TREE ASSESSMENT AND DEVELOPMENT IMPACT REPORT

DECEMBER 2018

SITE

96-104 CABARITA ROAD AVALON BEACH NSW 2107

CLIENT

Meraki Developments Pty Ltd

CONSULTING ARBORIST

Kyle A. Hill, Growing My Way Tree Services

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Founder: Growing My Way Tree Services (1977) • Member of International Society of Arboriculture
National Arborists Association (USA) • National Arborists Association of Australia

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Diploma Conservation and Land Management • Job No. 3049 v3

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1. SUMMARY

The Development Proposal for 96-104 Cabarita Road, by Mark Hurcum Design Practice on behalf of Meraki Developments, dated November 2018, proposes the subdivision of the land into 10 Community Title lots (9 residential and one community lot) and 1 torrens title lot. Lodged concurrently are 9 DAs for individual dwelling houses on the Community Title residential lots. However this report only relates to the subdivision as this DA includes all the works that have the potential to impact on existing trees such as construction of an access road, establishment of building footprints within each lot and provision of services.

The site's southern boundary abuts Cabarita Road and runs steeply down to Careel Bay in the north. The landscape has been heavily disturbed in the earlier construction of terraces, paths and gardens. This has significantly changed ground profiles with cut and fill terracing, stone retaining walls, raised garden beds and concrete pathways contouring the site. It is populated by a mix of remnant forest and exotic plantings. Conspicuously absent is forest regeneration in the form of native saplings and regrowth. Indeed the site appears lacking the natural diversity, complexity and understory typical of a healthy forest community – possibily as a byproduct of the earlier landscaping design, exotic plantings, weed invasion and management practices.

Significant species on site, particularly *Corymbia maclulata,* are members of the Pittwater Spotted Gum Forest, listed as an Endangered Ecological Community under the *Threatened Species Conservation Act (1995)*. Statuesque specimens, notable by size and presence are predominantly aging and exhibiting signs of senescence, poor health and declining vigour. The younger trees growing in their shadows lack vitality and appear supressed due to the phototropic effects. The extensive weed growth dominating the ground cover may also be preventing the ideal conditions, such as bare earth, required for successful *C. maculata* seed germination and subsequent forest regeneration.

This report contains observations and recommendations intended to assist in the assessment and management of all trees whose location is within 5 metres of the proposed building envelopes, in addition to any significant trees beyond, that are potentially impacted by the construction of the proposed development.

There are **146 trees** that have been assessed as to potential impact by the proposed development – see figures 1 and 2 and the Tree Summary Table on pages 28-31.

Of these, **41 trees** are either dead and present on site as stags, or exempt by size or species according to *Table 1-Exempt Tree Species of article B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council Development Control Plan 2014.

Some of these trees may be considered for retention where they are deemed valuable by presence and amenity to the site and are not impacted by the proposed development. Others may be removed and replaced with more valuable plantings as part of a coordinated landscape/ecology plan. Priority weed species, as identified under the *Biosecurity Act 2015*, such as *Olea europaea* subsp. *cuspidata* (African olive), are recommended for removal to prevent their spread.

1. SUMMARY (continued)

On the basis of the proposed plans, of the **remaining 105 trees** that have been assessed as to potential impact of the proposed development:

a) 44 trees (**1, 2, 3E, 3H, 4B, 5, 7C, 7D, 7F, 11A, 20, 21A, 27, 27A, 36, 40, 41, 47, 54, 55, 56, 62C, 69E, 69I, 70A, 89K, 90A, 90B, 91, 95, 104, 104A, 104D, 104E, 128C, 129, 130, 133, 134, 135, 136B, 139B, UN1** and **UN4** (*UN being un-numbered on site*) are not directly or significantly impacted by the proposed development. Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection, these trees are deemed viable for retention and protection.

   Of these, five trees (**40, 139B, 104, 104D** and **104E**) are in very poor condition, and while considered not significantly impacted, due to senescence and, in the case of 104 and 104E, evidence of suspected pathogenic *Armillaria luteobubalina* fungal fruiting bodies, it is recommended that their ongoing condition be monitored with consideration of removal should their declining structure become hazardous.

b) Four trees (**22, 93, 94** and **103**) are structurally compromised or dying, with evidence of decay, and significant deadwood in their canopies, rendering them potentially hazardous. They are at the end of their useful life expectancy and their removal is recommended as reasonable duty of care.

c) 26 trees (**3, 3B, 3C, 22B, 22C, 22E, 44, 47A, 67A, 67B, 69C, 69D, 71C, 84B, 86, 89F, 90, 92A, 94A, 94B, 95A, 95B, 95C, 118A, 136A** and **138**) are deemed unsustainable under the currently specified plans due to their location within, or proximity to, the proposed building such that their SRZs and/or TPZs will be breached by its excavation and construction**.** These trees are proposed to be removed and replaced, ideallly with indigenous species, as a part of a coordinated landscape plan.

d) 26 trees (**3D, 3F, 3G, 4 ,6, 8, 11B, 49, 66, 69A, 82A, 92, 96, 97, 100, 102, 102A, 118, 119, 119B, 128C, 130B, 131, 134B, 136** and **140**) are impacted by the proposed development in that their TPZs are notionally breached by more than 10%. However, due the contour of the site and the buildings' elevated design, in most of these instances the encroachments are from upper level slabs 'floating' above ground level, suggesting there is scope to manage construction so as not to adversely impact to tree health.

   Any piers required to support these slabs must be flexibly located to ensure the SRZs is not breached, and to avoid any significant root disturbance within the TPZs. In this way, any unavoidable changes to ground levels within the TPZs may be limited within tolerance.

   Tree management strategies and protection requirements for these trees are fully discussed under 'Recommendations'. Subject to construction specification and careful management, and provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), these trees are deemed viable for retention and protection.

1. SUMMARY (continued)

e) 5 trees (**11, 31, 45, 46** and **101**) are impacted by the proposed development, with excavation required in over 10% of their TPZ, along with further intrusion from above ground slabs, possibly requiring supporting piers, albeit flexibly located to minimise impact. That said, the impact may be mitigated by possible irregular root growth due the heavily disturbed ground profile of remnant landscaping, retaining and terracing, and that the proposed excavation is not contiguous (in the case of trees 11 and 101, where the trees are located between, and impacted by, two dwellings).

   In order for these trees to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance within the TPZ, nor adverse impact to tree health. Any roots over 50mm that require severing, are to be severed under the supervision and only with the approval of the site arborist. Tree management strategies for these trees are fully discussed under 'Recommendations'.

These findings have been summarised on the table of Assessed Tree Impacts and Management by proposed Lot, on page 4.

Other trees on the site have been deemed as exempt by size, species or by proximity to the proposed development as defined by the Northern Beaches Council *Control B4.22 Preservation of Trees or Bushland Vegetation* and/or the Australian Standard® AS 4970–2009 *Protection of trees on development sites*.

Trees nominated for removal are on the basis that they are not viable for retention and protection with the development proposal as currently specified. It is recommended that these trees be adequately offset with replacement plantings, ideally indigenous species, as a part of a coordinated landscape plan.

Given the generally ageing condition of the tree population, many trees have been observed as carrying deadwood in their canopies. Any retained trees in areas of traffic or public amenity should have deadwood removed as a reasonable duty of care.

As a consequence of the general age of the tree population combined with the phototropic effect of overshadowing by surrounding trees, the tree canopies generally appear above the height of the proposed dwellings. That said, any tree canopy pruning required to accommodate new built infrastructure separation and the proposed dwellings, should be undertaken under the advice and supervision of the site arborist – refer 'Recommendations' for tree management strategies.

This document supports in concept (from a tree management perspective) the proposal for development, conditional on adequate protection being provided by way of design specification, installation of tree protection and compliance with tree protection measures as specified by the Australian Standard® AS 4970–2009 *Protection of trees on development sites* - see 'Recommendations', Appendix B and the Tree Summary Table on pages 30 to 34.

SUMMARY OF ASSESSED TREE IMPACTS & MANAGEMENT BY PROPOSED LOT

	Total number of assessed trees by Lot	Exempt trees		Exempt trees			Trees confirmed as required to be removed		Trees subject to root investigation to support viability
		By size or species	Dead trees	Not impacted	Not impacted but in poor health – monitor condition for removal	With management	Due to location	Due to condition	
Lot 1	**9**	1	-	4	-	3	1	-	-
Lot 2	**25**	5	1	9	-	6	3	-	1
Lot 3	**5**	1	-	3	-	-	-	1	-
Lot 4	**5**	-	-	1	-	-	3	-	1
Lot 5	**11**	1	-	4	1	1	2	-	2
Lot 6	**34**	13	-	9	-	3	9	-	-
Lot 7	**13**	6	–	1	-	1	3	2	-
Lot 8	**10**	2	-	1	-	3	3	-	1
Lot 9	**16**	3	2	1	3	5	1	1	-
Lot 10	**18**	3	3	6	1	4	1	-	-
TOTAL TREES	**146**	**35**	**6**	**39**	**5**	**26**	**26**	**4**	**5**

2. INTRODUCTION

Mark Hurcum requested Kyle A. Hill, Growing My Way Tree Services to prepare a Tree Assessment and Development Impact Report for 96-104 Cabarita Road Avalon Beach NSW 2107, on behalf of Meraki Developments.

This report contains observations and recommendations intended to assist in the assessment and management of 146 trees that are potentially impacted by the proposed development, determined by their location within 5 metres of the proposed building envelopes, and including any significant trees beyond - see figures 1 and 2 and the Tree Summary Table on pages 28-31.

Other trees on the site have been identified as exempt by size or species as defined by Northern Beaches Council *Tree Management* guidelines and/or the Australian Standard® AS 4970–2009 *Protection of trees on development sites*.

The sole consent authority is Northern Beaches Council.

The report discusses the current condition of trees identified by:

- Detail and Level Survey of 96-104 Cabarita Road Avalon Beach by Byrne and Associates P/L Consulting Surveyors & Engineers, dated 210/3/18.
- Proposed Architectural drawings of Lot developments 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice Architects, September 2018.
- Observations and findings recorded on site by Kyle Hill and V.W. Zoc.

Kyle Hill is a qualified AQF 5, Registered Practising Consulting Arborist, Arboriculture Australia Registration No.1884. Site evaluation and data collection was conducted by Kyle and VW Zoc (AQF5) from 27 July to 1 September 2018.

3. METHODOLOGY

Assessment of the trees has been conducted from ground level by visual observation, applying the principles of Visual Tree Assessment (VTA) techniques developed by Mattheck, Claus & et al., (Stage 1 VTA). Principle explanations and illustrations are contained in the publication, *The Body Language of Trees* by Mattheck, C. (1994).

Assessment includes:

- Trees' current condition and likely future health.
- Species tolerance to root disturbance and/or development.
- Likely future hazard potential to persons and/or property.
- Trees' amenity value, such as significance, screening and habitat.

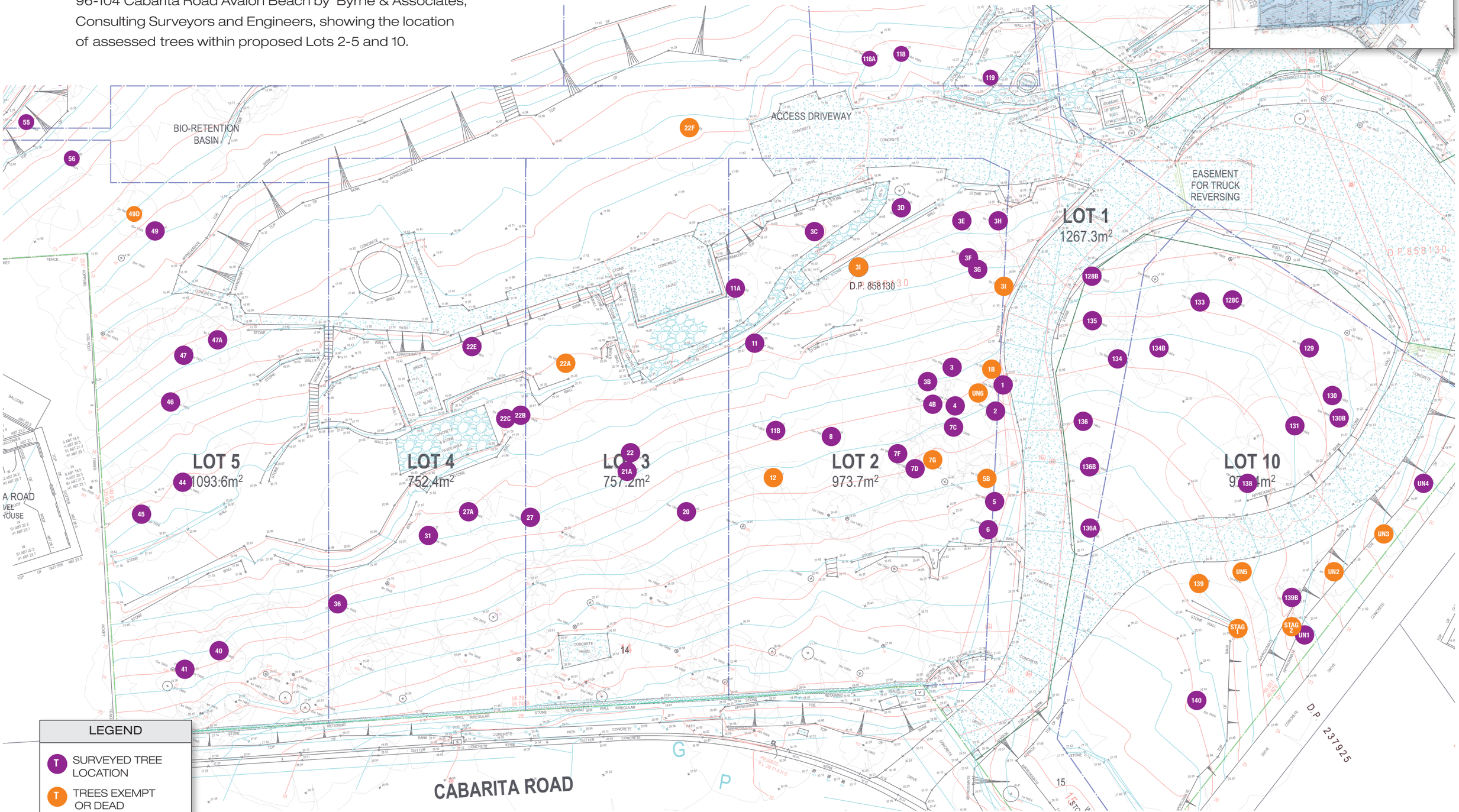
No root analysis, soil testing, Resistograph® drilling or aerial canopy inspection was undertaken. See the following Appendices for further information:

- Appendix A: Glossary of common Arboreal terms
- Appendix B: Tree Protection & Management prior to and during Construction.

4. OBSERVATIONS

4.1 THE SITE

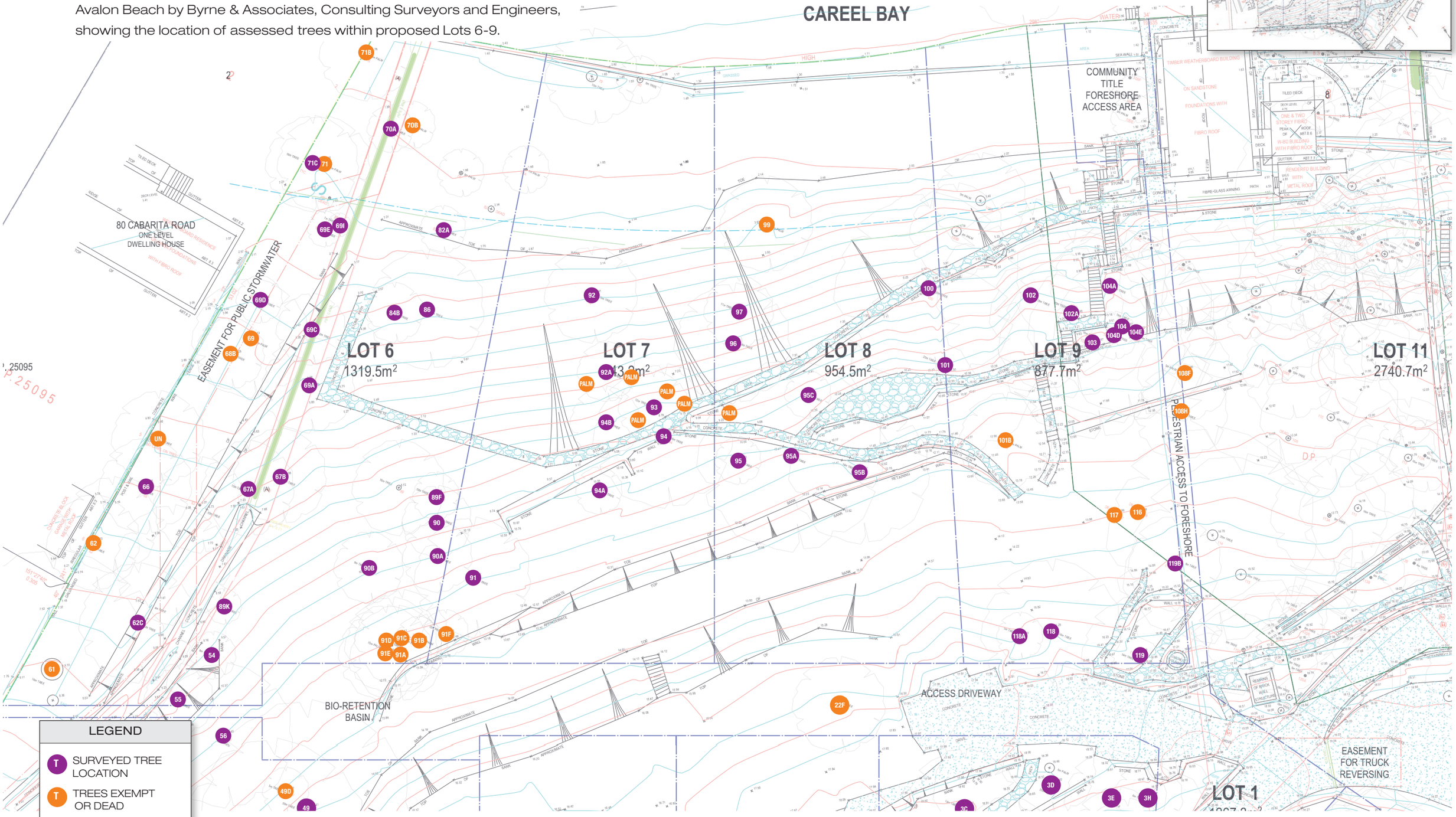
Figure 1, below, is part of the Detail and Level Survey of 96-104 Cabarita Road Avalon Beach by Byrne & Associates, Consulting Surveyors and Engineers, showing the location of assessed trees within proposed Lots 2-5 and 10.



4. OBSERVATIONS (continued)

4.1 THE SITE (continued)

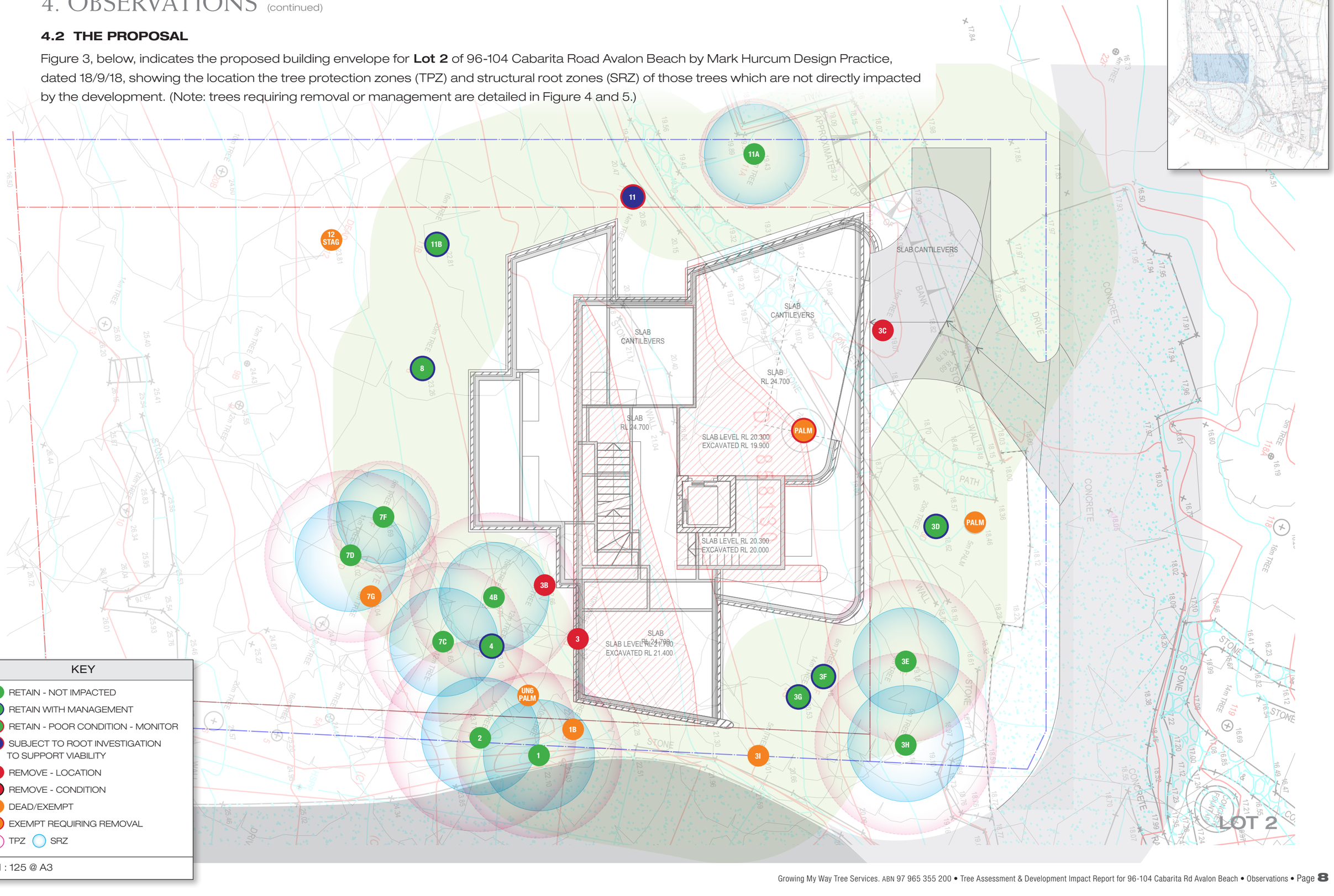
Figure 2, below, is part of the Detail and Level Survey of 96-104 Cabarita Road Avalon Beach by Byrne & Associates, Consulting Surveyors and Engineers, showing the location of assessed trees within proposed Lots 6-9.



4. OBSERVATIONS (continued)

4.2 THE PROPOSAL

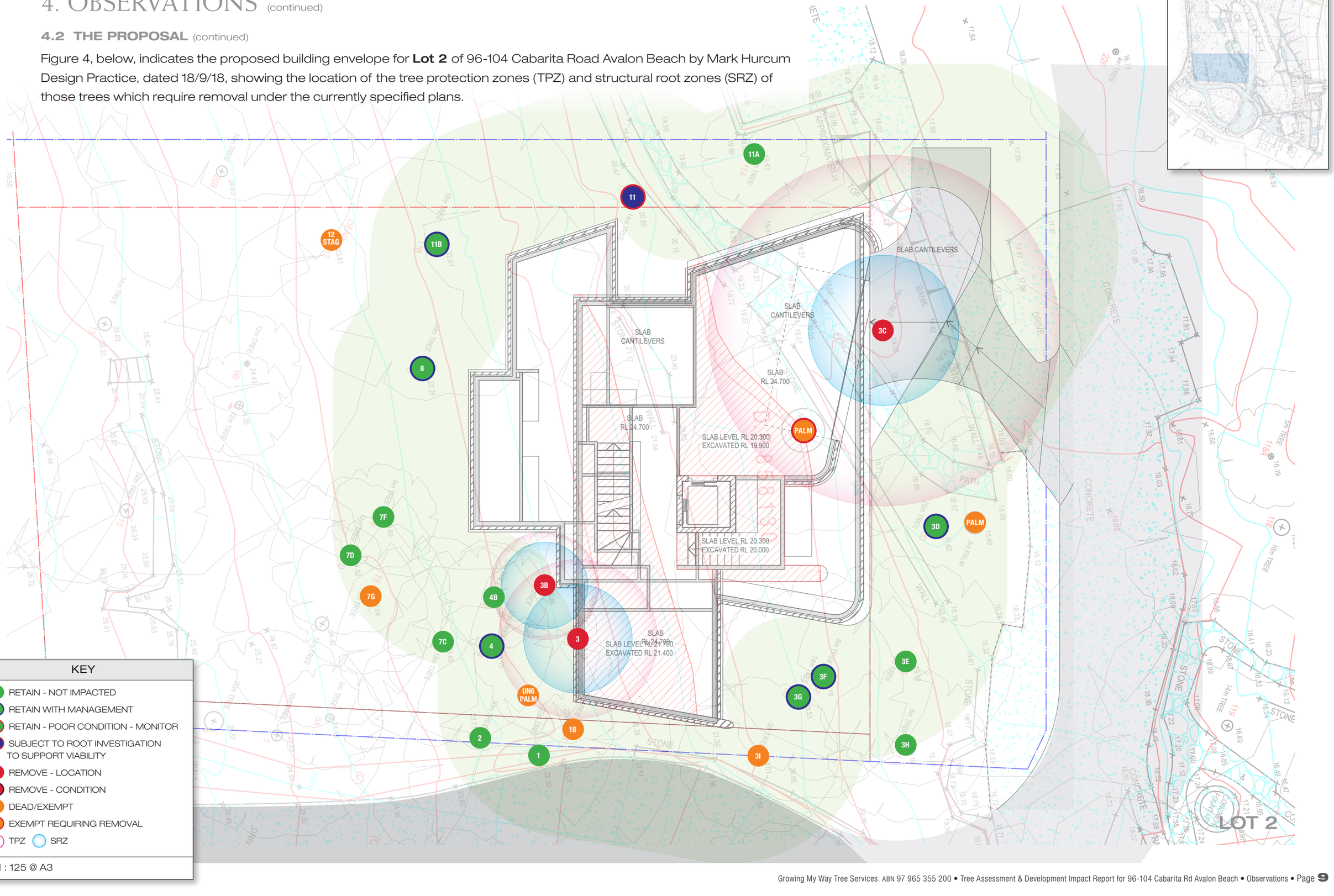
Figure 3, below, indicates the proposed building envelope for **Lot 2** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 18/9/18, showing the location the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which are not directly impacted by the development. (Note: trees requiring removal or management are detailed in Figure 4 and 5.)

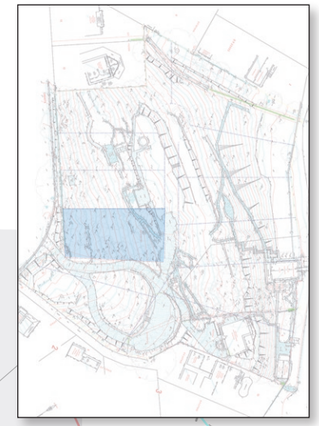


4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 4, below, indicates the proposed building envelope for **Lot 2** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 18/9/18, showing the location of the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which require removal under the currently specified plans.





KEY

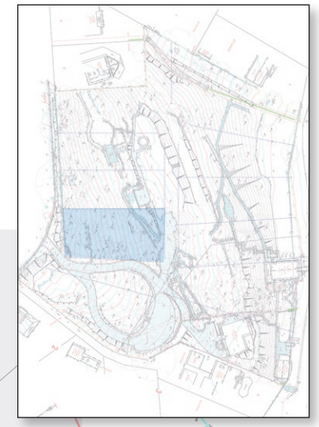
- RETAIN - NOT IMPACTED
- RETAIN WITH MANAGEMENT
- RETAIN - POOR CONDITION - MONITOR
- SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
- REMOVE - LOCATION
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ
- SRZ

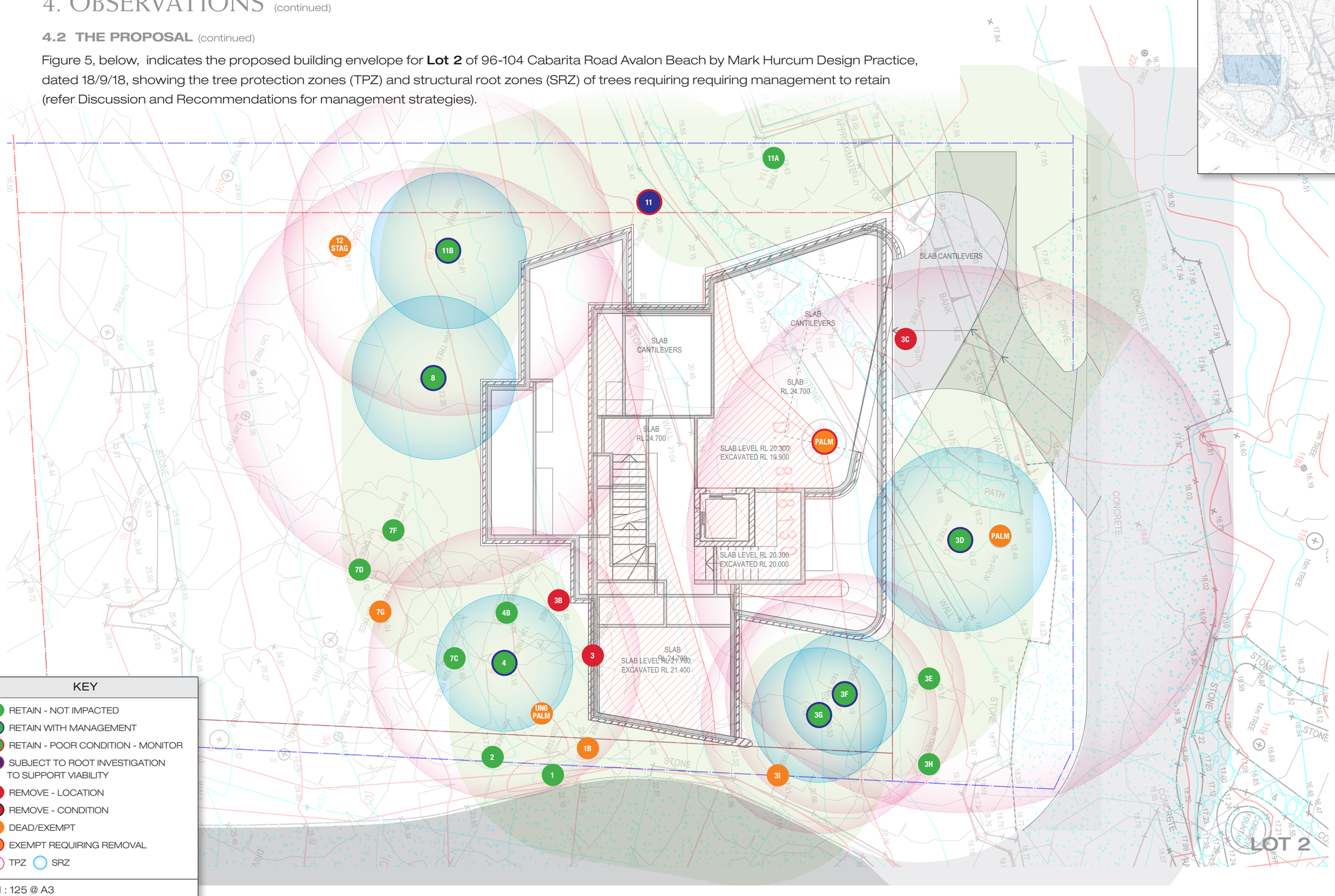
1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 5, below, indicates the proposed building envelope for **Lot 2** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 18/9/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of trees requiring requiring management to retain (refer Discussion and Recommendations for management strategies).





KEY

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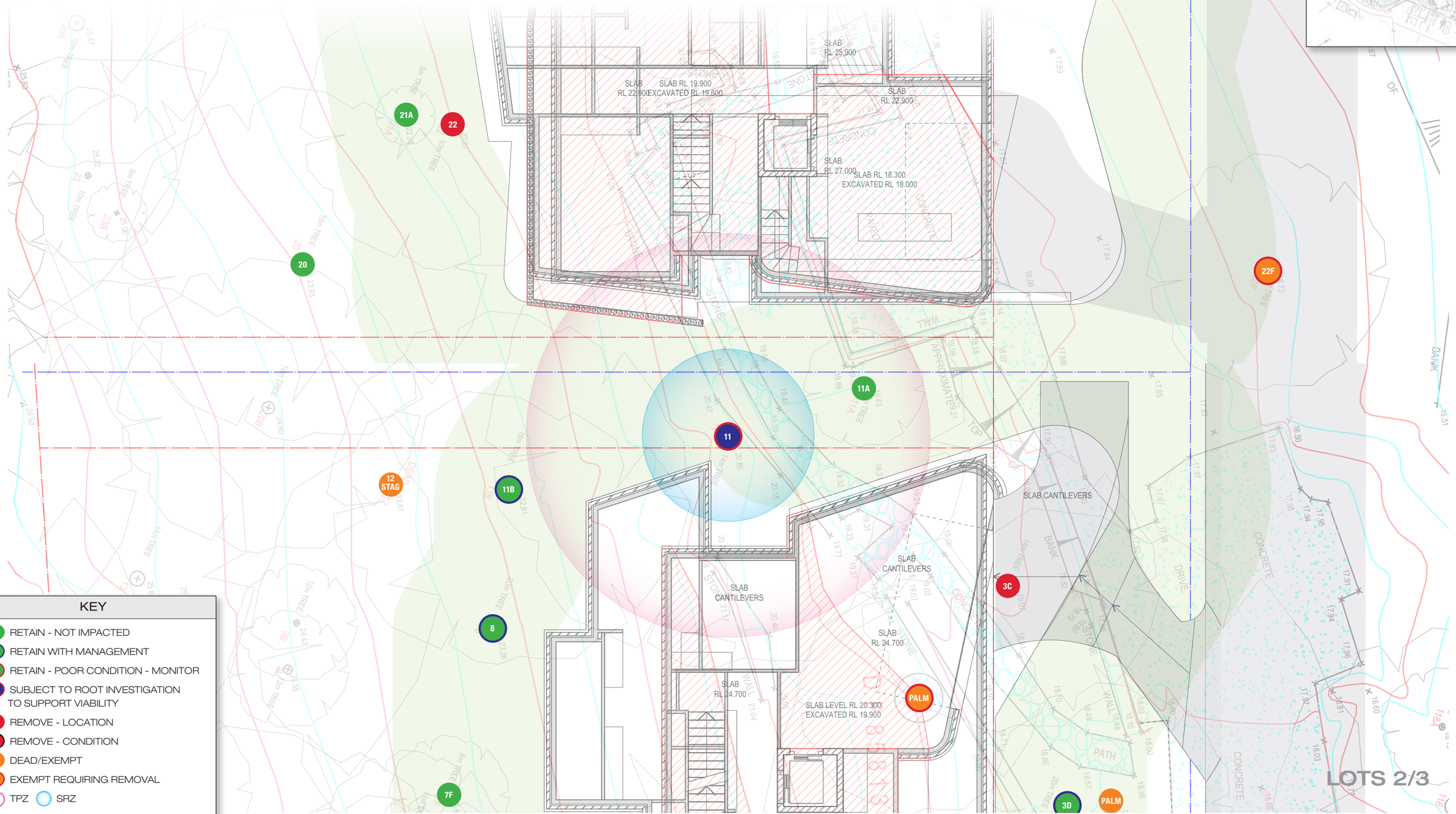
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ
- SRZ

1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 6, below, indicates the proposed building envelopes for **Lots 2 and 3** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 18/9/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of Tree 11 (recommended for root investigation to determine viability – refer Discussion and Recommendations).



KEY

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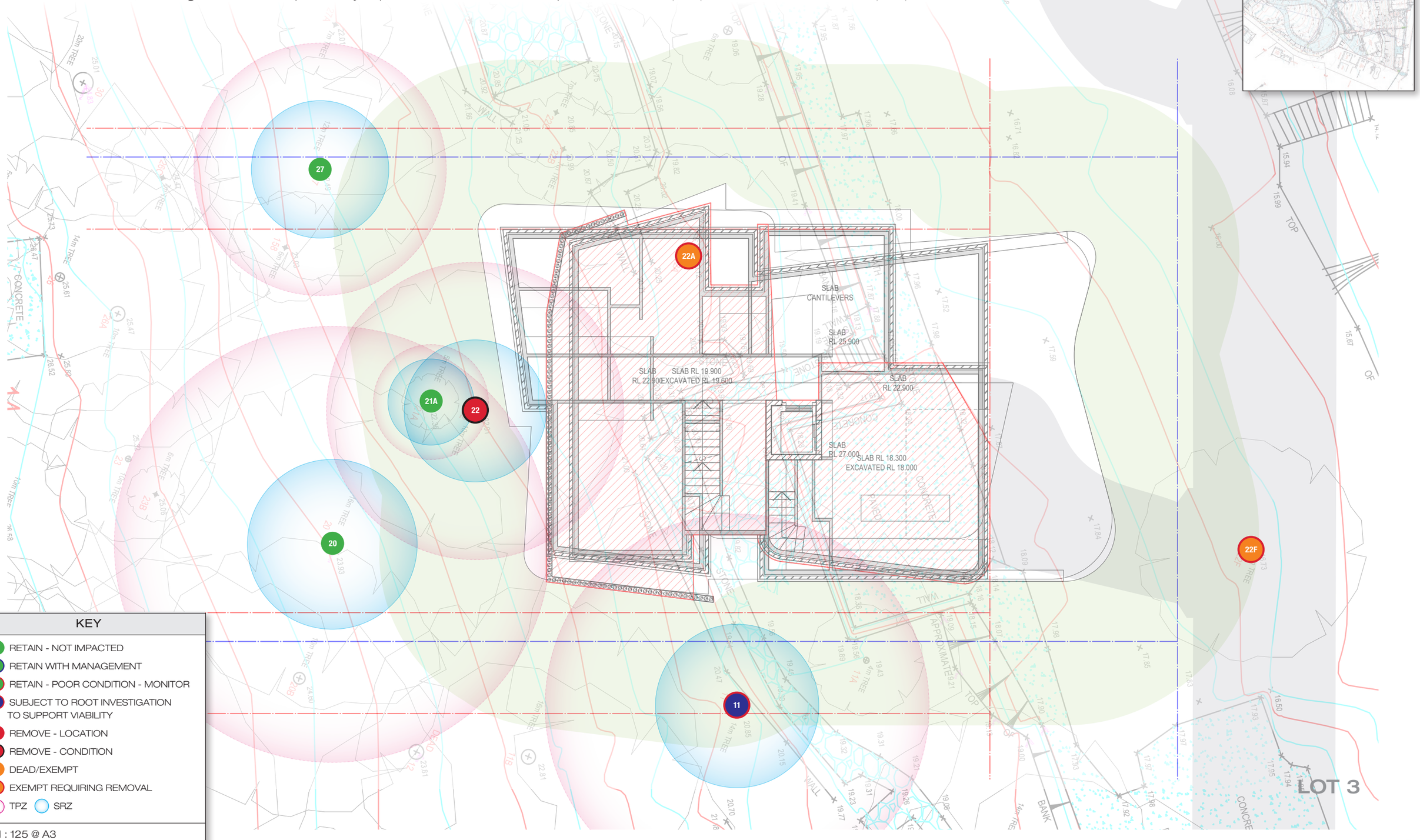
- RETAIN WITH MANAGEMENT
- RETAIN - POOR CONDITION - MONITOR
- SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
- REMOVE - LOCATION
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ SRZ

1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

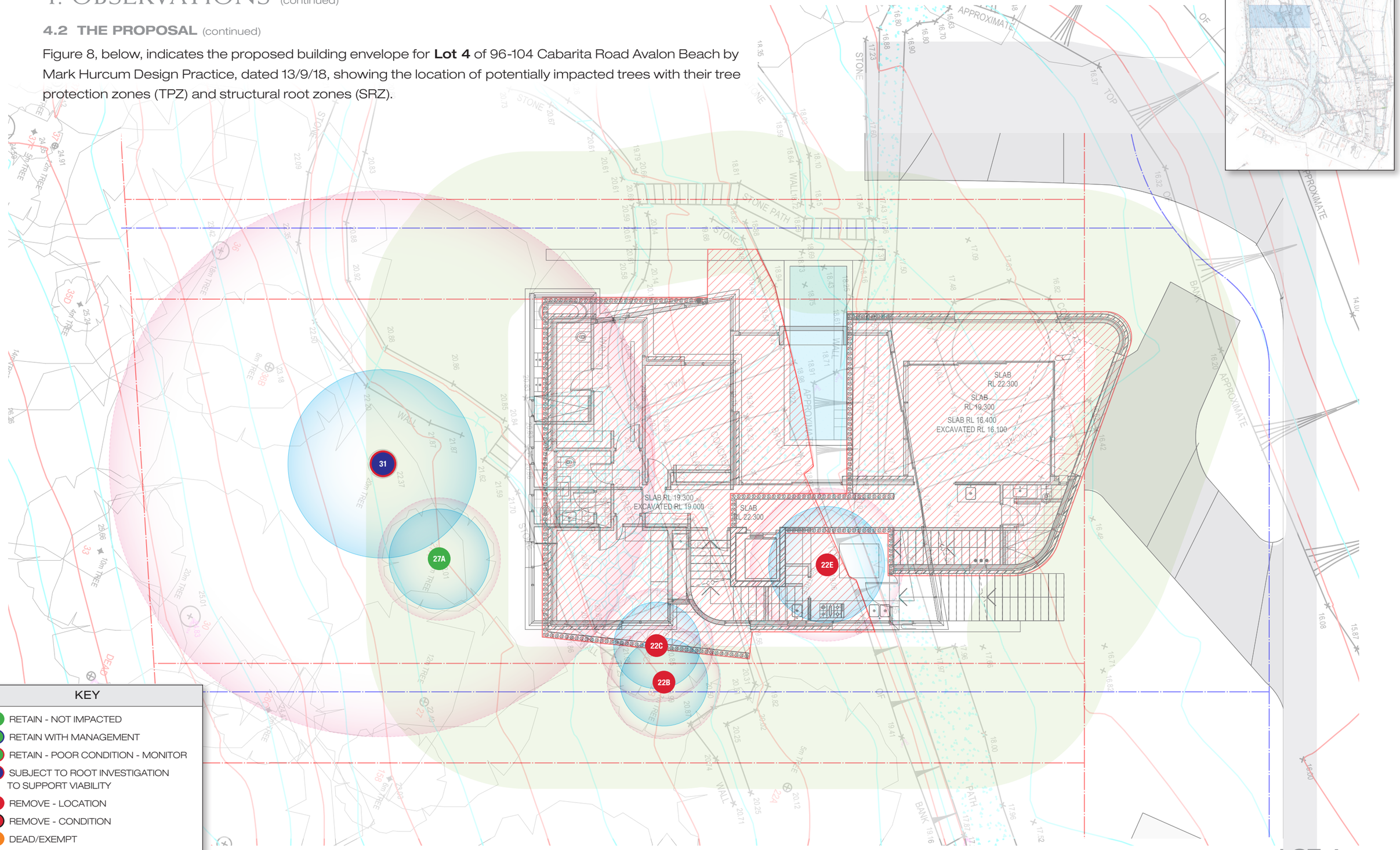
Figure 7, below, indicates the proposed building envelope for **Lot 3** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 30/8/18, showing the location of potentially impacted trees with their tree protection zones (TPZ) and structural root zones (SRZ).



4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

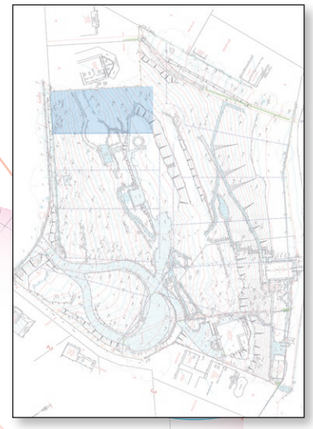
Figure 8, below, indicates the proposed building envelope for **Lot 4** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 13/9/18, showing the location of potentially impacted trees with their tree protection zones (TPZ) and structural root zones (SRZ).

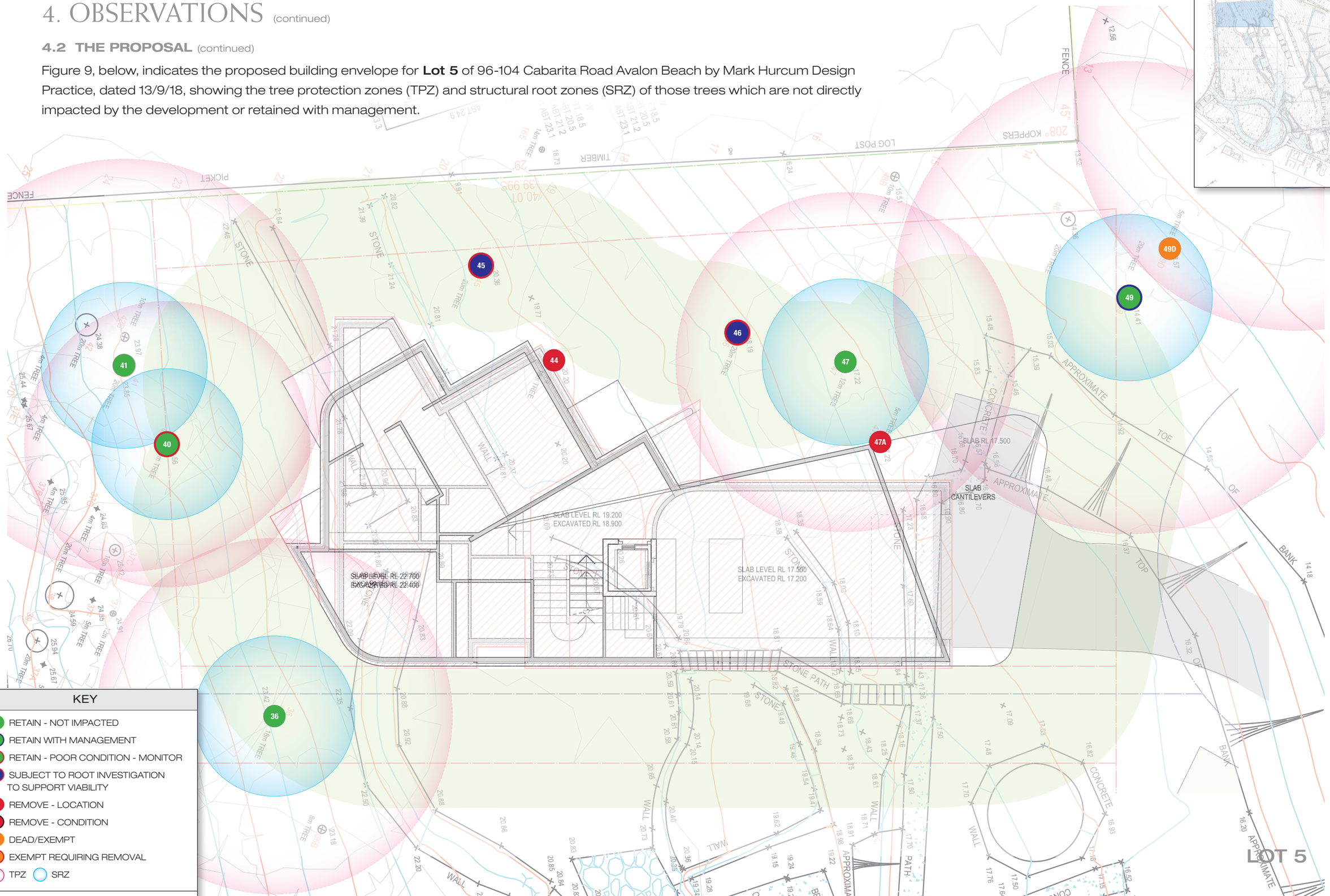


4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 9, below, indicates the proposed building envelope for **Lot 5** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 13/9/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which are not directly impacted by the development or retained with management.

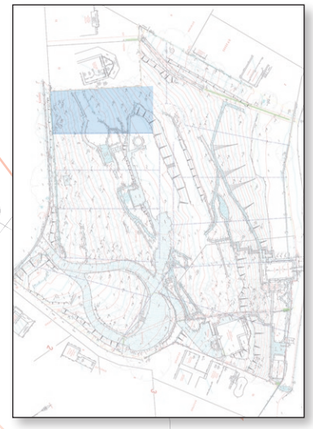


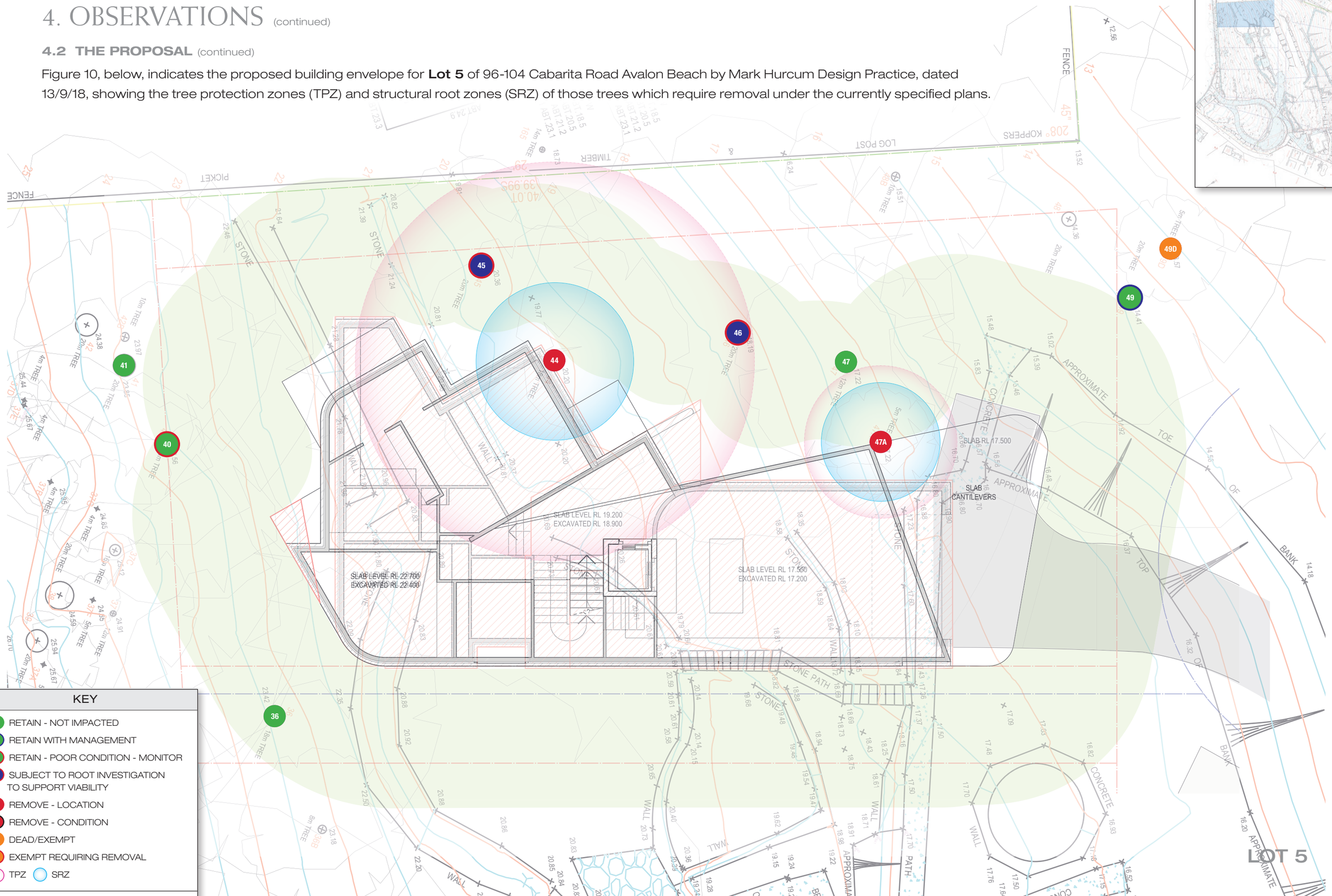


4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 10, below, indicates the proposed building envelope for **Lot 5** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 13/9/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which require removal under the currently specified plans.





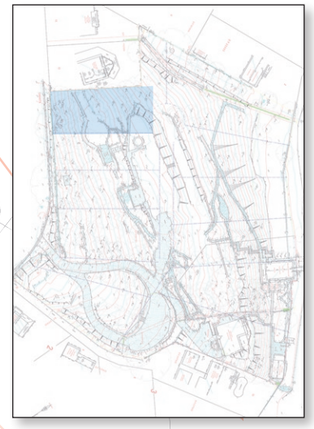
KEY
RETAIN - NOT IMPACTED
RETAIN WITH MANAGEMENT
RETAIN - POOR CONDITION - MONITOR
SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
REMOVE - LOCATION
REMOVE - CONDITION
DEAD/EXEMPT
EXEMPT REQUIRING REMOVAL
TPZ SRZ

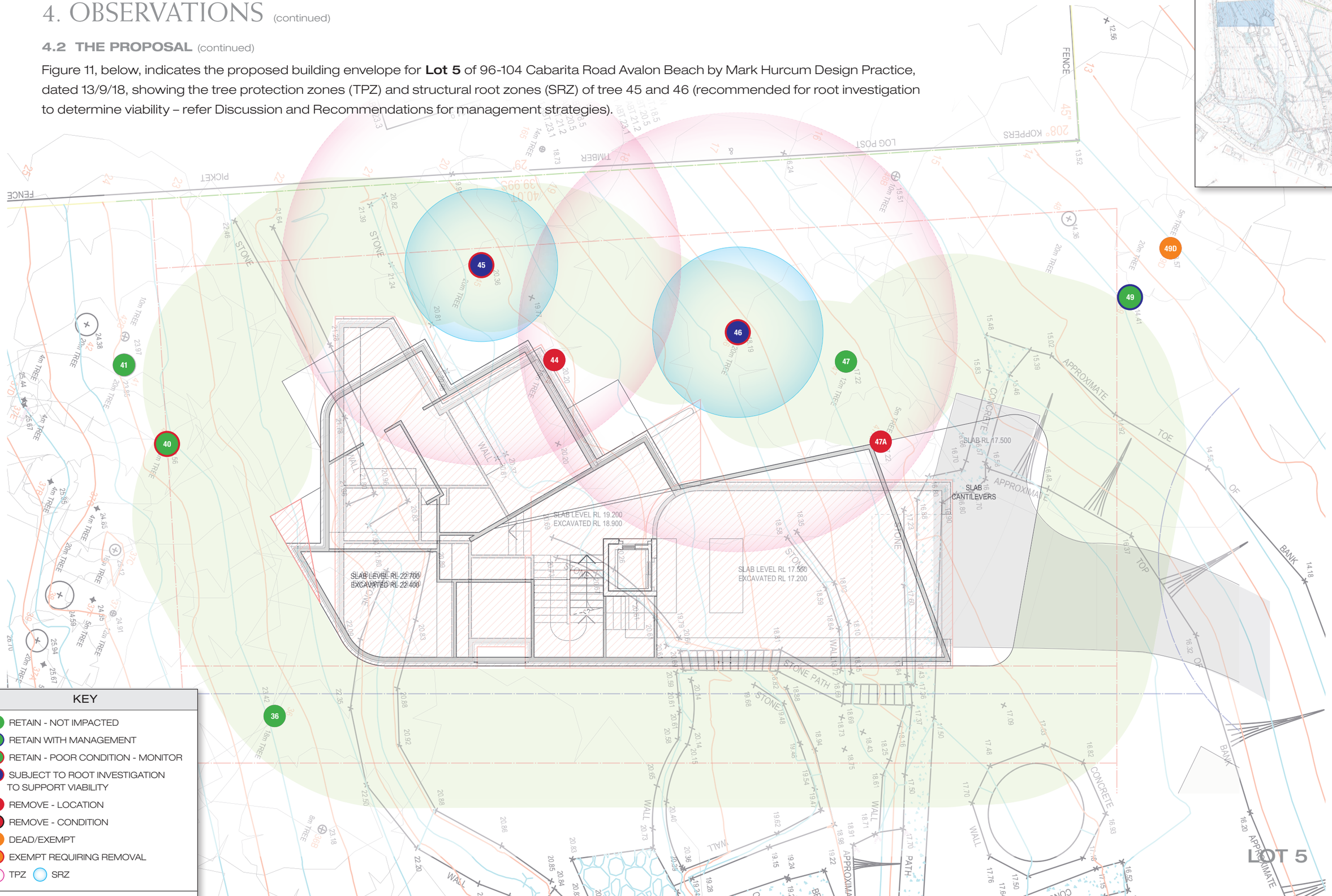
1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 11, below, indicates the proposed building envelope for **Lot 5** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 13/9/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of tree 45 and 46 (recommended for root investigation to determine viability – refer Discussion and Recommendations for management strategies).





KEY

- RETAIN - NOT IMPACTED
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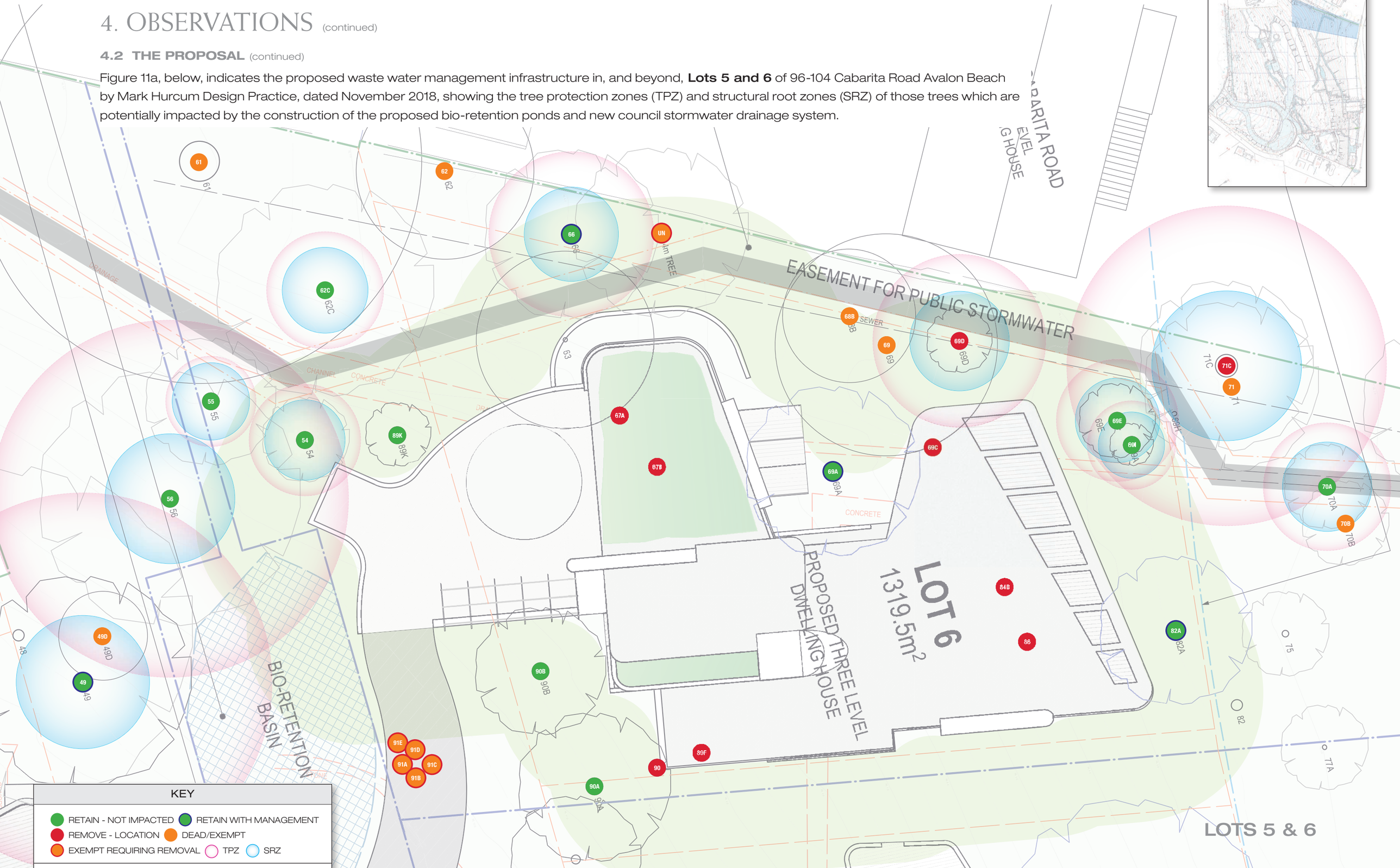
- RETAIN - POOR CONDITION - MONITOR
- SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
- REMOVE - LOCATION
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ SRZ

1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

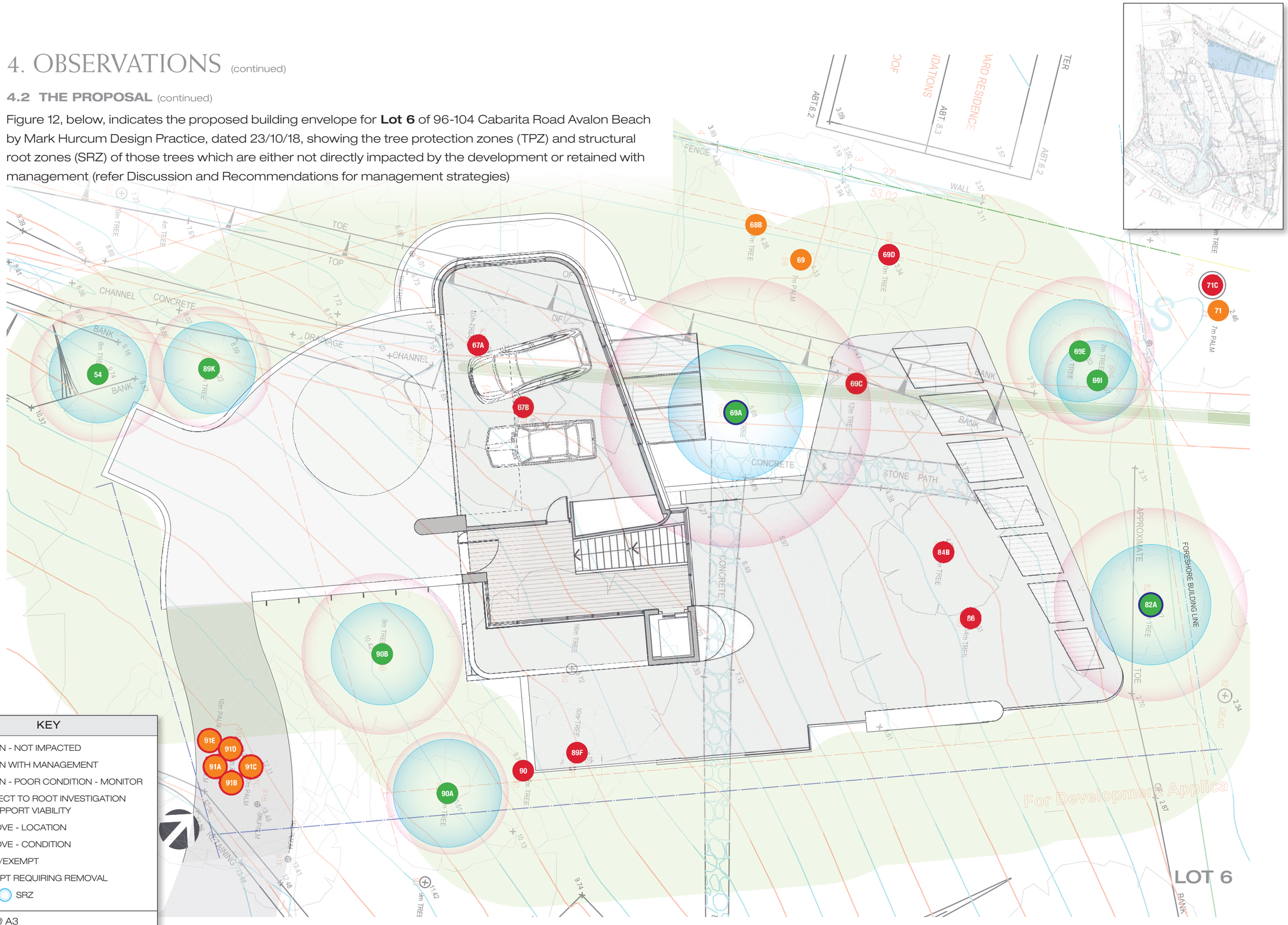
Figure 11a, below, indicates the proposed waste water management infrastructure in, and beyond, **Lots 5 and 6** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated November 2018, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which are potentially impacted by the construction of the proposed bio-retention ponds and new council stormwater drainage system.



4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

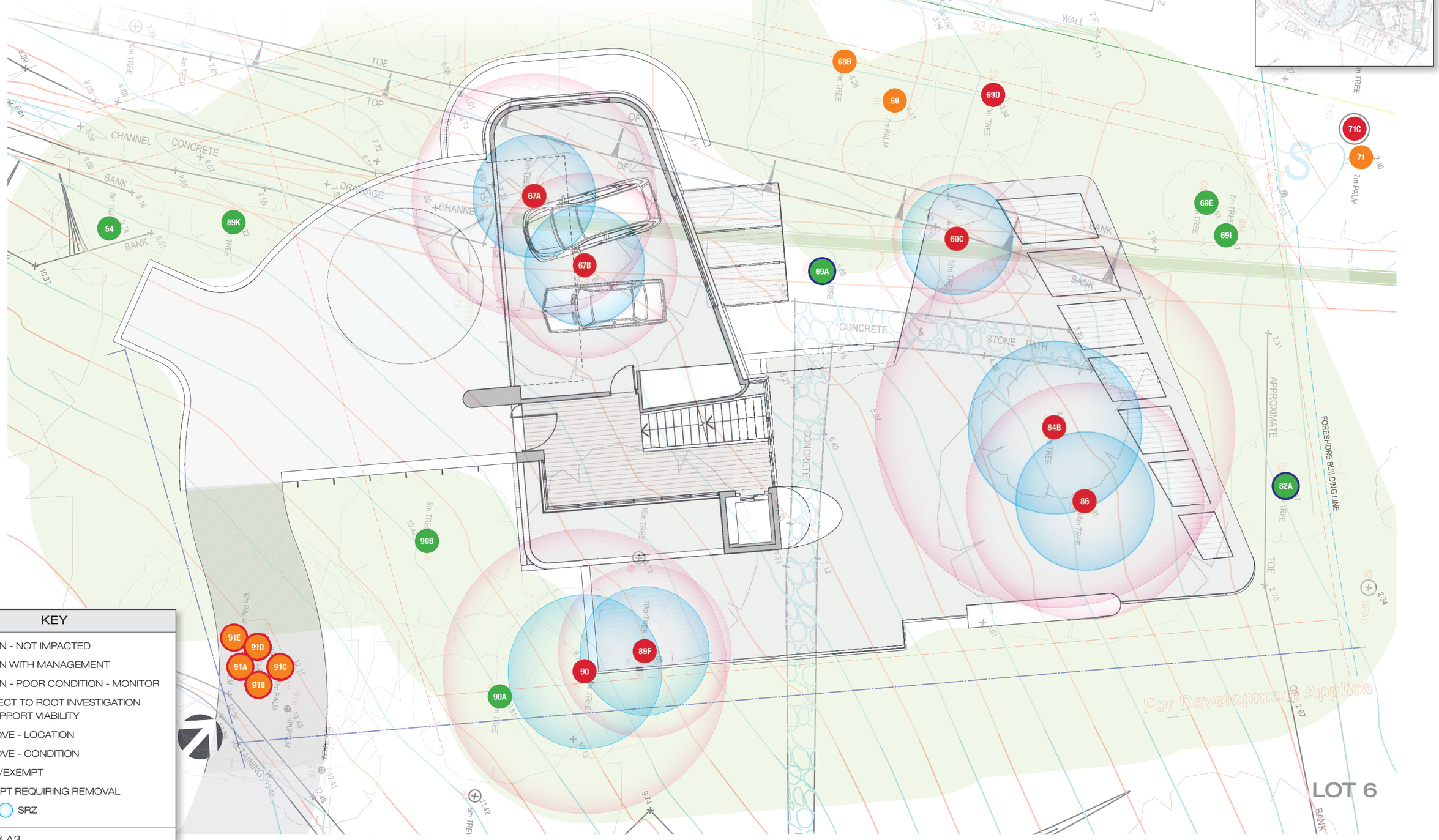
Figure 12, below, indicates the proposed building envelope for **Lot 6** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 23/10/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which are either not directly impacted by the development or retained with management (refer Discussion and Recommendations for management strategies)



4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

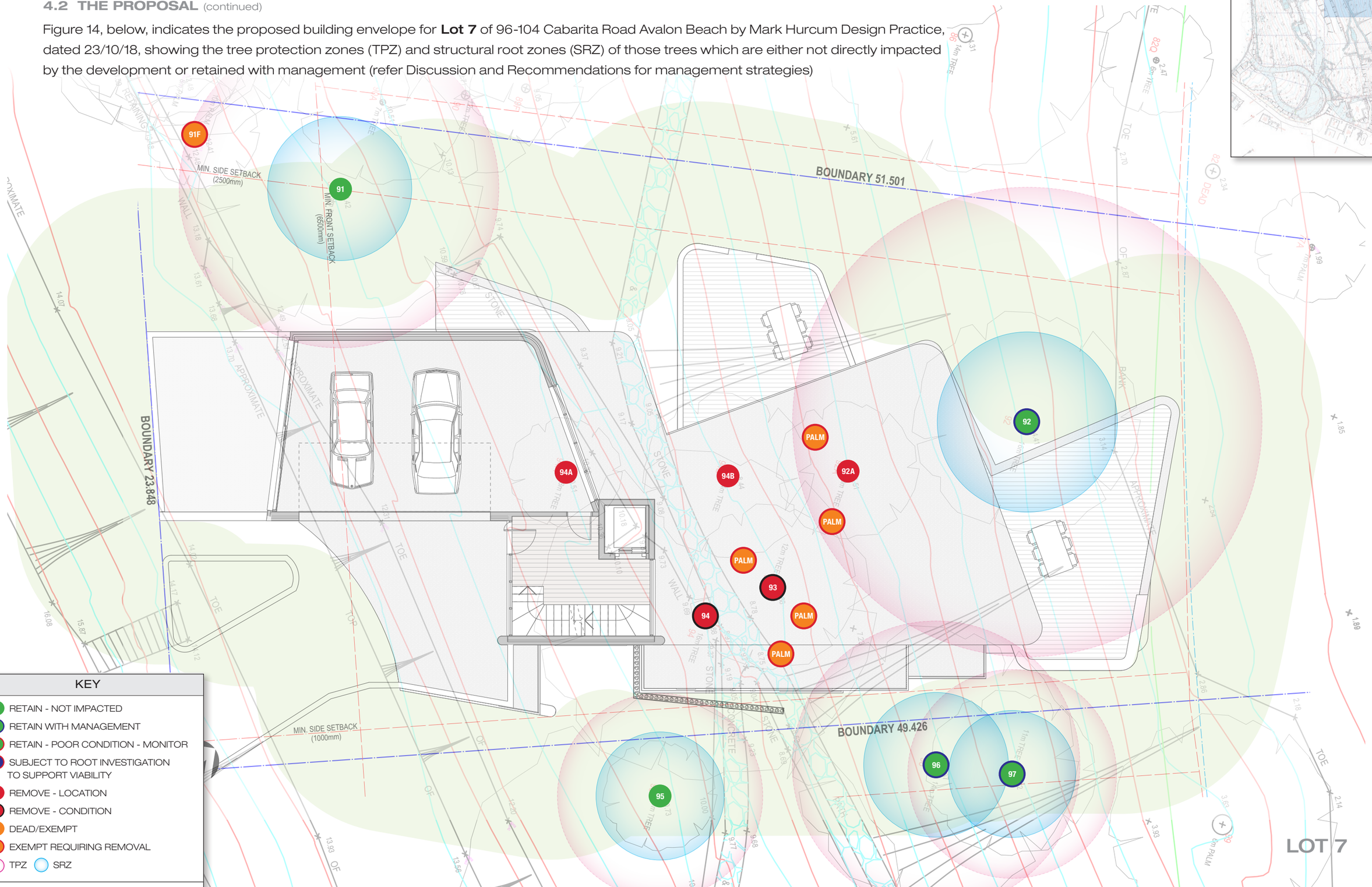
Figure 13, below, indicates the proposed building envelope for **Lot 6** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 23/10/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which require removal under the currently specified plans.



4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

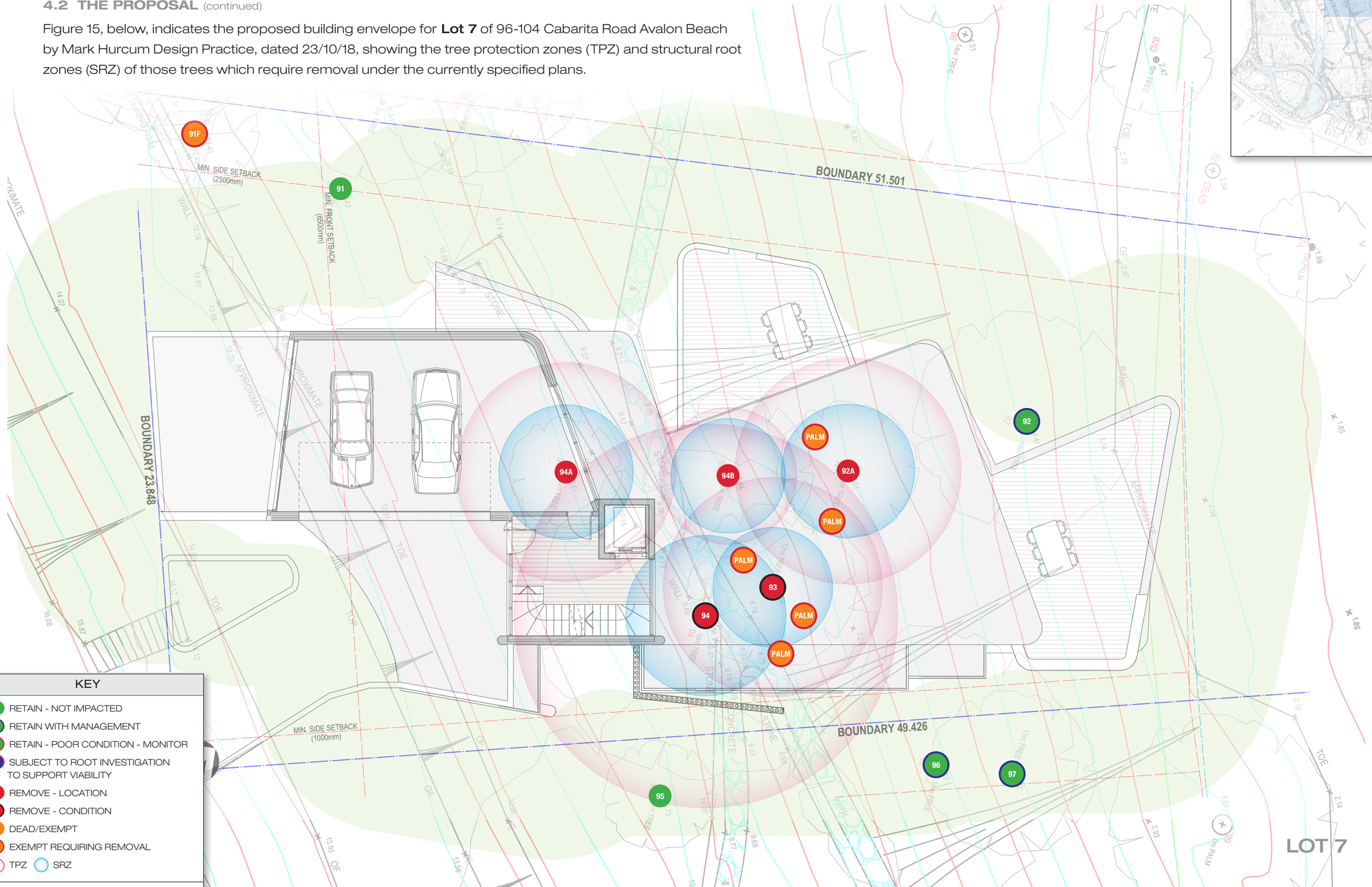
Figure 14, below, indicates the proposed building envelope for **Lot 7** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 23/10/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which are either not directly impacted by the development or retained with management (refer Discussion and Recommendations for management strategies)



4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 15, below, indicates the proposed building envelope for **Lot 7** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 23/10/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which require removal under the currently specified plans.



KEY

- RETAIN - NOT IMPACTED
- RETAIN WITH MANAGEMENT
- RETAIN - POOR CONDITION - MONITOR
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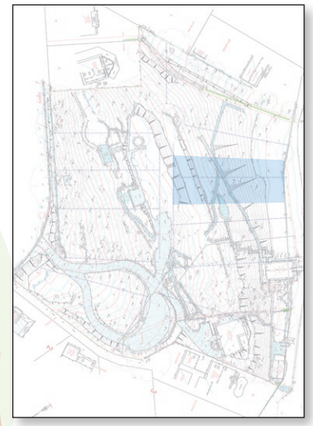
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ SRZ

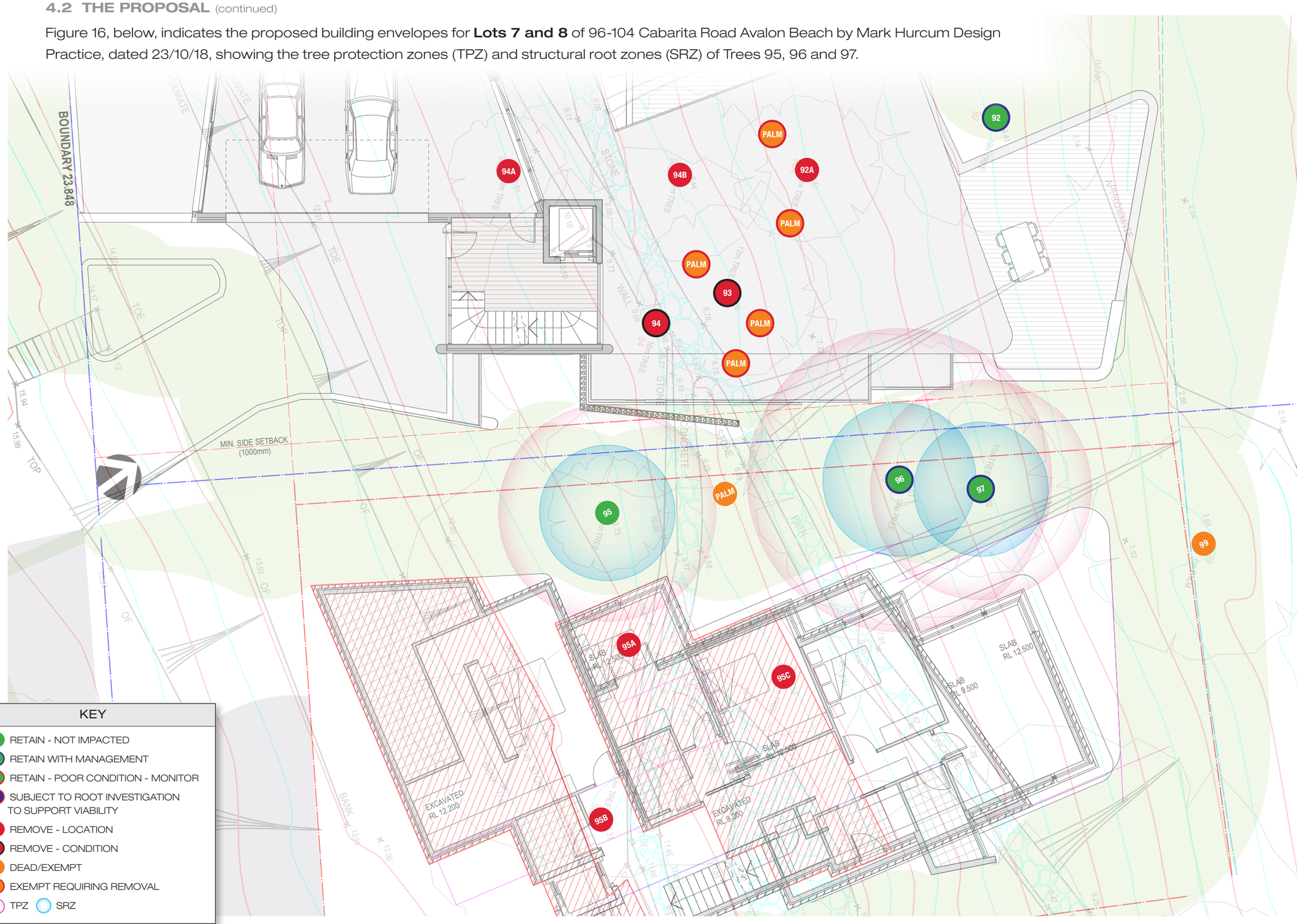
1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 16, below, indicates the proposed building envelopes for **Lots 7 and 8** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 23/10/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of Trees 95, 96 and 97.





KEY

- RETAIN - NOT IMPACTED
- RETAIN WITH MANAGEMENT
- RETAIN - POOR CONDITION - MONITOR
- SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
- REMOVE - LOCATION
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ SRZ

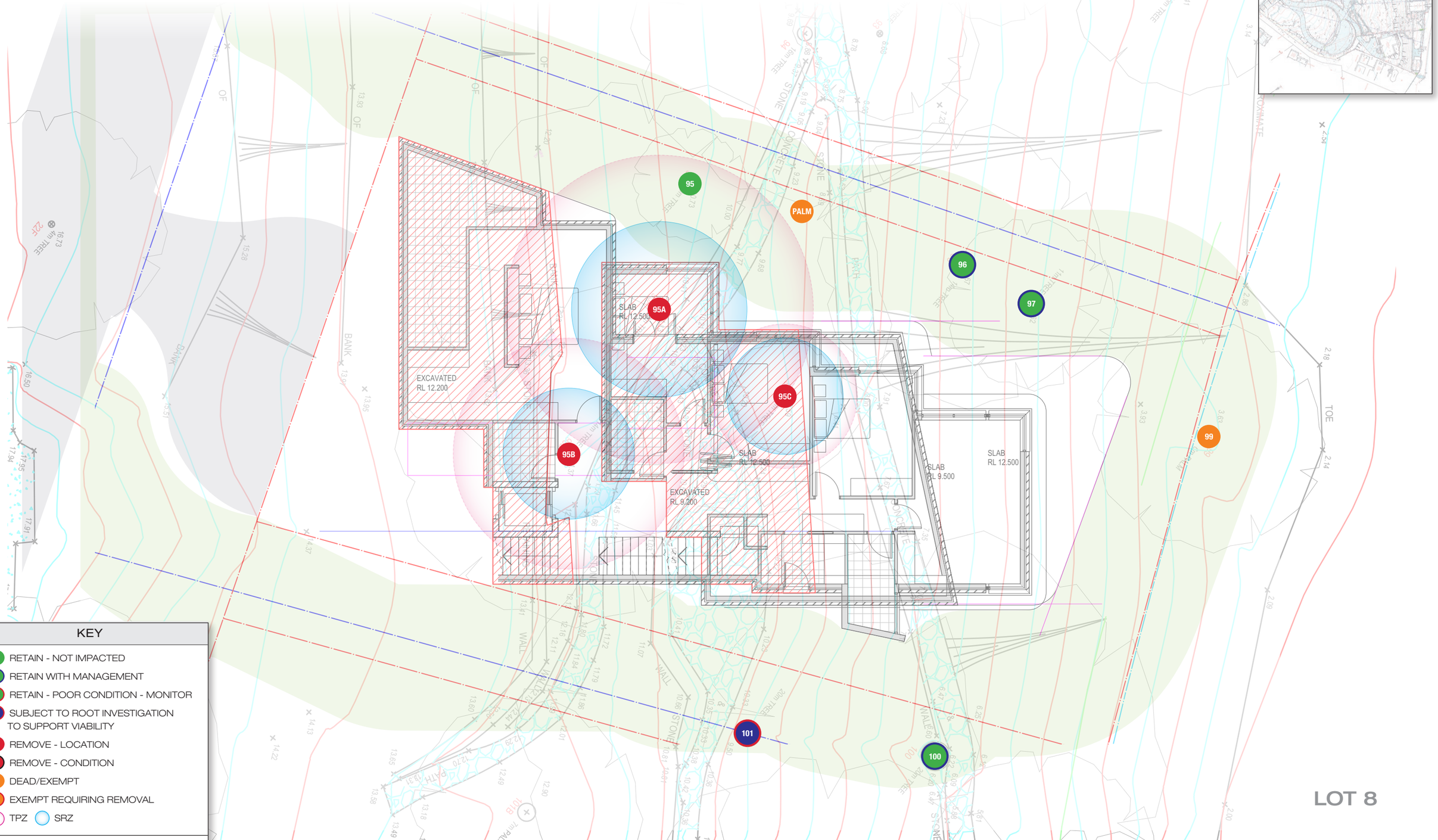
1 : 125 @ A3

LOTS 7/8

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 17, below, indicates the proposed building envelope for **Lot 8** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 18/9/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which require removal under the currently specified plans.



KEY

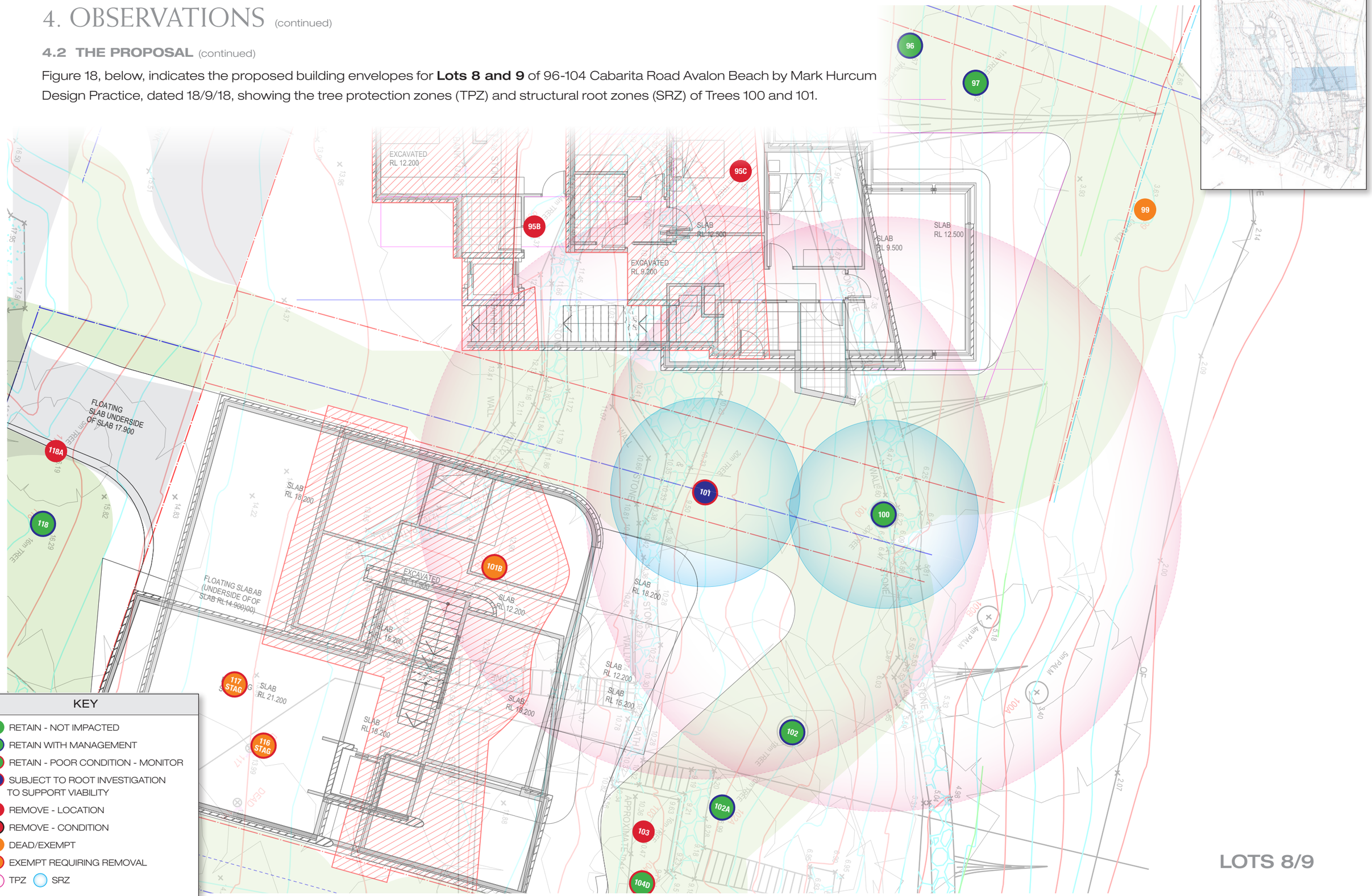
- RETAIN - NOT IMPACTED
- RETAIN WITH MANAGEMENT
- RETAIN - POOR CONDITION - MONITOR
- SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
- REMOVE - LOCATION
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ
- SRZ

1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

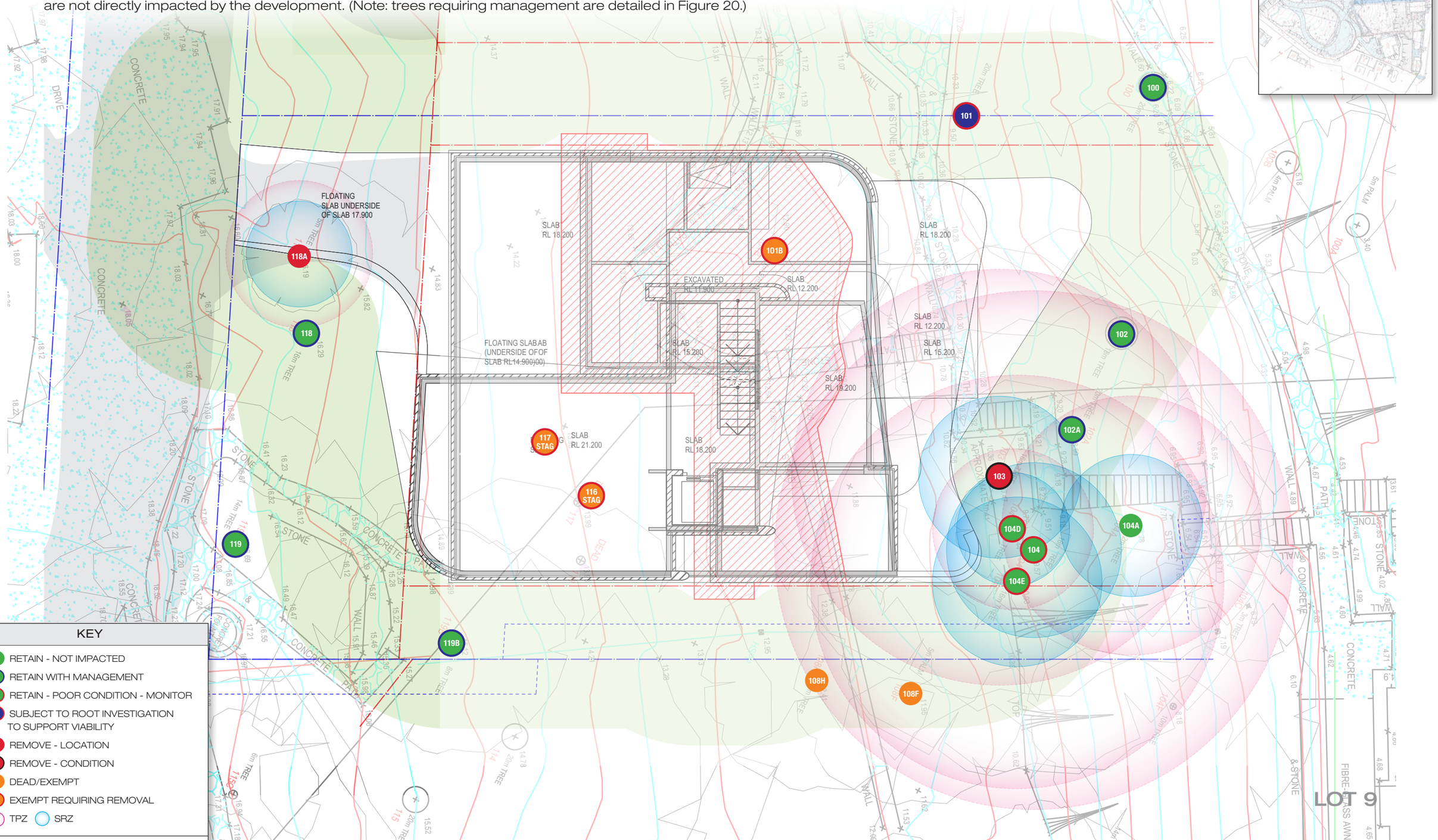
Figure 18, below, indicates the proposed building envelopes for **Lots 8 and 9** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 18/9/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of Trees 100 and 101.



4. OBSERVATIONS (continued)

4.1 THE PROPOSAL

Figure 19, below, indicates the proposed building envelope for **Lot 9** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 30/8/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of those trees which either require removal or are not directly impacted by the development. (Note: trees requiring management are detailed in Figure 20.)



KEY

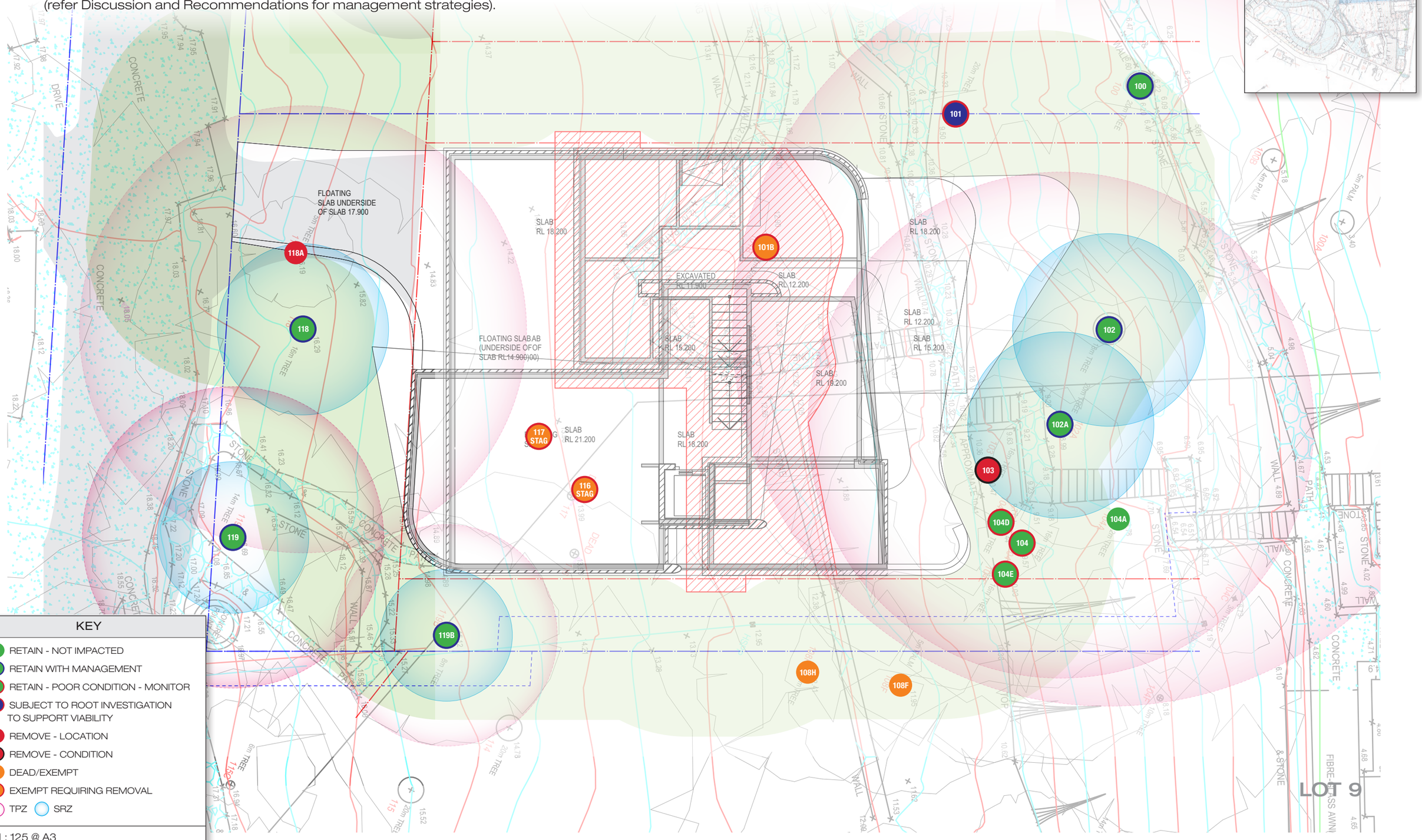
- RETAIN - NOT IMPACTED
- RETAIN WITH MANAGEMENT
- RETAIN - POOR CONDITION - MONITOR
- SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
- REMOVE - LOCATION
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ SRZ

1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 20, below, indicates the proposed building envelope for **Lot 9** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 30/8/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of trees requiring requiring management to retain (refer Discussion and Recommendations for management strategies).



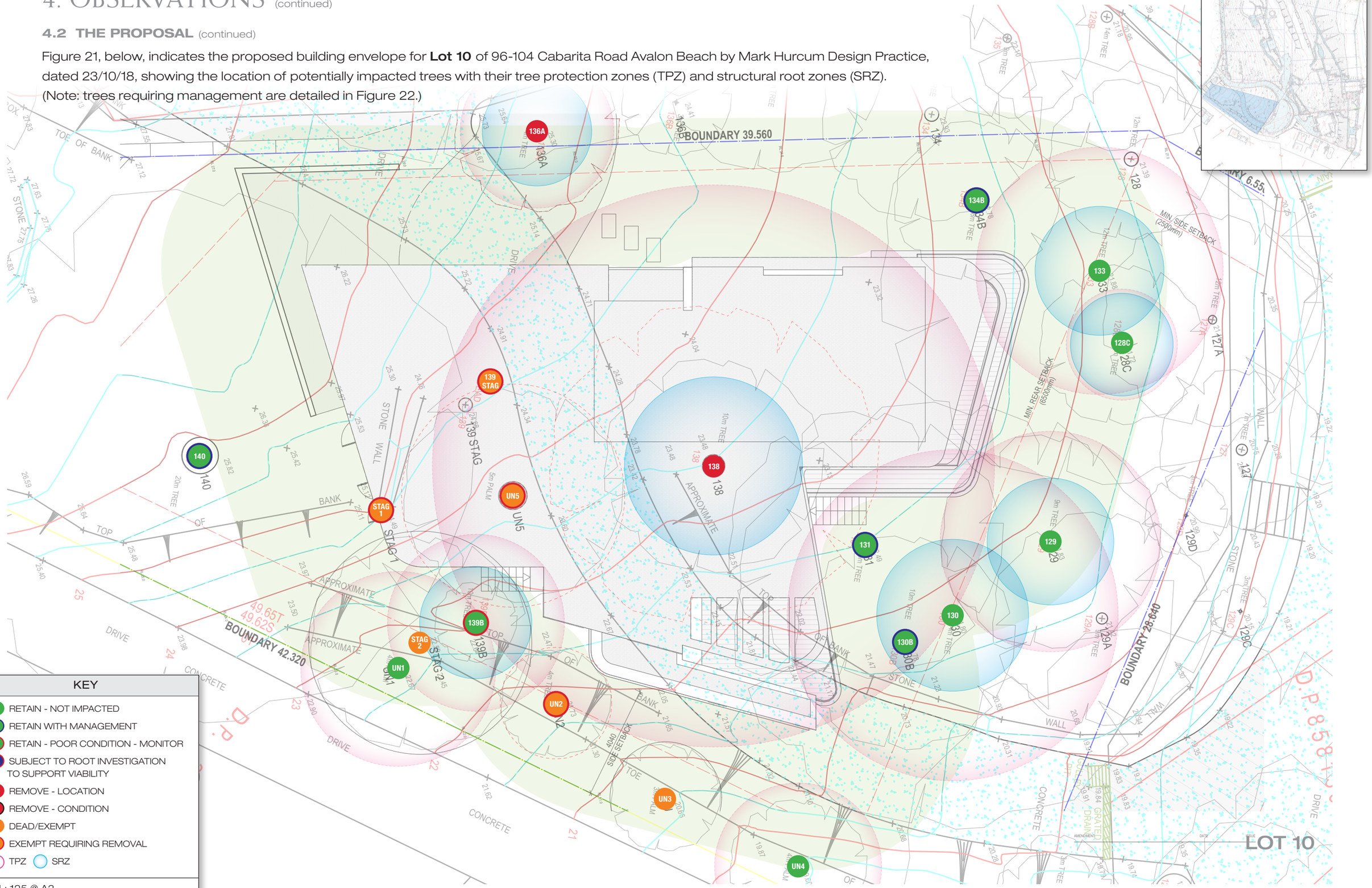
KEY
RETAIN - NOT IMPACTED
RETAIN WITH MANAGEMENT
RETAIN - POOR CONDITION - MONITOR
SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
REMOVE - LOCATION
REMOVE - CONDITION
DEAD/EXEMPT
EXEMPT REQUIRING REMOVAL
TPZ SRZ

1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 21, below, indicates the proposed building envelope for **Lot 10** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 23/10/18, showing the location of potentially impacted trees with their tree protection zones (TPZ) and structural root zones (SRZ).
(Note: trees requiring management are detailed in Figure 22.)



KEY

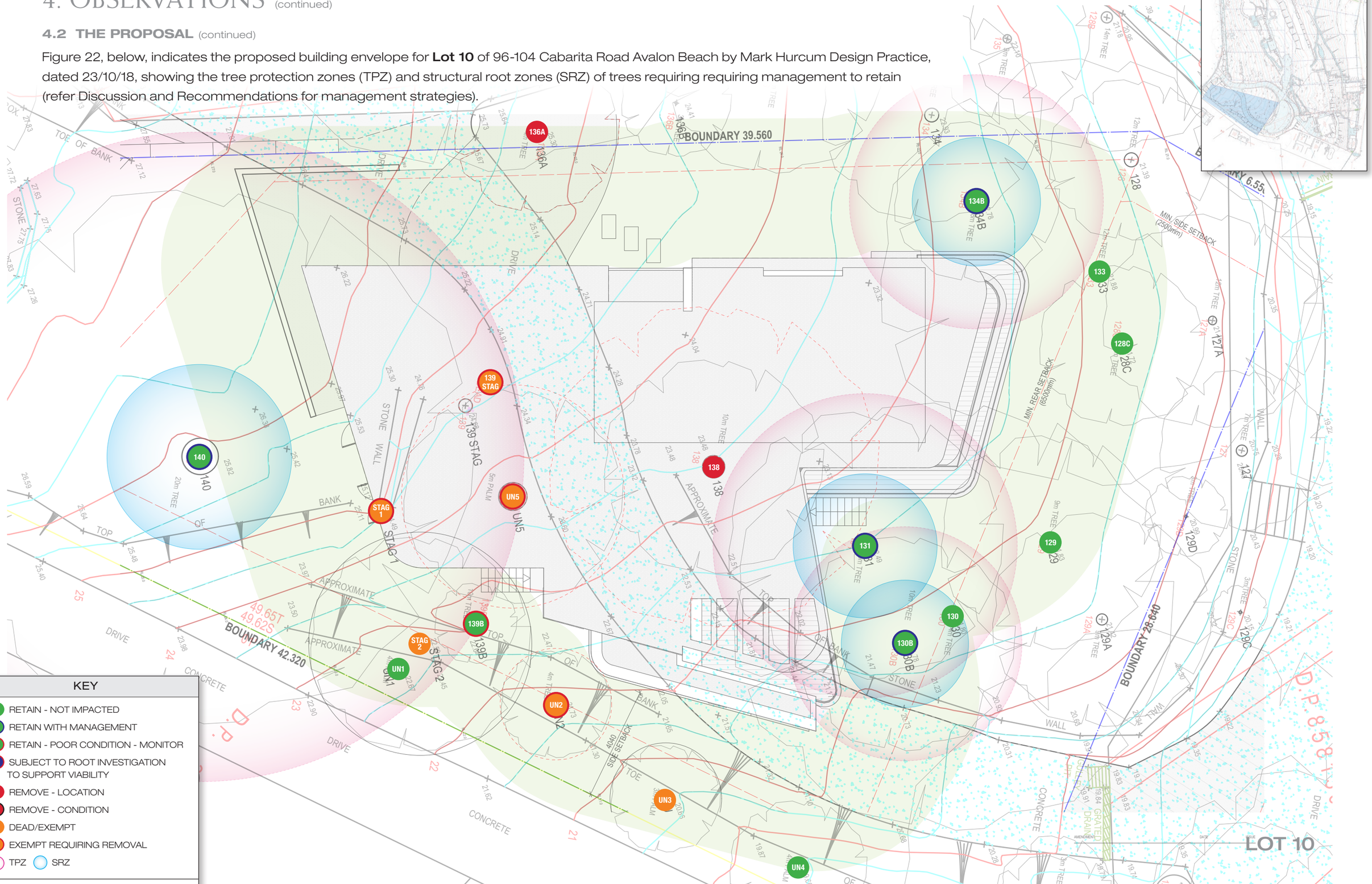
- RETAIN - NOT IMPACTED
- RETAIN WITH MANAGEMENT
- RETAIN - POOR CONDITION - MONITOR
- SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
- REMOVE - LOCATION
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ SRZ

1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 22, below, indicates the proposed building envelope for **Lot 10** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 23/10/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of trees requiring requiring management to retain (refer Discussion and Recommendations for management strategies).



KEY

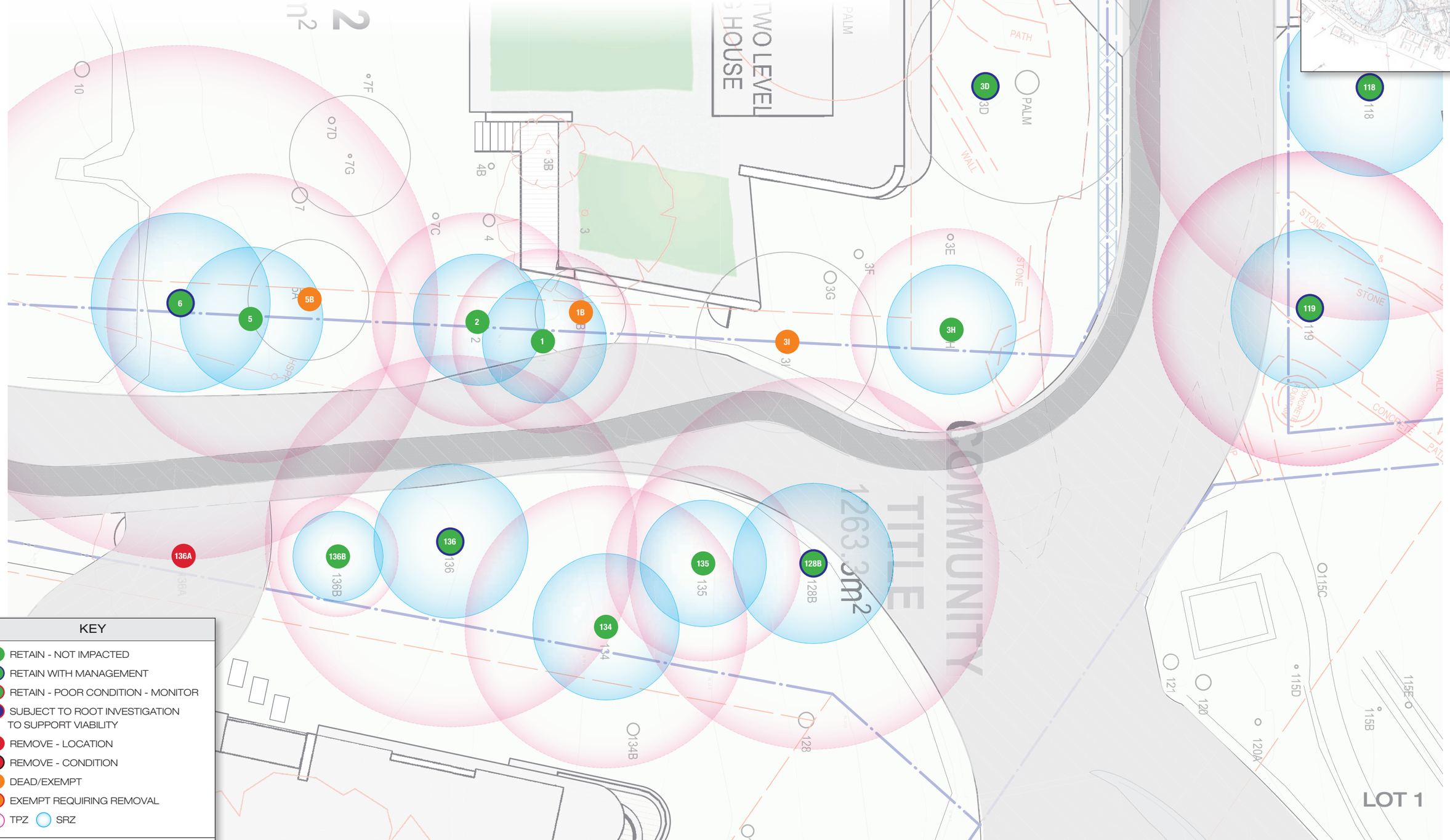
- RETAIN - NOT IMPACTED
- RETAIN WITH MANAGEMENT
- RETAIN - POOR CONDITION - MONITOR
- SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
- REMOVE - LOCATION
- REMOVE - CONDITION
- DEAD/EXEMPT
- EXEMPT REQUIRING REMOVAL
- TPZ
- SRZ

1 : 125 @ A3

4. OBSERVATIONS (continued)

4.2 THE PROPOSAL (continued)

Figure 22a, below, indicates the proposed services provision infrastructure for **Community Title Lot 1** of 96-104 Cabarita Road Avalon Beach by Mark Hurcum Design Practice, dated 2/11/18, showing the tree protection zones (TPZ) and structural root zones (SRZ) of potentially impacted trees (refer Discussion and Recommendations for management strategies).



KEY
RETAIN - NOT IMPACTED
RETAIN WITH MANAGEMENT
RETAIN - POOR CONDITION - MONITOR
SUBJECT TO ROOT INVESTIGATION TO SUPPORT VIABILITY
REMOVE - LOCATION
REMOVE - CONDITION
DEAD/EXEMPT
EXEMPT REQUIRING REMOVAL
TPZ SRZ
1 : 125 @ A3

4. OBSERVATIONS (continued)

4.3 TREE SUMMARY TABLE

Tree No.	Species	Height (m)	Spread (m)	DBH (m)	Basal ø (m)	TPZ (m)	SRZ (m)	Age	Health & Vigour	Ground Level	Lot No.
1	*C. maculata*	10	6	0.255	0.325	3.06	2.06	M-OM	Fair-Poor	22.10	1/2
1B	*G. robusta*	*Exempt species*									2
2	*C. maculata*	11	10	0.295	0.370	3.54	2.18	M-OM	Fair-Poor	23.71	1/2
3	*C. maculata*	10	5-6	0.245	0.305	2.94	2.01	M-OM	Poor	22.32	2
3B	*Callistemon* spp.	5	2.5	0.080	0.180	2.00	1.61	M-OM	Poor	23.00	2
3C	*C. maculata*	15	9	0.540	0.660	6.48	2.78	OM	Poor	19.7	2
3D	*C. maculata*	20	18	0.820	1.010	9.84	3.32	M-OM	Fair-Good	18.62	2
3E	*E. paniculata*	10	6	0.250	0.290	3.00	1.97	M-OM	Fair-Poor Health Poor Vigour	19.18	2
3F	*S. paniculatum*	11	10	0.360	0.390	4.32	2.23	M-OM	Fair	20.18	2
3G	*C. maculata*	15	8	0.355	0.480	4.26	2.43	M-OM	Fair-Poor	20.53	2
3H	*S. paniculatum*	9	7	0.185; 0.215	0.360	3.36	2.15	S	Very Poor	19.14	2
3I	*J. mimosifolia*	*Exempt species*									2
4	*E. acmenoides*	13	6	0.408	0.500	4.90	2.47	M-OM	Poor	23.10	2
4B	*C. maculata*	12	7	0.260	0.312	3.12	2.03	OM	Fair-Poor	23.04	2
5	*C. maculata*	15	7	0.400	0.450	4.80	2.37	M-OM	Fair-Poor	25.20	1
5B	*J. mimosifolia*	*Exempt species*									2
6	*E. paniculata*	20	16	0.710	0.772	8.52	2.97	M	Fair-Good	25.57	1
7C	*C. maculata*	12	6	0.245	0.305	2.94	2.01	OM	Poor	23.65	2
7D	*C. maculata*	12	5	0.265	0.320	3.18	2.05	M-OM	Poor	24.02	2
7F	*C. maculata*	10	4	0.172	0.220	2.06	1.75	M-OM	Fair-Poor	23.69	2
7G	*O. europaea* subsp. *cuspidata*	*Exempt species*									2
8	*C. maculata*	20	14	0.630	0.760	7.56	2.95	M	Good	23.26	2
11	*C. maculata*	14	10	0.555	0.695	6.66	2.84	M	Fair-Good	20.85	2
11A	*G. ferdinandi*	6	4	0.115; 0.120	0.250	2.04	1.85	M	Fair	19.43	2
11B	*C. maculata*	16	8-9	0.495	0.680	5.94	2.81	M	Fair-Good	22.81	2
12	*Unidentified*	*Dead tree*									2
UN6	*P. canariensis**	*Exempt species*									2
20	*L. confertus*	16	10	0.630	0.760	7.56	2.95	M	Fair-Good	23.93	3
21A	*G. ferdinandi*	7.5	3.5	0.132	0.150	2.00	1.50	M	Fair-Poor	22.35	3
22	*A. torulosa*	14	8	0.430	0.500	5.16	2.47	OM	Poor	22.01	3
22A	*H. caffrum*	*Exempt species*									3

4. OBSERVATIONS (continued)

Tree No.	Species	Height (m)	Spread (m)	DBH (m)	Basal ø (m)	TPZ (m)	SRZ (m)	Age	Health & Vigour	Ground Level	Lot No.
22B	*C. gummiferum*	8	3	0.130	0.165	2.00	1.55	M-OM	Fair-Poor	20.99	4
22C	*C. gummiferum*	7	2.5	0.125	0.160	2.00	1.53	M-OM	Poor	20.85	4
22E	*F. rubiginosa*	7-8	6	0.225	0.320	2.70	2.05	M	Fair	19.06	4
22F	*Plumeria* spp.	*Exempt by size*									1
27	*C. maculata*	14	6	0.365	0.460	4.38	2.39	OM	Very Poor	22.49	3/4
27A	*A. torulosa*	8	5	0.125; 0.125	0.225	2.16	1.77	OM	Fair-Poor	22.01	4
31	*C. maculata*	26	14	0.585; 0.545	1.005	9.60	3.32	OM	Fair-Poor	22.37	4
36	*C. maculata*	20	8	0.535	0.730	6.42	2.90	M-OM	Poor	23.42	4/5
40	*E. paniculata*	14	8	0.400; 0.160	0.630	5.16	2.73	OM-S	Very Poor	23.56	5
41	*C. maculata*	24	14	0.485; 0.385	0.790	7.44	3.00	M-OM	Poor	23.85	5
44	*L. confertus*	16	12	0.600	0.700	7.20	2.85	M	Fair-Poor Health Fair-Good Vigour	20.20	5
45	*A. robusta*	26	8	0.600	0.650	7.20	2.76	M	Fair	20.36	5
46	*S. glomulifera*	25	15	0.660	0.840	7.92	3.08	M-OM	Fair-Poor	18.19	5
47	*S. glomulifera*	20	10	0.510	0.800	6.12	3.01	M-OM	Fair-Poor	17.22	5
47A	*S. braunii*	10	5	0.230	0.360	2.76	2.15	M	Fair-Poor	17.22	5
49	*A. robusta*	25	10	0.710	0.800	8.52	3.01	M	Good	14.41	5
49D	*P. undulatum*	*Exempt by size*									5
54	*A. torulosa*	<13.5	<4.5	0.210	0.240	2.52	1.82	M	Fair	9.74	6
55	*G. ferdinandi*	<12.5	<6.5	0.170	0.220	2.04	1.75	M	Good	9.95	6
56	*A. robusta*	26	8-9	0.670	0.750	8.04	2.93	M	Good	11.49	5
61	*F. microcarpa* var *hillii*	*Exempt species*									6
62	*L. lucidum*	*Exempt species*									6
62C	*P. undulatum*	<15	<3	0.220	0.280	2.64	1.94	M	Poor	7.22	6
66	*P. undulatum*	<15	<9	multi-stem <0.170	0.350	3.72	2.13	M	Good	5.98	6
UN	*C. camphora*	*Exempt species*									6
67A	*G. ferdinandi*	12	5	0.230; 0.245	0.320	4.08	2.05	M	Fair	6.90	6
67B	*G. ferdinandi*	12	7	0.257	0.300	3.08	2.00	M	Fair	6.98	6
68B	*C. australe*	*Exempt species*									6
69	*P. canariensis*	*Exempt species*									6
69A	*C. glauca*	12-13	8	0.335; 0.255	0.520	5.04	2.51	M-OM	Fair-Poor	5.68	6
69C	*C. glauca*	14	2.5	0.180	0.250	2.16	1.85	M-OM	Poor	4.18	6

4. OBSERVATIONS (continued)

Tree No.	Species	Height (m)	Spread (m)	DBH (m)	Basal ø (m)	TPZ (m)	SRZ (m)	Age	Health & Vigour	Ground Level	Lot No.
69D	*S. sinuatus*	14	3	0.325	0.400	3.90	2.25	M-OM	Fair-Poor	3.34	6
69E	*C. glauca*	13	3.5	0.230	0.270	2.76	1.91	M-OM	Poor	2.83	6
69I	*C. glauca*	11	2	0.115	0.140	2.00	1.50	M-OM	Poor-Very Poor	2.67	6
70A	*C. glauca*	<15	<5	0.230; 0.080	0.310	2.88	2.02	M	Fair	1.99	6
70B	*A. cunninghamiana*	*Exempt species*									6
71	*P. canariensis*	*Exempt species*									6
71B	*P. canariensis*	*Exempt species*									6
71C	*C. glauca*	<21	<10	0.450; 0.400	1.050	7.20	3.38	M	Good	2.46	6
82A	*M. styphelioides*	8.5	6-7	0.230; 0.190	0.400	3.60	2.25	M-OM	Fair-Poor	2.47	6
84B	*C. glauca*	14-15	12	0.210; 0.450	0.725	6.00	2.89	M-OM	Fair-Poor Health Fair Vigour	4.21	6
86	*C. glauca*	13	4	0.330	0.425	3.96	2.31	M-OM	Poor	4.31	6
89F	*C. glauca*	12	3	0.240	0.360	2.88	2.15	OM	Fair-Poor	9.05	6
89K	*P. undulatum*	13	3	0.190	0.210	2.28	1.72	M	Fair-Poor	9.22	6
90	*A. torulosa*	14	8	0.395	0.550	4.74	2.57	M	Fair	9.71	6
90A	*G. ferdinandi*	12	7	0.110; 0.153	0.310			M	Fair-Good	10.51	6
90B	*G. ferdinandi*	11	6	0.250	0.270	3.00	1.91	M	Fair	10.42	6
91	*L. polygalifolium*	12-13	6	0.467	0.530	5.60	2.53	OM	Fair-Poor	11.42	7
91A-E	*S. romanzoffiana*	*5 x Palms – Exempt species*									6
91F	*A. cunninghamiana*	*Exempt species*									7
92	*C. maculata*	25	10-12	0.685	0.895	8.22	3.16	M-OM	Fair-Poor	4.41	7
92A	*M. quinquenervia*	12	5	0.330	0.440	3.96	2.34	M	Fair-Poor	6.51	7
93	*C. maculata*	12	3	0.320	0.340	3.84	2.10	OM-S	Very Poor-Dying	8.68	7
94	*C. maculata*	15	9	0.560	0.680	6.72	2.81	OM-S	Very Poor	8.88	7
94A	*M. grandiflora*	12	7	0.250; 0.200	0.445	3.84	2.36	M-OM	Fair-Poor	10.51	7
94B	*A. torulosa*	10	7	0.144; 0.145	0.305	2.40	2.01	M-OM	Fair-Poor	8.44	7
UN	*P. canariensis*	*5 x Palms – Exempt species*									7
95	*C. maculata*	12	5	0.300	0.400	3.60	2.25	OM-S	Very Poor	10.73	8
95A	*C. maculata*	14	8	0.320; 0.300	0.800	5.28	3.01	M-OM	Poor	11.13	8
95B	*C. maculata*	13	7	0.330	0.400	3.96	2.25	M-OM	Fair-Poor	11.37	8
95C	*C. maculata*	10	4	0.207	0.300	2.48	2.00	OM-S	Very Poor	9.59	8
96	*C. maculata*	21	12-14	0.420	0.535	5.04	2.54	M-OM	Fair	6.67	8
97	*C. maculata*	18	6	0.305	0.390	3.66	2.23	M	Fair-Poor	5.62	8

4. OBSERVATIONS (continued)

Tree No.	Species	Height (m)	Spread (m)	DBH (m)	Basal ø (m)	TPZ (m)	SRZ (m)	Age	Health & Vigour	Ground Level	Lot No.
UN	*P. canariensis**					*Exempt species*					8
99	*P. canariensis*					*Exempt species*					8
100	*C. maculata*	32	16	0.335; 0.825	1.065	10.68	3.40	M-OM	Fair-Good	6.20	8
101	*C. maculata*	28	20	0.860	1.070	10.32	3.40	M-OM	Fair-Good	10.33	8/9
101B	*P. canariensis*					*Exempt species*					9
102	*C. maculata*	29	14	1.085	1.021	13.02	3.34	M-OM	Fair-Good	8.69	9
102A	*C. maculata*	30	16	0.730	0.945	8.76	3.23	M-OM	Good	8.99	9
103	*C. maculata*	26	10	0.593	0.660	7.12	2.78	OM-S	Very Poor	10.47	9
104	*C. maculata*	22	10	0.740	0.790	8.88	3.00	M-OM	Fair	9.57	9
104A	*C. maculata*	13	8	0.370	0.483	4.44	2.44	M-OM	Fair-Poor	8.78	9
104D	*C. maculata*	9	3	0.230	0.280	2.76	1.94	OM-S	Very Poor	10.44	9
104E	*C. maculata*	28	12	0.590	0.735	7.08	2.91	OM	Fair-Poor Health Fair Vigour	10.03	9
108F	*P. canariensis*					*Exempt species*					9
108H	*J. mimosifolia*					*Exempt species*					9
116	*Unidentified*					*Dead Tree*					9
117	*Unidentified*					*Dead Tree*					9
118	*C. maculata*	24	15	0.645	0.775	7.74	2.97	M-OM	Fair	16.29	9
118A	*B. celsissima*	7	4	0.165; 0.125	0.240	2.52	1.82	M	Fair-Good	16.19	9
119	*C. maculata*	18	8	0.435	0.580	5.22	2.63	M-OM	Poor	16.69	9
119B	*S. paniculatum*	9	8	0.320	0.415	3.84	2.29	M	Fair Health Fair-Poor Vigour	15.12	9
128B	*C. maculata*	<24	<10	0.484	0.475	5.81	2.42	M	Good	21.18	1
128C	*G. ferdinandi*	5-6	4.5	0.140; 0.085	0.250	2.00	1.85	M	Fair-Poor	21.72	10
129	*E. umbra*	10	7	0.330	0.410	3.96	2.28	OM	Poor	21.83	10
130	*C. maculata*	26	9	0.495	0.630	5.94	2.73	M-OM	Fair-Poor	21.80	10
130B	*B. integrifolia*	12	6	0.350	0.415	4.20	2.29	M	Fair	21.78	10
131	*C. maculata*	20	9	0.455	0.560	5.46	2.59	M	Fair	22.49	10
133	*E. paniculata*	12	7	0.370	0.430	4.44	2.32	OM	Very Poor	21.88	10
134	*A. flexuosa*	<10.5	<8	0.170; 0.220; 0.270	0.480	4.68	2.43	M	Fair-Good	22.93	1
134B	*A. unedo*	6	5	0.230; 0.220 0.120; 0.160	0.425	4.56	2.31	M-OM	Fair-Poor	22.78	10
135	*C. glauca*	<15	<5.5	0.140; 0.230	0.34	3.24	2.10	M	Fair-Good	22.10	1

4. OBSERVATIONS (continued)

Tree No.	Species	Height (m)	Spread (m)	DBH (m)	Basal ø (m)	TPZ (m)	SRZ (m)	Age	Health & Vigour	Ground Level	Lot No.
136	*E. umbra*	<24	<11	0.513	0.595	6.16	2.66	M	Good	24.10	1
136A	*B. divaricata*	5-5.5	6-6.5	0.140; 0.14; 0.120	0.290	2.76	1.97	M	Good	25.30	1
136B	*C. gummiferum*	<5.5	<2.5	0.080	0.140	2.00	1.50	M	Good	24.41	1
138	*A. flexuosa*	14	12	0.760; 0.360	0.925	10.08	3.20	OM	Poor	23.48	10
139	*Unidentified*	*Dead Tree/Stag*									10
139B	*C. maculata*	14	1	0.265	0.310	3.18	2.02	OM-S	Very Poor	22.64	10
140	*C. maculata*	24	12	0.970	1.008	11.64	3.32	OM	Fair-Poor	25.82	10
Stag1	*Unidentified*	*Dead Tree/Stag*									10
Stag2	*Unidentified**	*Dead Tree/Stag*									10
UN1	*L. australis*	5	5	0.320	0.480	3.50	n/a	M	Fair	22.67	10
UN2	*O. europaea* subsp. *cuspidata*	*Exempt species –priority weed*									10
UN3	*L. australis*	*Exempt by size*									10
UN4	*L. australis*	5	4	0.350	0.520	3.00	n/a	M	Good	19.60	10
UN5	*P. canariensis*	*Exempt species*									10

* Tree present on site but not indicated on survey

UN denotes tree indicated by position on survey, but unnumbered

Spread is estimated approximate canopy width.

DBH is trunk diameter measured at 1.4m above ground level.

SRZ is the Structural Root Zone, measured as a radius from the centre of the trunk - see Appendix A for definition. The SRZ calculation does not apply to palms, other monocots, cycads and tree ferns.

TPZ is the Tree Protection Zone, measured as a radius from the centre of the trunk - see Appendix A for definition.
In line with *AS 4970-2009* guidelines, TPZ of palms and other monocots are estimated as not less than 1m outside the crown projection, and expressed as a radius from the centre of the trunk

Height and spread figures were estimated from the ground and are approximations only.

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 23: 1. *Corymbia maculata*

Fig. 24: **2.** *Corymbia maculata*

Fig. 25: **3.** *Corymbia maculata*

Fig. 26: **3B.** *Callistemon spp.* (R)

Fig. 27: **3C.** *Corymbia maculata*

Fig. 28: **3D.** *Corymbia maculata*

Fig. 29: **3E.** *Eucalyptus paniculata*

Fig. 30: **3F** (L) *Syzygium paniculatum*
3G (R) *Corymbia maculata*

Fig. 31: **3G.** *Detail of Phellinus fruiting body*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 32: **3H.** *Syzygium paniculatum*

Fig. 33: (L-R) **4B.** *Corymbia maculata* **4.** *Eucalyptus acmenoides*

Fig. 34: **7C.** (centre) *Corymbia maculata*

Fig. 35: **7D.** *Corymbia maculata*

Fig. 36: **7F.** (centre) *Corymbia maculata*

Fig. 37: **8.** *Corymbia maculata*

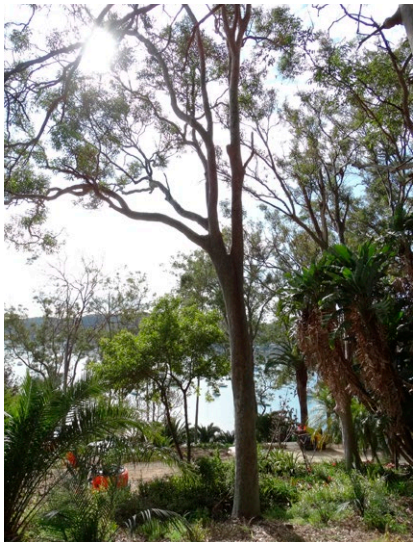


Fig. 38: **11.** *Corymbia maculata*

Fig. 39: **11A.** *Glochidion ferdinandi*

Fig. 40: **11B.** (R) *Corymbia maculata;* **12** *stag* (L)

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 41: **12.** Dead stag

Fig. 42: **20.** *Lophostemon confertus*

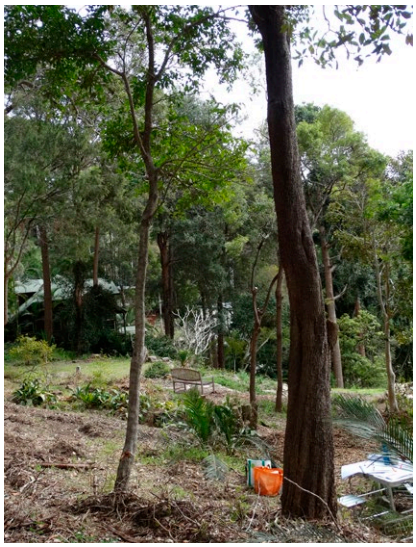


Fig. 43: (L - R) **21A.** *Glochidion ferdinandi;* **22.** *Allocasuarina torulosa*

Fig. 44: **22B.** (L); **22C** (R) *Ceratopetalum gummiferum*

Fig. 45: **22E.** *Ficus rubiginosa*

Fig. 46: **22E.** Detail of remnant planter pot

Fig. 47: **27.** *Corymbia maculata*

Fig. 48: **27A.** (front centre) *Allocasuarina torulosa*

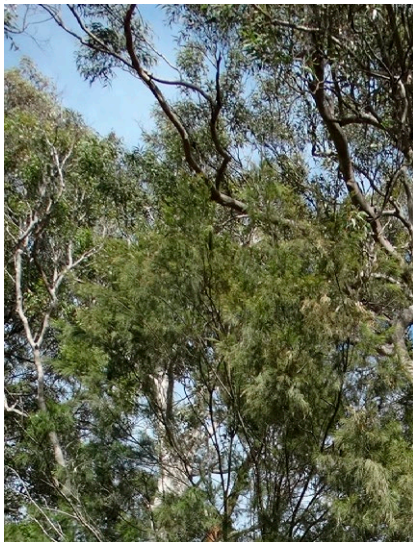


Fig. 49: **31.** *Corymbia maculata*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 50: **36.** *Corymbia maculata*

Fig. 51: **40.** *Eucalyptus paniculata*

Fig. 52: **41.** *Corymbia maculata*

Fig. 53: **44.** *.Lophostemon confertus*

Fig. 54: **45.** *Agathis robusta*

Fig. 55: **46.** (L); **47** (R) *Syncarpia glomulifera;*

Fig. 56: **47A (L).** *Scolopia braunii*

Fig. 57: **49.** *Agathis robusta*

Fig. 58: **67A.** (L); **67B (R).** *Glochidion ferdinandi*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 59: **69A.** *Casuarina glauca*

Fig. 60: **69C.** *Casuarina glauca*

Fig. 61: **69D.** *Stenocarpus sinuatus*

Fig. 62: **69E** (L)**; 69I** (R) *Casuarina glauca*

Fig. 63: **82A.** *Melaleuca styphelioides*

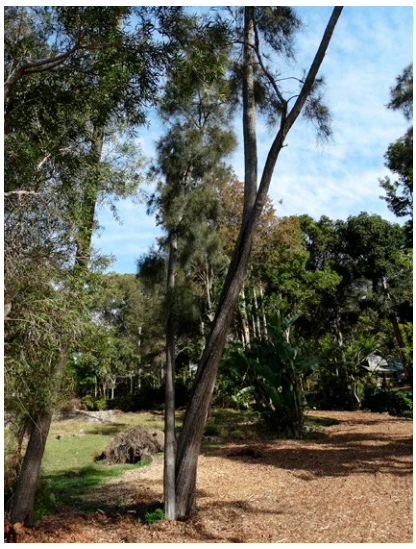


Fig. 64: **84B.** *Casuarina glauca*

Fig. 65: **86.** *Casuarina glauca*

Fig. 66: **89F.** *Casuarina glauca*

Fig. 67: **89K.** *Pittosporum undulatum*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 68: **90.** *Allocasuarina torulosa*

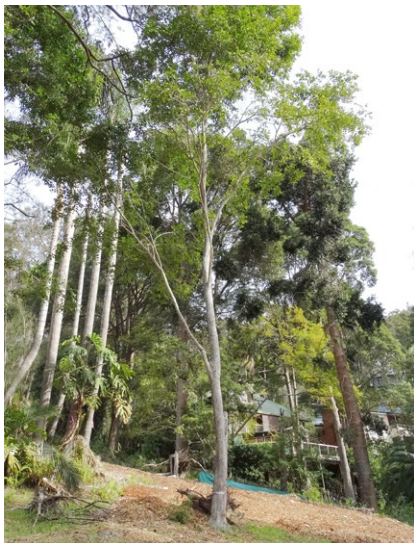


Fig. 69: **90B.** *Glochidion ferdinandi*

Fig. 70: **91.** *Leptospermum polygalifolium*

Fig. 71: **92.** *Corymbia maculata*

Fig. 72: **92A.** *Melaleuca quinquenervia*

Fig. 73: **93.** (Centre); **94** (R) *Corymbia maculata*

Fig. 74: **94.** *Corymbia maculata*

Fig. 75: **94A.** *Magnolia grandiflora*

Fig. 76: **94B.** *Allocasuarina torulosa*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

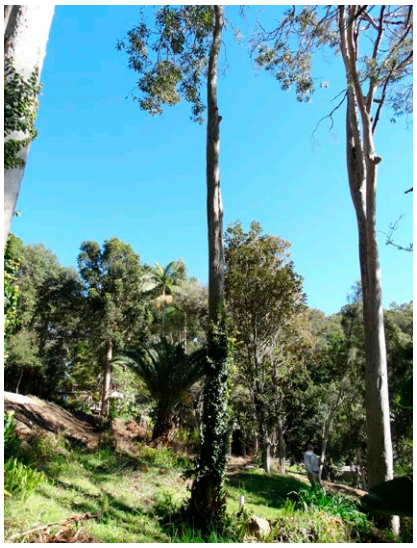


Fig. 77: **95.** *Corymbia maculata*

Fig. 78: **95A.** *Corymbia maculata*

Fig. 79: **95B.** *Corymbia maculata*

Fig. 80: **95C.** *Corymbia maculata*

Fig. 81: **95C.** *detail of basal wound*

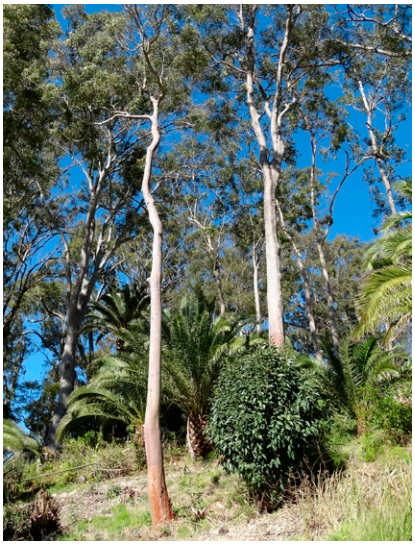


Fig. 82: **97.** (L)**; 96** (R) *Corymbia maculata*

Fig. 83: **97.** *detail of kino - evidence of likely insect attack*

Fig. 84: **100.** *Corymbia maculata*

Fig. 85: **101.** *Corymbia maculata*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 86: **102.** *Corymbia maculata*

Fig. 87: **102A.** *Corymbia maculata*

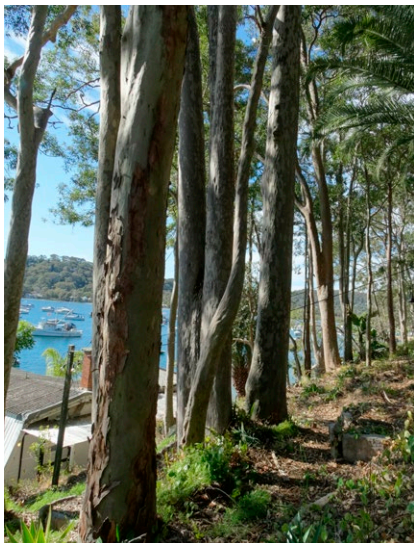


Fig. 88: Stand of *Corymbia maculata* (L-R) **103; 104D; 104; 104E**

Fig. 89: **103.** *Corymbia maculata*

Fig. 90: **104E** (L); **104** (R) *Corymbia maculata*

Fig. 91: **104A.** *Corymbia maculata*

Fig. 92: **104D** (front centre) *Corymbia maculata*

Fig. 93: **104D.** *Detail of decay site*

Fig. 94: Detail of fungal fruiting bodies on **104** (top); **103** (left); **104E** (right)

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 95: **118.** *Corymbia maculata*

Fig. 96: **118A.** *Buckinghamia celsissima*

Fig. 97: **119.** *Corymbia maculata*

Fig. 98: **119B.** *Syzygium paniculatum*

Fig. 99: **128C.***Glochidion ferdinandi*

Fig. 100: **129.** *Eucalyptus umbra*

Fig. 101: **130.** *Corymbia maculata*

Fig. 102: **130B.** *Banksia integrifolia*

Fig. 103: **131.** *Corymbia maculata*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 104: **133.** *Eucalyptus paniculata*

Fig. 105: **133.** *Detail of decayed stump*

Fig. 106: **134B.** *Arbutus unedo*

Fig. 107: **138.** *Agonis flexuosa*

Fig. 108: (L-R) **139** - dead tree; **Stag1**

Fig. 109: **139B** (R) *Corymbia maculata*

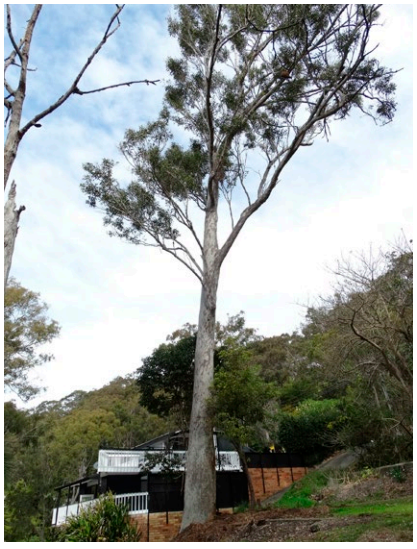


Fig. 110: **140.** *Corymbia maculata*

Fig. 111: **UN1** (L) *Livistona australis;* **Stag2**

Fig. 112: **UN4.** *Livistona australis*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

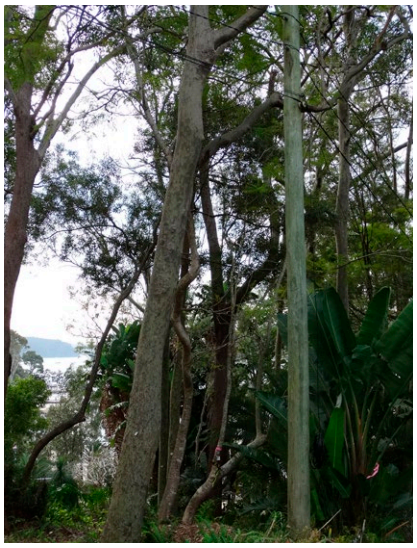


Fig. 113: **5.** *Corymbia maculata*

Fig. 114: **6.** *Eucalyptus paniculata*

Fig. 115: **54.** *Allocasuarina torulosa*

Fig. 116: **55.** *Glochidion ferdinandi*

Fig. 117: **56.** *Agathis robusta*

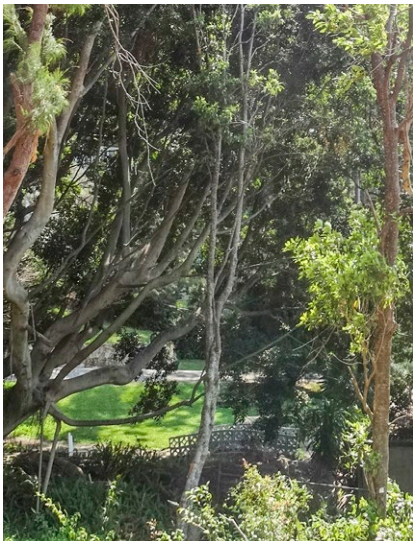


Fig. 118: **62C.** *Pittosporum undulatum*

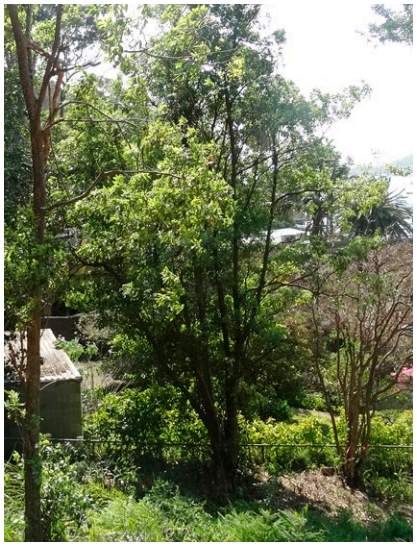


Fig. 119: **66.** *Pittosporum undulatum*

Fig.120 (L-R) **71C** *C. glauca*, **71** & **71B** *P. canariensis*, **70A** *C. glauca*, **70B** *A. cunninghamiana*

4. OBSERVATIONS (continued)

4.4. SITE IMAGES (continued)

Fig. 121: **90A.** *Glochidion ferdinandi*

Fig. 122: **128B.** *Corymbia maculata*

Fig. 123: **134.** *Agonis flexuosa*

Fig. 124:(R) **135** *Casuarina glauca*

Fig. 125: **136.** *Eucalyptus umbra*

Fig. 126: **136A.** *Bauhinia divaricata*

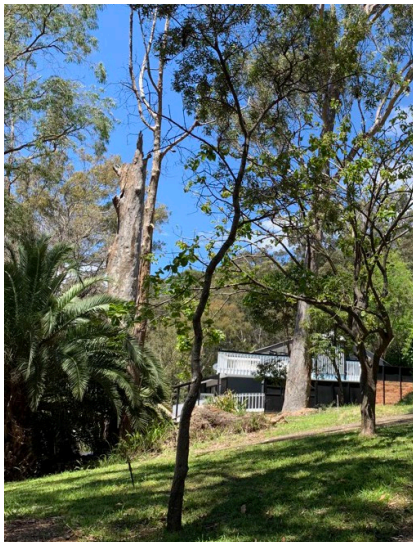


Fig. 127: **136B.** *C. gummiferum*

5. DISCUSSION

The Development Proposal for 96-104 Cabarita Road, by Mark Hurcum Design Practice on behalf of Meraki Developments, dated November 2018, proposes the subdivision of the site and construction of nine new residences.

The site's southern boundary abuts Cabarita Road and runs steeply down to Careel Bay in the north. The landscape has been heavily disturbed in the earlier construction of terraces, paths and gardens. This has significantly changed ground profiles with cut and fill terracing, stone retaining walls, raised garden beds and concrete pathways contouring the site. It is populated by a mix of remnant forest and exotic plantings. Conspicuously absent is forest regeneration in the form of native saplings and regrowth. Indeed the site appears lacking the natural diversity, complexity and understory typical of a healthy forest community – possibly as a byproduct of the earlier landscaping design, exotic plantings, weed invasion and management practices.

Significant species on site, particularly *Corymbia maculata,* are members of the Pittwater Spotted Gum Forest, listed as an Endangered Ecological Community under the *Threatened Species Conservation Act (1995)*. Statuesque specimens, notable by size and presence, are aging and exhibiting signs of senescence, poor health and declining vigour. The younger trees growing in their shadows lack vitality and appear suppressed due to the phototropic effects. The extensive weed growth dominating the ground cover may also be preventing the ideal conditions required, such as bare earth, for successful *C. maculata* seed germination and subsequent forest regeneration.

There are **146 trees** that have been assessed as to potential impact by the proposed development, determined by their location within 5 metres of the proposed building envelopes, and including any significant trees beyond - see figures 1 and 2 and the Tree Summary Table on pages 30 to 34.

Of these, **41 trees** are either dead and present on site as stags, or exempt by size or species according to *Table 1-Exempt Tree Species of article B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council Development Control Plan 2014.

Some of these trees may be considered for retention where they are deemed valuable by presence and amenity to the site and are not impacted by the proposed development. Others may be removed and replaced with more valuable plantings as part of a coordinated landscape/ecology plan. Priority weed species, as identified under the *Biosecurity Act 2015*, such as *Olea europaea* subsp. *cuspidata* (African olive), are recommended for removal to prevent their spread.

The **remaining 105 trees** have been assessed as to potential impact of the proposed development. For ease of navigation, recommendations for these trees have been broken down by proposed Lot.

LOT 1: COMMUNITY TITLE – SERVICES PROVISION

A services conduit is proposed to be laid below the new and existing driveway structures to deliver services to House Lots 2 to 10.

The driveway located on Lot 1, close to the boundaries of Lots 10 and 2, retains its existing level under the proposed plans. There are several trees lining the driveway and excavation for the proposed services cavity may require excavation within the TPZ of some trees.

Construction specification such as below-ground thrust boring, is recommended to limit intrusion, with services infrastructure located as deep as possible to minimise the likelihood of encountering significant roots. (Refer to Recommendations, on page XX, for specific management strategies and tree-sensitive construction specification recommended for the implementation of the services infrastructure.)

Trees **1** and **2** (both *C. maculata*, discussed under Lot 2) are not directly impacted by the proposed services infrastructure. Trees **1B**, **3I** and **5B**, also discussed under Lot 2, are exempt by species[1].

5*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 113. It has a slight lean and an asymmetric canopy to the east due to overshadowing and it exhibits deadwood up to 80mm diameter in up to 5% of its canopy. The proposed below-ground services infrastructure requires negligible excavation (1.3%) within Tree 5's TPZ. As such it is considered not directly impacted by the development as currently specified.

6*: Eucalyptus paniculata* (Grey ironbark) is a mature specimen showing fair to good health and vigour - see figure 114. It has no branches below 12m and exhibits deadwood of up to 100mm diameter in up to 5% of its canopy. The proposed services conduit intrudes into 5.5% of Tree 6's TPZ. Subject to engineering and construction specification, Tree 6 is considered sustainable given careful management.

Tree **3D**, in Lot 2, is also notionally impacted by the services infrastructure, but the driveway is constructed above ground at this point, with clearance for the services trench, such that there is no excavation required.

Located at the north eastern corner of Lot 2, Tree **3H** is an endangered *Syzygium paniculatum*, and while the construction footprints of the dwelling, driveway and services are outside the range of its Tree Protection Zone, particular care should be taken to ensure there are no indirect impacts to 3H's health.

128B*: Corymbia maculata* (Spotted gum) is a mature specimen in good health and vigour – see figure 122. The proposed services infrastructure intrudes into 7.2% of its TPZ.

1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

5. DISCUSSION (continued)

Subject to engineering and construction specification, Tree 128B is considered sustainable given careful management.

134*: Agonis flexuosa* (Willow Myrtle). Native to Western Australia, Tree 134 is a mature specimen showing fair to good health and vigour – see figure 123. It is not directly impacted by the development as currently specified.

135*: Casuarina glauca* (Grey she-oak) is a mature specimen showing fair to good health and vigour – see figure 124. It is not directly impacted by the development as currently specified.

136*: Eucalyptus umbra* (Broad-leaved white mahogany) is a mature specimen in good health and vigour - see figure 125. The proposed services infrastructure may impact Tree 136's TPZ by up to 9.3%. Subject to engineering and construction specification, Tree 136 is considered sustainable given careful management.

136A*: Bauhinia divaricata* (Orchid tree) is a mature specimen showing good health and vigour - see figure 126. It is a planted introduced species and is located within the footprint of its proposed driveway access to the dwelling on Lot 10. As such is Tree 136A is deemed unsustainable under the currently specified plans.

136B*: Ceratopetalum gummiferum* (NSW Christmas Bush) is a mature specimen in good health and vigour – see figure 127. It is not directly impacted by the development as currently specified.

In Lot 9, Trees **118** and **119** are located on the far side of the driveway from the proposed services trench, and 1.3 to 1.7m below the existing driveway ground level, suggesting limited and manageable impact within their TPZs.

22F*: Plumeria* spp. (Frangipani) is under 5m in height and as such is exempt by size. It is located on the proposed community title driveway, near Lot 3 and requires removal under the current plans.

LOT 2

1*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair to poor health and vigour – see figure 23. It has a thin canopy entirely in the east, generally suppressed due to the overshadowing of neighbouring trees. It has deadwood of up to 40mm in 5% of its canopy. Tree 1 is not directly impacted by the development as currently specified.

1B*: Grevillea robusta* (Silky oak) is exempt by species[1].

2*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair to poor health and vigour, suppressed due to the overshadowing of surrounding trees – see figure 24. There is a distinct swelling on the southern side of its trunk at 0.5m, no

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

5. DISCUSSION (continued)

branches below 7m, and significant deadwood of up to 80mm diameter in 5% of its canopy. Tree 2 is not directly impacted by the development as currently specified.

3*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in poor health and vigour – see figure 25. It has an asymmetric crown to the north and a leggy habit consistent with being heavily overshadowed by neighbouring trees. There are no branches below 8m and it is nearing the end of its useful life expectancy. Tree 3 is located at the edge of the footprint for the proposed dwelling on Lot 2, and as such is deemed unsustainable under the currently specified plans.

3B*: Callistemon* spp. (Bottlebrush) is a mature to over-mature tree in poor health and vigour – see figure 26. It has been planted in a raised garden bed and has co-dominant stems, with the south-western stem lopped at 1m. The tree is growing to the north east, with a sparse, leggy canopy whose habit and growth is consistent with overshadowing of surrounding trees. There is a fleshy climber growing up both stems to a height of 1m. Tree 3B is located adjacent to the building footprint of the proposed dwelling, such that its SRZ and TPZ are breached. As such it is deemed unsustainable under the currently specified plans.

3C*: Corymbia maculata* (Spotted gum) is an over-mature specimen in poor health and vigour – see figure 27. It has co-dominant stems at 4m consistent with regrowth from being lopped at 4m and 8m, with old pruning stubs and a failed central stem. There is significant epicormic growth and deadwood up to 100mm in diameter in over 10% of its canopy. It is nearing the end of its useful life expectancy and warrants consideration for removal due to poor health and declining structure. Tree 3C is located in the driveway and under a cantilevered mid-level slab of the dwelling on Lot 2, and is deemed unsustainable under the currently specified plans.

3D*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair to good health and vigour – see figure 28. It is located in a raised garden bed between a path and a drainage channel, surrounded by a large clump of *Strelitzia nicolai*. Leaning to the south, its growth habit is consistent with being overshadowed in its formative years. There are no branches below 10m and significant deadwood up to 20mm in diameter in over 5% of its canopy. Tree 3D's TPZ is impacted by the proposed dwelling, requiring 9.8% excavation for the lower-level, with the mid-level structure above ground in a further 20.3% of the zone, about half of which is cantilevered, with no resulting impact. Additionally, the upgraded driveway and access are located in 27.5% of the TPZ, but are elevated approximately 1m above the existing concreted surface, suggesting no further disturbance. Any supporting piers must be flexibly located to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health. On this basis, despite being notionally impacted, Tree 3D is considered sustainable given careful management and construction specification.

5. DISCUSSION (continued)

3E*: Eucalyptus paniculata* (Grey ironbark) is a mature to over-mature specimen showing fair to poor health and poor vigour – see figure 29. Its canopy is sparse and lacking vigour and grows predominantly in the north-east. There are no branches below 7m and it is nearing the end of its useful life expectancy. Tree 3E is not directly impacted by the development as currently specified.

3F*: Syzygium paniculatum* (Magenta Lillypilly) is a mature to over-mature specimen in fair health and vigour – see figure 30 (left). It has a thin and leggy habit due to the phototropic effect of overshadowing of neighbouring trees. It is significant as a listed endangered species in NSW under the *Biodiversity Conservation Act 2016.* The proposed lower level of dwelling on Lot 2 requires negligible excavation (2.1%) in the TPZ, while the mid-level slab floats above ground in a further 15.5% of the zone. While not envisaged, should any pier supports be required, they must be located flexibly to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. On this basis, and with due care, Tree 3F is considered not directly impacted by the development as currently specified.

3G*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair to poor health and vigour – see figure 30 (right). It has co-dominant stems at 6m and a thin and leggy habit due to the overshadowing of surrounding trees. There is a large *Phellinus* fruiting body emerging from a wound site 4m about ground on the north side of the trunk indicating possible substantial internal decay – see detail figure 31. The proposed lower level of dwelling on Lot 2 requires negligible excavation (1.3%) in the TPZ, while the mid-level slab floats above ground in a further 15.3% of the zone. While not envisaged, should any pier supports be required, they must be located flexibly to avoid any significant root disturbance within the TPZ. On this basis, and with due care, Tree 3G is considered not directly impacted by the development as currently specified.

3H*: Syzygium paniculatum* (Magenta Lillypilly) is a senescent specimen showing very poor health and vigour – see figure 32. It has co-dominant stems, branching at 200mm above ground level. Its canopy is extremely sparse and deadwood is evident in over 30% of the canopy: it appears to be dying. It is significant as a listed endangered species in NSW under the *Biodiversity Conservation Act 2016.* Tree 3H is not directly impacted by the development as currently specified.

3I*: Jacaranda mimosifolia* (Jacaranda) is an exempt species[1].

4*: Eucalyptus acmenoides* (White mahogany) is a mature to over-mature specimen in poor health and vigour – see figure 33 (right). There is a large failed eastern stem from 6m and significant deadwood up to 80mm in diameter. Tree 4's canopy is thin and has

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

a leggy habit and there is epicormic growth on its trunk which may be evidence of stress. It is growing in a heavily disturbed ground profile, with emerging bedrock/large floaters that may have caused irregular root growth. It is nearing the end of its useful life expectancy. Tree 4's TPZ is impacted with 11.4% excavation required under the proposed plans, and with the mid-level slab floating above ground in an additional 3.7% of the zone. The excavation should be undertaken under the supervision of the site arborist to ensure that there is no significant root disturbance within the TPZ, and any supporting piers should be flexibly located to minimise impact. On this basis, given careful management, Tree 4 is considered sustainable under the current plans.

4B*: Corymbia maculata* (Spotted gum) is an over-mature specimen in fair to poor health and vigour – see figure 33 (centre). It has an asymmetric canopy to the north due to the overshadowing of surrounding trees with up to 5% deadwood. There are no limbs below 8m. Tree 4B is not directly impacted by the development as currently specified.

5B*: Jacaranda mimosifolia* (Jacaranda) is an exempt species[1].

7C*: Corymbia maculata* (Spotted gum) is an over-mature specimen in poor health and vigour – see figure 34. It has a leggy canopy and is suppressed by the phototropic effect of overshadowing. There are no branches below 10m and it is nearing the end of it's useful life expectancy. Tree 7C is not impacted by the development as currently specified.

7D*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in poor health and vigour – see figure 35. It has significant deadwood up to 80mm in diameter in over 10% of its canopy and is suppressed by the phototropic effect of overshadowing. There are no branches below 7m and it is nearing the end of its useful life expectancy. Tree 7D is not impacted by the development as currently specified.

7F*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair to poor health and vigour – see figure 36. It has an asymmetric crown growing predominantly in the north-west due to the phototropic effect of surrounding trees, and no limbs below 6m. There is evidence of deadwood of up to 60mm in diameter to 5% of the canopy and it is nearing the end of its useful life expectancy. Tree 7F is not impacted by the development as currently specified.

7G*: Olea europaea* subsp. *cuspidata* (African olive) is exempt by species[1] and, while located, is un-numbered on the survey. Classified as a priority weed species under the *Biosecurity Act 2015*, it is recommended for removal to prevent its spread.

8*: Corymbia maculata* (Spotted gum) is a mature specimen showing good health and vigour – see figure 37. It has no lower branches below 10m and 5-10% deadwood in

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014*

5. DISCUSSION (continued)

its canopy. Tree 8 is located close to the proposed dwelling with excavation for the lower level required in 5% of its TPZ. Additionally, the mid-level slab floats above ground level in a further 21.7% of the zone. Any piers supporting this slab must be flexibly located to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance and avoid adverse impact to tree health. On this basis, despite being notionally impacted, Tree 8 is considered sustainable given careful management and construction specification.

11*: Corymbia maculata* (Spotted gum) is a mature specimen in fair to good health and fair vigour – see figure 38. It exhibits an asymmetric crown to the north, with <15% canopy in the south. There is deadwood of up to 60mm diameter in up to 5% of the canopy. Tree 11's TPZ is encroached by the development on both Lots 2 and 3. On Lot 2, the proposed structure requires excavation for its lower level slab in 4.3% of the TPZ, which then cantilevers above ground for a further 14.8%, but without impact. The mid-level slab floats above ground in 9.4% of the zone. This slab is proposed to be supported by flexibly located piers to minimise root disturbance. In Lot 3, the proposed plan require an additional excavation of 8.4% of the TPZ. While the combined excavation is beyond guidelines, the impact may be mitigated by it not being contiguous. Tree 11 is growing in heavily disturbed land, directly above an excavated concrete pathway, retained by a stone wall and it is possible that root growth is irregular in the zone due to the changed ground levels. In order for Tree 11 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance within the TPZ, nor adverse impact to tree health.

11A*: Glochidion ferdinandi* (Cheese tree) is a mature specimen in fair health and vigour – see figure 39. It is planted in a garden bed abutting a retaining wall and has co-dominant stems, with branch wounding at 1.5m on its western stem and 2.5m on the northern side of its eastern stem. It is not impacted by the development as currently specified.

11B*: Corymbia maculata* (Spotted gum) is a mature specimen showing fair to good health and vigour – see figure 40. It has an asymmetric canopy due to the phototropic effect of overshadowing, with 90% favouring the north. There is deadwood of up to 100mm in diameter in 5-10% of its canopy. While the proposed mid-level of dwelling on Lot 2 requires negligible excavation (<1%), its slab continues above ground in a further 13% of the TPZ. Should any pier supports be required in this zone, they must be located flexibly to avoid any significant root disturbance within the TPZ. On this basis, and with due care, Tree 11B is considered not directly impacted by the development as currently specified.

12*:* is a dead stag, potentially providing wildlife habitat – see figure 41. It is not directly impacted by the development as currently specified.

5. DISCUSSION (continued)

There are a number of *Phoenix canariensis* (Phoenix palms) on Lot 2 – one located near the eastern border close to Trees 1 and 2 (tagged **UN6**), and a further four planted in a garden bed adjacent to the driveway west of 3D and east of 3C**.** *P. canariensis* are exempt by species[1] and, while present, these palms not recorded on the survey.

There are two large clumps of *Strelitzia nicolai* (Giant Bird of paradise) recorded on the survey of Lot 2 – one located in near the centre of the lot and another surrounding Tree 3D.

LOT 3

20*: Lophostemon confertus* (Brush box) is a mature specimen showing fair to good health and vigour – see figure 42. It has been crown lifted to a height of 3m, as evidenced by multiple pruning stubs/scars. Its canopy grows predominantly to the north due to the phototropic effect of surrounding trees. Tree 20 is not directly impacted by the development as currently specified.

21A*: Glochidion ferdinandi* (Cheese tree) is a mature specimen showing fair to poor health and vigour – see figure 43 (left). It leans to the north and has been crown lifted to a height of 3.5m with a 60mm diameter pruning stub at 1.5m and a small machinery scar on its southern side. Tree 21A's canopy grows predominantly in the north due to the overshadowing of neighbouring trees. It is not directly impacted by the development as currently specified.

22*: Allocasuarina torulosa* (Forest she-oak) is an over-mature specimen in poor health and vigour – see figure 43 (right). Its canopy is sparse and grows predominantly in the north due to overshadowing, with up to 10% deadwood of up to 40mm diameter. There is a pruning stub in the north-west at 2m and a large wound extending from below ground level to 1.5m, with significant central decay, seriously compromising the tree's structure. It is at the end of its useful life expectancy and is considered potentially hazardous. Its TPZ is breached by the proposed excavation for Lot 4's dwelling and taking into account its poor health and declining structure Tree 22 is recommended for removal and replacement.

22A*: Harpephyllum caffrum* (Kafir plum) is exempt by species[1].

27*: Corymbia maculata* (Spotted gum) is an over-mature specimen showing very poor health and vigour – see figure 47. It has co-dominant stems at 6m and significant deadwood up to 100mm diameter in up to 60% of its canopy. Its canopy is sparse with significant epicormic growth. It is nearing the end of its useful life. Tree 27 is not directly impacted by the development as currently specified.

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

5. DISCUSSION (continued)

LOT 4

22B*: Ceratopetalum gummiferum* (NSW Christmas Bush) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 44 (left). It has been crown lifted to 4m and its canopy grows predominantly to the east due to overshadowing. Tree 22B's SRZ and TPZ are breached by excavation for the proposed dwelling on Lot 4 and as such is deemed unsustainable under the currently specified plans.

22C*: Ceratopetalum gummiferum* (NSW Christmas Bush) is a mature to over-mature specimen in poor health and vigour – see figure 44 (right). It has been crown lifted to 4m, with numerous pruning stubs and its canopy favours north and north-east. Tree 22C is located at the edge of the building footprint of the proposed dwelling on Lot 4 such that it's SRZ and TPZ are breached by excavation. As such it is deemed unsustainable under the currently specified plans.

22E*: Ficus rubiginosa* (Port Jackson fig) is a mature specimen in fair health and vigour – see figure 45. It was previously a pot plant, as evidenced by the remnant of its original plastic planter pot embedded at its base – see figure 46. On its north side it has a 200mm diameter remnant stub at 900mm above ground and a 100mm diameter branch pruned at 1.6m. Its canopy grows predominantly to the north due to overshadowing and there is epicormic growth at its base. Tree 22E is located within the building footprint of the proposed dwelling on Lot 4 and as such is deemed unsustainable under the currently specified plans.

27A*: Allocasuarina torulosa* (Forest she-oak) is an over-mature specimen showing fair to poor health and vigour – see figure 48. It has co-dominant stems at 60mm above ground and a thin canopy growing predominantly to the north due to the phototropic effect of surrounding trees. Tree 27A is not directly impacted by the development as currently specified.

31*: Corymbia maculata* (Spotted gum) is an over-mature specimen showing fair to poor health and vigour – see figure 49. It has co-dominant stems at 1.2m and a thin canopy, predominantly in the north due to the overshadowing of neighbouring trees. There is evidence of deadwood up to 200mm diameter in up to 30% of the canopy, which represents a potentially significant hazard. The mid-level of the proposed dwelling on Lot 4 requires excavation of 14% in the TPZ, with the upper level slab floating above ground in a further 2.4%. However, the tree is located in a heavily disturbed ground profile with cut-and-fill terracing, and a 1m stone retaining wall to its north within 1.5m of it trunk, and it is possible that root growth is irregular in the zone due to the changed ground levels. In order for Tree 31 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance within the TPZ, nor adverse impact to tree health.

LOT 5

36*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing poor health and vigour – see figure 50. It has a thin and leggy canopy, growing predominantly in the north due to the overshadowing of neighbouring trees. There is evidence of deadwood up to 150mm diameter in up to 10% of the canopy. Tree 36's TPZ is breached by the proposed excavation by 7.5%, and as such, with due care, is considered not directly impacted by the development as currently specified.

40*: Eucalyptus paniculata* (Grey ironbark) is an over-mature to senescent specimen in very poor health and vigour – see figure 51. It has co-dominant stems with a decay site at its base where it forks. Its canopy is very sparse with up to 60% deadwood up to 150mm in diameter. While Tree 40 is not directly impacted by the development, it is nearing the end of its useful life expectancy. As such its ongoing condition should be monitored with consideration of removal should its declining structure become hazardous.

41*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing poor health and vigour – see figure 52. It has co-dominant stems, and a thin and leggy canopy which grows predominantly in the north, due to the phototropic effect of overshadowing by neighbouring trees. There is up to 30% deadwood evident in the canopy. Tree 41 is not directly impacted by the development as currently specified.

44*: Lophostemon confertus* (Brush box) is a mature specimen showing fair to poor health and fair to good vigour – see figure 53. Its habit is consistent with being previously lopped at 4m. There is a *Ficus* spp. growing up its stem to 8m. Tree 44 abuts the proposed building footprint for the dwelling on Lot 5, breaching its SRZ and TPZ. As such it is deemed unsustainable under the currently specified plans.

45*: Agathis robusta* (Queensland Kauri) is a mature specimen in good health and vigour – see figure 54. Tree 45's TPZ is breached by the proposed excavation for the dwelling on Lot 5 by 17.6% of its area. However, the ground profile is heavily disturbed by nearby landscaping, retaining and terracing, and it is possible that root growth is irregular in the zone due to the changed ground levels. In order for Tree 45 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance.

46*: Syncarpia glomulifera* (Turpentine) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 55 (left). It has co-dominant stems at 5m and over 5% deadwood in its canopy. Its crown grows predominantly in the north and east due to the overshadowing of surrounding trees. Tree 46's TPZ is breached by the proposed excavation for the dwelling on Lot 5 by 17.4% of its area. However, the ground profile is heavily disturbed by nearby landscaping, retaining and terracing, and it is possible that root growth is irregular in the zone due to the changed ground levels. In order for Tree 46 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance.

5. DISCUSSION (continued)

47*: Syncarpia glomulifera* (Turpentine) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 55 (right). Its condition is suppressed and its crown grows predominantly in the east due to the overshadowing of surrounding trees. There is evidence of up to 5% deadwood. Tree 47's TPZ is infringed by the proposed excavation by 7.5%, and as such, with due care, is considered not directly impacted by the development as currently specified.

47A*: Scolopia braunii* (Flintwood) is a mature specimen in fair to poor health and vigour – see figure 56. There are multiple pruning stubs up to 1.5m, including a 150mm diameter limb removed at 1m on its southern side. Its canopy grows predominantly in the north and east due to overshadowing and appears to be under insect attack. Tree 47A abuts the proposed building footprint for the dwelling on Lot 5, breaching its SRZ and TPZ. As such it is deemed unsustainable under the currently specified plans.

49*: Agathis robusta* (Queensland Kauri) is a mature specimen in good health and vigour – see figure 57. Its canopy grows predominantly to the north and it has no branches below 7m. The proposed bio-retention basin intrudes into Tree 49's TPZ by approximately 12%. Excavation should be undertaken with the advice and supervision of the site arborist to ensure there is no significant root disturbance within the zone. On this basis, given careful management, Tree 49 is considered sustainable under the current plans.

49D*: Pittosporum undulatum* (Native Daphne) is under 8m in height, and as such exempt by size.

56*: Agathis robusta* (Queensland Kauri) is a mature specimen in good health and vigour – see figure 117. Tree 56's TPZ appears to be impacted by up to 10.8% by excavation for the proposed bio-retention ponds. Additionally the parking bay for Lot 6's driveway sits above ground in 1.9% of the zone, potentially requiring pier support. Any excavation for the ponds or flexibly-located piers for the driveway should be undertaken with care to avoid any significant root disturbance within the TPZ. As such Tree 56 is considered not significantly impacted by the development as currently specified.

LOT 6

54*: Allocasuarina torulosa* (Forest she-oak) is a mature specimen showing fair health and vigour – see figure 115. It has multiple pruning stubs to 7m and deadwood of up to 70mm diameter in more than 20% of its canopy. The parking bay of the driveway access intrudes into Tree 54's TPZ by 4.2% and piers should be flexibly located to avoid any intrusion into the SRZ. On this basis Tree 54 is considered not directly impacted by the development as currently specified.

55*: Glochidion ferdinandi* (Cheese tree) is a mature specimen showing good health and vigour – see figure 116. It has co-dominant stems at its base, with the northern stem lopped at 600mm. The canopy is thin and suppressed due to previous over-

shadowing and there is evidence of leaf-eating insect attack. Tree 55 is not directly impacted by the development as currently specified.

61*: Ficus microcarpa* var *hillii* (Hills weeping fig) is an exempt species[1].

62*: Ligustrum lucidum* (Large leaf privet) is an exempt species[1].

62C*: Pittosporum undulatum* (Native Daphne) is a mature specimen showing poor health and vigour - see figure 118. Tree 62C is not directly impacted by the development as currently specified.

66*: Pittosporum undulatum* (Native Daphne) is a mature specimen with multiple stems, showing good health and vigour – see figure 119. The proposed stormwater infrastructure requires excavation in up to 15% of Tree 66's TPZ. Excavation should be undertaken with the advice and supervision of the site arborist to ensure there is no significant root disturbance within the zone. On this basis, given careful management, Tree 66 is considered sustainable under the current plans.

UN*: Cinnamomum camphora* (Camphor laurel) is an exempt species[1]. It is impacted by the stormwater infrastructure, and as such requires removal under the current plans.

67A*: Glochidion ferdinandi* (Cheese tree) is a mature specimen showing fair health and vigour – see figure 58 (left). It has co-dominant stems at 1.4m and its canopy is growing predominantly in the north and east, due to the overshadowing of neighbouring trees. Tree 67A is located within the building footprint of the proposed dwelling on Lot 6 and as such is deemed unsustainable under the currently specified plans.

67B*: Glochidion ferdinandi* (Cheese tree) is a mature specimen showing fair health and vigour – see figure 58 (right). Its northern stem has been lopped at 2m and is sprouting epicormic growth. Its canopy grows predominantly in the north and west. Tree 67B is located within the building footprint of the proposed dwelling on Lot 6 and as such is deemed unsustainable under the currently specified plans.

68B*: Castanospermum australe* (Queensland blackbean) is exempt by species[1].

69*: Phoenix canariensis* (Phoenix palm) is exempt by species[1].

69A*: Casuarina glauca* (Grey she-oak) is an over-mature specimen showing fair to poor health and vigour – see figure 59. It has co-dominant stems and bears a significant lean to the west. Its canopy grows predominantly to the north and carries up to 5% deadwood. Tree 69A's TPZ is impacted in 7.4% of its area by excavation for the proposed dwelling's lower level slab, which floats above ground in a further 12.9% of the zone. Additionally, the mid-level slab floats above ground in 9.1%, with the proposed balcony intruding a further 14% of the zone, of which 3.8% is above, but within, the SRZ. Excavation within the SRZ must be avoided. Any supporting piers

1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

within the TPZ should be located flexibly to avoid any significant root disturbance. In doing this, unavoidable changes to ground levels within the TPZ may be minimised and avoid adverse impact to tree health. On this basis, despite being notionally impacted, Tree 69A is considered sustainable given careful management and construction specification.

69C*: Casuarina glauca* (Grey she-oak) is an over-mature specimen in poor health and vigour – see figure 60. It has a significant lean to the south due to overshadowing. Tree 69C is located within the building footprint of the proposed dwelling on Lot 6 and as such is deemed unsustainable under the currently specified plans.

69D*: Stenocarpus sinuatus* (Queensland Firewheel tree) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 61. It has been crown-lifted to a height of 8m, as evidenced by multiple pruning stubs. There is a large dead stub, over 150mm in diameter, to the west at 8m. Tree 69D is located adjacent to the proposed stormwater infrastructure, such that its SRZ and TPZ would be breached by excavation. As a result Tree 69D is deemed unsustainable under the currently specified plans.

69E*: Casuarina glauca* (Grey she-oak) is a mature to over-mature specimen showing poor health and vigour – see figure 62 (left). It leans to the south west, with a growth habit that is consistent with being overshadowed. The proposed stormwater infrastructure intrudes into Tree 69E's TPZ by 9.1%, and as such, with due care, is considered not directly impacted by the development as currently specified.

69I*: Casuarina glauca* (Grey she-oak) is a mature to over-mature specimen showing poor to very poor health and vigour – see figure 62 (right). It has a thin and sparse canopy and its suppressed condition is consistent with being overshadowed. Tree 69I is not directly impacted by the development as currently specified.

70A*: Casuarina glauca* (Grey she-oak) is a mature specimen, with two stems, showing fair health and vigour – see figure 120. It is located directly above the existing drainage pipe, which is proposed to be utilised for stormwater. As such, no further excavation is required and Tree 70A is not impacted by the development as currently specified.

70B*: Archontophoenix cunninghamiana* (Bangalow palm) is exempt by species[1].

71*: Phoenix canariensis* (Phoenix palm) is exempt by species[1].

71B*: Phoenix canariensis* (Phoenix palm) is exempt by species[1].

71C*: Casuarina glauca* (Grey she-oak) is a mature specimen in good health and vigour – see figure 120. Tree 71C is located adjacent to the proposed stormwater infrastructure, such that its SRZ and TPZ would be breached by excavation. As a result Tree 71C is deemed unsustainable under the currently specified plans.

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

5. DISCUSSION (continued)

82A*: Melaleuca styphelioides* (Prickly paperbark) is a mature to over-mature specimen showing fair to poor condition – see figure 63. It has co-dominant stems and its habit is consistent with being previously overshadowed. There is deadwood up to 100mm and multiple torn stubs in its upper canopy, with a large torn stub over 100mm diameter on its western stem. The lower level slab of the proposed dwelling on Lot 6 floats 1.5m - 2.4m above ground level in 16.8% of Tree 82A's TPZ, of which 1% also breaches its SRZ. Any supporting piers within this zone must be flexibly located to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In doing so, unavoidable changes to ground levels within the TPZ may be limited within tolerance. On this basis, despite being notionally impacted, Tree 82A is considered sustainable given careful management and construction specification.

84B*: Casuarina glauca* (Grey she-oak) is a mature to over-mature specimen in fair to poor health and fair vigour – see figure 64. Consisting of a main trunk and sucker, the main stem leans significantly to the west, with its canopy growing predominantly in the north and west, while its sucker leans to the south, with its canopy also in the south. Tree 84B is located within the building footprint of the proposed dwelling on Lot 6 and as such is deemed unsustainable under the currently specified plans.

86*: Casuarina glauca* (Grey she-oak) is a mature to over-mature specimen showing poor health and vigour – see figure 65. It has multiple remnant suckers up to 200mm diameter from being pruned at its base. It has a significant lean to the north, and its canopy grows exclusively to the north. Tree 86 is located within the building footprint of the proposed dwelling on Lot 6 and as such is deemed unsustainable under the currently specified plans.

89F*: Casuarina glauca* (Grey she-oak) is an over-mature specimen showing fair to poor health and vigour – see figure 66. Once co-dominant, a 200mm diameter stem has been lopped at 700mm. It leans to the north-east, with a canopy exclusively in the north due to the overshadowing of surrounding trees. Tree 89F is located within the building footprint of the proposed dwelling on Lot 6 and as such is deemed unsustainable under the currently specified plans.

89K*: Pittosporum undulatum* (Native Daphne) is a mature specimen showing fair to poor health and vigour – see figure 67. It has multiple pruning and deadwood stubs to 5m, with some epicormic growth evident in its canopy and at its base. The canopy is predominantly in the south, with >10% deadwood up to 20mm in diameter. The elevated driveway access to Lot 6 sits 1.7m above ground level in 9.6% of Tree 89K's TPZ. With flexibly-located piers to ensure no intrusion into the SRZ, Tree 89K is considered not directly impacted by the development as currently specified.

90*: Allocasuarina torulosa* (Forest she-oak) is a mature specimen showing fair health and vigour – see figure 68. It leans to the west, with its canopy also predominantly in the west. Tree 90 is located close to the mid-level of the proposed dwelling on Lot 6 such that its SRZ and TPZ are significantly breached by excavation. As a result it is deemed unsustainable under the currently specified plans.

5. DISCUSSION (continued)

90A*: Glochidion ferdinandi* (Cheese tree) is a mature specimen showing fair to good health and vigour – see figure 121. It has co-dominant stems at 400mm and a 100mm diameter western stem pruned at 350mm above ground. Tree 90A is not directly impacted by the development as currently specified.

90B*: Glochidion ferdinandi* (Cheese tree) is a mature specimen in fair health and vigour – see figure 69. A 100mm western limb has been lopped at 2m, and its canopy grows predominantly in the east. The structural support for proposed driveway access intrudes into Tree 90B's TPZ by 5.6%, and as such, it is considered not significantly impacted by the development as currently specified.

91A-E*:* These are a group of five *Syagrus romanzoffiana* (Cocos palms) located on the proposed driveway to Lot 6. *S. romanzoffiana* are exempt by species[1].

LOT 7

91*: Leptospermum polygalifolium* (Lemon-scented tea-tree) is an over-mature specimen showing fair to poor health and vigour – see figure 70. It has an asymmetric canopy predominantly in the north, which is thin and leggy due to the overshadowing of surrounding trees. There are pruning scars on its eastern side at 2.5m (100mm diameter) and 3m (200mm diameter). Tree 91's TPZ is notionally breached by 6.7% with negligible excavation required, and as such is considered not directly impacted by the development as currently specified.

91F*: Archontophoenix cunninghamiana* (Bangalow palm) is exempt by species[1]. It abuts the driveway access to Lot 6, and as such requires removal under the current plans.

92*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair to poor health and vigour – see figure 71. It leans to the north and has co-dominant stems at 6m. There is deadwood in over 5% of its canopy and evidence of some epicormic growth. Tree 92 is located close to the proposed dwelling on Lot 7, whose lower-level (RL 7.4) is to be above ground in 25.3% of the TPZ, edging into the SRZ at its eastern reaches, and the mid-level (RL 10.4) cantilevered above in a further 21.1% of the zone. Flexible location and construction specification of footings, such as pier and beam, is required to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In doing so, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health. On this basis, despite being notionally impacted, Tree 92 is considered sustainable given careful management and construction specification.

92A*: Melaleuca quinquenervia* (Broad-leaved paperbark) is a mature specimen showing fair to poor health and vigour – see figure 72. Its condition is suppressed from the overshadowing of neighbouring trees and its canopy grows predominantly in the

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

north. A large northern stem (>120mm diameter) has been lopped at 3.5m. Tree 92A is located within the building footprint of the proposed dwelling on Lot 7 and as such is deemed unsustainable under the currently specified plans.

93*: Corymbia maculata* (Spotted gum) is an over-mature to senescent specimen showing very poor health and vigour – see figure 73 (left). It appears to be dying, with deadwood >80mm diameter in over 40% of its canopy, which is predominantly epicormic. There is a large dead hanger in the canopy at 10m. It is located within the footprint of Lot 7's dwelling. Tree 93 is at the end of its useful life expectancy and, taking into account the volume and size of the deadwood and its declining structure, is recommended for removal and replacement.

94*: Corymbia maculata* (Spotted gum) is an over-mature to senescent specimen in very poor health and vigour – see figure 73 (right) and 74. It has co-dominant stems at 6m and deadwood up to 200mm diameter in over 60% of its canopy, which represents a significant hazard risk. There is some epicormic growth in its canopy. It is located within the footprint of Lot 7's dwelling and taking into account the volume and size of the deadwood and its declining structure Tree 94 is recommended for removal and replacement.

94A*: Magnolia grandiflora* (Evergreen magnolia) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 75. It has co-dominant stems at 0.5m and multiple pruning scars, including the stub of 200mm diameter limb lopped on the north eastern stem which is sprouting epicormic growth. There is some evidence of leaf disease. Tree 94A is located within the building footprint of the proposed dwelling on Lot 6 and as such is deemed unsustainable under the currently specified plans.

94B*: Allocasuarina torulosa* (Forest she-oak) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 76. It features co-dominant stems and multiple pruning stars at its base and on its south-western stem. There are multiple small hangers in it canopy, and its condition is generally suppressed due to the overshadowing of surrounding trees. Tree 94B is located within the building footprint of the proposed dwelling on Lot 7 and as such is deemed unsustainable under the currently specified plans.

There are five *Phoenix canariensis* (Phoenix palms) on Lot 7. *P. canariensis* are exempt by species[1] and, while present, these palms are not recorded on the survey.

LOT 8

95*: Corymbia maculata* (Spotted gum) is an over-mature to senescent specimen in very poor health and vigour – see figure 77. It has an asymmetric canopy to the south with

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

over 5% deadwood up to 70mm in diameter. There is a *Ficus* spp. growing up its stem, which should be removed for tree health. Tree 95 is not directly impacted by the development as currently specified.

95A*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing poor health and vigour – see figure 78. It has co-dominant stems and a growth habit consistent with being lopped at its base. It has an asymmetric canopy predominantly to the north due to the overshadowing neighbouring trees and a thin and leggy canopy, with up to 10% deadwood up to 50mm in diameter. There is a *Ficus* spp. growing up both stems to 3m. Tree 95A is nearing the end of its useful life and is located within the building footprint of the proposed dwelling on Lot 8. As such it is deemed unsustainable under the currently specified plans.

95B*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 79. It has an asymmetric canopy exclusively to the south, due to the overshadowing of neighbouring trees. There are no branches below 7m and deadwood up to 50mm diameter in up to 5% of the canopy. Tree 95B is located within the building footprint of the proposed dwelling on Lot 8 and as such is deemed unsustainable under the currently specified plans.

95C*: Corymbia maculata* (Spotted gum) is an over-mature to senescent specimen in very poor health and vigour – see figure 80. Its canopy is very thin and leggy due to the overshadowing of surrounding trees, with over 10% deadwood. There is a large basal wound on its southern side with evidence of decay from ground level to 700mm – see detail figure 81. Tree 95C is located within the building footprint of the proposed dwelling on Lot 8 and is deemed unsustainable under the currently specified plans.

96*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair health and vigour – see figure 82 (right). It has co-dominant stems at 10m and there is deadwood up to 80mm in diameter in up to 5% of its canopy. Tree 96's TPZ is impacted on both Lot 7 and Lot 8. On Lot 7, the proposed lower level slab notionally intrudes into the TPZ by 10.3%, requiring negligible excavation, with the mid-level slab floating above in a additional 4% of the zone. On Lot 8 the mid-level slab sits above ground in 17.5% of its TPZ. Any supporting piers to support this slab must be flexibly located to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In doing this, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health. On this basis, despite being notionally impacted, Tree 96 is considered sustainable given careful management and construction specification.

97*: Corymbia maculata* (Spotted gum) is a mature specimen in fair to poor health and vigour – see figure 82 (left). It has an asymmetric canopy to the north and up to 5% deadwood. There appears to be possible insect attack on the western side at the tree's base, evidenced by large discharge of sap (kino) – see figure 83. The proposed

dwelling's mid-level slab sits above ground in 19.9% of Tree 97's TPZ. Any supporting piers must be flexibly located to ensure no significant root disturbance within the TPZ, nor adverse impacts to tree health. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance. On this basis, despite being notionally impacted, Tree 97 is considered sustainable given careful management and construction specification.

99*: Phoenix canariensis* (Phoenix palm) is exempt by species[1].

100*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair to good health and vigour – see figure 84. It has two stems at 1.2m and deadwood of up to 150mm in diameter in up to 5% of its canopy. There is a potential disease path caused by a deadwood stub at 4m on the upper side of its eastern stem, and a large cavity at 7m on its north eastern side which could offer potential wildlife habitat. Tree 100's TPZ is impacted on both Lot 8 and Lot 9. The lower level of the proposed dwelling on Lot 8 requires excavation in 3.4% of the TPZ, with the slab floating above ground in a further 14.2%. On Lot 9, the mid-level slab is planned to sit above ground in a further 9% of the zone. Any supporting piers must be flexibly located to avoid any significant root disturbance within the TPZ, nor adverse impacts to tree health. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance. On this basis, despite being notionally impacted, Tree 100 is considered sustainable given careful management and construction specification.

101*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in fair to good health and vigour – see figure 85. It has multiple stubs on its trunk and carries up to 10% deadwood. Tree 101's TPZ is impacted on both Lot 8 and Lot 9. The lower and mid levels of the proposed dwelling on Lot 8 requires excavation in 8.7% of the TPZ, with the slabs continuing above ground in a further 14.1% of the zone. On Lot 9, the mid-level of the proposed dwelling requires excavation of an additional 9.7%, with the slab continuing above ground in a further 16.6% of the zone. While the impact is beyond guidelines, it is noted that Tree 101 is growing in a heavily disturbed ground profile, alongside a concrete pathway, with a stone wall retaining what appears cut and fill terracing, and a change of contour level of 3m within its SRZ, and it is possible that root growth is irregular in the zone due to the changed ground levels. In order for Tree 101 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance within the TPZ, nor adverse impact to tree health.

There are a number of small *Strelitzia nicolai* (Giant Bird of paradise) and a *Phoenix canariensis* (Phoenix palm) near the western boundary of Lot 8. *P. canariensis* are exempt by species[1] and, while present, these palms are not recorded on the survey.

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

LOT 9

101B*: Phoenix canariensis* (Phoenix palm) is exempt by species[1].

102*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing fiar to good health and vigour – see figure 86. It has co-dominant stems separating at 3m and 7m, and minimal canopy in the south-east due to overshadowing. There is up to 5% deadwood and some epicormic growth on its upper branches. The proposed dwelling impacts Tree 102 with excavation required on its lower level in 6.6% of its TPZ, and the slab for the mid-level floats above ground level in a further 15.5%. Any supporting piers to support this slab must be flexibly located to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health. On this basis, despite being notionally impacted, Tree 102 is considered sustainable given careful management and construction specification.

102A*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in good health and vigour – see figure 87. It has an asymmetric canopy with minimal presence on its south-eastern side. There are no branches below 7m. Tree 102A's TPZ is impacted by the proposed dwelling on Lot 9 in that the mid-level slab sits above ground in 30.2% of the zone. Any supporting piers to support this slab must be flexibly located to avoid any significant root disturbance within the TPZ, nor adverse impacts to tree health. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance. On this basis, despite being notionally impacted, Tree 102A is considered sustainable given careful management and construction specification.

There is a stand of four *Corymbia maculata* (103, 104D, 104 and 104E) alongside the terraced pathway in Lot 9's north – see figure 88. These trees are growing closely together and are mostly senescent. At the time of assessment there was evidence of fungal fruiting bodies at the base of three of the four trees (specifically 103, 104 and 104E), considered likely to be *Armillaria luteobubalina*, a primary cause of pathogenic root rot – see figure 94. This is supported by the loss of vitality and poor condition of the trees, and their close proximity and likely co-mingled root mass supports possible spread of infection.

103*: Corymbia maculata* (Spotted gum) is an over-mature to senescent specimen showing very poor health and vigour – see figure 89. Its central stem appears to be dead or dying. It carries over 80% deadwood over 120mm in diameter and its growth appears predominantly epicormic. Tree 103 is nearing the end of its useful life expectancy, and taking into account the volume of deadwood and its declining structure Tree 103 is recommended for removal and replacement.

1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

5. DISCUSSION (continued)

104*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing fair health and vigour – see figure 90 (right). It has co-dominant stems at 2m and an asymmetric canopy in the north-east due to overshadowing. There is deadwood up to 80mm in diameter in up to 5% of the canopy, with some epicormic growth. The proposed dwelling would require excavation in 3.5% of Tree 104's TPZ, with its mid-level's slab sitting above ground level in a further 18.6%. Any supporting piers must be flexibly located to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance.

104A*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing fair to poor health and fair to good vigour – see figure 91. It has an asymmetric canopy to the north and north-east with a leggy habit and suppressed condition due to overshadowing. Tree 104A is not directly impacted by the development as currently specified.

104D*: Corymbia maculata* (Spotted gum) is an over-mature to senescent specimen showing very poor health and vigour – see figure 92. It leans to the south, with a thin and insubstantial canopy in the south, due to the overshadowing of surrounding trees. There is a large wound on its northern side – see figure 93, with a hollow cavity over 500mm in length and evidence of substantial decay. Tree 104D is nearing the end of its useful life expectancy. As such its ongoing condition should be monitored with consideration of removal should its declining structure become hazardous.

104E*: Corymbia maculata* (Spotted gum) is an over-mature specimen showing fair to poor health and fair to good vigour – see figure 90 (left). It has no branches below 14m and significant epicormic growth. Its canopy is predominantly in the east, due to the phototropic effect from competition with surrounding trees.

Considering their proximity, and likely interlocking root mass, impacts to trees 104D, 104 and 104E have been taken as a group, using 104's TPZ extent, impacts and management recommendation. On this basis, despite being notionally impacted, Trees 104D, 104 and 104E are considered sustainable given careful management and construction specification. That said, due to the compromised condition of the group and evidence of possible *Armillaria* root rot, their ongoing condition should be monitored with consideration of removal should their declining structure become hazardous.

108F*: Phoenix canariensis* (Phoenix palm) is exempt by species[1].

108H*: Jacaranda mimosifolia* (Jacaranda) is exempt by species[1].

116*:* is a dead tree. It is located within the proposed building footprint of the dwelling on Lot 9, and as such requires removal under the current plans.

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1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

5. DISCUSSION (continued)

117*: is a dead tree. It is located within the proposed building footprint of the dwelling on Lot 9, and as such requires removal under the current plans.*

118*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing fair to good health vigour – see figure 95. It has an asymmetric canopy favouring the north/ north-west and deadwood of up to 50mm diameter in up to 10% of the canopy. There is a trunk wound at 3.5m and notable epicormic growth in the upper reaches of its canopy. Tree 188 is located below the existing concrete driveway which is retained by a 1m stone wall. With a level of 18.02, the existing driveway is 1.7m above tree 118's ground level of 16.29. The slab for proposed dwelling's mid level sits above ground in 16.1% of the zone, and the driveway entry ramp sits above ground in a further 17.3%. Any supporting piers must be flexibly located to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In this way, any unavoidable changes to ground levels may be limited within tolerance, avoiding adverse impact to tree health. The new driveway also notionally breaches Tree 118's TPZ, but with an RL of 18.55, it sits above the existing driveway, suggesting limited change to ground levels is required. That said, any engineering requiring excavation must be carefully managed under the supervision of the site arborist to avoid change to ground levels within the SRZ and any significant root disturbance within its TPZ. On this basis, Tree 118 is considered sustainable.

118A*: Buckinghamia celsissima* (Ivory curl tree) is a mature specimen in fair to good health and vigour – see figure 96. It has co-dominant stems at 0.5m and a canopy predominantly in the north. Tree 118A is located under the proposed driveway entry ramp to Lot 9, and as such is deemed unsustainable under the currently specified plans.

119*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen in poor health and vigour – see figure 97. It has a thin and leggy canopy, predominantly in the north, due to overshadowing and significant epicormic growth in the upper canopy with a notable volume of minor deadwood up to 60mm in diameter. There is electrical wiring attached at 4.5m which should be removed for tree health. Tree 119's TPZ and SRZ are notionally breached by the proposed new driveway by approximately 30%. However the tree is located in a garden bed with a ground level of 16.69, surrounded by concrete pathways and below a 1m stone wall retaining the existing concreted driveway with a level of 18.38. The new driveway has a RL of 18.55 at this point, suggesting limited change to ground levels is required. That said, any engineering requiring excavation must be carefully managed to avoid change to ground levels within the SRZ and any significant root disturbance within its TPZ. On this basis, Tree 119 is considered sustainable.

119B*: Syzygium paniculatum* (Magenta Lillypilly) is a mature specimen in fair health and fair to poor vigour – see figure 98. It has a leggy habit and a thin canopy due to the phototropic effect of overshadowing by surrounding trees. There is a remnant pruning scar on its western side at 2m; a branch stub from recent lopping at 3m on its north-western side and a remnant pruning scar at 4.5m on its western side. Tree 119B

is significant as a listed endangered species in NSW under the *Biodiversity Conservation Act 2016.* The slab for the mid-level of the proposed dwelling sits above ground level in 11.8% of Tree 119B's TPZ. Additionally the raised timber stair access to the boatshed is located close to the tree, between the boundaries of Lots 9 and 11. Any supporting piers must be flexibly located to ensure there is no excavation within the SRZ and to avoid any significant root disturbance within the TPZ that may impair tree health. On this basis, with careful management, Tree 119B is not considered significantly impacted by the development as currently specified.

LOT 10

128C*: Glochidion ferdinandi* (Cheese tree) is a mature specimen showing fair to poor health and vigour – see figure 99. It has 3 stems, the eastern stem being dead and lopped. There is a small hollow in its trunk at 300mm from ground: a possible decay site. Its canopy is predominantly in the north. Tree 128C is not directly impacted by the development as currently specified.

129*: Eucalyptus umbra* (Broad-leaved white mahogany) is an over-mature specimen showing poor health and vigour – see figure 100. Its canopy is thin and leggy due to the phototropic effect of overshadowing, and there is significant epicormic growth in its upper canopy and base. It exhibits deadwood up to 70mm diameter in over 5% of its canopy. Tree 129 is not directly impacted by the currently specified plans.

130*: Corymbia maculata* (Spotted gum) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 101. Tree 130 has no branches below 10m, and exhibits deadwood up to 100mm diameter in 5% of its canopy. The mid-level of the proposed dwelling sits above ground in 9.4% of Tree 130's TPZ. As such it is deemed not to be directly impacted by the development as currently specified.

130B*: Banksia integrifolia* (Coast banksia) is a mature specimen showing fair health and vigour – see figure 102. It exhibits a lean to the east due to overshadowing and up to 5% deadwood of up to 40mm in diameter. The mid-level of the proposed dwelling extends above ground in 14.3% of 130B's TPZ. Should pier supports be required within the TPZ, they must be located flexibly to avoid any significant root disturbance. On this basis, Tree 130B is considered not significantly impacted by the currently specified plans.

131*: Corymbia maculata* (Spotted gum) is a mature specimen showing fair health and vigour – see figure 103. The design of the dwelling proposes an elevated slab that floats above Tree 131's TPZ in 25% of its area. Any footings supporting this slab require flexible location and construction specification, such as pier and beam, to avoid any root disturbance within its TPZ. Additionally, an upper level slab cantilevers over the zone at 4.5m – 6m above ground level, requiring no excavation. On this basis, despite being notionally impacted, Tree 131 is considered sustainable given careful management and construction specification.

5. DISCUSSION (continued)

133*: Eucalyptus paniculata* (Grey ironbark) is an over-mature specimen showing very poor health and vigour – see figure 104. It has a pruning stub at 2.5m from a lopped western branch and a large decay site on its south-eastern side where a 150mm branch has been removed (see detail figure 105). It is generally suppressed from overshadowing, with epicormic growth evident in its upper canopy. There is deadwood up to 50mm diameter in over 10% of its canopy. The proposed building footprint intrudes into Tree 133's TPZ by 8.9%. As a result it is deemed not to be directly impacted by the development as currently specified.

134B*: Arbutus unedo* (Irish strawberry) is a mature to over-mature specimen showing fair to poor health and vigour – see figure 106. It has four stems and multiple pruning stubs. There is some epicormic growth on its trunk and stems, and its canopy is suppressed from overshadowing, with over 5% deadwood up to 40mm diameter. The lower-level of the proposed dwelling notionally intrudes into 134B's TPZ by 20.5%. However, the slab has been designed to cantilever at this point, with no resulting impact. While not envisaged, should any pier supports be required, they must be located flexibly to avoid any root disturbance within its TPZ. On this basis, Tree 134B is considered not directly impacted by the development as currently specified.

138*: Agonis flexuosa* (Willow Myrtle). Native to Western Australia, Tree 138 is an over-mature specimen showing poor health and vigour – see figure 107. It has co-dominant stems at 0.8m, a thin canopy and suppressed vigour due to overshadowing. There is evidence of 5% deadwood up to 40mm diameter. It is located within the proposed footprint of the dwelling on Lot 1 and as such it is deemed unsustainable under the currently specified plans.

139*:* is a dead tree (likely *G. robusta*) with compromised structural integrity due to decay, rendering it potentially hazardous – see figure 108. It is located within the proposed building footprint of the dwelling on Lot 1. Tree 139 is recommended for removal and replacement.

139B*: Corymbia maculata* (Spotted gum) is an over-mature to senescent specimen showing very poor health and vigour – see figure 109. Its canopy grows entirely in the south due to overshadowing and comprises over 60% deadwood. There is epicormic growth in its upper crown, and evidence of dead epicormic growth on its northern side. Tree 139B is not impacted by the development, but is nearing the end of its useful life expectancy. As such its ongoing condition should be monitored with consideration of removal should its declining structure become hazardous.

140*: Corymbia maculata* (Spotted gum) is an over-mature specimen showing fair to poor health and vigour – see figure 110. It has a slight lean to the south-west and significant deadwood up to 200mm diameter in up to 10% of the canopy, along with significant epicormic growth in its upper crown. It is significant by size and presence to the site. T140's TPZ is breached in 9.5% of its area by excavation for the proposed lower level slab, which floats above ground in a further 4.6% of the zone. Should any footings be

required, flexible location and construction specification such as pier and beam is required to avoid any root disturbance within its TPZ. On this basis, Tree 140 is not considered significantly impacted by the development as currently specified.

STAG1*:* is a dead tree. It abuts the proposed building footprint of the dwelling on Lot 1, and as such requires removal under the current plans.

STAG2*:* is a dead tree near the eastern boundary of the site. It is not marked on survey.

UN1*: Livistona australis* (Cabbage tree palm) is a mature specimen in fair health and vigour – see figure 111. It is un-numbered on the survey. It is not directly impacted by the development as currently specified.

UN2*: Olea europaea* subsp. *cuspidata* (African olive) is exempt by species[1] and, while located, is un-numbered on the survey. Classified as a priority weed species under the *Biosecurity Act 2015*, it is recommended for removal to prevent its spread.

UN3*: Livistona australis* (Cabbage tree palm) is a mature specimen in fair to good health and vigour. It is un-numbered on the survey and, at 3m is exempt by size.

UN4*: Livistona australis* (Cabbage tree palm) is a mature specimen in fair health and vigour – see figure 112. It is un-numbered on the survey. It is not directly impacted by the development as currently specified.

UN5*: Phoenix canariensis* (Phoenix palm) is exempt by species[1] and, while located, is un-numbered on the survey.

1 As listed in *Table 1-Exempt Tree Species* of article *B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council *Development Control Plan 2014.*

6. RECOMMENDATIONS

The following recommendations have been made with regard to the proposed development of the site at 96–104 Cabarita Road Avalon Beach, and take into account responsible and sustainable tree management and the application of the Northern Beaches Council *Tree Management* guidelines and/or the Australian Standard® AS 4970–2009 *Protection of trees on development sites*.

There are **146 trees** that have been assessed as to potential impact by the proposed development, determined by their location within 5 metres of the proposed building envelopes, and including any significant trees beyond - see figures 1 and 2 and the Tree Summary Table on pages 30 to 34.

Of these, **41 trees** are either dead and present on site as stags, or exempt by size or species according to *Table 1-Exempt Tree Species of article B4.22 Preservation of Trees or Bushland Vegetation* in the Northern Beaches Council Development Control Plan 2014.

Some of these trees may be considered for retention where they are deemed valuable by presence and amenity to the site and are not impacted by the proposed development. Others may be removed and replaced with more valuable plantings as part of a coordinated landscape/ecology plan. Priority weed species, as identified under the *Biosecurity Act 2015*, such as *Olea europaea* subsp*. cuspidata* (African olive), are recommended for removal to prevent their spread.

The **remaining 105 trees** have been assessed as to potential impact of the proposed development. For ease of navigation, recommendations for these trees have been broken down by proposed Lot.

LOT 1 – COMMUNITY TITLE

There are **9 trees** within the assessment zone on Lot 1, including 1 exempt tree (22F). Of the remaining 8 trees:

a) There are four trees (**5, 134, 135** and **136B**) that are not directly or significantly impacted by the proposed development. Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), these trees are deemed viable for retention and protection.

b) There is one tree (**136A**) that is deemed unsustainable under the currently specified plans due to the location within the footprint of the proposed driveway access to Lot 10's dwelling such that its SRZ and TPZ will be breached by its construction. This tree is proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

c) There are three trees (**6, 128B** and **136**) which are potentially impacted by the proposed services infrastructure. The recommended below-ground thrust boring for conduit notionally intrudes into the tree's TPZs by up to 5.5%, 7.2% and 9.3% respectively. However, impact could be mitigated by locating the channel as deep

as possible to reduce the likelihood of encountering significant roots. Any roots over 50mm that require severing, are to be severed under the supervision and only with the approval of the site arborist.

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

LOT 2

There are **25 trees** within the assessment zone on Lot 2, including 5 exempt and 1 dead trees. Of the remaining 19 trees:

a) There are nine trees (**1, 2, 3E, 3H, 4B, 7C, 7D, 7F** and **11A**) that are not directly or significantly impacted by the proposed development**.** Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), these trees are deemed viable for retention and protection**.**

b) There are three trees (**3, 3B** and **3C**) that are deemed unsustainable under the currently specified plans due to its location within, or close to, the proposed building such that their SRZs and/or TPZs will be breached by its excavation and construction**.** These trees are all in poor health and nearing the end of their useful life expectancy. They are proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

c) There are six trees (**3D, 3F, 3G, 4, 8** and **11B**) whose TPZs are notionally breached by the proposed building footprint of the new dwellings. However due the contour of the site and the building elevation, in much of the site the structures are proposed to be built above the trees' ground level, suggesting there is scope to manage construction so as not to adversely impact to tree health.

Of these, trees **3F, 3G** and **11B** require no, or negligible, excavation, however building slabs float above ground in up to 15.5% the TPZ. Tree **8** and **3D** require excavation of 5% and 9.8% respectively, with upper levels floating above ground in between 10-21% of the zone. Any piers required to support these 'floating' slabs must be flexibly located to ensure the SRZs are not breached, and to avoid any significant root disturbance within the TPZs. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health.

In the case of tree **4**, the proposed plans require 11.4% excavation which, being slightly above guidelines, should be undertaken under the supervision of the site arborist to ensure there is no disturbance to significant roots.

On this basis, despite being notionally impacted, these trees considered sustainable given careful management and construction specification.

6. RECOMMENDATIONS (continued)

d) There is one tree, **11**, which is impacted by the proposed development of both Lot 2 and Lot 3 dwellings. The current plans require excavation impacts of 4.3% in Lot 2 and 8.4% in Lot 3, and notional encroachments of 14.8% from upper level floating slabs, possibly requiring supporting piers, albeit flexibly located to minimise impact. That said, the impact may be mitigated by possible irregular root growth due the heavily disturbed ground profile of remnant landscaping, retaining and terracing, and that the proposed excavation is not contiguous. In order for Tree 11 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance within the TPZ, nor adverse impact to tree health. Any roots over 50mm that require severing, are to be severed under the supervision and only with the approval of the site arborist.

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

LOT 3

There are **5 trees** within the assessment zone on Lot 3, including 1 exempt tree. Of the remaining 4 trees:

a) There are three trees (**20, 21A** and **27**) that are not directly or significantly impacted by the proposed development**.** Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), these trees are deemed viable for retention and protection**.**

b) There is one tree (**22**) that is both impacted by the proposed development and in very poor health, with its structure seriously compromised due to decay. It is at the end of its useful life expectancy and is considered potentially hazardous. As such, Tree 22 is recommended for removal and replacement.

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

LOT 4

There are **5 trees** within the assessment zone on Lot 4, Of these:

a) There is one tree (**27A**) that is not impacted by the proposed development**.** Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), tree 27A is deemed viable for retention and protection**.**

b) There are three trees (**22B, 22C** and **22E**) that are deemed unsustainable under the currently specified plans due to the location within, or close to, the proposed building such that their SRZs and/or TPZs will be breached by its excavation and construction**.**

These trees are proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

c) There is one tree (**31**) that is impacted by the proposed development on Lot 4. The current plans require excavation impacts of 14%, with the upper level slab floating above ground in a further 2.4%. That said, the impact may be mitigated by possible irregular root growth due to the heavily disturbed ground profile of remnant landscaping, retaining and terracing. In order for Tree 11 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance within the TPZ, nor adverse impact to tree health. Any roots over 50mm that require severing, are to be severed under the supervision and only with the approval of the site arborist

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

LOT 5

There are **11 trees** within the assessment zone on Lot 5, including 1 exempt tree. Of the remaining 10 trees:

a) There are six trees (**36, 40, 41, 47, 49** and **56**) that are not directly or significantly impacted by the proposed development**.** Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), these trees are deemed viable for retention and protection**.**

Of these, Tree **40** is senescent and in very poor condition, with a decay site and significant deadwood (up to 150mm in up to 60% of its canopy). As such, tree 40's ongoing condition should be monitored with consideration of removal should its declining structure become hazardous.

In the case of trees **49** and **56**, the proposed bio-retention pools require excavation of approximately 12% and 10.8% respectively within the TPZ. Any roots over 50mm that require severing, are to be severed under the supervision of the site arborist.

b) There are two trees (**44** and **47A**) that are deemed unsustainable under the currently specified plans due to their location close to the proposed building such that their SRZs and/or TPZs will be breached by its excavation and construction**.** These trees are proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

c) There are two trees, **45** and **46**, which are impacted by the proposed development in Lot 5. The current plans require excavation impacts of 17.6% and 17.4% respectively within their TPZs. Both trees are located in disturbed ground profile of remnant landscaping and terracing. In order for trees 45 and 46 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that

excavation would not cause significant root disturbance within the TPZ, nor adverse impact to tree health. Any roots over 50mm that require severing, are to be severed under the supervision and only with the approval of the site arborist.

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

LOT 6

There are 34 trees within the assessment zone on Lot 6, including 13 exempt trees. Of the remaining 21 trees:

a) There are nine trees (**54, 55, 62C, 69E, 69I, 70A, 89K, 90A** and **90B**) that are not directly or significantly impacted by the proposed development. Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), these trees are deemed viable for retention and protection.

b) There are nine trees (**67A, 67B, 69C, 69D, 71C, 84B, 86, 89F** and **90**) that are deemed unsustainable under the currently specified plans due to their location within, or close to, the proposed building footprint or council stormwater infrastructure, such that their SRZs and TPZs are breached. These trees are proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

c) There are three trees (**66, 69A** and **82A**) whose TPZs are breached by the proposed building footprint of the new dwelling on Lot 6 or council stormwater infrastructure.

For tree **69A**, excavation for the proposed dwelling is required in 7.4% of its TPZ and above-ground slabs and balcony float in a further 36% of the zone. With **82A**, the lower level slab floats above ground in 16.8% of the TPZ, edging into the SRZ. Any piers required to support these slabs must be flexibly located to ensure there is no intrusion into the SRZ and avoid any significant root disturbance within the TPZs. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health.

In the instance of tree **66**, excavation for the stormwater drain is required in up to 15% of its TPZ. This should be undertaken with the supervision of the site arborist to ensure no significant root disturbance within the TPZ, nor adverse impact to tree health. Any roots over 50mm that require severing, are to be severed under the supervision and only with the approval of the site arborist.

On this basis, these trees are considered sustainable given careful management and construction specification.

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

6. RECOMMENDATIONS (continued)

LOT 7

There are **13 trees** within the assessment zone on Lot 3, including 6 exempt trees. Of the remaining 7 trees:

a) There is one tree (**91**) that is considered not impacted by the proposed development**.** Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), this tree is deemed viable for retention and protection**.**

b) There are five trees (**92A, 93, 94, 94A** and **94B**) that are deemed unsustainable under the currently specified plans. All are located within the proposed building footprint**.** These trees are proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

Of these, trees **93** and **94** are senescent and in very poor condition. Both trees carry significant deadwood (up to 200mm in up to 60% of their canopies), which is potentially hazardous, and they should be removed as reasonable duty of care.

c) There is one tree (**92**) whose TPZ is notionally impacted by the new dwelling on Lot 7, in that the slabs for the lower and mid-level float above ground in 46.4% of the zone, and edging into its SRZ. Flexible location and construction specification of footings, such as pier and beam, is required to ensure the SRZ is not breached, and to avoid any significant root disturbance within the TPZ. In doing so, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health. On this basis, and with due care, tree 92 is considered sustainable given careful management and construction specification.

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

LOT 8

There are **10 trees** within the assessment zone on Lot 8, including 2 exempt trees. Of the remaining 8 trees:

a) There is one tree (**95**) that is not directly impacted by the proposed development**.** Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), these trees are deemed viable for retention and protection**.**

b) There are three trees (**95A, 95B** and **95C**) that are deemed unsustainable under the currently specified plans due to its location within the proposed building footprint**.** Of these 95A and 95C are senescent and in poor health. These trees are proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

6. RECOMMENDATIONS (continued)

c) There are three trees (**96, 97** and **100**) whose TPZs are notionally impacted by the proposed new dwellings. However due the contour of the site and the building elevation, in much of the site the structures are proposed to be built above the trees' ground level, suggesting there is scope to manage construction so as not to adversely impact to tree health.

Of these, tree **96** is impacted on both Lots 7 and 8, but requires negligible excavation within its TPZ. In Lot 7, lower and mid-level slabs sit above ground in 14.3% of the zone and in Lot 8 by an additional 17.5%. Tree **97** is potentially impacted by the proposed dwelling on Lot 8, where the above-ground mid-level slab intrudes into 19.9% of its TPZ.

In the case of tree **100**, the TPZ is impacted in both Lots 8 and 9, with the proposed plans for the lower level of Lot 8 requiring 3.4% excavation in the TPZ, with the slab continuing above ground in a further 14.2%. Additionally the mid-level of the proposed dwelling on Lot 9 sits above ground in a further 9%.

For these trees, any piers required to support above ground slabs must be flexibly located to ensure the SRZ is not breached and to avoid any significant root disturbance within the TPZ. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health. On this basis, despite being notionally impacted, these trees are considered sustainable given careful management and construction specification.

d) Tree **101** is also impacted by the proposed development of both Lot 8 and Lot 9 dwellings. The current plans require excavation impacts of 8.7% in Lot 8 and 9.7% in Lot 9, and notional encroachments of 14.1% in Lot 8 and 16.6 in Lot 9 from upper level floating slabs, possibly requiring supporting piers, albeit flexibly located to minimise impact. That said, the impact may be mitigated by possible irregular root growth due the heavily disturbed ground profile of remnant landscaping, retaining and terracing, and that the proposed excavation is not contiguous. In order for Tree 101 to be retained, a root investigation under supervision of the site arborist would need to demonstrate that excavation would not cause significant root disturbance within the TPZ, nor adverse impact to tree health. Any roots over 50mm that require severing, are to be severed under the supervision and only with the approval of the site arborist.

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

6. RECOMMENDATIONS (continued)

LOT 9

There are **16 trees** within the assessment zone on Lot 9, including 3 exempt and 2 dead trees. Of the remaining 11 trees:

a) There are four trees (**104**, **104A**, **104D** and **104E**) that are not directly or significantly impacted by the proposed development**.**

Of these, trees **104, 104D and 104E** are part of a stand of four *C. maculata* growing closely together in heavily disturbed ground profile alongside a concrete pathway.

Considering their proximity, and likely co-mingled root mass, these trees have been assessed as a group, with excavation required in 3.5% of the combined TPZ and the mid-level slab of proposed dwelling floating above ground through a further 18.6% of the zone. Any supporting piers for this slab must be flexibly located to avoid any significant root disturbance within the TPZs. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and on this basis, despite being notionally impacted, trees 104, 140D and 104E are considered sustainable given careful management.

That said, the trees exhibit general lack of vitality, which is supported by the evidence of suspected *Armillaria luteobubalina* fruiting bodies at the base of 3 of the 4 trees in the stand, which could further impact tree health. As such, their ongoing condition should be monitored with consideration of removal should their declining structure become hazardous.

b) One of the stand of four *C. maculata* described above, tree **103** is dying and carries over 80% deadwood over 120mm in diameter, rendering it hazardous. It also had evidence of the suspected *A. luteobubalina* fruiting bodies at its base. Due to the volume of deadwood and its declining structure, Tree 103 is recommended for removal and replacement

c) There is one tree, **118A,** is deemed unsustainable due to its location under the proposed driveway entry ramp to Lot 9. This tree is proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

d) There are five trees (**102, 102A, 118, 119** and **119B**) that are notionally impacted by the proposed new dwelling on Lot 9. However due the contour of the site and the building elevation, in much of the site the structures are proposed to be built above the trees' ground level, suggesting there is scope to manage construction so as not to adversely impact to tree health.

Of these, trees **102A** and **119B** require no excavation, but slabs float above ground within their TPZs, which may require supporting piers. Tree 119B is also close to the proposed raised timber stair access to the boatshed. In the instance of tree **102**, excavation would be required in 6.6% of its TPZ, with the slab continuing above ground level in a further 15.5% of the zone.

6. RECOMMENDATIONS (continued)

For these trees, any supporting piers must be flexibly located to ensure the SRZs are not breached, and to avoid any significant root disturbance within the TPZs. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health.

Trees **118** and **119** are located in garden beds, surrounded by concrete pathways and terracing, approximately 1.7m below the existing driveway, which is retained by a 1m stone wall, within the trees' TPZs. The proposed new driveway, with an RL of 18.55, sits 0.5m above the concrete surface of the existing driveway (RL18.02), suggesting limited change to ground levels would be required. That said, any engineering requiring excavation must be carefully managed under supervision of the site arborist to avoid change to ground levels within the SRZ and any significant disturbance within the trees' TPZs.

On this basis, despite being notionally impacted, these trees considered sustainable given careful management and construction specification.

Detailed management strategies for these trees is outlined at the end of these recommendations (refer page 80).

LOT 10

There are **18 trees** within the assessment zone on Lot 10, including 3 exempt and 3 dead trees. Of the remaining 12 trees:

a) There are eight trees (**128C, 129, 130, 133, 139B, UN1** and **UN4**) that are not directly or significantly impacted by the proposed development**.** Provided tree protection recommendations are observed with regard to excavation, trunk and surface protection (see appendix B), these trees are deemed viable for retention and protection**.**

   Of these, tree **139B** is in very poor health and is nearing the end of its useful life expectancy. As such, its ongoing condition should be monitored with consideration of removal should its declining structure become hazardous.

b) There is one tree, **138**, that is deemed unsustainable under the currently specified plans due to its location within the proposed building footprint. Tree 138 is proposed to be removed and replaced, ideally with indigenous species, as a part of a coordinated landscape plan.

c) There are three trees (**130B, 131, 134** and **140**) whose TPZs are notionally breached by the proposed building footprint of the new dwellings. However due the contour of the site and the building elevation, in much of the site the structures are proposed to be built above the trees' ground level, suggesting there is scope to manage construction so as not to adversely impact to tree health.

6. RECOMMENDATIONS (continued)

Of these, trees **130B** and **131** require no excavation, however building slabs float above ground within the zone which may require supporting piers within the TPZ. In the instance of tree **140**, excavation would be required in 9.5% of its TPZ, with the slab continuing above ground level in a further 4.6% of the zone. Any supporting piers must be flexibly located to ensure the SRZs are not breached, and to avoid any significant root disturbance within the TPZs. In this way, any unavoidable changes to ground levels within the TPZ may be limited within tolerance, and avoid adverse impact to tree health. On this basis, despite being notionally impacted, these trees considered sustainable given careful management and construction specification.

Detailed management strategies for these trees is outlined below.

Recommended Management Strategies

Being steeply contoured towards the waterfront, in much of the site the proposed development features elevated dwellings with slabs that 'float' above ground. While these slabs notionally encroach into tree protection zones, there is scope to manage construction so as not to adversely impact to tree health.

In these instances, the flexible location of footings, and tree-sensitive construction measures such as pier and beam, suspended slabs, cantilevered building sections, screw piles and contiguous piling can do much to minimise the impact to trees, by limiting the extent of excavation and ensuring there is no significant root disturbance.

During construction process, consideration needs to be given to minimising disturbance within TPZs to avoid root damage. Root damage to and severing of significant roots must be avoided. Any changes to soil levels within the TPZ require appropriate soil fill (sand and/or 80-20) to minimise soil oxygen/moisture changes and impacts to tree health. All new surfaces within the TPZ need to be permeable to allow water infiltration and gas exchange. Areas within the TPZ that will be subject to significant foot or any machinery traffic during the construction process require surface protection (see appendix B).

With regard to the under-driveway services infrastructure, we recommend implementing 'below ground thrust boring' construction method. Individual Lot services infrastructure is to be installed using manual excavation, (i.e. *not* mechanical excavation). The deeper the location of the services infrastructure could reasonably be presumed to equate to the less impact to 'live woody tree roots'. The manual excavation phase is specified to be totally supervised by the site retained Practising/Consulting Arborist. This person must have a minimum AQF level 5 Diploma qualification in Horticulture-Arboriculture or stand-alone Arboriculture in addition to at least five years practical management of 'live woody tree root systems'. Any live woody tree roots greater than 50mm in diameter is considered to be of a 'significant diameter' and as such will require a 'root-by-root management strategy' to be applied and documented in writing by the site's retained Practising/Consulting Arborist, with supporting photographic evidence.

6. RECOMMENDATIONS (continued)

Photographic documentation of the condition of all retained trees is recommended. Documentation should be compiled prior to any work commencing and be updated at 3-monthly intervals during construction and post-construction for a minimum period of 6 months. Annual updates are recommended to form part of the trees' long term management strategy.

It is recommended that trees identified for removal be adequately offset with replacement plantings, ideally indigenous species, as part of a coordinated landscape/ecology plan.

Given the generally ageing condition of the tree population, many trees have been observed as carrying deadwood in their canopies. Any retained trees in areas of traffic or public amenity should have deadwood removed as a reasonable duty of care.

As a consequence of the general age of the tree population combined with the phototropic effect of overshadowing by surrounding trees, the tree canopies generally appear above the height of the proposed dwellings. That said, any tree canopy pruning required to accommodate new built infrastructure separation and the proposed dwellings, should be undertaken under the advice and supervision of the site arborist, in compliance with Australian Standard® AS4373-2007 *Pruning of amenity trees*. (Chapter 7 – *Pruning Classes*: clause 7.1 - *General,* and clause 7.2 - *Crown maintenance*: sub-clauses 7.2.1 – *General*; 7.2.2 – *Dead wooding;* and 7.2.4 – *Selective pruning*.) Any branches over 100mm in diameter are considered significant.

This document supports in concept (from a tree management perspective) the proposal for development, conditional on adequate protection being provided by way of design specification, installation of tree protection and compliance with tree protection measures as specified by the Australian Standard® AS 4970–2009 *Protection of trees on development sites* - see appendix B and the Tree Summary Table on pages 28-31.

If you have any questions relating to this report or implementation of recommendations please call Kyle Hill on 0412 221 962.

Yours faithfully,

Kyle A. Hill – Practising and Consulting Arborist

7. LIMITATIONS ON THE USE OF THIS REPORT

This report is to be utilised in it's entirety only. Any written or verbal submission, report or presentation that includes statements taken from the findings, discussions, conclusions or recommendations made in this report, may only be used where the whole of the original report (or a copy) is referenced in, and directly attached to that submission, report or presentation.

8. ASSUMPTIONS

Care has been taken to obtain information from reliable resources. All data has been verified in-so-far as possible; however, Growing My Way Tree Services, can neither guarantee nor be responsible for the accuracy of information provided by others.

Unless stated otherwise:

Information contained in this report covers only the trees that were examined and reflects the condition of the trees at the time of inspection.

The inspection was limited to visual examination of the subject trees without dissection, excavation, probing or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the subject trees may not arise in the future.

9. RECOMMENDED REFERENCES

Barrell, J. 1993. '*Preplanning Tree Surveys: Safe Useful Life Expectancy (SULE) is the Natural Progression*', Arboricultural Journal 17:1, February 1993, pp.

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Phillip J. Craul, '*Urban Soil in Landscape Design*', J. Wiley & Sons, New York USA 1992

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Hitchmough, J.D. 1994. *'Urban Landscape Management'*, Inkata Press, Sydney.

Mattheck, C. & Breloar, H. 1994 *'Body Language of Trees'*, The Stationery Office, London.

AS4373:2007, *'Pruning of Amenity Trees'*, Standards Australia.

AS4970:2009 '*Protection of trees on development sites*'

APPENDIX A: GLOSSARY

GLOSSARY OF COMMON ARBOREAL TERMS:

Age: **I:** Immature refers to a refers to a well-established but juvenile tree.
SM: Semi-mature refers to a tree at growth stages between immaturity and full size.
M: Mature refers to a full sized tree with some capacity for further growth.
OM: Over-mature refers to a tree about to enter decline or already declining.
S: Senescent refers to a tree in a significant state of decline. This is the last life stage of a tree prior to death.

Crown Foliage Density of Potential (CFDP) refers to the density of a tree's crown in relation to the expected density of a healthy specimen of the same species. CFDP is measured as a percentage.

Decay refers to the break down tissues within the tree. There are numerous types of decay that affect different types of tissues, spread at different rates and have different affect on both the tree's health and structural integrity.

Health refers to the tree's form and growth habit, as modified by its environment (aspect, suppression by other tree, soils) and the state of the scaffold (ie. trunk and major branches), including structural defects such as cavities, crooked trunks or weak trunk/branch junctions. These are not directly connected with health and it is possible for a tree to be healthy but in poor condition/vigour. Classes are: Excellent (**E**), V. Good (**VG**), Good (**G**), Fair (**F**), Declining (**D**), Poor (**P**), Very Poor (**VP**).

Vigour refers to the tree's growth rate/condition as exhibited by the crown density, leaf colour, presence of epicormic shoots, ability to withstand disease invasion and the degree of dieback. Classes are: Excellent (**E**), V. Good (**VG**), Good (**G**), Fair (**F**), Declining (**D**), Poor (**P**), Very Poor (**VP**).

Diameter at Breast Height (DBH) refers to the tree trunk diameter at breast height (1.4 metres above ground level).

Useful Life Expectancy (ULE) refers to any individual tree specimens potential life expectancy (viability) based on VTA assessment, three groups are described,

Short means Less than five (5) years
Medium means five to fifteen (5 to 15) years
Long means more than fifteen (15) years

Significant diameter roots are defined as being greater than 50mm in diameter.

Structural Root Zone (SRZ) refers to a radial offset which relates to tree stability. This zone is presumed to be main location of the tree's structural support roots. It is calculated using the formula SRZ radius= $(D \times 50)^{0.42} \times 0.64$, as defined by AS 4970-2009 *Protection of trees on development sites.* The TPZ of palms, other monocots, cycads and tree ferns is calculated at not less than 1m outside the crown projection.

APPENDIX A: GLOSSARY (continued)

Tree Protection Zone (TPZ) is a "No Go Zone" surrounding a tree to aid in its ability to cope with disturbances associated with construction works. This zone often contains a significant amount (but by no means all) of a tree's fine, non-woody roots required for uptake of nutrients, oxygen and water. Tree protection involves minimising root damage that is caused by activities such as construction. Tree protection also reduces the chance of a tree's decline in health or death and the possibly damage to structural stability of the tree from root damage.

To limit damage to the tree, protection within a specified distance of the tree's trunk must be maintained throughout the proposed development works. No excavation, stockpiling of building materials or the use of machinery is permitted within the TPZ.

The TPZ refers to a radial offset of 12 times the trunk DBH measured from the centre of the trunk, as defined by AS 4970-2009 *Protection of trees on development sites*. The TPZ of palms, other monocots, cycads and tree ferns is calculated at not less than 1m outside the crown projection.

A TPZ is required for each tree or group of trees within five metres of building envelopes.

Stem/bark inclusion refers to a genetic fault in the tree's structure. This fault is located at the point where the stems/branches meet. In the case of an inclusion this point of attachment is potentially weak due to bark obstructing healthy tissue from joining together to strengthen the joint.

Point of Attachment refers to the point at which a stem/branch etc joins.

Dead wood refers to any whole limb that no longer contains living tissues (eg. live leaves and/or bark). Some dead wood is common in a number of tree species.

Die back refers to the death of growth tips/shoots and partial limbs. Die back is often an indicator of stress and tree health.

One dimensional crown refers to branching habits and leaves that extend/grow in one direction only. There are many causes for this growth habit such as competition and pruning.

Epicormic growth/shoots refer to growth/shoots that are/have sprouted from axillary buds within the bark. Epicormic growth/shoots are a survival mechanism that often indicates the presence of a current or past stress even such as fire, pruning, drought etc.

Over Head Powerlines (OHP) refers to over head electricity wiring

LVOHP Low Voltage Over head Powerlines
HVOHP High Voltage Over head Powerlines
ABC Aerial Bundled Cable

APPENDIX B: TREE PROTECTION

- **Tree protection/management prior to and during construction**

  Where possible the installation of Tree Protection Zone (TPZ) fencing is to be carried out prior to commencement of all works. The most suitable fencing material is 1.8m tall chain link mesh with 50mm metal pole supports, see detail 1: tree protection fencing.

  A mulch layer of woodchip (coarse, no fines) to a depth of 75mm is required within the TPZ to aid in retention of soil moisture and to protect soil from contaminants. Water is to be applied by hand held or soaker/leaky hose within TPZ. Watering is to be carried out by either an Arborist or is to form part of the Builder's/Contractor's contract, with recommended monthly checks by the site arborist.

  There is to be no stock piling of building material (including waste), machinery or any other item within TPZ of any retained tree. Access to personnel and machinery, and storage of fuel, chemicals, cement or site sheds shall be managed to minimise impacts to tree health and vigour

  Regular monitoring of protected trees during development works for unforeseen changes or decline, will aid in the success and longevity of the retained trees.

- **Removal of trees** shall be undertaken by accordance with WorkCover NSW *Amenity Tree Code of Practice*, 1998.

- **Alternate construction** methods shall be considered before any excavation into the TPZ is undertaken to reduce impact on trees. Consideration shall be given regarding the use of alternative foundation designs incorporating pier and beam and footings such as post and caisson walls and reverse L-shaped wall footings as an alternative to excavation within the TPZ or as a means of minimising excavation within the Tree Protection Zone. Permeable surface materials shall be used where possible surface to allow gas exchange and water infiltration in areas overlapping the TPZ

- **Excavation** within any TPZ shall be undertaken manually with hand tools, care shall be taken not to damage roots of trees designated for protection. Roots exposed that have a diameter greater than 50mm are deemed significant and shall be managed under the direct supervision of the Site Arborist.

APPENDIX B: TREE PROTECTION (continued)

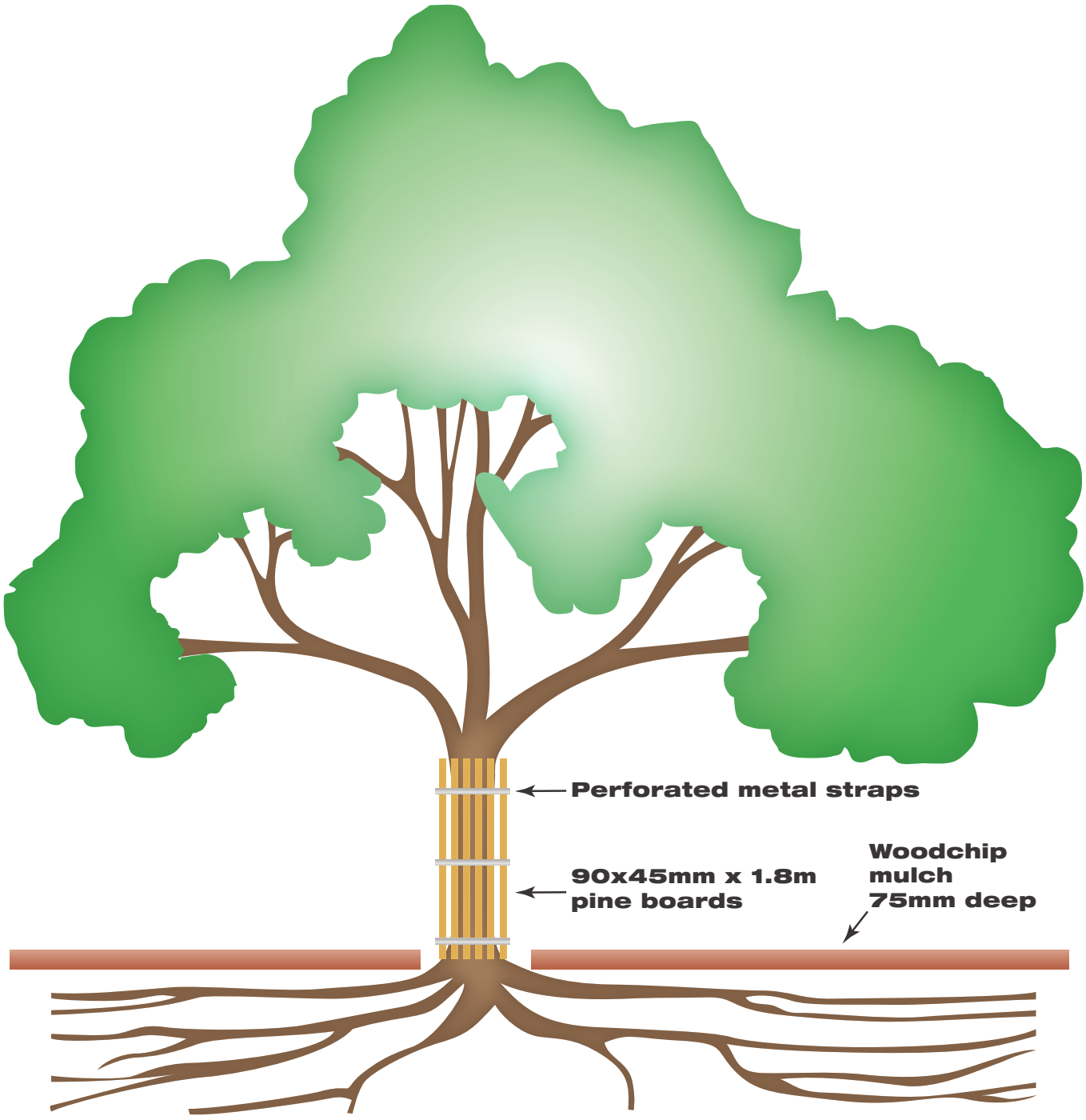

Figure 128: Trunk Protection