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Tree Consultants & Contractors  
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5 June 2025

Heidelberg Materials Pty Ltd  
C/O ESA2  
Attention: Natasha Reifschneider

### **Re: 60 Valley Road and 150 Quarry Road, Langwarrin**

#### **Introduction**

Heidelberg Materials is proposing to extend its sand existing Langwarrin quarrying operations to an adjacent site at 60 Valley and 150 Quarry Road, Langwarrin. In January and March/2024 I assessed the trees outside the boundary of the subject site, as previously assessed and reported on in the arboricultural report by Treelogic dated the 31/03/2023. These trees included all those whose Tree Protection Zones (TPZs) extended close to or overlapped into the subject site. Since my assessments in early 2024 the design has changed relatively modestly. Of relevance to these neighbouring trees outside of the subject site:

The drainage line on the northern and eastern sides of the proposed pit have been moved to be adjacent to the interior of the proposed bund. This has been done to remove any encroachment (from excavation to construct the drainage line) into the TPZs of neighbouring trees to the north and east of the Site.

Galbraith and Associates has now been requested by ESA2 to:

- (1) review the Amended Drawings and changes
- (2) provide a report detailing the neighbouring trees and discussing the likely impact if any to them, as a result of implementing the plans.

The design drawings upon which I base my assumptions are the Amended Drawings by Dartmouth Consulting, including figures WP01Rev B – WP03 Rev B dated 25/Oct/24, WP04 Rev B dated 27/03/25 and the Rev B sections dated 27/03/25.

The tree numbering system I have used is based on that of the arboricultural report by Treelogic dated the 31/03/2023. I have copied and pasted the Appendix 2A plans from that report showing the numbers and locations of the trees on pages 4-6. The locations of the trees as shown on the Treelogic plan are in a number of instances substantially different to where they are actually located. For example, Trees 8-14 are located > 10m north of the boundary, much further away than what is shown on the plan. I have therefore annotated in the table of tree data how far the trunk centres are approximately from the boundary after conducting my own measurements.

The trees are described in the attached tables of data on pages 7-11.

As the trees were all in neighbouring properties which I did not have access to, the trunk diameters were estimated using my vast experience over 30 years plus of measuring trunk diameters. This was relatively easy given that the great majority of the trees of concern are close to the boundaries. For those trees where there is close to or greater than 10% of their TPZ areas overlapping the boundary, distances from the boundary were for the most part determined by pushing a semi-rigid tape measurer towards the trunk centres from the boundary fence.

In relation to trees 48-67, no individuals were checked closely as no works are proposed near these trees. Trees 69 onwards are in the great majority of circumstances set well back from the boundary fence with little or no Tree Protection Zone (TPZ) overlap into the subject site. However all those which had TPZs nearing the boundary or overlapping it were checked closely.

**Tree Protection Zone (TPZ) Explanation** According to the Australian Standard AS 4970-2009 'Protection of Trees on Building Sites', the TPZ is the principal means of protecting trees on development sites. It is a combination of the root area and crown area requiring protection. It is an area isolated from construction disturbance, so that the tree remains viable.' The radius of the TPZ is calculated by multiplying the DBH by 12. The radius is measured from the centre of the stem at ground level. An area of up to 10% of the TPZ area is deemed as minor and acceptable to encroach if 10% of the *area* of the TPZ is made up in other directions. *Thus if encroachment is from one side only, incursion to as close as approximately 8.27 times the DBH (~ 68.7% the listed TPZ radius) is permissible according to the Standard.*

Where the tree has more than one trunk, the TPZ is deduced by taking the square root of the sum of the squares of each of the DBHs, and multiplying this figure by 12

The TPZs as determined by the AS 4970-2009 approach should be construed as a rough guide. Many factors such as the type of encroachment on the TPZ, species tolerance, age, tree height, presence of spiral grain, soil type, soil depth, tree lean, the existence of onsite structures or root directional impediments, level of wind exposure, irrigation and ongoing tree care and maintenance are each highly influential on the size and success of the TPZ estimation.

### **The Trees – General**

The great majority of the trees close to the boundary in the neighbouring properties are self-sown examples of species which occur naturally in the area. So for example, trees 1-46 opposite the northerly boundary consist predominantly of Mealy Stringybark (*Eucalyptus cephalocarpa*), but also represented are Gippsland Manna Gums (*Eucalyptus pryoriana*), Narrow leaved Peppermints (*Eucalyptus radiata*), the odd Swamp Gum (*Eucalyptus ovata*) and weed trees such as Monterey Pine (*Pinus radiata*). Near the south-east and easterly boundaries, these species are again encountered, along with wattles such as Golden Wattle (*Acacia pycnantha*) and Black Wattle (*Acacia mearnsii*) and natives which are regarded as weeds in the area such as Coast Wattle (*Acacia longifolia* ssp *sophorae*) and Coast Tea-tree which are small rambling shrubby trees.

The trees are in variable condition, the dominant height being approx. 12m.

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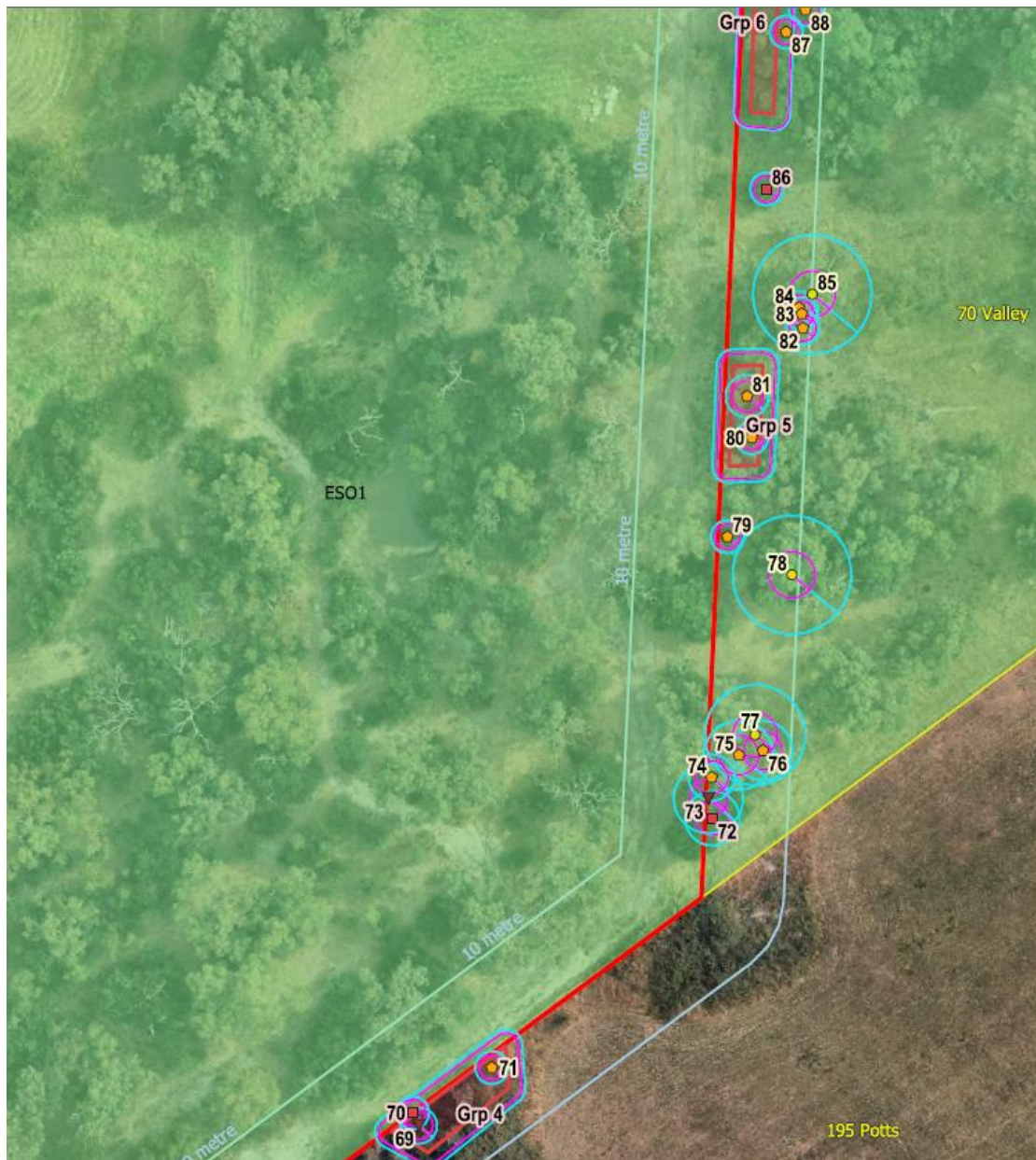
Aerial view of the subject site showing the locations of the trees adjacent to the site as per the Treelogic numbering system.

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Tree No	Species	Distance of the trunk centre from the fence (m)	DBH(cm)	TPZ (m)	SRZ(m)	Condition
1	Eucalyptus ovata (Swamp Gum)	4	40	4.8	2.5	Fair - Heavy lean to the east
2	Eucalyptus pryoriana (Gippsland Manna Gum)	3	33	4	2.4	Fair
3	E. pryoriana	5	33	4	2.4	Fair
4	Pittosporum undulatum (Sweet Pittosporum)		7	2	1.5	Weed - Fair-poor
5	Eucalyptus cephalocarpa (Mealy Stringybark)		34		2.3	Dead
6	E. cephalocarpa		20	2.4	1.9	Good
7	E. cephalocarpa	2.7	22	2.6	2	Fair
Trees 8-14 are greater than 10m from the boundary						
15	E. cephalocarpa	2.7	33	4.0	2.4	Fair – leans SW
16	E. cephalocarpa	2.2	47	5.6	2.5	Good
17	E. pryoriana	4.2	50	6	2.7	Fair
18	E. cephalocarpa	2.2	30		2.2	Dead
19	E. pryoriana	5	60, 55	9.8	3	Top 1/3 is dead
20	E. cephalocarpa	1.0	33	4.0	2.2	Fair
21	E. cephalocarpa		23	2.8	2	Fair
22	Eucalyptus radiata (Narrow leaved Peppermint)	5.0	58	7	2.9	Fair-good
23	E. radiata	6.0	45	5.4	2.6	Fair-good
24	E. cephalocarpa	> 10				
25	E. cephalocarpa	1.3	27	3.3	2.1	Poor – advanced decline
26	E. cephalocarpa		21	2.5	1.9	Fair-poor
27	E. cephalocarpa		22	2.6	1.9	Fair
28	E. pryoriana		40, 43, 37, 35	9.3	3.2	Fair
29						Uprooted
30	E. cephalocarpa	7	29	3.5	2.2	Heavy lean to the SW
31	E. pryoriana	3.5	23	2.8	2	Fair-good
32	E. radiata	5	22	2.6	1.9	Fair

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Tree No	Species	Distance of the trunk centre from the fence (m)	DBH(cm)	TPZ (m)	SRZ(m)	Condition
33	E. pryoriana	5.3	23	2.8	2	Fair-good
34	Pinus radiata (Monterey Pine)	0.6	52	6.3	2.7	Healthy weed tree
35	E. pryoriana	4.6	47, 43		2.7	Dead
36	Pinus radiata		27	3.2	2.1	Healthy weed tree
37	E. radiata	1.7	38, 31	5.9	2.6	Fair-good
38	E. radiata	2.7	33, 30	5.4	2.5	Heavy lean
39	E. radiata	1.7	18, 18, 13	3.4	2	Almost dead
40	E. pryoriana	7	45	5.4	2.3	Fair-poor
41	Acacia longifolia var sophorae (Coast Wattle)	> 10m away				Weed
42	E. pryoriana	4.3	32	3.8	2.2	Fair
43	E. pryoriana	2.0	65	7.8	2.9	Fair – heavy lean to east
44	E. pryoriana	3.0	45	5.4	2.6	Fair
45	E. pryoriana		35	4.2	2.4	Fair
46	E. pryoriana		70	8.4	3	Fair
47	Ac. sophorae		12	2	1.5	Weed
48	Eucalypt		55		2.8	Dead
49	E. ovata		10	2	1.5	Fair
50	E. pryoriana		7	2	1.5	Fair
51	E. pryoriana		8	2	1.5	Fair
52	E. pryoriana		6	2	1.5	Fair
53	E. pryoriana		9	2	1.5	Fair
54	Eucalypt		45		2.6	Dead
55	Ac. sophorae		6	2	1.5	Weed
56	E. pryoriana		45	5.4	2.6	Fair
57	E. pryoriana		50	6	2.7	Fair
58	Ac. pycnantha (Golden Wattle)		10	2	1.5	Fair
59	E. cephalocarpa		16	2	1.5	Fair

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Tree No	Species	Distance of the trunk centre from the fence (m)	DBH(cm)	TPZ (m)	SRZ(m)	Condition
60	Ac. sophorae		20	2.4	1.8	Weed
61	Eucalypt		36		2.3	Dead
62	E. cephalocarpa		15	2	1.5	Fair
63	Eucalypt		42		2.5	Dead
64	Ac mearnsii (Black Wattle)		21	2.5	1.8	Fair-poor
65	Eucalypt		40		2.5	Dead
66	Exocarpus cupressiformis (Wild Cherry)		20	2.4	1.8	Fair
67	Exocarpus cupressiformis		19, 14, 13	3.2	2.1	Fair
68	Pinus radiata	1.5	85	10.2	3.4	Healthy
69	E. cephalocarpa	1.8	18	2.2	1.7	Poor structure
70	Ac. sophorae	0.4	15	2	1.5	Weed
71	E. cephalocarpa		13	2	1.5	Fair
72	Ac. sophorae		18, 15, 14	3.3	2	Weed
73	Eucalypt		35		2.4	Dead
74	E. cephalocarpa	1.9	23	2.8	1.9	Fair-poor
75	E. cephalocarpa	3.3	40	4.8	2.4	Fair
76	E. pryoriana		30	3.6	2.2	Fair
77	E. pryoriana		40, 32	6.1	2.7	Fair-good
78	E. pryoriana		60	7.2	2.8	Fair
79	E. ovata		10	2	1.5	Fair
80	E. ovata		10	2	1.5	Fair
81	E. ovata		22	2.6	1.8	Fair
82	E. cephalocarpa		16	2	1.5	Fair
83	E. cephalocarpa		12	2	1.5	Fair
84	E. cephalocarpa		11	2	1.5	Fair
85	E. cephalocarpa		60	7.2	2.8	Fair
86	Ac. sophorae		6	2	1.5	Weed

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Tree No	Species	Distance of the trunk centre from the fence (m)	DBH(cm)	TPZ (m)	SRZ(m)	Condition
87	E. cephalocarpa		4	2	1.5	Fair
88	Allocasuarina littoralis (Black Sheoak)		14	2	1.5	Fair
89	E. cephalocarpa		75	9	3	Fair
90	E. cephalocarpa		37, 33	5.9	2.7	Fair
91	E. cephalocarpa	6.3	40, 35	6.4	2.9	Fair
92	E. cephalocarpa		30, 20	4.3	2.3	Fair
93	E. cephalocarpa	4.7	45, 36	7.1	2.9	Fair
94	Exo cupressiformis		7	2	1.5	Fair
95	Exo cupressiformis		23, 20	3.7	2.4	Fair
96	Eucalypt		30		2.2	Dead
97	Ac. sophorae		25	3	2	Weed
98	E. cephalocarpa	4.3	30	3.6	2.2	Fair-poor
99	E. cephalocarpa	4	30, 30	4.8	2.4	Poor
100	Eucalypt		30		2.2	Dead
101	E. cephalocarpa		22	2.6	1.8	Poor
102	E. cephalocarpa	4	30, 20	4.3	2.3	Fair
103	E. pryoriana		25	3	2	Fair
104	E. pryoriana		30, 35, 30	6.6	2.7	Fair
105	Leptospermum laevigatum (Coast Tea-tree)		15, 13, 12, 12	3.1	2.5	Weed
106	E. pryoriana	3.5	35	4.2	2.3	Fair-good
107	E. pryoriana	3.3	57	6.8	2.8	Fair-good
108	E. pryoriana		75	9	3.1	Fair
109	E. cephalocarpa		30	3.6	2.2	Fair
110	E. pryoriana		36, 33	5.9	2.8	Fair
111	E. cephalocarpa		30, 15	4	2.4	Fair
112	E. pryoriana		40	4.8	2.5	Fair
113	E. radiata		33, 31	5.4	2.6	Fair-good

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Tree No	Species	Distance of the trunk centre from the fence (m)	DBH(cm)	TPZ (m)	SRZ(m)	Condition
114	E. cephalocarpa		40	4.8	2.5	Fair-poor
Grp 1	Ac. sophorae		6-10	2	1.5	Clump of weed
Grps 2, 3 & 5	Ac. sophorae		< 5	2	1.5	Clump of weed
Grp 4	Ac. sophorae		< 10	2	1.5	Clump of weed
Grp 6	Ac. sophorae, Lep laevigatum & Kunzea ericoides		< 10	2	1.5	Clump of weed

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### Neighbouring Trees whose TPZs Overlap the Subject Site

The trees which have significantly more than 10% of their TPZs overlapping the subject site are as follows:

Tree No	Species	Distance of the trunk centre from the fence (m)	DBH(cm)	TPZ (m)	SRZ(m)	Condition
16	E. cephalocarpa	2.2	47	5.6	2.6	Fair-good
19	E. pryoriana	5.0	60, 55	9.8	3	Fair-poor – top 1/3 dead
20	E. ceph.	1.0	33	4.0	2.2	Fair
25	E. ceph	1.3	27	3.3	2.1	Poor – advanced decline
34	Pinus radiata	60cm	52	6.3	2.7	Healthy weed tree
37	E. radiata	1.7	38, 31	5.9	2.6	Fair-good
38	E. radiata	2.7	33, 30	5.4	2.5	Fair-poor
43	E. pryoriana	2.0	65	7.8	2.9	Fair – heavy lean to east
44	E. pryoriana	3.0	45	5.4	2.6	Fair
70	Ac. sophorae	0.4	15	2	1.5	Weed
107	E. pryoriana	3.3	57	6.8	2.8	Fair-good

Thus if one wishes to absolutely satisfy the Australian Standard guidelines of restricting any excavation into more than 10% of the TPZ areas in order to be highly confident that there will be no impact on the longevity of any of the neighbouring trees, one should avoid any site cuts or excavation within the following distances from the boundary opposite each tree:

1.7m from the fence opposite Tree 16

1.7m from the fence opposite Tree 19 (This tree is in quite poor condition)

1.7m from the fence opposite Tree 20

0.9m from the fence opposite Tree 25 (This tree is already in very poor condition)

3.7m from the fence opposite Tree 34 (This is a weed tree)

2.3m from the fence opposite Tree 37

1m from the fence opposite Tree 38

3.3m from the fence opposite Tree 43

0.2m from the fence opposite Tree 44

1.1m from the fence opposite Tree 70

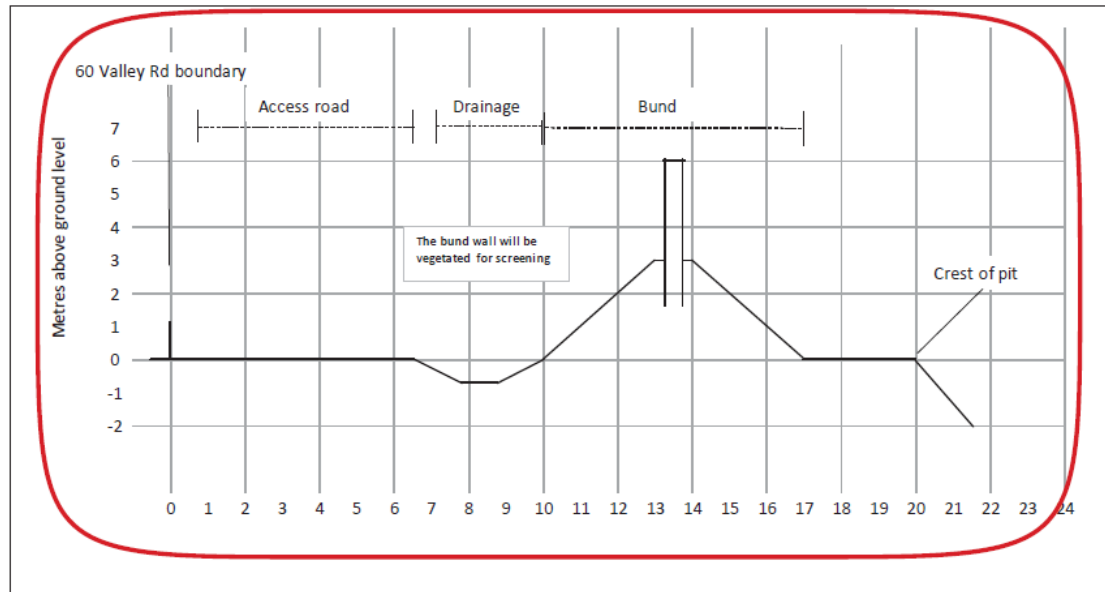
1.4m from the fence opposite Tree 107

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### Impact of the Proposal

The below represents a section from page 13 of the Amended Plans. It is apparent that along the northern boundary, i.e. opposite trees 1-46, there is not proposed to be any excavation within an approximately 6.3m wide strip. The land use of an infrequently used track adjacent to the inside of the boundary is proposed to remain the same, with no alterations. None of the TPZs of any of the neighbouring trees to the north protrude anywhere near 6.3m into the subject site, let alone 10% of the TPZs. Thus one can be extremely confident that there will be no impact on any of these trees from the proposal.



In relation to the trees to the south-east and east of the boundary, i.e. trees 69-114, according to the WP01 Rev B drawing, the battering down for the drainage channel begins at least 3.5m from the boundary. The only tree whose TPZ protrudes into the subject site to an extent anywhere near this distance is Tree 107, whose TPZ overlaps the boundary by 3.5m. Thus there is proposed to be no encroachment into its TPZ, let alone a level of 10% which is permissible according to the Aust Std.

### Conclusion

The Amended Plans according to drawings WP01 Rev B dated 27/Mar/25 and the section above can be readily implemented in a manner in which one may be extremely confident that there will be no adverse impact on any of the neighbouring trees.

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### ***Structural Root Zone***

According to the Aus Std. AS 4970:2009, the structural root zone is the area of the root plate required for a tree's stability. In order to calculate the indicative radius of such a zone from the trunk centre, according to the Aus Std., one uses the following formula: SRZ radius is  $(D \times 50)^{0.42} \times 0.64$ , where D is the trunk diameter in metres taken from just above the root buttress. The minimum indicative SRZ radius is 1.5m for any tree, irrespective of how small. A graph is provided in the Aust Std, with a curve depicted relating the SRZ to trunk diameter. Unfortunately, the calculated figures do not match those derived from the graph. The Aust Std. does not mention from where this formula is taken although acknowledges the publication 'Mattheck, C. & Breloer, H. (1994) *The Body Language of Trees* HMSO Publications' in the preface and bibliography. The figures derived from the graph for the indicative SRZs are far greater than those implied from the curve of 95% fit for the results from studies of upturned root plates of windblown and winched over German trees (see Mattheck, C. & Breloer, H. (1994). Furthermore the figures derived from the graph for the indicative SRZs are far greater than what one calculates them to be, using the formula provided by the Standard i.e.  $(D \times 50)^{0.42} \times 0.64$ . The calculated figures according to the Aust Std. are considerably greater for small and large trunks than those of Mattheck & Breloer.

In reality, the radii calculated whether by graph or using the formula, are much larger than necessary, except in cases such as where the soils are very shallow or where the structural root development is unidirectional or highly asymmetric for some reason, and the excavation is to be within the zone of the roots. **The structural stability generally depends far more on what proportion of the circumference of the tree is to be excavated than the actual distance of excavation from a tree, and this is often not taken into account quite when using the SRZ.**

GALBRAITH & ASSOCIATES

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