64 Mackillop Drive, Baulkham Hills

Arboricultural Impact Assessment

Prepared for
Aqualand Dee Why Development Pty Ltd

6 September 2017

DOCUMENT TRACKING

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Abbreviations

Abbreviation	Description
AQF	Australian Qualifications Framework
AS	Australian Standards
DBH	Diameter at Breast Height
ELA	Eco Logical Australia
m	Metre
mm	Millimetre
Ha	Hectare
NDE	Non-Destructive Excavation
NO	Number
NSW	New South Wales
SP	Species

SRZ	Structural Root Zone
TPZ	Tree Protection Zone
VTA	Visual Tree Assessment
LGA	Local Government Area

Executive summary

Eco Logical Australia Pty Ltd (ELA) was commissioned by Aqualand Dee Why Development Pty Ltd (herein referred to as Aqualand) to prepare an Arboricultural Impact Assessment (AIA) for a proposed development at Lots 1001 and 1002 on DP 1190982, 64 Mackillop Drive, Baulkham Hills NSW.

This Planning Proposal seeks to amend *The Hills Local Environmental Plan 2012* to rezone the site from the current split zoning of R2 Low Density Residential and R3 Medium Density Residential to part R3 Medium Density Residential, part R4 High Density Residential, part RE1 Public Recreation and retain existing R2 Low Density Residential. This Planning Proposal includes amendments to the maximum building height development standards to allow varying heights of part 9m, part 12m and part 16m in the proposed R4 High Density Residential land and modifications to the heritage map. The Planning Proposal is accompanied by a masterplan which provides for approximately 110 medium density dwellings comprising of townhouses and small lot dwellings, approximately 270 apartments in low rise residential flat buildings, a public reserve and a communal space incorporating the heritage farmhouse and curtilage.

The proposed development has resulted in a number of changes to 6/2012/JP including adjustments of internal roads and lot layout. ELA has:

- identified the trees within the site that are likely to be affected by the proposal
- assessed the current overall health and condition of the subject trees
- evaluated the significance of the subject trees and assessed their suitability for retention.

Overall a total of 220 trees were assessed within the study area (**Table 3** and **Appendix A**). Under the current proposal, 139 trees can be successfully retained including 58 trees of high retention value, 64 trees of medium retention value and 17 trees of low retention value.

Under the existing consent, Condition 6 allows for the removal of trees affected by road and drainage works. A comparison between JP/2012/JP and the proposed development is shown in **Table 1**. The proposal has resulted in the retention of 23 trees along Barina Downs Road which were previously approved for removal, 18 of which were assessed as of high retention value, and 5 of which form part of the Critically Endangered Ecological Community (CEEC) Cumberland Plain Woodland (CPW)(ELA FFA Report 2017). In addition, the proposal has resulted in the retention of 6 trees for the previously approved internal road adjacent to the farm house, 4 of which are part of the CPW community (ELA FFA Report 2017).

Table 1: Net tree retention between Development Consent 6/2012/JP and Planning Proposal

	Development Consent C6/2012/JP	Planning Proposal	Net position (high retention trees)
Trees requiring removal along Barina Downs Road	29	6	23 (18)
Trees requiring removal within internal roads	11	5	6 (5)

1 Background

1.1 Introduction

Eco Logical Australia Pty Ltd (ELA) was commissioned by Aqualand Dee Why Development Pty Ltd (herein referred to as Aqualand) to prepare an Arboricultural Impact Assessment (AIA) for a proposed development at Lots 1001 and 1002 on DP 1190982, 64 Mackillop Drive, Baulkham Hills NSW.

Aqualand has exchanged contracts to the above site which has Development Consent 6/2012/JP dated 25 September 2013 for medium density residential development. Aqualand is investigating the feasibility of redeveloping Lots 1001 and 1002 for a higher residential density given the imminent North West Rail Line and nearby Norwest Station.

The purpose of this report is to:

- identify the trees within the site that are likely to be affected by the proposal
- assess the current overall health and condition of the subject trees
- evaluate the significance of the subject trees and assess their suitability for retention.

1.2 The proposal

This Planning Proposal seeks to amend *The Hills Local Environmental Plan 2012* to rezone the site from the current split zoning of R2 Low Density Residential and R3 Medium Density Residential to part R3 Medium Density Residential, part R4 High Density Residential, part RE1 Public Recreation and retain existing R2 Low Density Residential. This Planning Proposal includes amendments to the maximum building height development standards to allow varying heights of part 9m, part 12m and part 16m in the proposed R4 High Density Residential land and modifications to the heritage map. The Planning Proposal is accompanied by a masterplan which provides for approximately 110 medium density dwellings comprising of townhouses and small lot dwellings, approximately 270 apartments in low rise residential flat buildings, a public reserve and a communal space incorporating the heritage farmhouse and curtilage.

1.3 The study area

The study area is located on Lots 1001 and 1002 of DP 1190982 at 64 Mackillop Drive, Baulkham Hills within The Hills Shire LGA and is shown in **Appendix A**. Areas outside of the study area directly to the south and south east, and some road infrastructure have previously been approved under the existing Development Consent 6/2012/JP

Under Development Consent 6/2012/JP, Condition 6 of the consent states:

'*Approval is granted for the removal of only those trees affected by road and drainage works. Trees shall only be removed as required at each stage of the development. All other trees are to remain and are to be protected during all works. Suitable replacement trees are to be planted upon completion of construction.*'

Accordingly, issue of the Construction Certificate for the Civil Works package including internal road construction, and road widening and footpath construction along Barina Downs Road allows removal of affected trees (shown in **Appendix A** and **Section 3)**. It should be noted that although previously approved for removal, design for the proposed development has sought to minimise impacts on trees

along Barina Downs Road to maintain vegetation screening. ELA have assessed the retaining wall drawing provided by Calibre (17-000013-SK44 dated 21/08/2017) to assess the viability of retaining trees along Barina Downs Road. The location of the proposed retaining wall is shown in **Appendix A**.

1.4 The subject trees

A total of **220** subject trees were inspected on 11 August 2017. Further information, observations and measurements specific to each of the subject trees can be found in **Chapter 3.**

1.5 Documents and plans referenced

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

- *Conceptual Master Plan – Revision C, dated 29 June 2017: DKO Architecture*
- *Hills Shire Council - Development Control Plan (DCP) 2012.*
- *Development Consent 6/2012/JP (DC 6/2012/JP) dated 25 September 2013.*

2 Method

2.1 Visual tree assessment

The subject trees were assessed in accordance with a stage one 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.
- No aerial inspections or root mapping was undertaken.
- Tree heights, canopy spread and diameter at breast height (DBH) was estimated, unless otherwise stated.
- Tree identification was based on broad taxonomical features present and visible from ground level at the time of inspection.

2.2 Retention Value

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

- **High:** These trees are considered important and should be retained and protected. Design modification or re-location of building/s should be considered to accommodate the setbacks as prescribed by *Australian Standard AS4970 Protection of trees on development sites*.
- **Medium:** These trees are moderately important for retention. Their removal should only be considered if adversely affected by the proposed works and all other alternatives have been considered and exhausted.
- **Low:** These trees are not considered important for retention, nor require special works or design modification to be implemented for their retention.

This tree retention assessment has been undertaken in accordance with the *Institute of Australian Consulting Arboriculturists* (IACA) *Significance of a Tree, Assessment Rating System* (STARS). Further details and assessment criteria are in **Appendix C**.

[1] VTA is an internationally recognised practice in the visual assessment of trees as prescribed by Mattheck, C. and Breloer, H. 1994. 'Field Guide for Visual Tree Assessment' *Arboricultural Journal*, Vol 18 pp 1-23.

2.3 Protection zones

- **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. The TPZ is an area that is isolated from the work zone to insure no disturbance or encroachment occurs into this zone. Tree sensitive construction measures must be implemented if works are to proceed within the TPZ.
- **Structural root zone (SRZ):** The SRZ is the area of the root system (as defined by AS 4970-2009) used for stability, mechanical support and anchorage of the tree. It is critical for the support and stability of the tree, and provides the bulk of mechanical support and anchorage. Severance of roots (>50 mmØ) within the SRZ is generally not recommended as it may lead to the destabilisation and/or decline of the tree.
- **Root investigation:** When assessing the potential impacts of encroachment into the TPZ consideration will need to be given to the location and distribution of the roots, including above or below ground restrictions affecting root growth. Location and distribution of roots may be determined through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), air spade and manual excavation. Root investigation is used to determine the extent and location of roots within the zone of conflict. Root investigation does not guarantee the retention of the tree.

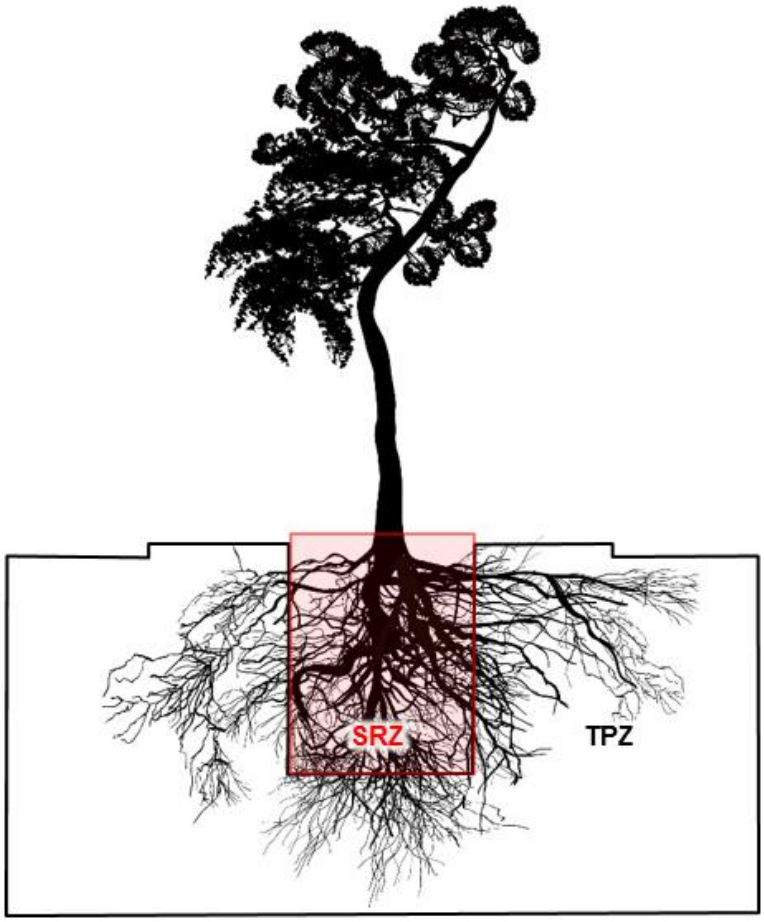

Figure 1: Indicative TPZ and SRZ

2.4 Impacts within the TPZ

- **High impact (>20%):** If the proposed encroachment is greater than 20 % of the TPZ the SRZ may be impacted. Tree sensitive construction techniques may be used for minor works within this area providing no structural roots are likely to be impacted, and the project arborist can demonstrate that the tree(s) remain viable. Root investigation by non-destructive methods is essential for any proposed works within this area.

- **Medium impact (<20%):** If the proposed encroachment is greater than 10 % of the TPZ and outside of the SRZ, the project arborist must demonstrate that the tree(s) remain viable. The area lost to this encroachment should be compensated for elsewhere, and be contiguous with the TPZ. All work within the TPZ must be carried out under the supervision of the project arborist.

- **Low impact (<10%):** If the proposed encroachment is less than 10% (total area) of the TPZ, and outside of the SRZ, detailed root investigations should not be required. The area lost to this encroachment should be compensated for elsewhere, and be contiguous with the TPZ.

- **No impact (0%):** No likely or foreseeable encroachment within the TPZ.

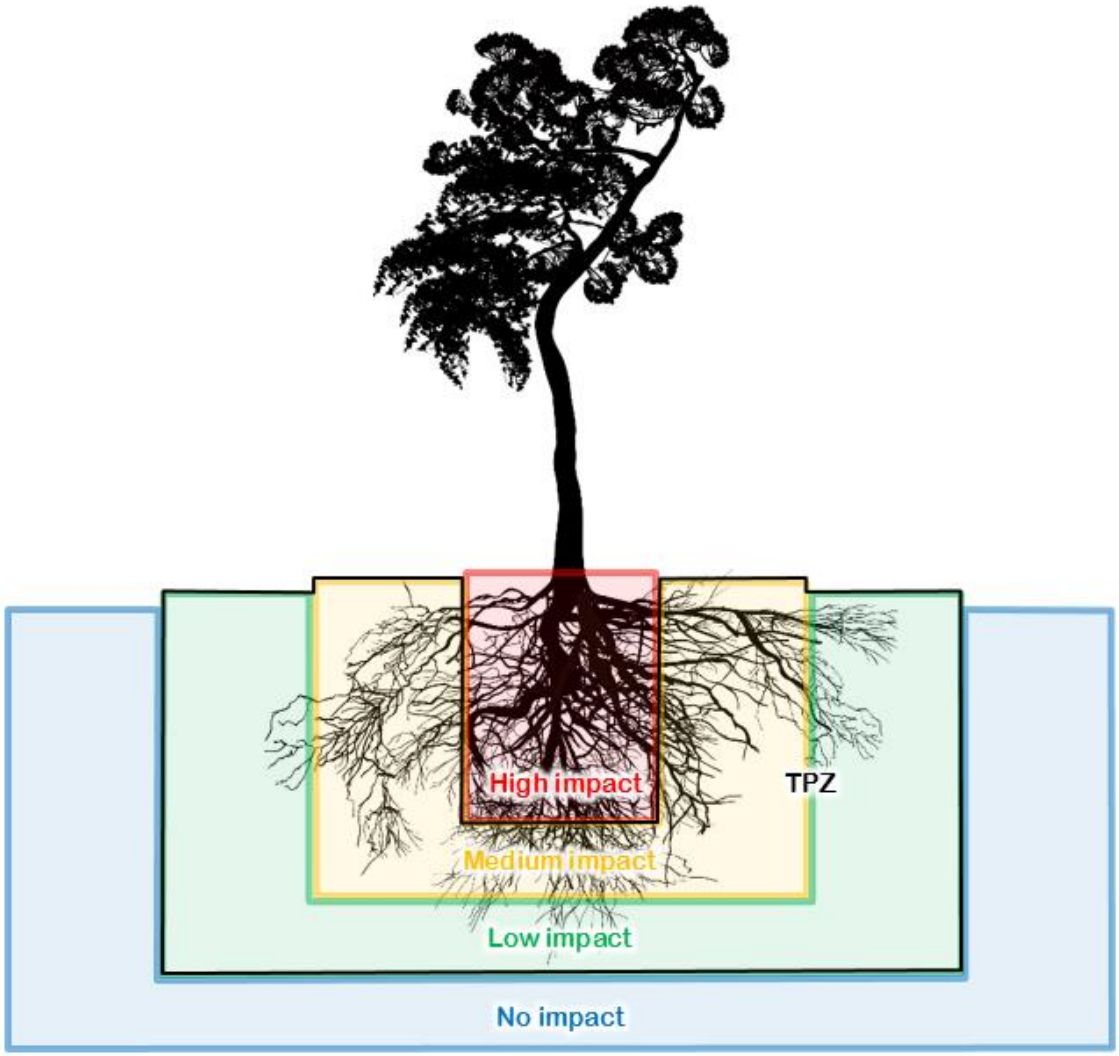

Figure 2: Indicative zones of impact within the TPZ

2.5 Mitigation measures

Encroachment within the TPZ must be offset with a range of mitigation measures to ensure that impacts to the subject tree(s) are reduced or restricted wherever possible. Mitigation must be increased relative to the level of encroachment within the TPZ to ensure the subject tree remains viable. **Table 2** outlines mitigation requirements under AS 4970-2009 within each category of encroachment.

Table 2: Mitigation measures

Impact	Requirements under AS 4970-2009	Mitigation (design phase)	Mitigation (construction phase)
Low impact (<10%)	• The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • Detailed root investigations should not be required.	• N/A	• The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • Tree protection must be installed.
Medium impact (<20%)	• The project arborist must demonstrate the tree(s) would remain viable. • Root investigation by non-destructive methods may be required. • 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 following design changes should be considered to retain trees where practicable, considering the retention value of the tree and the complexity and cost of the change. • Relocate services/pathways outside of tree protection zones • Design services to be installed at a minimum depth of 1200 mm below ground to avoid impact to the root zones of trees. • Design pathways to be installed on or above grade, minimising/eliminating excavation within tree protection zones. • Design pathways using porous materials (eco-paving, porous asphalt, decomposed granite) to allow water and oxygen to reach the root zone. • Design pathways using tree sensitive techniques (pier and beam, suspended slabs). • The area lost to encroachment should be compensated for elsewhere, contiguous with the TPZ.	• The area lost to this encroachment should be compensated for elsewhere, contiguous with the TPZ. • The project arborist would be consulted for any works within the TPZ. • Tree protection must be installed. • Tree sensitive techniques can be used to install services within the TPZ. Horizontal directional drilling (HDD), boring, non-destructive excavation (NDE). • Location and distribution of roots may be determined through non-destructive excavation (NDE) methods such as hydro-vacuum excavation (sucker truck), air spade and manual excavation.
High impact (>20%)		• Relocate services/pathways outside of tree protection zones • Design services to be installed at a minimum depth of 1200mm below ground to avoid impact to the root zones of trees. • Design pathways to be installed on or above grade, minimising/eliminating excavation within tree protection zones. • Design pathways using porous materials (eco-paving, porous asphalt, decomposed granite) to allow water and oxygen to reach the root zone. • Design pathway using tree sensitive techniques (pier and beam, suspended slabs). • The area lost to encroachment can be compensated for elsewhere, contiguous with the TPZ.	• As above • Removal of existing hard surfaces should be undertaken manually to avoid root damage. • Tree sensitive techniques can be used to install the services: Horizontal directional drilling (HDD), boring, non-destructive excavation (NDE).

3 Results

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

- **High Impact (100%): 62** trees are located wholly within the proposed development and are recommended for removal. Of these, **6** trees were previously approved for removal under 6/2012/JP (shown in brackets):
    - **6** trees of high retention value (1)
    - **41** trees of medium retention value (4)
    - **15** trees of low retention value (1)

- **High impact (>20%): 18** trees will be subject to a high impact >20% of the TPZ and are recommended for removal. Of these, **2** trees were previously approved for removal under 6/2012/JP (shown in brackets). Tree sensitive construction techniques may be used for minor works within this area providing structural roots have been mapped through non-destructive methods and the project arborist can demonstrate tree viability:
    - **7** trees of high retention value (1)
    - **6** trees of medium retention value (1)
    - **5** trees of low retention value

- **High impact (<20%): 1** tree will be subject to a high impact <20% of the TPZ. Further detailed assessments (root mapping) via non-destructive methods will be required in order to determine the suitability of retention:
    - **1** tree of low retention value

- **Minor impact (<10%): 16** trees will be subject to a minor impact within the TPZ. Of these, **8** trees were previously approved for removal under 6/2012/JP (retention shown in brackets below). The anticipated minor impact of the proposed development will have negligible impacts to the trees health, vigour or stability. Under the current proposal, these trees can be successfully retained including:
    - **10** trees of high retention value (7)
    - **3** trees of medium retention value (1)
    - **3** trees of low retention value

- **No Impact: 123** trees will not be impacted by the proposed works. Of these, **24** trees were previously approved for removal under 6/2012/JP (retention shown in brackets below). Under the current proposal, these trees can be successfully retained including:
    - **48** trees of high retention value (15)
    - **61** trees of medium retention value (9)
    - **14** trees of low retention value

Table 3: Results of the arboricultural assessment

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
1	*Corymbia maculata*	1	24	9	Good	Good	**High**	550	6600	2600	**Minor: <10%**	-
2	*Corymbia citriodora*	1	15	8	Good	Good	**High**	350	4200	2100	**Major: 100%**	-
3	*Ficus hillii*	1	3	2	Fair	Fair	**Low**	150	2000	1500	**Minor: <10%**	-
4	*Ficus hillii*	1	4	3	Fair	Fair	**Low**	200	2400	1500	**None: 0%**	-
5	*Ficus hillii*	1	6	6	Fair	Fair	**Low**	200	2400	1500	**None: 0%**	-
6	*Cupressus x leylandii*	1	7	4	Good	Good	**Medium**	250	3000	1900	**Major: 100%**	-
7	*Cupressus x leylandii*	1	5	4	Fair	Fair	**Medium**	250	3000	1900	**Major: 100%**	-
8	*Ficus hillii*	1	7	4	Good	Good	**Medium**	250	3000	1900	**Major: 100%**	-
9	*Ficus hillii*	1	5	4	Good	Fair	**Medium**	250	3000	1900	**Major: 100%**	-
10	*Ficus hillii*	1	8	8	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	
11	*Eucalyptus scoparia*	1	9	3	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	**Yes**

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
12	*Eucalyptus saligna*	1	20	8	Good	Fair	**High**	800	9600	3200	**Minor: <10%**	-
13	*Eucalyptus microcorys*	1	15	7	Good	Good	**High**	500	6000	2500	**None: 0%**	**Yes**
14	*Eucalyptus microcorys*	1	16	7	Good	Fair	**High**	400	4800	2300	**Minor: <10%**	**Yes**
15	*Eucalyptus microcorys*	1	15	9	Good	Fair	**High**	500	6000	2500	**Major: >20%**	**Yes**
16	*Eucalyptus microcorys*	1	14	7	Good	Fair	**High**	550	6600	2600	**None: 0%**	**Yes**
17	*Eucalyptus microcorys*	1	14	7	Good	Fair	**High**	450	5400	2400	**Minor: <10%**	**Yes**
18	*Erythrina x sykesii*	1	10	12	Fair	Fair	**Medium**	900	10800	3200	**Major: >20%**	**Yes**
19	*Podocarpus elatus*	1	10	5	Good	Fair	**Medium**	300	3600	2000	**Major: 100%**	-
20	*Lagunaria patersonia*	1	9	6	Fair	Fair	**Medium**	300	3600	2000	**Major: 100%**	-
21	*Araucaria heterophylla*	1	9	2	Fair	Fair	**Low**	150	2000	150	**Major: 100%**	-
22	*Liquidambar styraciflua*	1	7	3	Fair	Good	**Medium**	200	2400	1500	**Major: 100%**	-
23	*Liquidambar styraciflua*	1	10	7	Fair	Fair	**Medium**	350	4200	2100	**Major: 100%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
24	*Unknown species*	1	4	4	Fair	Poor	**Low**	200	2400	1500	**Major: 100%**	-
25	*Eucalyptus microcorys*	1	16	10	Good	Good	**High**	450	5400	2400	**Minor: <10%**	**Yes**
26	*Eucalyptus fibrosa*	1	10	5	Good	Fair	**Medium**	300	3600	2000	**None: 0%**	**Yes**
27	*Eucalyptus sp.*	1	11	5	Good	Fair	**Medium**	250	3000	1900	**None: 0%**	**Yes**
28	*Eucalyptus fibrosa*	1	14	8	Good	Fair	**High**	350	4200	2100	**None: 0%**	**Yes**
29	*Eucalyptus crebra*	1	12	7	Good	Fair	**High**	300	3600	2000	**None: 0%**	**Yes**
30	*Eucalyptus crebra*	1	12	5	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	**Yes**
31	*Eucalyptus fibrosa*	1	11	7	Good	Fair	**High**	400	4800	2300	**None: 0%**	**Yes**
32	*Eucalyptus crebra*	1	12	5	Fair	Fair	**High**	350	4200	2100	**None: 0%**	**Yes**
33	*Eucalyptus crebra*	1	6	4	Good	Fair	**Medium**	300	3600	2000	**Minor: <10%**	**Yes**
34	*Eucalyptus crebra*	1	10	5	Good	Fair	**Medium**	300	3600	2000	**None: 0%**	**Yes**
35	*Eucalyptus sp.*	1	13	10	Good	Fair	**High**	400	4800	2300	**Minor: <10%**	**Yes**

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
36	*Eucalyptus crebra*	1	18	7	Fair	Good	**High**	400	4800	2300	**None: 0%**	**Yes**
37	*Eucalyptus crebra*	1	13	8	Fair	Good	**High**	350	4200	2100	**None: 0%**	**Yes**
38	*Eucalyptus crebra*	1	10	3	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	**Yes**
39	*Eucalyptus sideroxylon*	1	12	10	Good	Good	**High**	400	4800	2300	**Minor: <10%**	**Yes**
40	*Eucalyptus crebra*	1	10	6	Good	Fair	**High**	400	4800	2300	**Minor: <10%**	**Yes**
41	*Eucalyptus crebra*	1	15	7	Good	Good	**High**	350	4200	2100	**Minor: <10%**	**Yes**
42	*Eucalyptus crebra*	1	8	8	Good	Fair	**Medium**	300	3600	2000	**None: 0%**	**Yes**
43	*Eucalyptus crebra*	1	8	3	Poor	Poor	**Low**	200	2400	1700	**Major: 100%**	**Yes**
44	*Eucalyptus crebra*	1	11	6	Fair	Good	**High**	350	4200	2100	**None: 0%**	**Yes**
45	*Eucalyptus crebra*	1	13	6	Fair	Good	**High**	300	3600	2000	**None: 0%**	**Yes**
46	*Eucalyptus crebra*	1	12	9	Good	Good	**High**	350	4200	2100	**None: 0%**	**Yes**
47	*Pinus radiata*	1	12	9	Good	Good	**High**	350	4200	2100	**Major: >20%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
48	*Eucalyptus crebra*	1	12	4	Fair	Fair	**Medium**	200	2400	1700	**None: 0%**	-
49	*Pinus radiata*	1	12	8	Good	Good	**High**	250	3000	1900	**Minor: <10%**	-
50	*Eucalyptus crebra*	1	12	4	Fair	Fair	**Medium**	300	3600	2000	**Major: >20%**	-
51	*Ficus hillii*	1	5	2	Fair	Fair	**Low**	200	2400	1700	**Minor: <10%**	-
52	*Eucalyptus crebra*	1	10	6	Fair	Fair	**Medium**	300	3600	2000	**Minor: <10%**	-
53	*Eucalyptus crebra*	1	12	7	Good	Good	**High**	300	3600	2000	**Major: >20%**	-
54	*Pinus sylvestris*	1	11	10	Poor	Fair	**Low**	1000	12000	3300	**Major: >20%**	-
55	*Erythrina x sykesii*	1	7	8	Fair	Fair	**Low**	400	4800	2300	**Major: >20%**	-
56	*Pinus sylvestris*	1	18	10	Good	Fair	**High**	900	10800	3200	**Major: >20%**	-
57	*Pinus sylvestris*	1	16	10	Good	Fair	**High**	900	10800	3200	**Major: >20%**	-
58	*Flindersia australis*	1	7	7	Fair	Good	**Medium**	300	3600	2000	**None: 0%**	-
59	*Flindersia australis*	1	12	7	Good	Fair	**High**	400	4800	2300	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
60	*Callistemon viminalis*	1	4	3	Fair	Poor	**Low**	150	2000	1500	**None: 0%**	-
61	*Flindersia australis*	1	10	7	Good	Fair	**High**	400	4800	2300	**None: 0%**	-
62	*Flindersia australis*	1	8	7	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-
63	*Flindersia australis*	1	12	8	Good	Fair	**High**	450	5400	2400	**None: 0%**	-
64	*Fraxinus pennsylvanica*	1	4	3	Fair	Fair	**Low**	100	2000	1500	**None: 0%**	-
65	*Flindersia australis*	1	11	8	Good	Fair	**High**	400	4800	2300	**None: 0%**	-
66	*Flindersia australis*	1	12	8	Good	Fair	**High**	600	7200	2700	**None: 0%**	-
67	*Callistemon viminalis*	1	4	2	Fair	Poor	**Low**	150	2000	1500	**None: 0%**	-
68	*Callistemon viminalis*	1	2	2	Fair	Poor	**Low**	150	2000	1500	**None: 0%**	-
69	*Fraxinus pennsylvanica*	1	4	4	Fair	Fair	**Low**	150	2000	1050	**None: 0%**	-
70	*Callistemon viminalis*	1	4	3	Good	Fair	**Medium**	150	2000	1500	**None: 0%**	-
71	*Pinus radiata*	1	8	6	Good	Good	**High**	500	6000	2500	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
72	*Callistemon viminalis*	1	4	6	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-
73	*Callistemon viminalis*	1	4	4	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-
74	*Callistemon viminalis*	1	4	3	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
75	*Flindersia australis*	1	12	7	Good	Fair	**High**	450	5400	2400	**None: 0%**	-
76	*Flindersia australis*	1	12	8	Good	Fair	**High**	350	4200	2100	**None: 0%**	-
77	*Callistemon viminalis*	1	3	3	Fair	Fair	**Low**	150	2000	1500	**Major: 100%**	-
78	*Callistemon viminalis*	1	3	3	Fair	Fair	**Medium**	200	2400	1700	**Major: 100%**	**Yes**
79	*Flindersia australis*	1	7	6	Good	Fair	**Medium**	250	3000	1900	**Major: 100%**	**Yes**
80	*Flindersia australis*	1	11	7	Good	Fair	**High**	350	4200	2100	**Major: >20%**	-
81	*Eucalyptus tereticornis*	1	14	7	Fair	Fair	**Medium**	350	4200	2100	**None: 0%**	-
82	*Eucalyptus tereticornis*	1	18	6	Good	Good	**High**	400	4800	2300	**None: 0%**	-
83	*Eucalyptus sp.*	1	15	7	Good	Fair	**High**	450	54800	2400	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
84	*Pittosporum undulatum*	1	3	3	Good	Fair	**Medium**	200	2400	1700	**None: 0%**	-
85	*Eucalyptus tereticornis*	1	20	8	Fair	Good	**High**	800	960	3000	**None: 0%**	-
86	*Eucalyptus tereticornis*	1	20	16	Fair	Good	**High**	1200	14400	3600	**None: 0%**	-
87	*Eucalyptus tereticornis*	1	10	3	Fair	Poor	**Low**	300	3600	2000	**Minor: <10%**	-
88	*Eucalyptus tereticornis*	1	25	8	Fair	Good	**High**	1100	12600	3300	**None: 0%**	-
89	*Eucalyptus tereticornis*	1	10	5	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
90	*Eucalyptus tereticornis*	1	17	6	Fair	Good	**High**	400	4800	2300	**None: 0%**	-
91	*Eucalyptus tereticornis*	1	16	8	Fair	Good	**High**	400	4800	2300	**None: 0%**	-
92	*Eucalyptus sp.*	1	7	2	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
93	*Eucalyptus tereticornis*	1	12	3	Fair	Good	**Medium**	200	2400	1700	**None: 0%**	-
94	*Eucalyptus tereticornis*	1	23	9	Good	Good	**High**	500	6000	2500	**None: 0%**	-
95	*Eucalyptus tereticornis*	1	25	9	Good	Good	**High**	1200	14400	3600	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
96	*Eucalyptus tereticornis*	1	17	3	Fair	Fair	**Medium**	150	2000	1500	**None: 0%**	-
97	*Eucalyptus tereticornis*	1	15	6	Fair	Good	**High**	250	3000	1900	**None: 0%**	-
98	*Eucalyptus tereticornis*	1	18	7	Fair	Good	**High**	600	7200	2700	**None: 0%**	-
99	*Eucalyptus tereticornis*	1	12	8	Fair	Good	**High**	400	4800	2300	**None: 0%**	-
100	*Angophora floribunda*	1	9	8	Good	Fair	**High**	400	4800	2300	**Major: 100%**	-
101	*Stenocarpus sinuatus*	1	8	3	Good	Good	**Medium**	200	2400	1700	**Major: 100%**	-
102	*Stenocarpus sinuatus*	1	7	4	Fair	Good	**Medium**	250	3000	1900	**Major: 100%**	-
103	*Pittosporum undulatum*	1	2	3	Fair	Poor	**Low**	200	2400	1700	**None: 0%**	-
104	*Eucalyptus tereticornis*	1	23	9	Good	Good	**High**	1200	14400	3600	**None: 0%**	- **Yes**
105	*Eucalyptus tereticornis*	1	18	10	Good	Fair	**High**	1200	14400	3600	**None: 0%**	- **Yes**
106	*Eucalyptus tereticornis*	1	12	6	Good	Fair	**Medium**	250	3000	1900	**None: 0%**	- **Yes**
107	*Eucalyptus tereticornis*	1	22	10	Fair	Good	**High**	1000	12000	33000	**None: 0%**	- **Yes**

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
108	*Eucalyptus tereticornis*	1	8	7	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
109	*Eucalyptus tereticornis*	1	21	11	Fair	Fair	**High**	850	10300	3100	**None: 0%**	-
110	*Eucalyptus tereticornis*	1	11	3	Fair	Fair	**Medium**	150	2000	1500	**None: 0%**	-
111	*Eucalyptus tereticornis*	1	23	7	Fair	Good	**High**	850	10300	3100	**None: 0%**	-
112	*Eucalyptus tereticornis*	1	13	6	Fair	Good	**High**	300	3600	2000	**None: 0%**	-
113	*Eucalyptus tereticornis*	1	10	4	Fair	Fair	**Medium**	200	2400	1700	**None: 0%**	-
114	*Pinus radiata*	1	9	3	Fair	Good	**Medium**	200	2400	1700	**Major: >20%**	-
115	*Jacaranda mimosifolia*	1	6	6	Good	Fair	**Medium**	300	3600	2000	**Major: 100%**	-
116	*Unknown species*	1	6	5	Good	Fair	**Medium**	250	3000	1900	**Major: 100%**	-
117	*Ulmus parvifolia*	1	4	4	Fair	Poor	**Low**	100	2000	1500	**Major: <20%**	-
118	*Jacaranda mimosifolia*	1	4	4	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
119	*Quercus palustris*	1	4	3	Fair	Fair	**Low**	200	2400	1700	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
120	*Ulmus parvifolia*	1	5	6	Fair	Fair	**Medium**	350	4200	21500	**Major: 100%**	-
121	*Erythrina x sykesii*	1	10	10	Good	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
122	*Erythrina x sykesii*	1	10	8	Good	Fair	**Medium**	800	9600	3000	**Major: 100%**	-
123	*Unknown species*	1	9	7	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-
124	*fraxinus pennsylvanica*	1	5	5	Fair	Fair	**Medium**	200	2400	1700	**Major: 100%**	-
125	*Eucalyptus sp.*	1	6	4	Fair	Fair	**Medium**	200	2400	1700	**None: 0%**	-
126	*Cupressus sempervirens*	1	10	3	Good	Good	**Medium**	300	3600	2000	**None: 0%**	-
127	*Liquidambar orientalis*	1	5	3	Fair	Good	**Medium**	200	2400	1700	**Minor: <10%**	-
128	*Ficus hillii*	1	8	7	Good	Fair	**Medium**	350	4200	2100	**Major: 100%**	-
129	*Cupressus sempervirens*	1	11	4	Good	Fair	**Medium**	300	3600	2000	**Major: >20%**	-
130	*Melaleuca sp.*	1	5	4	Fair	Fair	**Medium**	200	2400	1700	**Major: 100%**	-
131	*Ficus benjamina*	1	6	3	Good	Fair	**Medium**	200	2400	1700	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
132	*Unknown species*	1	4	4	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
133	*Photinia robusta*	1	3	3	Good	Fair	**Low**	150	2000	1500	**None: 0%**	-
134	*Flindersia australis*	1	14	7	Good	Fair	**High**	550	6600	2600	**None: 0%**	-
135	*Flindersia australis*	1	4	5	Fair	Fair	**Medium**	200	2400	1700	**None: 0%**	-
136	*Flindersia australis*	1	9	7	Fair	Good	**Medium**	350	4200	2100	**None: 0%**	-
137	*Erythrina x sykesii*	1	8	10	Fair	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
138	*Erythrina x sykesii*	1	9	8	Fair	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
139	*Callistemon viminalis*	1	2	2	Fair	Fair	**Low**	100	2000	1500	**Major: 100%**	-
140	*Erythrina x sykesii*	1	9	7	Fair	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
141	*Erythrina x sykesii*	1	9	8	Fair	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
142	*Lophostemon confertus*	1	13	7	Good	Good	**High**	350	4200	2100	**Major: 100%**	-
143	*Flindersia australis*	1	7	7	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
144	*Flindersia australis*	1	9	6	Good	Fair	**Medium**	400	4800	2300	**None: 0%**	-
145	*Flindersia australis*	1	9	6	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-
146	*Flindersia australis*	1	12	7	Good	Fair	**High**	350	4200	2100	**None: 0%**	-
147	*Erythrina x sykesii*	1	12	9	Fair	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
148	*Eucalyptus punctata*	1	19	16	Good	Fair	**Medium**	1800	15000	4200	**Major: 100%**	-
149	*Fraxinus pennsylvanica*	1	6	5	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-
150	*Fraxinus pennsylvanica*	1	5	6	Fair	Good	**Medium**	250	3000	1900	**None: 0%**	-
151	*Fraxinus pennsylvanica*	1	4	5	Fair	Fair	**Medium**	200	2400	1700	**None: 0%**	-
152	*Calodendron capense*	1	6	6	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-
153	*Unknown species*	1	4	4	Fair	Fair	**Medium**	200	2400	1700	**None: 0%**	-
154	*Unknown species*	1	3	3	Fair	Poor	**Low**	250	3000	1900	**None: 0%**	-
155	*Pinus radiata*	1	15	12	Good	Good	**High**	850	10300	3100	**Major: >20%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
156	*Araucaria heterophylla*	1	7	6	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
157	*Erythrina x sykesii*	1	10	9	Fair	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
158	*Erythrina x sykesii*	1	8	9	Fair	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
159	*Erythrina x sykesii*	1	9	6	Fair	Fair	**Medium**	350	4200	2100	**Major: 100%**	-
160	*Erythrina x sykesii*	1	8	8	Fair	Fair	**Medium**	350	4200	2100	**Major: 100%**	-
161	*Erythrina x sykesii*	1	9	7	Fair	Fair	**Medium**	400	4800	2300	**Major: 100%**	-
162	*Erythrina x sykesii*	1	10	8	Fair	Fair	**Medium**	500	6000	2500	**Major: 100%**	-
163	*Erythrina x sykesii*	1	10	8	Fair	Fair	**Medium**	450	5400	2400	**Major: 100%**	**Yes**
164	*Unknown species*	1	9	7	Fair	Good	**Medium**	300	3600	2000	**None: 0%**	-
165	*Unknown species*	1	6	5	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
166	*Fraxinus pennsylvanica*	1	9	10	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
167	*Fraxinus pennsylvanica*	1	9	7	Fair	Good	**Medium**	250	3000	1900	**Major: 100%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
168	*Eucalyptus tereticornis*	1	22	16	Fair	Fair	**High**	850	10300	3100	**Major: >20%**	-
169	*Fraxinus pennsylvanica*	1	10	9	Fair	Fair	**Medium**	350	4200	2100	**Major: >20%**	-
170	*Fraxinus pennsylvanica*	1	11	8	Fair	Fair	**Medium**	350	4200	2100	**Major: 100%**	-
171	*Fraxinus pennsylvanica*	1	8	8	Fair	Fair	**Medium**	300	3600	2000	**Major: 100%**	**Yes**
172	*Eucalyptus tereticornis*	1	22	9	Good	Fair	**High**	600	7200	2700	**Major: 100%**	**Yes**
173	*Fraxinus pennsylvanica*	1	4	5	Fair	Fair	**Low**	150	2000	1500	**Major: 100%**	-
174	*Fraxinus pennsylvanica*	1	5	6	Fair	Fair	**Low**	200	2400	1700	**Major: >20%**	-
175	*Fraxinus pennsylvanica*	1	6	4	Fair	Fair	**Low**	200	2400	1700	**Major: >20%**	-
176	*Fraxinus pennsylvanica*	1	4	4	Fair	Fair	**Low**	200	2400	1700	**Major: >20%**	-
177	*Araucaria cunninghamii*	1	24	8	Good	Good	**High**	450	5400	2400	**Major: 100%**	-
178	*Fraxinus pennsylvanica*	1	2	2	Fair	Poor	**Low**	150	2000	1500	**Major: 100%**	-
179	*Fraxinus pennsylvanica*	1	3	3	Fair	Fair	**High**	150	2000	1500	**Major: 100%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
180	*Fraxinus pennsylvanica*	1	4	4	Fair	Fair	**Low**	200	2400	1700	**Major: 100%**	-
181	*Fraxinus pennsylvanica*	1	4	4	Fair	Fair	**Low**	200	2400	1700	**Major: 100%**	-
182	*Fraxinus pennsylvanica*	1	5	5	Fair	Good	**Medium**	250	3000	1900	**Major: 100%**	-
183	*Erythrina x sykesii*	1	9	11	Fair	Fair	**Medium**	1000	12000	3300	**None: 0%**	-
184	*Eucalyptus tereticornis*	1	20	7	Good	Good	**High**	450	5400	2400	**None: 0%**	-
185	*Corymbia citriodora*	1	12	10	Good	Good	**High**	850	10300	3100	**None: 0%**	-
186	*Callistemon viminalis*	1	3	4	Good	Fair	**Low**	150	2000	1500	**None: 0%**	-
187	*Stenocarpus sinuatus*	1	6	3	Fair	Fair	**Medium**	200	2400	1700	**None: 0%**	-
188	*Corymbia citriodora*	1	15	10	Fair	Good	**High**	350	4200	2100	**None: 0%**	-
189	*Flindersia australis*	1	6	5	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-
190	*Melaleuca quinquenervia*	1	9	6	Good	Fair	**Medium**	400	4800	2300	**None: 0%**	-
191	*Corymbia citriodora*	1	11	8	Good	Fair	**High**	350	4200	2100	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
192	*Corymbia citriodora*	1	11	6	Fair	Good	**Medium**	250	3000	1900	**Major: 100%**	-
193	*Callistemon viminalis*	3	3	2	Fair	Fair	**Low**	100	2000	1500	**Major: 100%**	-
194	*Lophostemon confertus*	1	6	3	Good	Fair	**Medium**	250	3000	1900	**Major: 100%**	-
195	*Callistemon viminalis*	2	5	2	Fair	Fair	**Low**	150	2000	1500	**Major: 100%**	-
196	*Lophostemon confertus*	1	6	3	Fair	Fair	**Medium**	250	3000	1900	**Major: 100%**	-
197	*Erythrina x sykesii*	1	8	5	Fair	Poor	**Medium**	400	4800	2300	**Major: 100%**	-
198	*Erythrina x sykesii*	1	9	9	Fair	Fair	**Medium**	450	5400	2500	**Major: 100%**	-
199	*Cinnamomum camphora*	1	11	6	Fair	Fair	**Low**	350	4200	2100	**Major: 100%**	-
200	*Fraxinus pennsylvanica*	1	2	3	Fair	Poor	**Low**	200	2400	1700	**Major: 100%**	-
201	*Cinnamomum camphora*	1	12	12	Fair	Fair	**Low**	550	6600	2600	**Major: 100%**	-
202	*Lophostemon confertus*	1	13	8	Good	Good	**High**	350	4200	2100	**None: 0%**	-
203	*Lophostemon confertus*	1	9	2	Fair	Poor	**Low**	250	3000	1900	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
204	*Lophostemon confertus*	1	10	6	Fair	Fair	**Medium**	250	3000	1900	**None: 0%**	-
205	*Lophostemon confertus*	1	13	8	Good	Fair	**High**	400	4800	2300	**None: 0%**	-
206	*Lophostemon confertus*	1	7	4	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-
207	*Lophostemon confertus*	1	7	4	Fair	Fair	**Medium**	300	3600	2000	**None: 0%**	-
208	*Lophostemon confertus*	1	13	7	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-
209	*Lophostemon confertus*	1	15	6	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-
210	*Lophostemon confertus*	1	15	6	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-
211	*Lophostemon confertus*	1	15	7	Good	Fair	**High**	450	5400	2400	**None: 0%**	-
212	*Lophostemon confertus*	1	8	2	Fair	Poor	**Low**	200	2400	1700	**None: 0%**	-
213	*Lophostemon confertus*	1	13	7	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-
214	*Lophostemon confertus*	1	13	7	Good	Good	**High**	350	4200	2100	**None: 0%**	-
215	*Lophostemon confertus*	1	10	4	Fair	Poor	**Low**	200	2400	1700	**None: 0%**	-

No.	Botanical Name	Trees In Group	Height (m)	Spread (m)	Health	Structure	Retention value	DBH (mm)	TPZ (mm)	SRZ (mm)	Impacts	Approved for removal under DC 6/2012/JP?
216	*Lophostemon confertus*	1	10	6	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-
217	*Lophostemon confertus*	1	14	6	Good	Fair	**Medium**	300	3600	2000	**None: 0%**	-
218	*Lophostemon confertus*	1	16	7	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-
219	*Lophostemon confertus*	1	14	6	Good	Fair	**Medium**	300	3600	2000	**None: 0%**	-
220	*Lophostemon confertus*	1	13	7	Good	Fair	**Medium**	350	4200	2100	**None: 0%**	-

4 Recommendations

4.1 Trees requiring detailed assessment

- Tree **117** will require detailed assessment to determine suitability for retention.

4.2 Offsetting

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

4.3 Tree work

- The tree protection plan outlined in **Chapter 5** and **Appendix B** should be implemented for all trees proposed to be retained and all trees that fall within 10 m of any construction activities.
- All tree work is to be carried out by an arborist with a minimum AQF Level 3 qualification in Arboriculture.
- All tree work must be in accordance with Australian Standard AS 4373-2007, Pruning of Amenity Trees and the NSW WorkCover Code of Practice for the Amenity Tree Industry (1998).
- Permission must be granted from the relevant consent authority, prior to removing or pruning of any of the subject trees.

5 Tree protection plan

5.1 Tree protection measures

The following tree protection measures will be required if trees are retained:

- Tree protection fencing must be established around the perimeter of the TPZ. If the protective fencing requires temporary removal, trunk, branch and ground protection must be installed and must comply with *AS 4970-2009 - Protection of trees on development sites*. Existing fencing and site hoarding may be used as tree protection fencing.
- If temporary access for machinery is required within the TPZ, ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Ground protection may include a permeable membrane such as geotextile fabric beneath a layer of mulch, crushed rock or rumble boards.
- Any additional construction activities within the TPZ of the subject trees must be assessed and approved by the project arborist, and must comply with *AS 4970-2009 - Protection of trees on development sites.*

Further information and guidelines on tree protection is in **Appendix B**.

5.2 Hold points, inspection and certification

The approved tree protection plan must be available onsite prior to the commencement of works, and throughout the entirety of the project. To ensure the tree protection plan is implemented, hold points have been specified in the schedule of works below. It is the responsibility of the principal contractor to complete each of the tasks.

Once each stage is reached, the work will be inspected and certified by the project arborist and the next stage may commence. Alterations to this schedule may be required due to necessity, however, this shall be through consultation with the project arborist only.

Table 4: Schedule of works

Pre-construction	Prior to demolition and site establishment indicate clearly (with spray paint on trunks) trees marked for removal only.
	Tree protection (for trees that will be retained) shall be installed prior to demolition and site establishment, this will include mulching of areas within the TPZ
During Construction	Scheduled inspection of trees by the project arborist should be undertaken monthly during the construction period.
	Inspection of trees by project arborist after all major construction has ceased, following the removal of tree protection measures.
Post Construction	Final inspection of trees by project arborist.

References

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

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

Harris, R., Clark, J., Matheny, N. and Harris, V. 2004. *Arboriculture.* Upper Saddle River, N.J.: Prentice Hall.

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Appendix A – Tree locations, impacts and study area

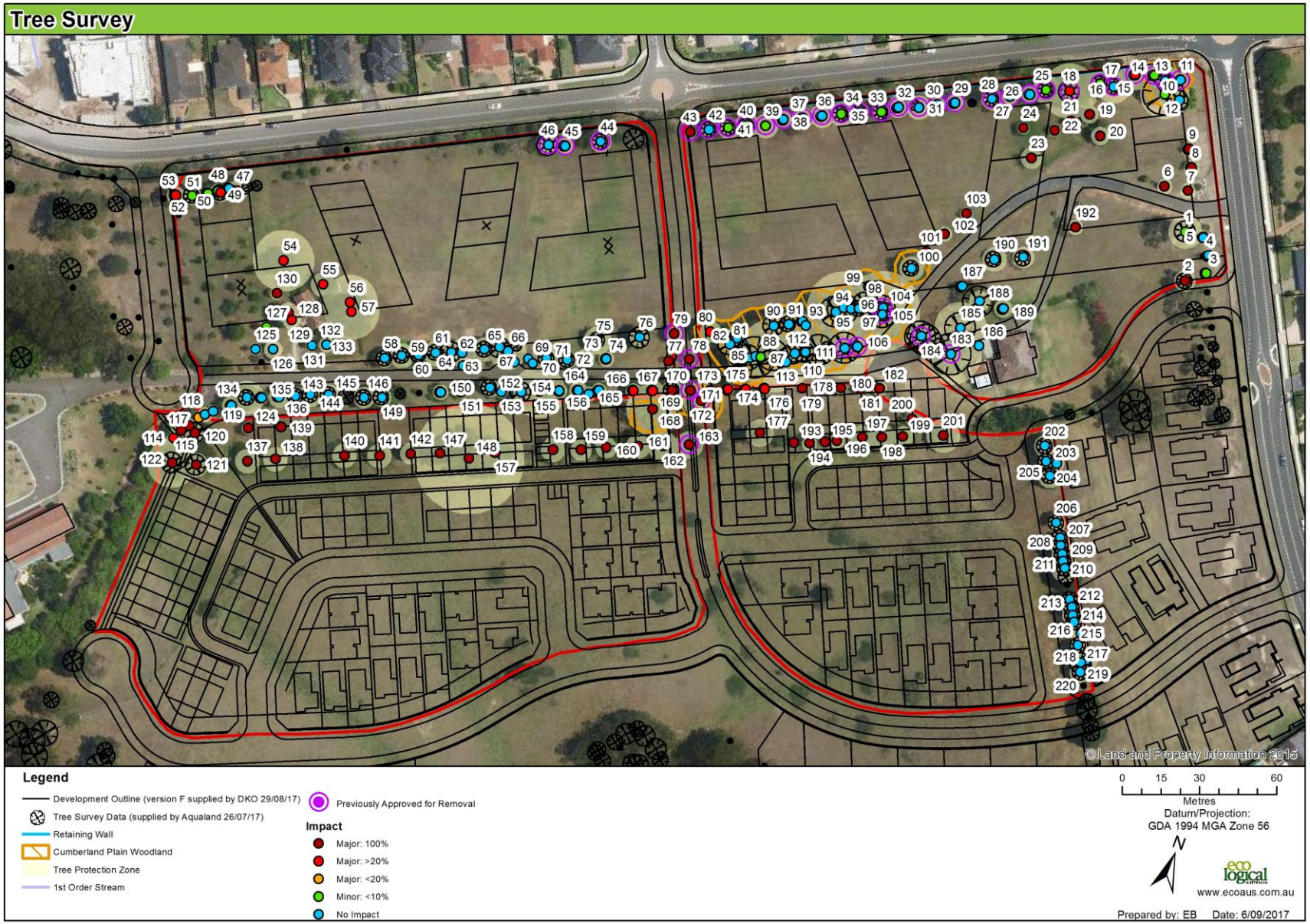


Figure 3: Study area, tree locations and impacts

Figure 4: Northwest portion of study area, tree locations, and impacts

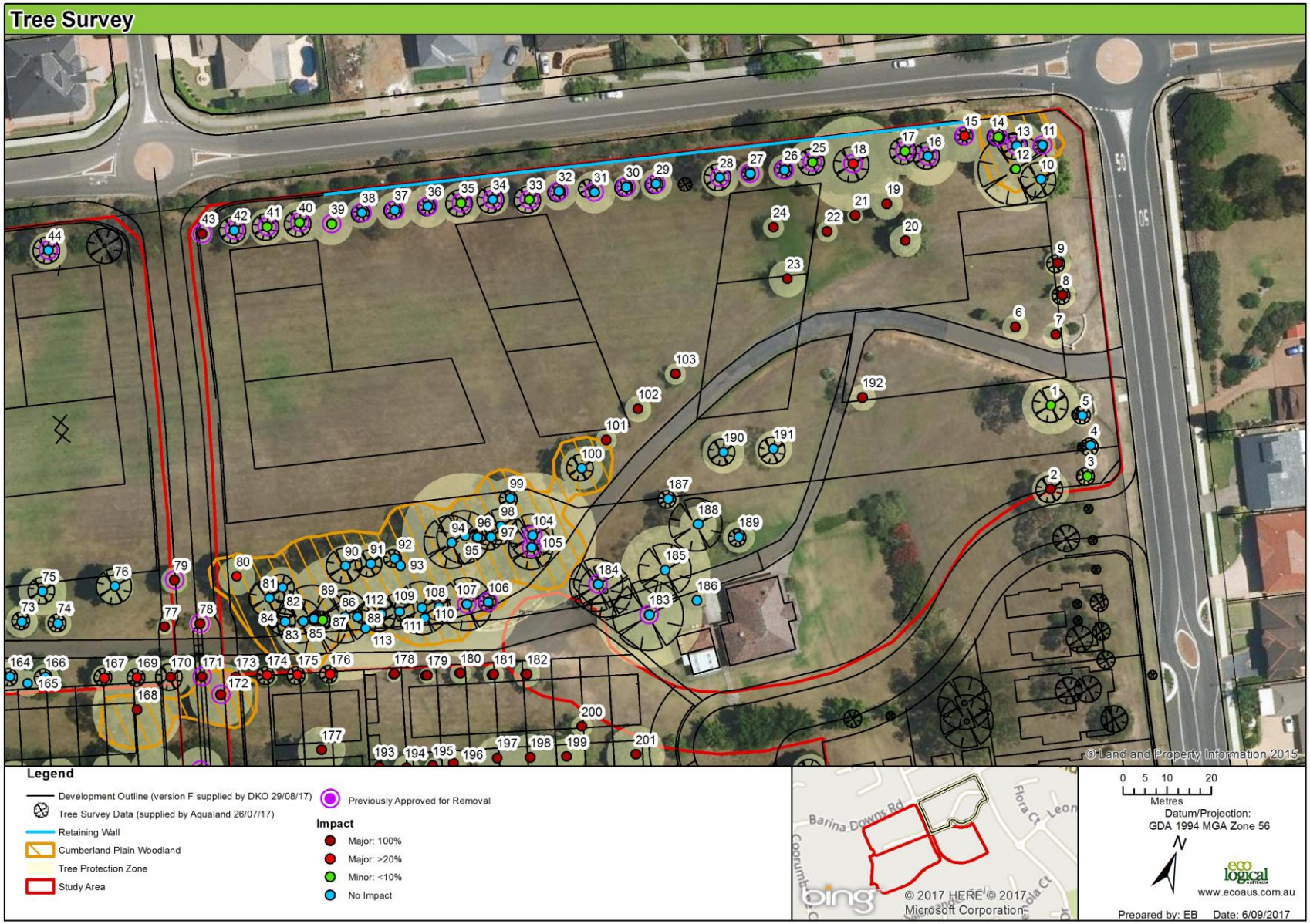


Figure 5: Northeast portion of study area, tree locations and impacts

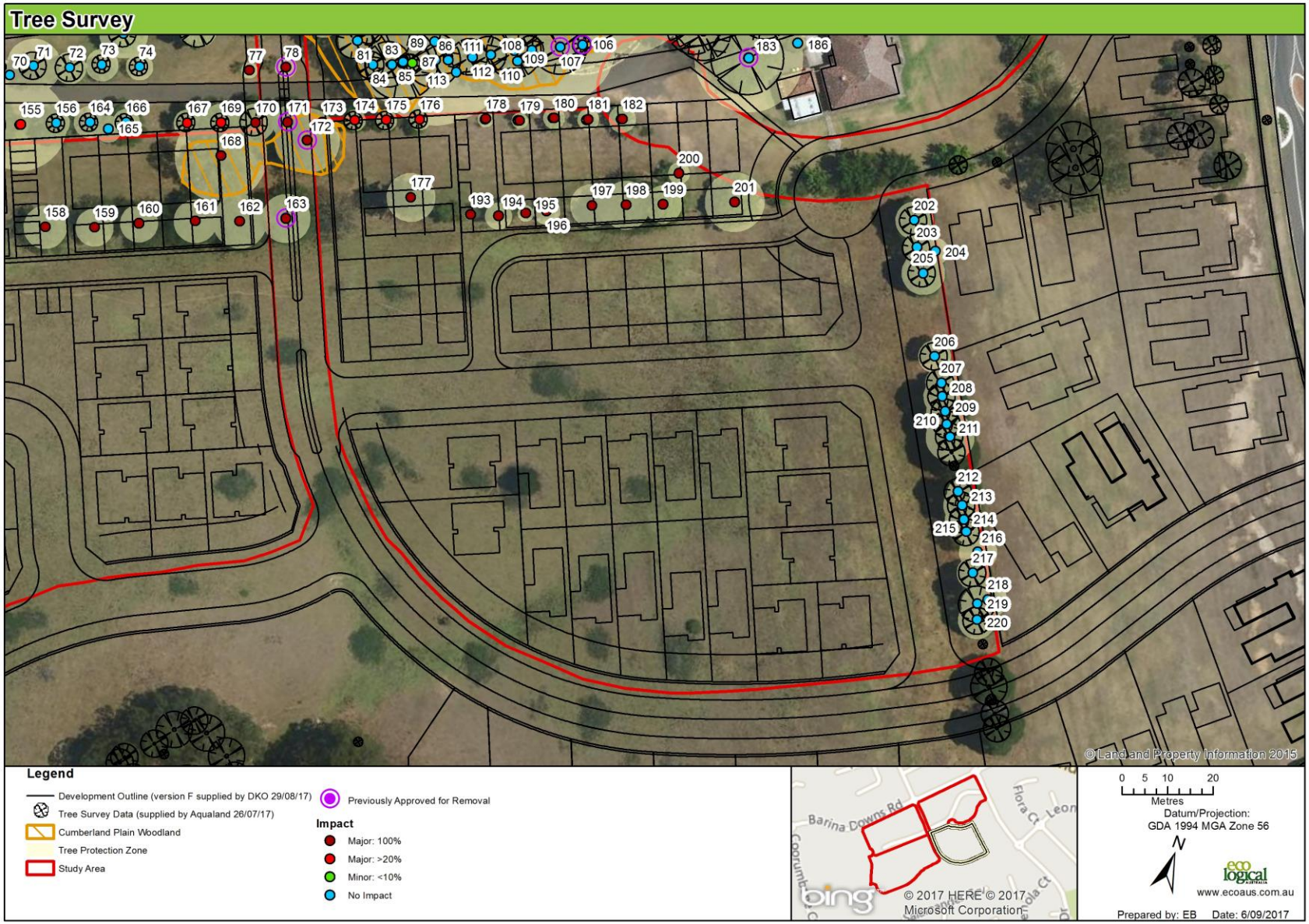


Figure 6: Southeast portion of study area, tree locations and impacts

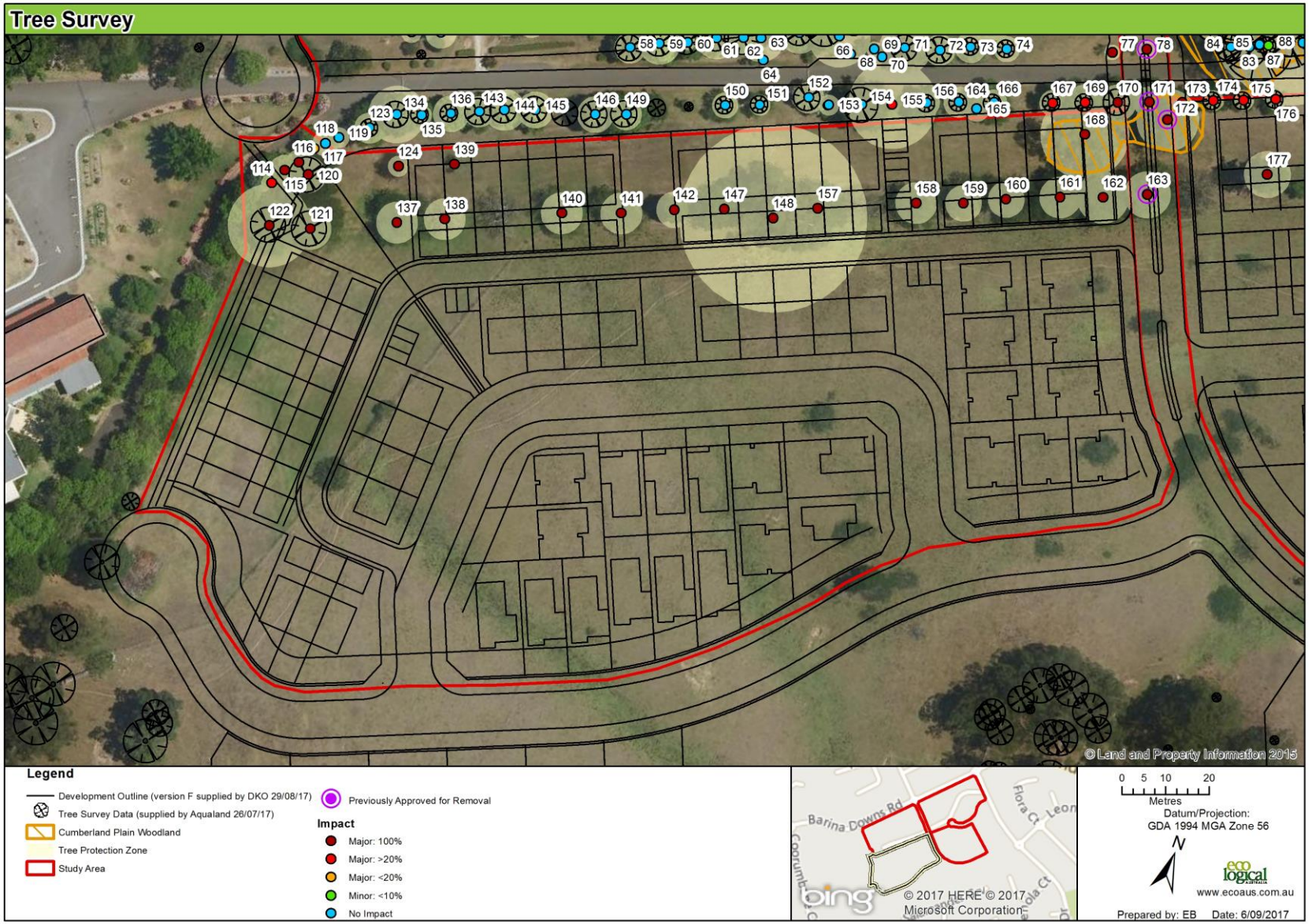


Figure 7: Southwest portion of study area, tree locations and impacts

Appendix B – Tree Protection Guidelines

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

Tree protection fencing

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

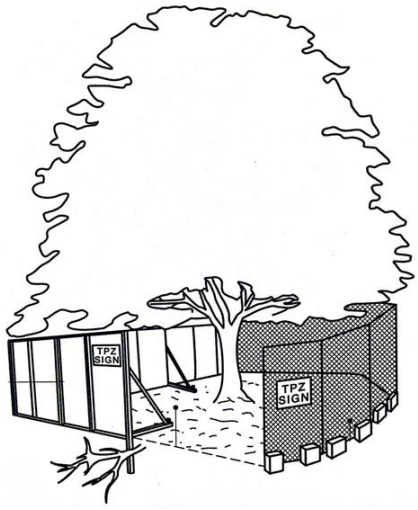
Trees that are to be retained must have protective fencing erected around the TPZ (or as specified in the body of the report) to protect and isolate it from the construction works. Fencing must comply with the *Australian Standard, AS 4687-2007, Temporary fencing and hoardings*.

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

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

Tree protection fencing shall be:

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



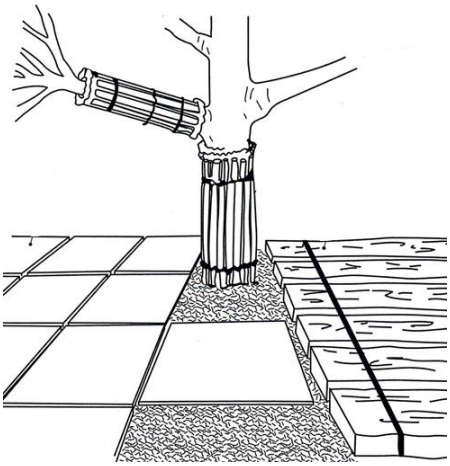
Crown protection

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

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

Trunk protection

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



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

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

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

Ground protection

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

If temporary access for machinery is required within the TPZ ground protection measures will be required. The purpose of ground protection is to prevent root damage and soil compaction within the TPZ. Ground protection may include a permeable membrane such as geotextile fabric beneath a layer of mulch, crushed rock or rumble boards.

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

Root protection & pruning

If incursions/excavation within the TPZ are unavoidable, exploratory excavation (under the supervision of the Project Arborist) using non-destructive methods may be considered to evaluate the extent of the root system affected, and determine whether or not the tree can remain viable.

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

Underground services

All underground services should be routed outside of the TPZ. If underground services need to be installed within the TPZ, they should be installed using horizontal directional drilling (HDD). The horizontal drilling/boring must be at minimum depth of 600mm below grade. Trenching for services is to be regarded as "excavation"

Appendix C – Tree retention assessment method

Tree Significance - Assessment Criteria - STARS©		
Low	**Medium**	**High**
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 an environmental pest species due to its invasiveness or poisonous/allergenic properties. The tree is a declared noxious weed by legislation	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 councils 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.

Tree Significance

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

Legend for Matrix Assessment

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

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