a	Appears structurally sound	Nil/retention
148	106 Redfern	Liquidambar styrachiflua (sweet gum)	6	2.67	12	12	5	0.5	5.5	M	1a	Appears structurally sound	Nil/retention
149	98 Redfern	Liquidambar styrachiflua (sweet gum)	6	2.67	10	10	4	0.5	5.5	M	1a	Appears structurally sound	Nil/retention
150	74 Redfern	Ficus benjamina (weeping fig)	7.2	2.67	12	15	5	1	6.2	M	1a	Appears structurally sound	Nil/retention
151-153	72-64 Redfern	Jacaranda mimosifolia (Jacaranda)	3.0ea	2.13 ea	6	6	N/A	1	2.0	M	2a	Appears structurally sound	Nil/retention
151-153	72-64 Redfern	Jacaranda mimosifolia (Jacaranda)	3.0ea	2.13 ea	6	6	N/A	1	2.0	M	2a	Appears structurally sound	Nil/retention
154-158	Redfern Park	Ficus macrophylla (Moreton Bay fig)	14.4	3.69	20	20	8	4	10.4	M	1c	Appears structurally sound, small deadwood noted	Minor/retention
154-158	Redfern Park	Ficus macrophylla (Moreton Bay fig)	14.4	3.69	20	20	8	4	10.4	M	1c	Appears structurally sound, small deadwood noted	Minor/retention
159	GT Buckingham	Callistemon sp	5.4	2.57	6	6	4	1.5	2.9	M	1a	Appears structurally sound	Nil/retention
160	Gt Buckingham	Jacaranda mimosifolia (Jacaranda)	3.6	2	6	6	4	1	2.6	M	1a	Appears structurally sound	Minor/retention
161	108 Gt Buckingham	Jacaranda mimosifolia (Jacaranda)	8.4	3.01	10	10	7	In roadside blister	8.4	M	1a	Appears structurally sound	Nil/retention
162	100 Gt Buckingham	Jacaranda mimosifolia (Jacaranda)	3.6	2	7	5	4	1	2.6	M	1a	Appears structurally sound	Minor/retention

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163	94 Gt Buckingham	Lophostemon confertus (Brush box)	4.8	2.47	12	6	N/A	1	3.8	M	1a	Appears structurally sound	Minor/retention
164	92 Gt Buckingham	Corymbia maculata (Spotted gum)	4.8	2.47	14	8	12	In roadside blister	4.8	M	1a	Appears structurally sound, small deadwood noted	Minor/retention
163-165	88-82 Gt Buckingham	Callistemon sp	2.4ea	2	4	4	3	1	1.4	M	1a	Appears structurally sound	Nil/retention
163-165	88-82 Gt Buckingham	Callistemon sp	2.4ea	2	4	4	3	1	1.4	M	1a	Appears structurally sound	Nil/retention
166	80 Gt Buckingham	Jacaranda mimosifolia (Jacaranda)	3.6	2.25	9	8	5	1	2.6	M	1a	Appears structurally sound	Nil/retention
167-168	78 Gt Buckingham	Melaleuca stypheliodes (prickly-leaved paperbark)	3.6	2.25	7	6	5	In roadside blister	3.6	M	1a	Appears structurally sound	Nil/retention
169	72 Gt Buckingham	Lophostemon confertus (Brush box)	7.2	2.85	18	12	6	1	6.2	M	1a	Appears structurally sound	Nil/retention
170	68 Gt Buckingham	Lophostemon confertus (Brush box)	7.2	2.85	18	12	6	1	6.2	M	1a	Appears structurally sound	Minor/retention
171-173	50 Gt Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	6	2.67	16	15	6	In roadside blister	6	M	1a	Appears structurally sound	Minor/retention
174	44 Gt Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	4.8	2.47	9	6	6	1	3.8	M	1a	Appears structurally sound	Nil/retention
175-178	42-32 Gt Buckingham	Corymbia maculata (Spotted gum),Jacaranda mimosifolia (Jacaranda)	2.4	2	5	5	4	1	1.4	SM	1a	Appears structurally sound	Nil/retention

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175-178	42-32 Gt Buckingham	Corymbia maculata (Spotted gum),Jacaranda mimosifolia (Jacaranda)	2.4	2	5	5	4	1	1.4	SM	1a	Appears structurally sound	Minor/retention
179	32 Gt Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	10	6	8	In roadside blister	8.4	M	1a	Appears structurally sound	Minor/retention
180	24 Gt Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	8	7	6	1	6.2	M	1a	Appears structurally sound	Nil/retention
181	16 Gt Buckingham	Callistemon sp	2.4	2	6	6	5	In roadside blister	2.4	M	1a	Appears structurally sound	Nil/retention
182	12 Gt Buckingham	Eucalyptus saligna (Sydney blue gum)	6	2.67	18	12	N/A	1	5.0	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
183	Gt Buckingham reserve	Eucalyptus saligna (Sydney blue gum)	6	2.67	22	16	N/A	1	5.0	M	1a	Appears structurally sound, small deadwood noted	Major/assess alternatives
184	105 Gt Buckingham	Jacaranda mimosifolia (Jacaranda)	6	2.67	10	10	5	0	6	M	1a	Appears structurally sound	Minor/retention
185	101 Gt Buckingham	Banksia integrifolia (Coast banksia)	7.2	2.85	12	9	7	In roadside blister	7.2	M	1a	Appears structurally sound	Major/retention
186	95 Gt Buckingham	Eucalyptus microcorys (Tallowwood)	10.8	3.31	18	18	10	0	10.8	M	1a	Appears structurally sound, small deadwood noted	Minor/retention
187	89 Gt Buckingham	Callistemon sp	3	2.13	5	4	3	0	3	SM	2a	Small deadwood noted, sparse canopy	Nil/retention

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189	83 Gt Buckingham	Jacaranda mimosifolia (Jacaranda)	3.6	2.25	10	7	6	0	3.6	M	1a	Appears structurally sound	Nil/retention
190	81 Gt Buckingham	Jacaranda mimosifolia (Jacaranda)	6	2.67	10	10	6	In roadside blister	6	M	1a	Appears structurally sound	Minor/retention
191	73 Gt Buckingham	Lophostemon confertus (Brush box)	7.8	2.93	15	10	5	0	7.8	M	1a	Appears structurally sound, small deadwood noted	Minor/retention
192	71 Gt Buckingham	Tristaniopsis laurina (water gum)	4.8	2.47	8	6	5	0	4.8	M	1a	Appears structurally sound	Nil/retention
193	67 Gt Buckingham	Jacaranda mimosifolia (Jacaranda)	6	2.67	12	12	7	0	6.0	M	1a	Appears structurally sound	Minor/retention
194	65 Gt Buckingham	Lophostemon confertus (Brush box)	6	2.67	16	9	N/A	0	6.0	M	1a	Appears structurally sound, small deadwood noted	Minor/retention
195	63 Gt Buckingham	Melaleuca stypheliodes (prickly-leaved paperbark)	4.8	2.47	10	8	7	In roadside blister	4.8	M	1a	Appears structurally sound	Minor/retention
196	61 Gt Buckingham	Melaleuca stypheliodes (prickly-leaved paperbark)	4.8	2.47	10	5	6	In roadside blister	4.8	M	1a	Appears structurally sound	Nil/retention
197	53-59 Gt Buckingham	Lophostemon confertus (Brush box)	4.8	2.47	9	8	3	0	4.8	M	1a	Appears structurally sound	Nil/retention
198	53-59 Gt Buckingham	Lophostemon confertus (Brush box)	4.8	2.47	9	5	3	0	4.8	M	1a	Appears structurally sound	Nil/retention
199	53-59 Gt Buckingham	Eucalyptus saligna (Sydney blue gum)	4.8	2.47	9	5	3	0	4.8	M	1a	Appears structurally sound	Minor/retention
200-202	53- 49 Gt Buckingham	Lophostemon confertus (Brush box)	2.4	2	5	4	N/A	1	1.4	SM	1a	Appears structurally sound	Major/assess alternatives

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203	47 Gt Buckingham	Eucalyptus saligna (Sydney blue gum)	3.6	2.25	10	9	8	0	3.6	M	1a	Appears structurally sound, small deadwood noted	Major/assess alternatives
204	45 Gt Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	6	2.67	7	4	5	0	6.0	M	2a	Small deadwood noted, sparse canopy	Major/assess alternatives
205	37 Gt Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	6	2.67	9	8	4	0	6.0	M	1a	Appears structurally sound	Nil/retention
206	35 Gt Buckingham	Corymbia citriodora (lemon scented gum)	5.4	2.57	15	10	8	0	5.4	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
207	31 Gt Buckingham	Eucalyptus saligna (Sydney blue gum)	6	2.47	18	9	8	0	6.0	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
208	27 Gt Buckingham	Lophostemon confertus (Brush box)	3.6	2.25	8	5	4	0	3.6	M	1a	Appears structurally sound	Nil/retention
209	21 Gt Buckingham	Tristaniopsis laurina (water gum)	2.4	2	4	3	3	0	2.4	SM	1a	Appears structurally sound	Nil/retention
210	11 Gt Buckingham	Archontophoenix cunninghamiana (Bangalow palm)	2.0ea	1.5ea	11	10	8	0	2.0	M	1a	Appears structurally sound	Nil/retention
211	Gt Buckingham Reserve	Platanus sp (plane tree)	5.4	2.57	12	8	N/A	In reserve	0	M	1a	Appears structurally sound, small deadwood noted	Major/assess alternatives
212	1 Gt Buckingham	Lophostemon confertus (Brush box)	4.8	2.47	12	9	3	0	4.8	M	1a	Appears structurally sound	Nil/retention
213	6 Gt Buckingham	Eucalyptus saligna (Sydney blue gum)	4.2	2.37	8	12	4	0	4.2	M	2a	Appears structurally sound, poor form	Nil/retention
214	2 Gt Buckingham	Lophostemon confertus (Brush box)	6	2.67	10	12	6	0	6.0	M	1a	Appears structurally sound	Nil/retention
215-224	99 Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	12	10	7	0	8.4	M	1a	Appears structurally sound	Minor/retention

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215-224	13 Belvoir	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	12	10	7	0	8.4	M	1a	Appears structurally sound	Minor/retention
225-230	94 Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	12	10	7	0	8.4	M	1a	Appears structurally sound	Major/retention
225-230	122 Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	12	10	7	0	8.4	M	1a	Appears structurally sound	Major/retention
232-236	86 Buckingham	Callistemon salignus (White bottlebrush)	4.8	2.47	7	5	4	0	4.8	M	2a	Small deadwood noted, poor form	Minor/retention
232-236	70 Buckingham	Callistemon salignus (White bottlebrush)	3.6	2.25	7	3	4	0	3.6	M	2a	Small deadwood noted, poor form	Nil/retention
237	56 Buckingham	Robinia pseudoacacia (black locust)	2.4	2	6	6	6	0	2.4	Semi-mature	1a	Appears structurally sound	Nil/retention
238	54 Buckingham	Callistemon salignus (White bottlebrush)	4.8	2.47	12	10	5	0	4.8	M	1a	Appears structurally sound	Minor/retention
239-240	51 Buckingham	Melaleuca quinquenervia (broad leaved paperbark)	5.4	2.57	7	5	5	0	5.4	M	1a	Appears structurally sound	Nil/retention
241-247	51 Buckingham	Robinia pseudoacacia (black locust)	3.6	2.25	7	5	6	0	3.6	M	1a	Appears structurally sound	Nil/retention
241-247	59 Buckingham	Robinia pseudoacacia (black locust)	3.6	2.25	7	5	6	0	3.6	M	1a	Appears structurally sound	Nil/retention
248-259	50 Buckingham	Tristaniopsis laurina (water gum)	3.6 ea	2.25ea	5-9	4-6	3	0	3.6	M	1a	Appears structurally sound	Nil/retention
248-259	20 Buckingham	Tristaniopsis laurina (water gum)	3.6 ea	2.25ea	5-9	4-6	3	0	3.6	M	1a	Appears structurally sound	Nil/retention

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259-269	35 Buckingham	Robinia pseudoacacia (black locust),Tristaniopsis laurina (water gum)	3.6 ea	2.25ea	5-9	4-6	3	0	3.6	M	1a	Appears structurally sound	Nil/retention
259-269	47 Buckingham	Robinia pseudoacacia (black locust),Tristaniopsis laurina (water gum)	3.6 ea	2.25ea	5-9	4-6	3	0	3.6	M	1a	Appears structurally sound	Nil/retention
270	Rutland	Tristaniopsis laurina (water gum)	3.6	2.25	9	7	6	0	3.6	M	1a	Appears structurally sound	Nil/retention
271	Rutland	Tristaniopsis laurina (water gum)	3.6	2.25	9	7	6	0	3.6	M	1a	Appears structurally sound	Nil/retention
272	118 Holt	Melaleuca quinquenervia (broad leaved paperbark)	8.4	3.01	12	11	6	N/a	0	M	1a	Appears structurally sound	Minor/retention
273	118 Holt	Melaleuca quinquenervia (broad leaved paperbark)	7.2	2.85	12	9	6	N/A	0	M	1a	Appears structurally sound	Minor/retention
274	Gladstone	Celtis sp (Hackberry)	6	2.85	16	12	4	3	3.6	M	1a	Appears structurally sound	Nil/retention
275	38 Waterloo	Eucalyptus robusta (Swamp mahogany)	4.2	2.37	18	10	9	0	4.2	M	1a	Appears structurally sound, small deadwood noted	Minor/retention
276	38 Waterloo	Melaleuca quinquenervia (broad leaved paperbark)	5.4	2.57	10	8	7	0	5.4	M	1a	Appears structurally sound	Minor/retention
277	Waterloo	Corymbia citriodora (lemon scented gum)	6	2.47	18	18	9	0	6.0	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
278	Waterloo	Corymbia citriodora (lemon scented gum)	6	2.47	18	18	9	0	6.0	M	1a	Appears structurally sound, small deadwood noted	Nil/retention

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279-280	80 Cooper	Melaleuca quinquenervia (broad leaved paperbark)	4.8ea	2.47ea	9	5	5	0	4.8	M	1a	Appears structurally sound	Major/retention
281	16 Waterloo	Jacaranda mimosifolia (Jacaranda)	2.4	2	8	4	5	0	2.4	SM	1a	Appears structurally sound	Minor/retention
282-283	21 Waterloo	Eucalyptus robusta (Swamp mahogany)	6	2.67	14	10	6	0	6.0	SM	1a	Appears structurally sound, small deadwood noted	Nil/retention
284-286	27 Waterloo	Jacaranda mimosifolia (Jacaranda)	2.4	2	6	4	5	0	2.4	SM	1a	Appears structurally sound	Nil/retention
287	31 Waterloo	Jacaranda mimosifolia (Jacaranda)	3	2.13	5	7	4	0	3.0	SM	1a	Appears structurally sound	Nil/retention
288-292	39 Waterloo	Eucalyptus robusta (Swamp mahogany), Jacaranda mimosifolia (Jacaranda)	3.6	2.25	10	6	5	0	3.6	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
288-292	59 Waterloo	Eucalyptus robusta (Swamp mahogany), Jacaranda mimosifolia (Jacaranda)	3.6	2.25	10	6	5	0	3.6	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
293	Cnr Sophia and Waterloo	Lophostemon confertus (Brush box)	7.2	2.85	14	10	8	0	7.2	M	1a	Appears structurally sound	Nil/retention
294	Cnr Sophia and Waterloo	Syzigium sp (lilly pilly)	8.4	3.01	14	15	7	2	6.4	M	1a	Appears structurally sound	Major/retention
295	70 Foveaux	Platanus sp (plane tree)	7.2	2.85	16	20	8	0	7.2	M	1a	Appears structurally sound	Minor/retention
296	Bellevue	Platanus sp (plane tree)	8.4	3.01	20	20	8	2	6.4	M	1a	Appears structurally sound	Major/retention
297	Bellevue	Melaleuca stypheliodes (prickly-leaved paperbark)	4.8	2.47	14	6	6	3	1.8	M	1a	Appears structurally sound	Nil/retention

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298-307	28 Bellevue	Fraxinus sp (Ash)	2.4	2	5	3	4	0	2.4	SM	3a	Excessive branch die-back noted, sparse canopy	Nil/retention
298-307	6 Bellevue	Fraxinus sp (Ash)	2.4	2	5	3	4	0	2.4	SM	3a	Excessive branch die-back noted, sparse canopy	Nil/retention
308	Bellevue	Populus sp (poplar)	9.6	3.17	25	12	10	1	8.6	M	1a	Appears structurally sound, small deadwood noted	Major/assess alternatives
309	Bellevue	Platanus sp (plane tree)	4.2	2.37	15	10	7	1.5	2.7	M	1a	Appears structurally sound	Major/assess alternatives
310-313	39 Bellevue	Melaleuca quinquenervia (broad leaved paperbark)	3.6	2.25	6	4	4	0	3.6	M	3a	Poor form	Nil/retention
310-313	21 Bellevue	Melaleuca quinquenervia (broad leaved paperbark)	3.6	2.25	6	4	4	0	3.6	M	3a	Poor form	Nil/retention
314-315	Bellevue	Melaleuca sp	6	2.85	9	6	5	0	6.0	M	1a	Appears structurally sound	Major/retention
316-317	Bellevue	Melaleuca sp	6	2.85	9	6	5	0	6.0	M	1a	Appears structurally sound	Major/retention
318	96 Albion	Platanus sp (plane tree)	9.6	3.17	18	24	9	0	9.6	M	1a	Appears structurally sound	Major/retention
319	94 Albion	Platanus sp (plane tree)	3	2.13	9	5	6	0	3.0	SM	1a	Appears structurally sound	Minor/retention
320	Albion	Platanus sp (plane tree)	8.4	3.01	18	20	8	0	8.4	M	1a	Appears structurally sound	Major/assess alternatives
321	83 Albion	Lophostemon confertus (Brush box)	3.6	2.25	8	8	5	0	3.6	M	3a	Poor form	Nil/retention

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322-323	71-75 Albion	Platanus sp (plane tree)	3.6	2.25	7	5	5	0	3.6	M	2a	Sparse canopy, poor form	Nil/retention
322-323	71-75 Albion	Platanus sp (plane tree)	3.6	2.25	7	5	5	0	3.6	M	2a	Sparse canopy, poor form	Nil/retention
324	63 Albion	Lophostemon confertus (Brush box)	4.2	2.37	10	6	6	0	4.2	M	1q	Appears structurally sound	Nil/retention
325	59 Albion	Lophostemon confertus (Brush box)	4.2	2.37	10	6	6	0	4.2	M	1q	Appears structurally sound	Nil/retention
326	Commonwealth	Melaleuca quinquenervia (broad leaved paperbark)	4.8	2.47	10	6	4	2	4.8	M	1a	Appears structurally sound	Nil/retention
327-332	Commonwealth	Melaleuca quinquenervia (broad leaved paperbark)	3.6	2.25	10-12	5-7	6	0	3.6	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
327-329	187 Commonwealth	Melaleuca quinquenervia (broad leaved paperbark)	3.6	2.25	10-12	5-7	6	0	3.6	M	1a	Appears structurally sound, small deadwood noted	Nil/retention
330	Ann	Melaleuca quinquenervia (broad leaved paperbark)	7.2	3.01	12	6	7	0	7.2	M	1a	Appears structurally sound	Nil/retention
331	6 Ann	Callistemon sp	2.4	2	5	4	4	0	2.4	M	1a	Appears structurally sound	Nil/retention
332	20 Ann	Fraxinus sp	3.6	2.25	9	10	5	0	3.6	M	1a	Appears structurally sound	Nil/retention
333	38 Ann	Liquidambar styraciflua (sweet gum)	8.4	3.01	18	16	6	0	8.4	M	2a	Sparse canopy, poor form	Nil/retention
334	37 Ann	Populus sp (poplar)	4.8	2.47	15	6	6	0	4.8	M	2a	Small deadwood noted, sparse canopy, poor form	Major/assess alternatives
335	33 Ann	Fraxinus sp	3.6	2.25	10	10	5	0	3.6	M	2a	Small deadwood noted	Major/assess alternatives

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336	29 Ann	Brachychiton acerifolius (Illawarra flame tree)	5.4	2.37	10	7	6	0	5.4	M	1a	Appears structurally sound	Major/assess alternatives
337	25 Ann	Melaleuca quinquenervia (broad leaved paperbark)	6	2.67	12	6	5	0	6.0	M	1a	Appears structurally sound	Major/assess alternatives
338-339	15 Ann	Fraxinus sp	2.4	2	6	4	2	0	2.4	M	2a	Small deadwood noted, poor form	Major/assess alternatives
338-339	Ann	Fraxinus sp	2.4	2	6	4	2	0	2.4	M	2a	Small deadwood noted, poor form	Major/assess alternatives

All dimensions are in metres	
DBH – Trunk diameter at 1.4 metres	
TPZ = Tree Protection Zone (calculated in accordance with AS4970)	
SRZ = Structural Root Zone (calculated in accordance with AS4970)	
SULE = Useful Life Expectancy (Barrel, J -1993-95) see appendix 12.1	

This review was based on Ausgrid's preliminary design (Dated 23 June 2022) which is subject to change via the contractor's design process. Changes to the design may result in changes to impacts on trees and the recommendations within this report.

6.0 Development impact

All parts of a tree may be damaged by construction activities, and the effects of damage are often cumulative meaning that seemingly minor damage to the tree can have adverse effects that may not become apparent until well after the project has been completed.

Crown damage often occurs when machinery impacts branches of the tree resulting in a loss of foliage. As the foliage is where the tree produces the sugars required for healthy growth it therefore stands to reason that any loss of foliage will affect the trees' ability to function normally.

In addition, when branches are torn or improperly pruned the trees' ability to recover is affected and pathogens that cause wood decay or disease have an increased opportunity to penetrate the trees natural defenses.

Trunk damage is usually caused by mechanical impact, and again wounding predisposes the tree to infection by pathogens.

Root damage is the most common cause of damage to trees on development sites, and often has the most serious effects as it commonly goes un-noticed for some time. Damage can be caused by mechanical factors such as tearing during excavation, as well as factors such as chemical contamination, changes in hydrology and altering gaseous exchange rates by filling, and compaction during movement of equipment.

Australian Standard 4970, *Protection of Trees on Development Sites* was adopted in 2009 to provide Arborists and the construction industry with a guide to assist in the preservation of retained trees on all types of development sites.

To assist professionals working to protect trees the Standard proposes the following:

> "Tree Protection Zone - A specified area above and below ground level at a given 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 development.
>
> *Structural Root Zone – The area around the base of a tree required for the tree's stability in the ground. The woody root growth and soil cohesion in this area are necessary to hold the tree upright. The SRZ is nominally circular with the trunk at its centre and is expressed by its radius in metres.*
>
> *This zone considers a tree's structural stability only, not the root zone required for a tree's vigour and long-term viability, which will usually be much larger."* (Ref. AS4970-2009)

Minor encroachment of the TPZ is sometimes unavoidable and at levels less than 10% of the total TPZ area can be tolerated if there is scope to increase the area of the TPZ contiguously about the unaffected perimeter. Where encroachment exceeds 10% further investigation will be required to determine the measures required to offset the incursion. Encroachment of the SRZ is not recommended as tree health and condition will almost certainly be adversely affected.

7.0 Discussion

Most trees on the route appear in generally good health and vigour with some deadwood and wounding noted, many of the trees exhibit asymmetrical form due to suppression by the larger trees and pruning for service line clearance. None of the trees were noted to contain hollows suitable for habitation by arboreal fauna.

New duct lines will be installed close to the crown of the road as specified in the proposed route layout so that the maximum distance can be achieved from the location of trees which are mainly within the pedestrian footpath.

Trees 41, 42-48, 51-57, 63, 183, 200-204, 212, 308, 309, 320 and 334-339 which are shown to be subject to encroachment of the Structural Root Zone are highlighted in red in the Tree Assessment table at Section 5.0. Further assessment of alternatives for the management of these trees will be required during the contractors design process.

Ausgrid proposes to retain as many of the subject trees as possible. To achieve this evaluation of proposed impacts will be investigated on-site prior to the removal of trees. This may include exploratory excavation by non-destructive means (hand digging, hydro-vac) and assessment by the project arborist to ascertain the size and position of structural roots that conflict with the proposed conduits.

Removals will only be carried out once it is demonstrated that no option for the preservation of a particular tree exists.

Trees 11, 21, 30, 33-36, 40, 62, 129, 185, 225-230, 279-280, 294, 296 and 314-318 which are shown to be subject to major encroachment of the Tree Protection Zone are highlighted in orange in the Tree Assessment table at Section 5.0. It may be possible to retain some of these trees and it is recommended that further investigation is undertaken during the set out to considerer non-destructive excavation methods. Supervision by the project arborist during the proposed works is recommended to assess roots as they are exposed and determine whether selective root removal can be undertaken to enable the retention of specific trees.

Remaining trees which are shown to be subject to minor or nil encroachment of the Tree Protection Zone are highlighted in green or yellow in the Tree Assessment table at Section 5.0. It is expected that all trees can be retained without the requirement for further consideration of the impacts of the proposed works.

The TPZ of grouped trees is calculated from the largest tree in the group and then extrapolated as a line parallel to the existing kerb, which will therefore cover the TPZ of smaller trees in the group. It should be noted that one sided encroachment of the calculated TPZ less than 10% of the total TPZ area is considered minor and acceptable under the provisions of AS4970. This is not to say that encroachment above this level cannot be supported, but major encroachment (>10%) will require closer examination with regard to the protection of specific trees.

The movement of machinery is to be excluded from the SRZ of retained trees by temporary fencing; with under-boring techniques used to install services through the TPZ where necessary. Locations for the storage of spoil and materials are to be detailed in the CEMP provided by Ausgrid's contractor and marked on all plans and restricted to areas that are already disturbed or away from trees and must not encroach the TPZ area of the subject trees (setbacks are to be marked on-site by an arborist).

Where excavation for the trench will cause an encroachment into the Tree Protection Zone (TPZ) of a retained tree exceeding 10% of the total TPZ area it is considered to be a major encroachment under the provisions of the Australian Standard AS4970-2009, Protection of Trees on Development Sites; and triggers the requirement for the implementation of measures to ensure that the tree will not be adversely affected by the works.

Where excavation is proposed within the TPZ of the subject trees it is to be carried out under close supervision; where roots are encountered that conflict with the location of conduit a consulting arborist is to assess the roots, making recommendations for their ongoing management. Wherever possible roots greater than 40 millimetres diameter are to be retained and protected, this may include excavating by hand around roots and passing the conduits beneath them. Wrapping roots in geo-textile fabric; utilising sandy material around retained roots when backfilling is recommended to protect retained roots from sharp edged filling materials.

Where no other option is available some roots greater than 40 millimetres diameter that conflict with the position of the electrical conduits may be severed within an established TPZ under advice from the consulting arborist using clean sharp hand-tools to minimise tearing, and therefore reducing the risk of incursion by harmful pathogens.

Prior to the commencement and for the duration of the works, the trunks of the subject trees are to be protected from unintended impacts by the erection of temporary fencing at the perimeter of the respective SRZ's or along the edge of the work area (whichever provides a greater set-back) to create an exclusion zone around each of the retained trees. Where space does not permit or where a TPZ fence needs to be temporarily moved for access, the trunks and/or branches of the retained tree will be protected by armouring as detailed in Section 4 of AS4970 (Appendix 12.4.B)

Several over-hanging branches are noted along the route which may be impacted by over-height machinery, branch and bark tearing is to be avoided. Where necessary branches are to be pruned by a suitably qualified contracting arborist in accordance with the Australian Standard AS4373-2007, "*Pruning of Amenity Trees*", and the Workcover Code of Practice for the Amenity Tree Industry, 1998.

7.1 Tree Protection

The following general measures are to be adopted as applicable to the site:

Site establishment

- significant trees are marked on plans
- staff are to be made aware of tree protection measures during induction to the site

During construction

- no storage of equipment or materials is permitted within the TPZ, no cement wasting or other pollutants must be allowed to enter the TPZ
- a temporary barrier is to be installed at the SRZ perimeter for the duration of works in the vicinity of individual trees to prevent mechanical damage to the trunk/branches
- excavation is to carried out by hand within 200 millimetres of roots greater than 40 mm diameter
- if required minor pruning of branches can be undertaken to avoid mechanical impacts that are likely to result in branch or bark tearing
- no roots are to be severed within an established SRZ.
- where roots greater than 40mm diameter are to be severed between the SRZ and TPZ an arborist is to be on-site to supervise the works

Post construction

- protective fencing is to be removed from site
- general maintenance pruning can be undertaken (in accordance with AS4373-2007) to remove deadwood or other defective branches up to 10% of the total canopy area of retained trees if required

8.0 Conclusions

Small trees and shrubs with DBH less than 0.2 metres along the route have not been considered as they are unlikely to be affected by the proposed works due to their setback from the trench or being in the proposed under-bored sections.

In some cases, larger trees will be exposed to major encroachment of the respective Tree Protection Zones (TPZ) caused by excavation of the electrical services trench. The implementation of specific protection measures detailed in section 7.0 and 7.1 of this report will therefore be required to ensure the viability of trees, and gain compliance with the provisions of AS4970-2009, "*Protection of Trees on Development Sites".*

The *Proposed Underground Feeder Locality and Key Plan* shows the proximity of the proposed trench in relation to the subject trees and other existing underground assets present within the roadway.

Where the structural root zone is proposed to be traversed;

3. non-destructive works within the Tree Protection Zone must document the nature (size of roots) and extent (depth) of root material, providing a preliminary assessment of the likelihood of safely passing through the Structural Root Zone.
4. where it may be considered possible, prior to working within the Structural Root Zone of any tree, ground truthing via means of exploratory non-destructive means (hand-digging, hydro-vac) within the proposed alignment at the direction of a suitably qualified arborist will be required.

This will;

3. determine the presence or absence of any significant tree roots and ultimately whether encroachment of the individual tree's Structural Root Zone to facilitate the proposal is possible.
4. ensure each tree is investigated and assessed to the fullest extent possible so a suitable determination can be made as to whether an individual tree can be retained or ultimately needs to be removed.

Twenty-four (24) trees/groups are subject to major encroachment from the proposed works. Of these thirteen (13) may be retained subject to further investigation during the set out for proposed works.

Eleven (11) trees/groups are subject to encroachment of the Structural Root Zone and will most likely be removed.

9.0 Recommendations

That Trees 41, 42-48, 51-57, 63, 183, 200-204, 212, 308, 309, 320 and 334-339 which are subject to encroachment of the Structural Root Zone will require further assessment during the contractors design process with the aim of retaining the trees.

That further investigation is undertaken during the set out to determine whether Trees 11, 21, 30, 33-36, 40, 62, 129, 185, 225-230, 279-280, 294, 296 and 314-318 subject to major encroachment of the Tree Protection Zone can be accommodated in conjunction with the proposed design by using non-destructive excavation methods.

That prior to the commencement of any works:

- Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) of retained trees are clearly plotted on all plans and marked on-site,

- The trunks of retained trees are to be protected by the erection of protective barriers at the SRZ perimeter to create an individual exclusion zone for the duration of works in the vicinity.

That all roots are to be retained within the SRZ of the subject trees.

That where there is no other option, and subject to inspection by an arborist, roots greater than 40 millimetres diameter may be severed between the SRZ and the TPZ where they conflict directly with the conduits using clean sharp hand-tools to minimise tearing.

That if required minor pruning is carried out in accordance with the Workcover Draft Code of Practice for Tree Works and Australian Standard AS4373-2007, "Pruning of Amenity Trees", and the Workcover Code of Practice for the Amenity Tree Industry, 1998.

Ian Hills - Principal Arborist
Accurate Tree Assessment

Registered User

10.0 Appendices

10.1. Safe Useful Life Expectancy Categories

1: Long SULE: Trees that appeared to be retainable at the time of assessment for more than 40 years with an acceptable level of risk.
(a) Structurally sound trees located in positions that can accommodate future growth.
(b) Trees that could be made suitable for retention in the long term by remedial tree care.
(c) Trees of special significance for historical, commemorative or rarity reasons that would warrant extraordinary efforts to secure their long-term retention.

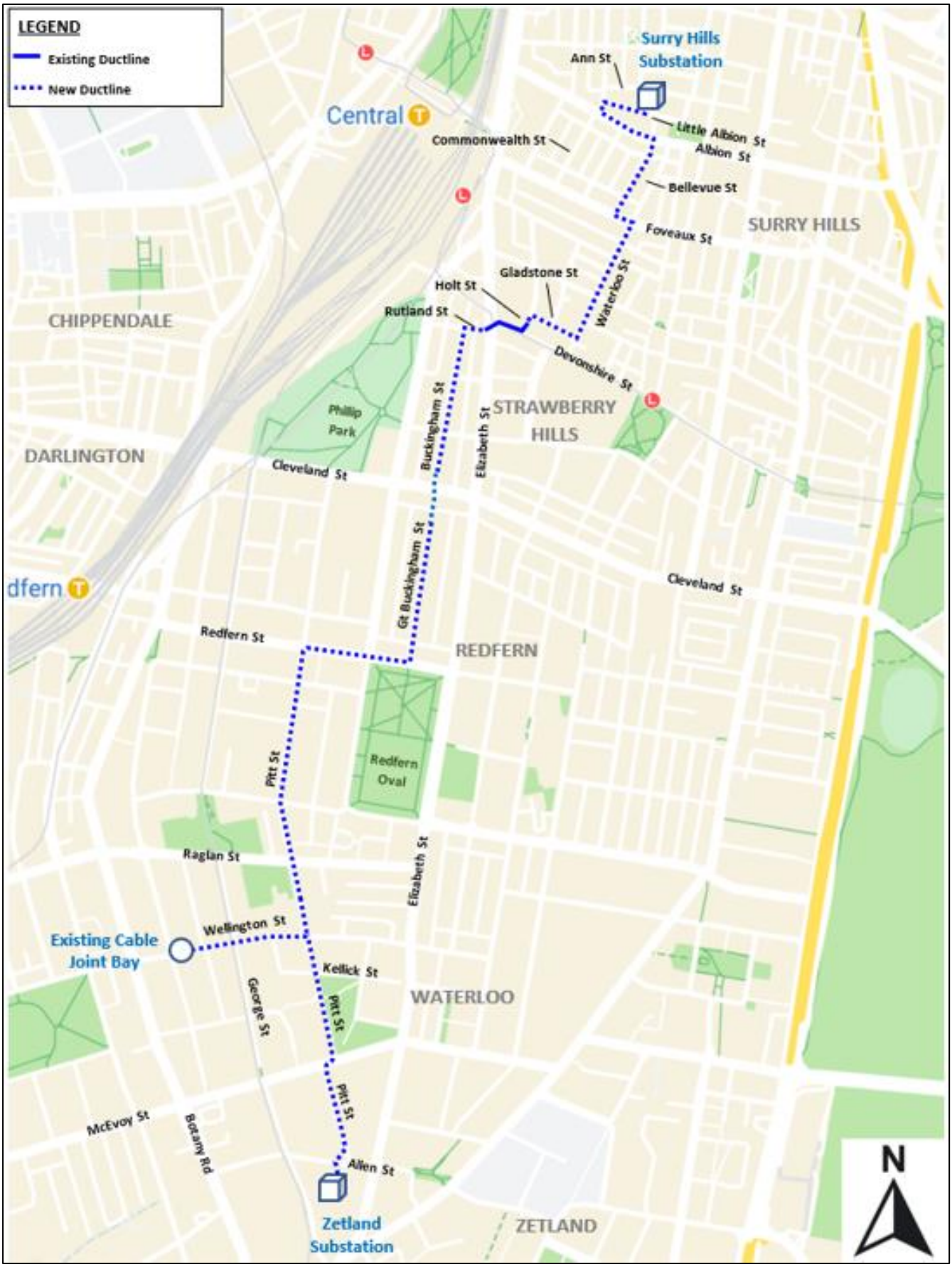
2: Medium SULE: Trees that appeared to be retainable at the time of assessment for 15–40 years with an acceptable level of risk.
(a) Trees that may only live between 15 and 40 more years.
(b) Trees that could live for more than 40 years but may be removed for safety or nuisance reasons.
(c) Trees that could live for more than 40 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
(d) Trees that could be made suitable for retention in the medium term by remedial tree care.

3: Short SULE: Trees that appeared to be retainable at the time of assessment for 5–15 years with an acceptable level of risk.
(a) Trees that may only live between 5 and 15 more years.
(b) Trees that could live for more than 15 years but may be removed for safety or nuisance reasons.
(c) Trees that could live for more than 15 years but may be removed to prevent interference with more suitable individuals or to provide space for new planting.
(d) Trees that require substantial remedial tree care and are only suitable for retention in the short term.

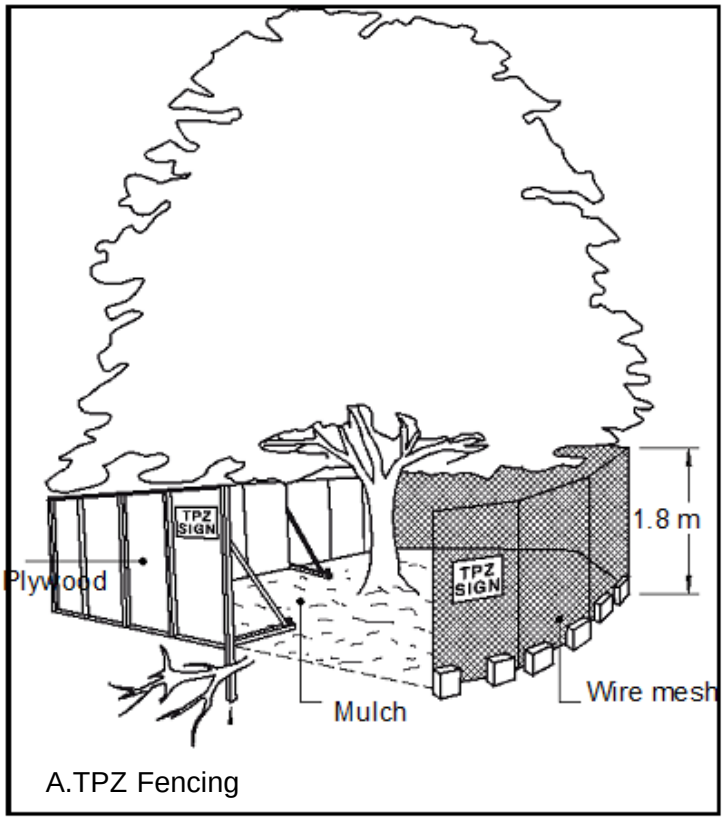
4: Remove: Trees that should be removed within the next 5 years.
(a) Dead, dying, suppressed or declining trees because of disease or inhospitable conditions.
(b) Dangerous trees because of instability or recent loss of adjacent trees.
(c) Dangerous trees because of structural defects including cavities, decay, included bark, wounds or poor form.
(d) Damaged trees that are clearly not safe to retain.
(e) 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.
(f) Trees that are damaging or may cause damage to existing structures within 5 years.
(g) Trees that will become dangerous after removal of other trees for the reasons given in (a)to(f)
(h) Trees in categories (a) to (g) that have a high wildlife habitat value and, with appropriate treatment, could be retained subject to regular review.

5: Small, young or regularly pruned: Trees that can be reliably moved or replaced.
(a) Small trees less than 5m in height.
(b) Young trees less than 15 years old but over 5m in height.
(c) Formal hedges and trees intended for regular pruning to artificially control growth.

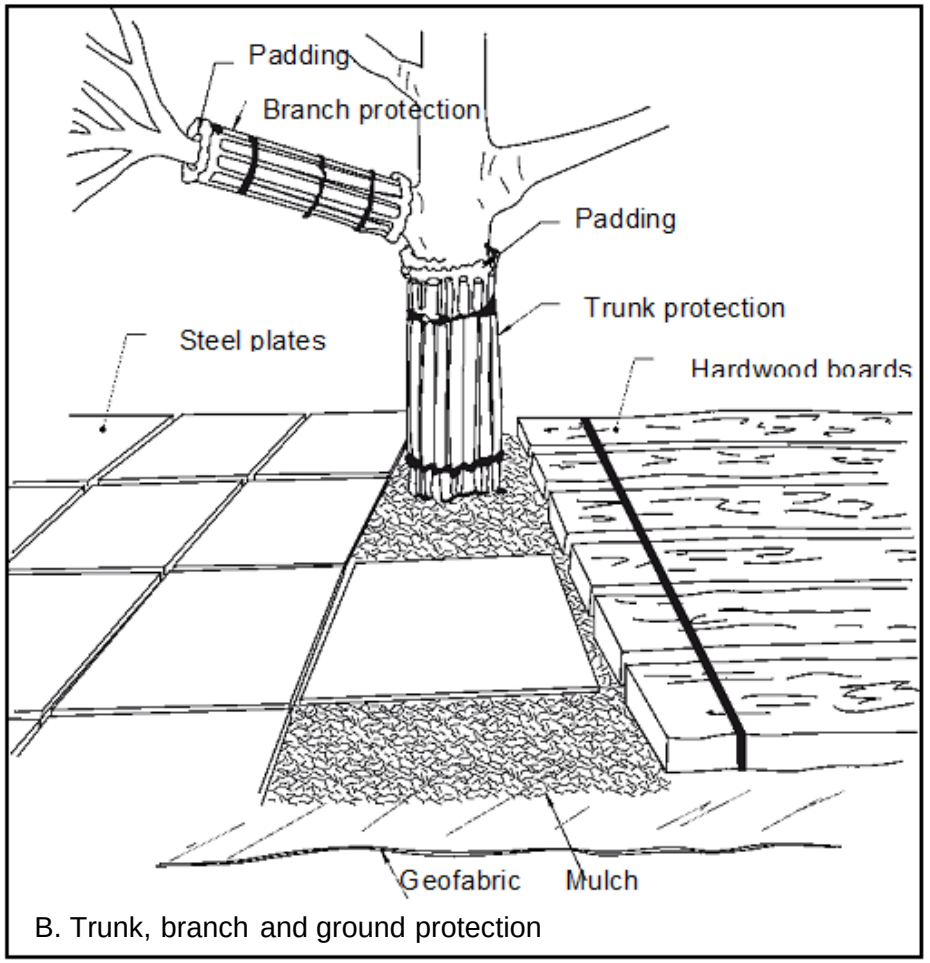
10.2 Concept plan of proposed Route



10.3 Tree protection

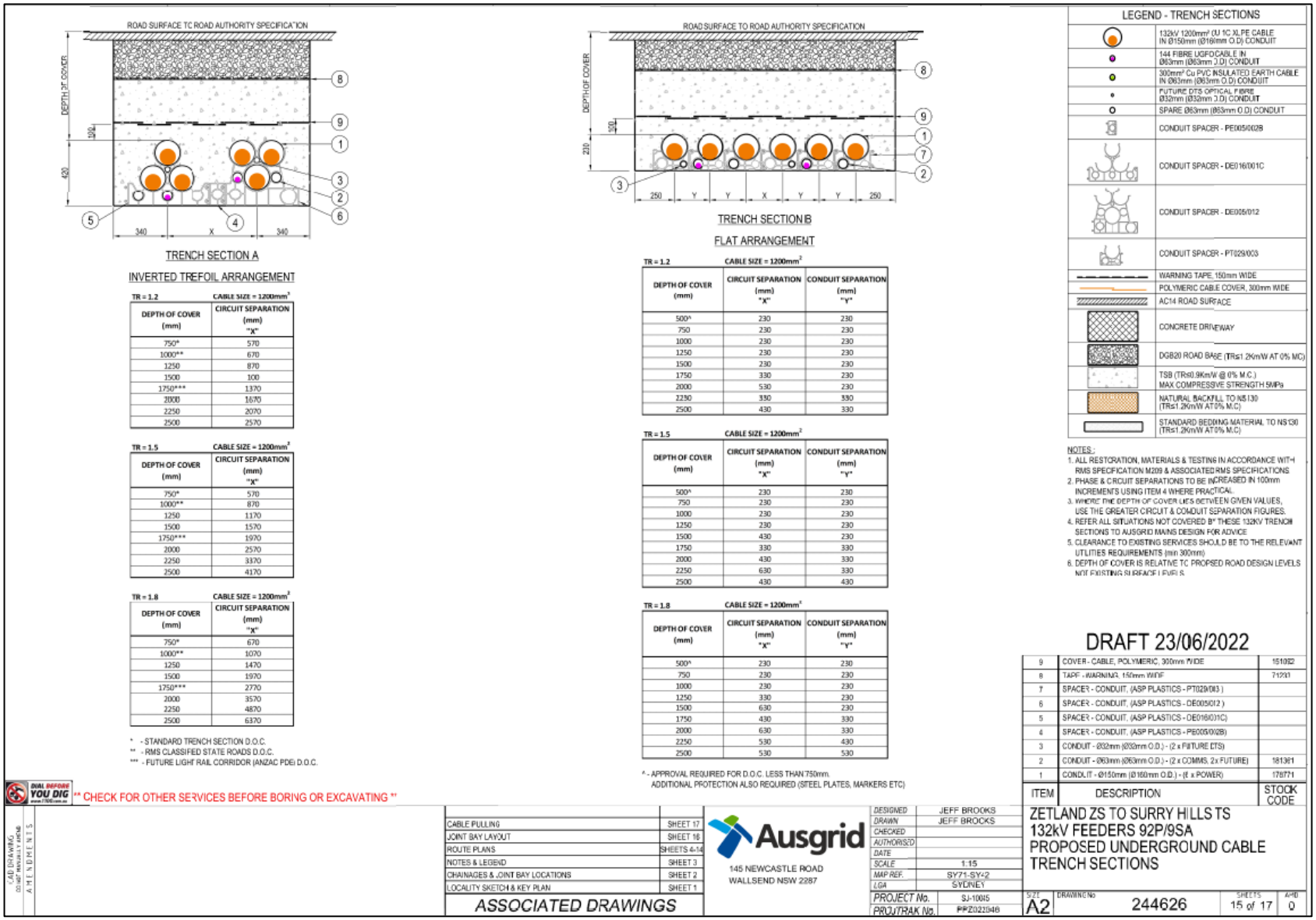


A.TPZ Fencing



B. Trunk, branch and ground protection

10.4 Trench Detail



10.5. References

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10.6 Qualifications – Ian Hills

Associate Diploma Horticulture	Ryde TAFE 1984
AQF3 Horticulture (Arboriculture)	Ourimbah TAFE 1998
AQF5 Diploma Horticulture (Arboriculture)	Kurri Kurri TAFE 2009 (Dux) Cert No. 5934155
QTRA Registered User 2083	December 2013
QTRA Advanced User 4469	March 2018
Working with Children Check Number	WWC1780469E
National Coordinated Criminal History Check Certificate	CAD5579CB8
QTRA Advanced User 4469	March 2020