BEFORE INDEPENDENT HEARING COMMISSIONERS IN CHRISTCHURCH

TE MAHERE Ā-ROHE I TŪTOHUA MŌ TE TĀONE O ŌTAUTAHI

IN THE MATTER of the Resource Management Act 1991

AND

IN THE MATTER of the hearing of submissions on Plan Change 14 (Housing and Business Choice) to the Christchurch District Plan

---

STATEMENT OF PRIMARY EVIDENCE OF ANDREW RICHARD BENSON ON BEHALF OF CHRISTCHURCH CITY COUNCIL

ARBORICULTURE

Dated: 11 August 2023

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1. My full name is **Andrew Richard Benson**. I am employed as an urban tree ecophysiologist at The Tree Consultancy Company, Auckland.

2. I have prepared this statement of evidence on behalf of the Christchurch City Council (the **Council**) in respect of my input into, and the matters arising from the submissions and further submissions on, Plan Change 14 to the Christchurch District Plan (the **District Plan**; **PC14**).

3. PC14 has identified certain Significant Trees and groups of Significant Trees within Appendix 9.4.7.1 of the District Plan as Qualifying Matter Trees and has proposed changes to certain rules in Subchapter 9.4 that relate to the protection of Significant Trees and Qualifying Matter Trees.

4. This evidence relates to those proposed changes and more specifically the proposed mechanisms for the protection of Significant and Qualifying Matter Trees. This evidence also provides comment on a suitable method to protect street trees (trees other than those identified as Significant or Qualifying Matter trees) from development.

5. I was engaged by the Council to prepare a technical report analysing, and making recommendations on, the three different available methods for determining a zone of setback, or protection around a tree for its preservation (**Technical Report**[1]). The purpose of my Technical Report was to inform and support the Council in developing setbacks from, or protection zones around Significant and Qualifying Matter Trees for their preservation including, any amendments required as part of PC14 to protect Significant Trees and Qualifying Matter Trees in Christchurch from development.

6. In accordance with the recommendations made in my Technical Report, in my opinion the Trunk Diameter Tree Protection Zone method (**Trunk Diameter TPZ Method**) provides the greatest assurance that Significant and Qualifying Matter Trees will receive adequate protection from the impacts of development compared with the other methods.

7. In accordance with the recommendations in my Technical Report the Council proposes – in its s32 report - to adopt the Trunk Diameter TPZ Method by replacing the existing reference to the 'Dripline' with the new 'Tree protection

[1] Andrew Benson, The Tree Consultancy Company. Technical report on Tree Protection Zones. File ref: 2400. 20/06/2022.

zone radius'[2] (**TPZ radius**) for Significant and Qualifying Matter Trees (9.4.4.1.3 (RD5)), and to replace the 10 m setback for Significant Trees from the predator proof fence around Riccarton Bush with the new TPZ radius (9.4.4.1.3 (RD5)).

8. This evidence addresses submissions requesting that the PC 14 proposed changes be rejected and that:

   (a) the 10 m setback from the predator proof fence in Riccarton Bush be reinstated; and

   (b) the reference to the Dripline, be maintained.

9. Having reviewed those submissions it is my opinion that the proposed changes in PC14 are a necessary and appropriate mechanism to provide adequate protection to Significant and Qualifying Matter Trees which, is supported by current science and arboricultural best practice. More specifically:

   (a) a standard 10 m setback from the predator-proof fence around Riccarton Bush may be insufficient to afford adequate protection from development to larger trees around the perimeter of Riccarton Bush. However, if a blanket approach to providing a setback is required for ease of use and enforcement, then it is my opinion that a 15 m setback is more appropriate.

   (b) replacing the Dripline approach with the new TPZ radius, affords greater protection to Significant Trees and Qualifying Matter Trees and is supported by current science and arboricultural best practice.

10. This evidence also addresses a submission that wishes to strengthen protections for trees more generally, that is, beyond the Significant and Qualifying Matter trees, including street trees. In addition to the recommendations above set out in my Technical Report, I also recommend that:

    (a) a new provision within the rules be inserted to require involvement from a Technician Arborist;

[2] means the [circular] protection area around a scheduled tree, which [has a radius that] is equivalent to 15 times the trunk diameter at 1.4 m, where activities and development are managed to prevent damage to a scheduled tree. The maximum extent of a tree protection zone radius is restricted to 15 m.

(b) a new definition is included in PC14 for multi-trunk trees, such as pōhutukawa (*Metrosideros excelsa*); and

(c) the rules to protect street trees are updated to reflect the trunk diameter TPZ method, instead of a 5 m setback approach, and that all street trees have a minimum TPZ radius of 3 m.

INTRODUCTION

11. My full name is **Andrew Richard Benson**. My job title is that of urban tree ecophysiologist at The Tree Consultancy Company. My core role is to provide technical advice regarding the environmental impacts to trees of human activities, such as construction impacts, or changes to the surrounding environment.

12. PC14 has identified certain Significant Trees and groups of Significant Trees within Appendix 9.4.7.1 of the District Plan as Qualifying Matter Trees. Council's section 32 assessment[3] and Significant Trees Qualifying Matters Technical Report[4] describe the importance of Significant and Qualifying Matter Trees and why they are a Qualifying Matter under PC14.

13. In May 2022, I was engaged by the Council to prepare the Technical Report assessing the options available for determining a setback or protection zone from a tree to assist the Council with determining the form of setback or other protection for Significant and Qualifying Matter Trees.

14. In preparing this evidence I have:

(a) Reviewed the proposed Significant and Qualifying Matter Tree provisions in sub-chapter 9.4 of PC14;[5]

(b) Reviewed section 6.25 in Council's section 32 Qualifying Matters report (Part 3) for PC14 relevant to the Significant and Qualifying Matter Tree provisions;[6]

[3] https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Section-32/Plan-Change-14-HBC-NOTIFICATION-Section-32-Qualifying-Matters-Part-3-15-March.pdf
[4] https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Section-32-Appendices-1/QM-Trees-Technical-Report-_Jun2022-FINAL.PDF
[5] Proposed Housing and Business Choice Plan Change (Plan Change 14) https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Provisions/Sub-chapter-9.4-without-9.4.7.1-and-9.4.7.2-FINAL.pdf
[6] Plan Change 14, Section 32 Report: Part 2 – Qualifying Matters (Part 3). https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Section-32/Plan-Change-14-HBC-NOTIFICATION-Section-32-Qualifying-Matters-Part-3-15-March.pdf

(c) Reviewed Council's 'Significant Trees Qualifying Matters Technical Report' attached as Appendix 24 to the section 32 Report;[7]

(d) Reviewed Council's Draft 'Significant and Other Trees Qualifying Matter (including heritage and non-heritage trees) section 42A Report;[8]

(e) Reviewed submissions received that are relevant to my evidence being;

(i) Submission 44 – Riccarton Bush Trust;

(ii) Submission 654 – Wendy Fergusson;

(iii) Submission 814 – Carter Group Ltd;

(iv) Submission 823 – The Catholic Diocese of Christchurch; and

(v) Submission 1011 - John Hardie on Behalf of Trustee of family trust.

(f) Reviewed Council's submission, being CCC PC14 – Appendix 1 – Submission Table; [9]

(g) Reviewed relevant objectives, policies and rules in the operative District Plan; and

(h) Had email and telephone conversations with Mr Toby Chapman (city arborist, the Council) regarding his opinions on appropriate minimum construction / development setbacks for street trees.

15. I am authorised to provide this evidence on behalf of the Council.

QUALIFICATIONS AND EXPERIENCE

16. I have undergraduate degrees in Biomolecular Science (2nd class honours) and Arboriculture (distinction), awarded by the Universities of Wales (Bangor) and Central Lancashire (Myerscough) in the United Kingdom, respectively. I also have a Ph.D. awarded by the New Zealand School of Forestry at the University of Canterbury (Christchurch, NZ), including the Graham Whyte

[7] Plan Change 14, Section 32 Report: Appendix 24 *'Significant Trees Qualifying Matters Technical Report'* prepared by Christchurch City Council dated 30 June 2022 https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Section-32-Appendices-1/QM-Trees-Technical-Report-_Jun2022-FINAL.PDF

[8] PLANNING OFFICER'S REPORT UNDER SECTION 42A OF THE RESOURCE MANAGEMENT ACT 1991 Significant and Other Trees Qualifying Matter (including heritage and non-heritage trees) (13/07/2023)

[9] https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/CCC-PC14-Submission-Appendix-1-Submission-Table.pdf

Forestry Prize for the highest performing post-graduate student, and the T. W. Adams Scholarship.

17. The research which I undertook for my Ph.D thesis explored the origins of long-standing best practice recommendations relating to tree protection on development sites and investigated whether applied science and allometric theory could be used to make improvements.

18. The research questions explored in my thesis looked at how root injuries to mature trees affected their physiological processes, the conclusions of which have an applied nature in modern tree care and have since been used to update current best practice recommendations. I have published my research in various journals and books, and presented at industry conferences in the USA, UK, and Aotearoa New Zealand. A record of my published material can be accessed using my ORCiD[10].

19. I serve on technical review panels for the International Society of Arboriculture and Arboriculture Australia for the development of Best Practice documentation for tree protection on development sites, [tree] root management, urban soil assessment, tree valuation, and tree risk assessment.

20. I have been an invited peer reviewer for several academic journals involving arboricultural, urban forestry, and ecophysiological research.

21. I continue to undertake collaborative root-based arboricultural research projects with The New Zealand School of Forestry (University of Canterbury) and The University of Florida as well as independently at The Tree Consultancy Company.

22. I provide industry training to other arboricultural professionals on how to protect trees on construction sites, and to other disciplines (engineers, architects etc.) on the principles of designing around trees.

23. I am the chair of two working groups within the New Zealand Arboricultural Association, including the chair of the Registered Consultants Programme.

24. I have professional memberships at the New Zealand Arboricultural Association (NZ Arb) and the UK Arboricultural Association (UKAA).

[10] https://orcid.org/0000-0002-4317-7776.

25. I am the nominated expert providing technical arboricultural advice to the Christ Church City Cathedral rehabilitation team, wherein there are three Significant Trees present within the cathedral grounds.

CODE OF CONDUCT

26. While this is not a hearing before the Environment Court, I have read the Code of Conduct for Expert Witnesses (contained in the 2023 Practice Note) and agree to comply with it. Except where I state I rely on the evidence of another person, I confirm that the issues addressed in this statement of evidence are within my area of expertise, and I have not omitted to consider material facts known to me that might alter or detract from my expressed opinions.

SCOPE OF EVIDENCE

27. My statement of evidence addresses the following matters:

    (a) provides a summary of my Technical Report including the reasons why the Trunk Diameter TPZ method using the TPZ radius is the preferred method for establishing a setback or protection zone from Significant and Qualifying Matter trees; and

    (b) responds to relevant submissions.

28. I address each of these points in my evidence below.

TECHNICAL REPORT SUMMARY

29. In May 2022, I was engaged by the Council to prepare the Technical Report[11] analysing three different options for determining a zone of setback, or protection around Significant and Qualifying Matter Trees for their preservation. The scope of the Technical Report was:

    (a) to undertake a document review of the current management regime in the District Plan; and any relevant academic literature; and

    (b) to provide recommendations on the appropriate setback or protection zone from Significant and Qualifying Matter Trees for their preservation.

[11] Andrew Benson, The Tree Consultancy Company. Technical report on Tree Protection Zones. File ref: 2400. 20/06/2022

30. The three following different setback or protection zone options analysed in the Technical Report were:

    (a) the Dripline of the protected tree; and

    (b) a standard 10 m buffer, irrespective of the size of the tree; and

    (c) the trunk diameter of the tree at breast height (1.4 m high) x 15 (or x12) (Trunk Diameter TPZ Method).

31. The purpose of the Technical Report was to provide up-to-date technical information to Council's planners and policy makers on the optimum setbacks or protection zones from trees to protect them from development and to therefore inform and support the Council in developing setbacks from, or protection zones around Significant and Qualifying Matter Trees in Christchurch for their preservation including, any amendments required as part of PC14.

32. The Dripline is defined as the area around a tree that is immediately under the tree's branches and to their farthest extent on all sides.

33. The Tree Protection Zone (**TPZ**) is defined as the area around a tree within which there are sufficient volumes of roots and soil to sustain healthy tree function.

34. The Rootzone is the full extent of a tree's root system, extending to the farthest tips of its root system on all sides.

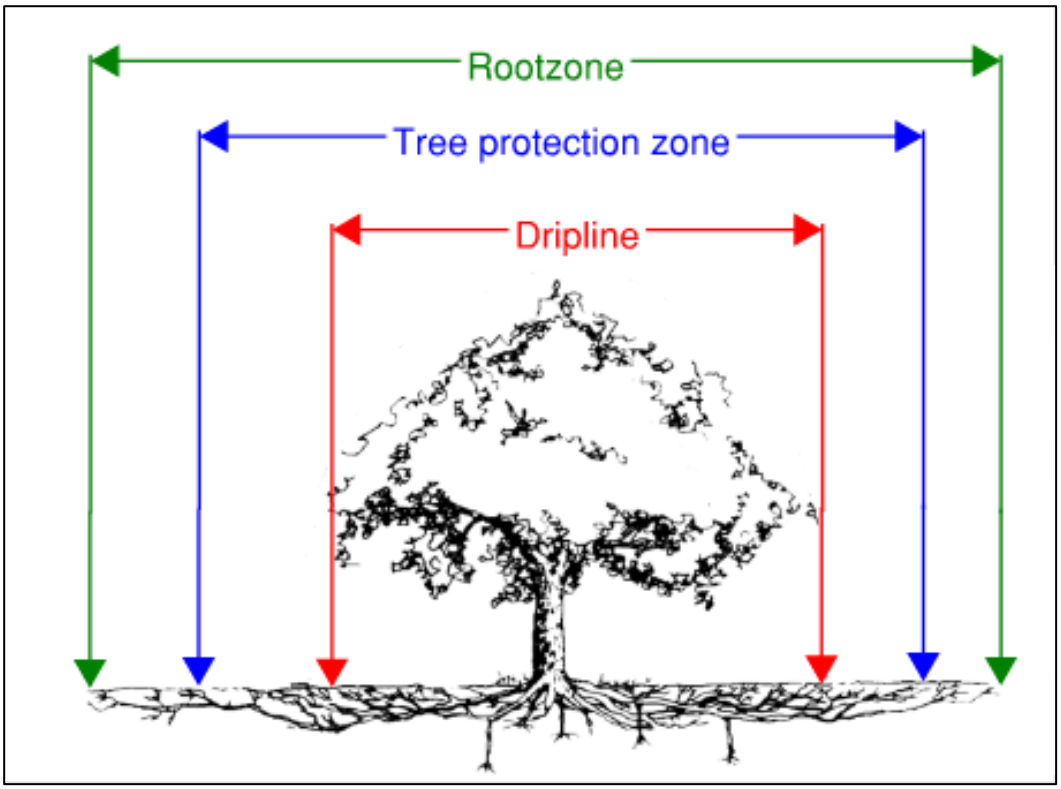


Figure 1: Diagrammatic representation of the definitions.

35. The Technical Report discussed the merits and disadvantages of the three possible setback options (Dripline, 10 m setback and Trunk Diameter TPZ Method). The current planning mechanism in the operative District Plan allows for either the Dripline Method[12] or a fixed distanc[e13] (10 m setback) method, which are easily enforceable within the regulatory framework but lack empirical support.

Dripline Method

36. The Dripline Method often fails to capture a sufficient extent of a tree's root system to provide it with the necessary setback or protection zone during construction, because:

37. Urban trees are often pruned (e.g., to clear utility wires and buildings) which will modify the shape of the crown but not the root system (**Figure 2**).

[12] 9.4.4.1.3, RD5 - Any works within the dripline of a significant tree listed in Appendix 9.4.7.1
[13] 9.4.4.1.3, RD6 - Any of the following within 10 metres of the base of any tree in the Significant Trees area at Riccarton Bush:

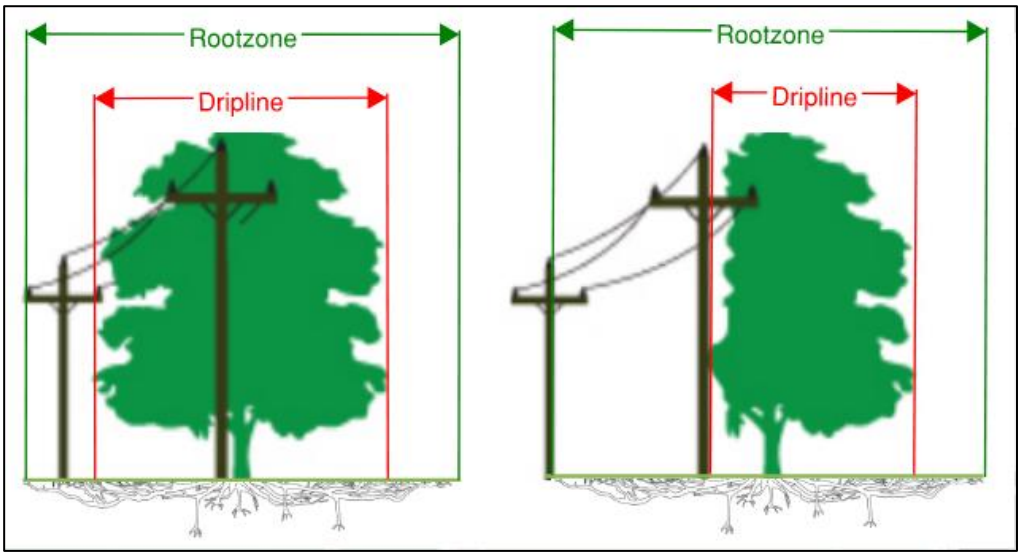


Figure 2: A tree before (left) and after (right) utility line pruning. The tree's dripline has been altered, but its root zone remains unaltered.

38. Some trees are taller than they are wide (known as excurrent), e.g., a Norfolk Island pine tree (*Araucaria heterophylla*) – a common urban tree in many parts of Aotearoa New Zealand – or a native kahikatea (*Dacrycarpus* dacrydioides). In contrast, broadly spreading trees (known as decurrent) such as an English oak (*Quercus robur*), or native pūriri (*Vitex lucens*), are wider than they are tall. The dripline method for ascribing a setback from these two different tree shapes when the trees are the same age, will almost always fail to capture a sufficient portion of the excurrent tree's root system to afford it the necessary protection during development (**Figure 3**).

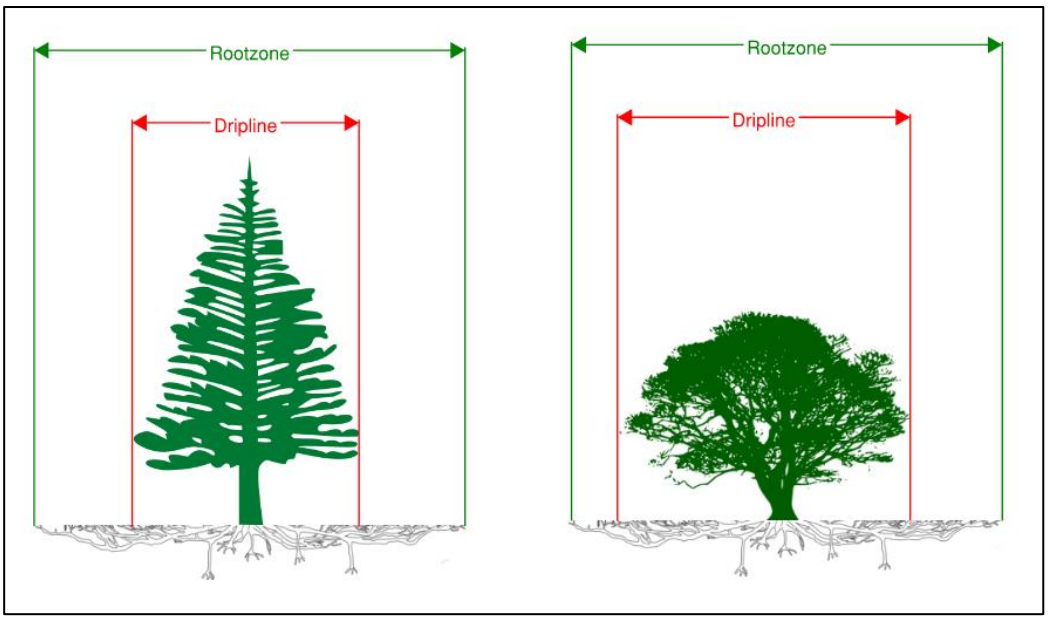


Figure 3: Example of an excurrent (left) and decurrent (right) tree's root zone and dripline. For scale, these trees have similar trunk diameters, which is used a proxy for estimating tree age.

39. Some trees grow asymmetrically because of slopes, or because the tree is leaning towards the light (this is typical of a tree leaning away from a building that is casting shade over its crown). A tree will often have an asymmetric root system to counteract the direction of lean. If the tree tends or leans in a particular direction, then there could be large areas of the root system that are outside of the dripline (**Figure 4**).

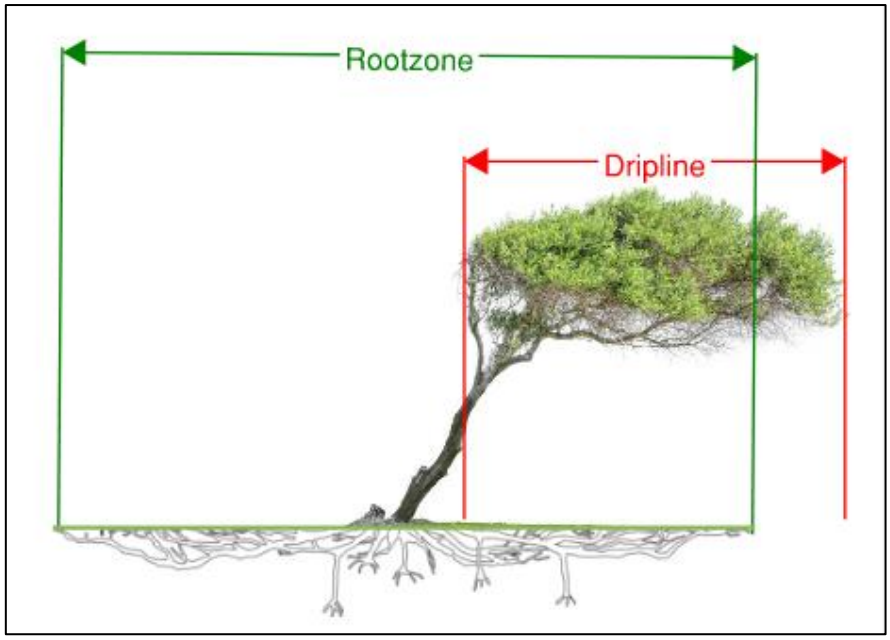


Figure 4: Example of a leaning tree's root zone vs the dripline.

Standard 10 m setback

40. A standard 10 m setback will fail to capture enough ground around a large-growing tree such as an English oak (*Quercus robur*), or tōtara (*Podocarpus totara*) at maturity and will likely provide more space than is necessary for a small-growing tree such as some ornamental magnolias (e.g., *Magnolia delavayi*). This method will likely set aside sufficient space for medium-sized trees (e.g., kōwhai, karaka, titoki) only (**Figure 5**).

41. For example, if the Australian Standard (AS4970:2009) method is applied – which defines a TPZ radius by multiplying the trunk diameter by 12 - then the maximum size for any tree protected by the 10 m setback would be a tree with a trunk diameter of 84 cm (0.84 m x 12 = 10 m). Thus, for any tree that

has a trunk diameter that is bigger than 84 cm, the 10 m setback will be insufficient.

42. The 10 m setback is advantageous for large-growing trees that are in a young age class. For example, a young kahikatea may grow to be 40 m tall with a trunk diameter of over 1 metre. If the young kahikatea is afforded a 10 m setback it will have that much soil area in which to obtain water and minerals and in which to grow a root system so that it may become a mature specimen. But it may become constrained as it reaches maturity, depending on the species of tree, and the nature of the development / infrastructure at the 10 m setback.

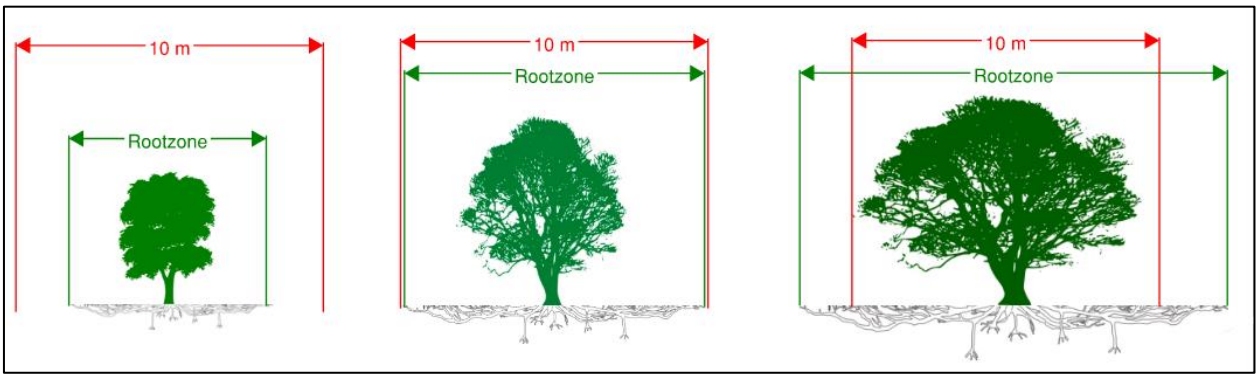


Figure 5: Example of a 10 m buffer applied to a small- (left), medium- (centre), and large-growing (right) tree at maturity.

Trunk Diameter TPZ Method

43. The Trunk Diameter TPZ Method is recognised by the International Society of Arboriculture and standard-setting institutions around the world (e.g., American Standard ANSI A300:2023; Australian Standard AS4970:2009; British Standard BS5837:2012) for the protection of trees on construction sites. The fundamentals of this approach are supported by established scientific principles (e.g., see Day, 2010[14]). This Method is illustrated in **Figure 6** on the next page.

44. The Trunk Diameter TPZ Method defines a TPZ as a circular area around the trunk of a tree with a radius equivalent to a multiple of the tree's trunk diameter at 1.4 m (or thereabouts). The standard multiple of trunk diameter is 12, but this appears to be an artefact of the imperial system of measure

[14] Day S. D, Wiseman P. E, Dickinson S. B, Harris J. R, 2010. *Contemporary concepts of root system architecture of urban trees.* Arboriculture and Urban Forestry 36, 149-59.

(e.g., one foot of TPZ radius for every inch of trunk diameter – see Hamilton, 1988[15]).

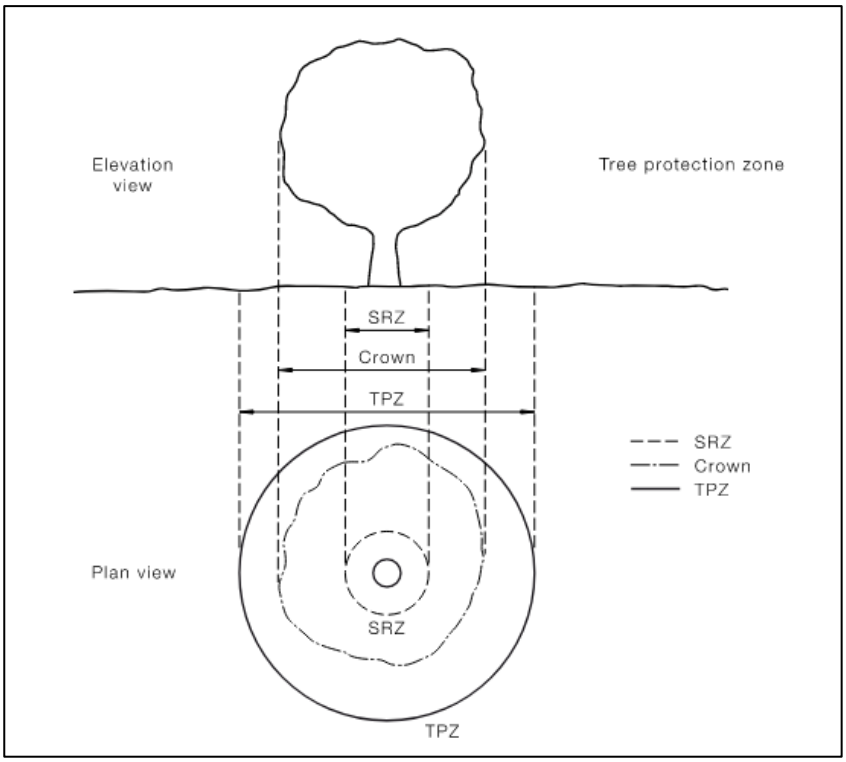


Figure 6: Example of a tree's crown and TPZ. Source – AS4970:2009.
(Note, the SRZ is the structural root zone, which is computed using trunk diameter, but is beyond the scope of this evidence)

45. A recent investigation into the suitability of the 12 x trunk diameter protection zone radius, and other protection zone radii, found that the TPZ radius is more appropriately set at 15 x trunk diameter, to achieve a more optimum standard of protection for trees on construction sites (see Benson, et al., 2019[16]).

46. The Australian and British Standards 'cap' the TPZ radius at 15 m, or an area equivalent to 707 m^2.

Technical Report conclusion and recommendations

47. Based on the current science available, the Technical Report concludes that the Trunk Diameter TPZ method using the TPZ radius is the preferred method for establishing a setback or protection zone from trees.

[15] Hamilton W. D, 1988. *Significance of root severance on performance of established trees*. Journal of Arboriculture 13, 288-92.
[16] Benson A, Koeser A, Morgenroth J, 2019. *A test of tree protection zones: Responses of live oak (Quercus virginiana Mill) trees to root severance treatments.* Urban Forestry & Urban Greening 38, 54-63.

48. The Technical Report therefore recommends that the Trunk Diameter TPZ method using the TPZ radius be adopted including through amendments to PC14. The Technical Report recommends that the tree protection zones (setbacks) from Significant and Qualifying Matter Trees should be ascribed as a circle with a minimum radius equivalent to 15 times the trunk diameter at 1.4 m. If the circular area is obstructed by site features such as buildings that will inhibit root growth and the soil is non-contiguous, then the area of the TPZ that is lost to the obstruction must be made up with soil area that is contiguous to the uninterrupted TPZ.

49. If the tree's branches extend farther than the limit of the trunk diameter-defined TPZ radius, then the TPZ radius must be made bigger to include the tree's branches as well.

50. Based on these recommendations PC14 proposes to replace reference to the Dripline with 'Tree protection zone radius' for Significant and Qualifying Matter Trees (9.4.4.1.3 (RD5)) and replace the 10 m setback for Significant and Qualifying Matter Trees at Riccarton Bush with a TPZ radius (9.4.4.1.3 (RD5)). It is proposed that the tree protection zone radius is established by multiplying the trunk diameter of a tree at 1.4 m by 15.

RESPONSE TO SUBMISSIONS

51. There were several submissions received on PC14 that are relevant to the subject of this evidence which I discuss and respond to below. There were however, no further submissions in relation to my evidence.

Submission 44 – Riccarton Bush Society

52. The relief sought by this submitter relating to the scope of my evidence and expertise is to remove the proposed insertion of the "*tree protection zone radius",* in Rule 9.4.4.1.3 (RD6) and instead maintain the existing rule requiring a 10 m setback from the predator-proof fence at Riccarton Bush.

53. PC14 proposes the following change to Rule 9.4.4.1.3 (RD6), with text struck through to be deleted, and text in *green* to be inserted.

RD6

a. Any of the following within ~~10 metres~~ tree protection zone radius of the base of any tree in the Significant Trees area at Riccarton Bush:

i. works (including earthworks, other than as provided for by Rule 9.4.4.1.1 P12);

ii. vehicular traffic;

iii sealing or paving (*excluding earthworks);*

iv storage of materials, vehicles, plant or equipment; or

v. the release, injection or placement of chemicals or toxic substances.

54. PC14 proposes to include a new definition of 'Tree protection zone radius' as follows:

Tree protection zone radius means the protection area around a scheduled tree, which is equivalent to 15 times the trunk diameter at 1.4m, where activities and development are managed to prevent damage to a scheduled tree. The maximum extent of a tree protection zone radius is restricted to 15 m.

55. The rationale for the relief sought by this submitter is that:

"…tree protection based on buffer of (at least 10m) from the base of the predator proof fence that indicated the "significant tree area" is superior as it protects all the trees withing [sic] *the area including saplings and other smaller (or thinner) trees."*

56. The submitter includes remarks in paragraphs 1.1 and 1.2 of their submission relevant to the scope of this evidence, which I have paraphrased as follows:

(a) Construction impacts (e.g., new buildings and associated infrastructure (utilities, driveways etc.)) can damage tree root systems and reduce soil volume which can have negative impacts on tree health.

(b) Construction impacts can have a negative effect on soil hydrology which can reduce the amount of water to which trees have access, which in turn, can have negative impacts on tree health.

57. Although I agree with the submitter's remarks, in my opinion a 10 m buffer is not superior but rather inferior to a Trunk Diameter TPZ Method based on a TPZ radius for a large tree. For example, a tree with a trunk diameter of 1 m, would require 15 m of TPZ radius (that is, a 15 m setback) under PC14.

58. I understand why the submitter would prefer a simple, easily enforceable setback around Riccarton Bush that captures trees of all sizes. However, in my opinion a blanket 10 m buffer risks jeopardising the preservation of Significant and Qualifying Matter Trees. This risk is demonstrated by the following example.

59. The following images show a small pocket of native bush containing mature kahikatea, pūriri, and kanuka (**Figure 7**). The surrounding pasture was developed, and a concrete driveway was constructed around the trees. The setback from the tree trunks to the edge of the new driveway was approximately 12 m, and approximately 6 m beyond the edge of the Driplines. Six years after the driveway was constructed, the edge trees were dead, because the development changed the soil hydrology (by adding impervious cover and channelling stormwater through pipes to a stormwater pond) and negatively affected the trees' access to groundwater (**Figure 8**).

Figure 7: Pre-development photograph of native trees taken in 2014

Figure 8: Post-development photograph of native trees taken in 2020

60. In my view the adoption of a Trunk Diameter TPZ method using a TPZ radius as recommended in my Technical Report and as proposed by PC14 would mitigate against the risk of trees being impacted by development as they have here.

61. Alternatively however, if the intent of the rule (9.4.4.1.3 (RD6)) is to protect the Significant and Qualifying Matter Trees around the perimeter of Riccarton Bush from the impacts of development and a blanket approach (e.g., a setback from the predator-proof fence) is preferred, then it is my opinion, that the setback should be at least 15 m, which is the maximum TPZ radius within the current best practice documents from Australia (AS4970:2009) and the United Kingdom (BS5837:2012), as well as proposed by PC14.[17] A 15 m setback will provide greater assurances that larger trees (e.g., with a trunk diameter of 0.9 m or more) on the perimeter of the forest will receive adequate protection from the impacts of development, such as those the submitter has highlighted in their submission.

[17] **Tree protection zone radius** *means the protection area around a scheduled tree, which is equivalent to 15 times the trunk diameter at 1.4 m, where activities and development are managed to prevent damage to a scheduled tree. The maximum extent of a tree protection zone radius is restricted to 15 m.* https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Provisions/Plan-Change-14-HBC-NOTIFICATION-Chapter-2-Abbreviations-and-Definitions.pdf

Submission 654 – Wendy Fergusson

62. The relief sought by this submitter relating to the scope of my evidence and expertise is to "*strengthen the requirements for trees*". The provisions proposed by PC14 in relation to Significant and Qualifying Matter trees that seek to adopt the trunk diameter TPZ method are, in my opinion, suitable for broader application to protect other, non-significant or non-qualifying mater trees from development impacts. For example, street trees are often exposed to impacts from development, wherein earthworks and civil / architectural works taking place within a site may impact the root systems of adjacent street trees.

63. Currently, Rule 9.4.4.1.1 (P12) allows for earthworks within 5 m of street trees provided the tree is no taller than 6 m, and that the activity is overseen by a 'works arborist'.

64. A 'works arborist' is defined as:

> *in relation to Sub-chapter 9.4 Significant and other trees of Chapter 9 Natural and Cultural Heritage, means a person who:*
>
> *a) by possession of a recognised arboricultural degree, diploma or certificate and on the job experience, is familiar with the tasks, equipment and hazards involved in arboricultural operations; and*
>
> *b) has demonstrated competency to Level 4 NZQA Certificate in Horticulture Services (Arboriculture) standard (or be of an equivalent arboricultural standard).*

65. If the tree is taller than 6 m, or if the activity is not overseen by a works arborist, then the earthworks within 5 m of the street tree is a Restricted Discretionary Activity under 9.4.4.1.3 (RD8).

66. My analysis of this rule is similar to my analysis of submissions 44 (Riccarton Bush Society), being that having a fixed setback (being 5 m in this instance) will be insufficient to provide the necessary protections for large trees and likely too great to provide immediate protections for small trees.

67. For reference, I have analysed our tree records from 2016 to present (10,324 records), including tree dimensions. Our records show that, of 907 trees in our database that are 6 m tall, the average trunk diameter at 1.4 m is 27.9 cm, which would afford that tree a TPZ radius of 4.2 m (0.279 x 15 = 4.2 m).

68. The current permitted activity rule (9.4.4.1.1 (P12)) allows for earthworks within the TPZ of a 6 m-tall tree. There are no other controls in place, such as a minimum distance from the tree trunk.

69. A more appropriate method of ascribing the setback from street trees, would be to adopt the trunk diameter TPZ radius method, by multiplying the diameter of the street tree's trunk by 15. This is advantageous for the reasons I have previously outlined when I addressed the four submissions above. Briefly again, the trunk diameter TPZ method will ensure that larger trees are afforded an ample setback from development and that smaller trees are not prohibitive to development.

70. There is however, one caveat to the trunk diameter TPZ method that is appropriate to include, in my opinion. The caveat is that I recommend that a minimum setback be provided for all street trees. The reason for this is that if the trunk diameter TPZ method were applied to a young tree – perhaps a tree that had been planted within the preceding three of four years - with a trunk diameter of 10 cm, for example, the trunk diameter TPZ radius afforded to this tree by PC14 would be 1.5 m (0.1 x 15 = 1.5). However, if the young tree is a species that is capable of achieving medium to large dimensions, such as an oak tree (*Quercus robur*), beech tree (*Fagus sylvatica*), or titoki (*Alectryon excelsus*), and a development were allowed to take place up to the 1.5 m TPZ involving new structures and retaining walls etc., then conceivably, the available space to which the young tree has access to grow and develop into its mature size will be restricted. Thus, a minimum setback should, in my opinion, be provided for all street trees, to ensure that the tree can achieve its mature size and provide the benefits identified by Council to Christchurch communities.

71. I have had a discussion with Mr Toby Chapman regarding his opinions of an appropriate minimum setback / TPZ radius for street trees, and he provided his advice to me via email on the 22nd of July 2023. Mr Chapman has investigated a sample of the city's street tree stock and has determined that most trees are at least 2 m from the boundary. He has reconciled this against the proposed new development allowances which allow for development within 1.5 m of the property boundary and has advised that the minimum setback from street trees should be 3 m, (equivalent to a trunk diameter TPZ radius for a tree with a 20 cm trunk diameter – 0.2 x 15 = 3 m).

72. Mr Chapman's reasoning is logical, and I can agree with his recommendation, particularly since he has greater local knowledge of Christchurch, its trees, and the intricacies of the Council's framework of rules.

73. I have analysed our database of tree records, and of 2,293 street trees that have been recorded since 2016, 769 of those trees have a trunk diameter of 20 cm or less. Mr Chapman's minimum setback of 3 m will afford protection to approximately one third of the street tree population by default, before needing to rely upon the trunk diameter TPZ method.

Submission 814 – Carter Group Ltd.

74. The relief sought by this submitter relating to the scope of my evidence and expertise is to reinstate the existing Dripline Method and delete the proposed definition of 'Tree protection zone radius'.

75. The rationale for the relief sought is that:

    (a) *"This definition [Dripline] is deleted, evidently, on the basis that it will be replaced by a new definition of 'Tree protection zone radius'. The dripline definition is preferred on the basis that it is more readily understood."*

    (b) *"The definition is highly subjective, lacks clarity and specificity, and is open to conflicting interpretation."*

76. I have set out the reasons why the Dripline Method of ascribing a tree protection zone or setback from a tree is unsuitable in the Technical Report (as summarised in my evidence above). Referring to the example illustrated in **Figure 7** and **Figure 8** and discussed above, the new driveway construction that resulted in the demise of these trees was constructed several metres beyond the Driplines. Whilst I can accept that the Dripline Method is readily understood by lay persons, the introduction of the Trunk Diameter TPZ Method using a TPZ radius as recommended in my Technical Report and proposed by the Council in PC14 provides greater assurance that Significant Trees and Qualifying Matter Trees will be protected compared with the Dripline Method.

77. It is acknowledged that the Trunk Diameter TPZ Method using a tree protection zone radius relies more upon specialist arboricultural expertise.

78. If, for example, a prospective applicant sought to develop a site that contained a Significant Tree, then they would need to obtain specialist advice

from an arboricultural expert (among other experts) to help inform that process and to navigate the provisions of the District Plan. I would expect that arboricultural expert to be adequately qualified and equipped to measure the circumference of a tree's trunk and to undertake some basic mathematical computations to calculate the TPZ radius.

79. However, irrespective of this need for expertise, my opinion remains that using the proposed TPZ radius optimises tree protection compared with other methods.

80. The proposed objectives and policies of Subchapter 9.4[18] are as follows:

9.4.2.1.1 Objective — Trees

(a) Maintain and enhance the contribution of the Christchurch District's significant trees listed in Appendix 9.4.7.1, and trees in road corridors, parks, reserves and public open space, to community amenity through:

9.4.2.2.3 Policy – Tree protection

(a) Protect from inappropriate physical works:

(i) trees that are listed in Appendix 9.4.7.1, particularly those trees identified as having exceptional values and those trees identified as qualifying matters; and

81. To receive adequate protection from development (among other things). a proper level of setback needs to be applied that reflects current science and arboricultural best practice. The Trunk Diameter TPZ Method using the TPZ radius would in my opinion achieve this outcome.

82. With respect to the use of Technician Arborists, I note that that elsewhere in the District Plan, there are requirements for a Technician Arborist to be involved in arboricultural decisions. For example, PC14 Rule 9.4.4.1 (P4):[19]

[18] https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Provisions/Sub-chapter-9.4-without-9.4.7.1-and-9.4.7.2-FINAL.pdf
[19] https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Provisions/Sub-chapter-9.4-without-9.4.7.1-and-9.4.7.2-FINAL.pdf

P4 ***Felling of***

(a) any significant tree (not including qualifying matter trees) listed in Appendix 9.4.7.1, other than provided for by Rule 9.4.4.1.1 P8 or P10, and except:

(i) when complying with permitted built form standards for the medium density residential zone (14.5.2) or high-density residential zone (14.6.2)

(ii) when required to meet an unobstructed outlook space standard

(iii) when complying with controlled subdivision activities under 8.5.1.2

(b) Any qualifying matter tree listed in appendix 9.4.7.1

83. The Activity-Specific Standard for this rule is:

(a) The tree shall be certified by a ***technician arborist*** *as:*

(i) dead; or

(ii) having a loss of structural integrity where the defects cannot be rectified and maintenance practices cannot improve the framework of the tree or mitigate threats to the safety of persons or property.

(b) Prior to felling the tree, a tree removal certificate shall be submitted to the Council with the information supplied to be in accordance with Appendix 9.4.7.3 Tree Removal Certificate. A Technician Arborist is defined in the District Plan[20] as:

(a) In relation to Sub-chapter 9.4 Significant and other trees of Chapter 9 Natural and Cultural Heritage, means a person who:

(i) by possession of a recognised arboricultural degree or diploma and on the job experience, is familiar with the tasks, equipment and hazards involved in arboricultural operations; and

[20] https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Provisions/Plan-Change-14-HBC-NOTIFICATION-Chapter-2-Abbreviations-and-Definitions.pdf

(ii) *has demonstrated proficiency in tree inspection and evaluating and treating hazardous trees; and*

(iii) *has demonstrated competency to Level 6 NZQA Diploma in Arboriculture standard (or be of an equivalent arboricultural standard).*

84. The requirement for a Technician Arborist to be involved in tree protection decisions is already present in the Christchurch Construction Standard Specification.[21]

22.3.2 Tree Management Plan

Where it is not possible to complete the works without encroaching within the Tree Protection Zone, a proposed methodology in the form of a Tree Management Plan, which is produced by a technician arborist, shall be submitted to the Council's arborist for approval at least 5 working days prior to work commencing within the vicinity of any tree/vegetation.

85. The requirement for a Technician Arborist to be involved in tree protection decisions is also present in the Christchurch City Council Tree Policy:[22]

3.1 *A Tree Protection Management Plan (TPMP) is to be submitted to us for any activity or work proposed near one of our trees where the works are likely to impact on the tree or its root zone.* The Tree Protection Management Plan is to be prepared by a Technician Arborist as follows:

Tree Protection Management Plan

Where it is not possible to complete the works without encroaching within the Tree Protection Zone, a proposed methodology in the form of a Tree Management Plan shall be produced by a technician arborist as per the specifications within the relevant sections of the CSS.

86. Given the value of the Significant Trees and Qualifying Matter Trees already determined by Council's section 32 assessment and supporting technical reports, and having regard to the Objectives and Policies of Subchapter 9.4, it is appropriate, in my opinion, to ensure that a Technician Arborist is involved in tree protection management decisions for Significant Trees and

[21] https://ccc.govt.nz/assets/Documents/Consents-and-Licences/construction-requirements/CSS/Download-the-CSS-2022/CSS-2022-PART-1-GENERAL.PDF
[22] https://ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Policies/Trees/Tree-Policy.pdf

Qualifying Matter Trees, just as a Technician Arborist must be involved in certifying dead trees in Rule 9.4.4.1 (P4).

87. Having a Technician Arborist involved in tree protection management decisions for Significant and Qualifying Matter Trees would:

    (a) alleviate the submitter's concerns about the complexities of the TPZ radius calculations by engaging a professional who is qualified and competent to make the necessary calculations;

    (b) ensure that the Objectives and Policies set out in Subchapter 9.4 are met and that Significant and Qualifying Matter trees are afforded adequate protection;

    (c) align with other policy documents already in place within Council's framework; and

    (d) also help to strengthen the requirements for trees, as was raised by submission 654 – Wendy Fergusson.

88. The Technician Arborist would be required to be involved in providing expert involvement for tree protection management decisions around Significant and Qualifying Matter trees during Restricted Discretionary Activities, e.g., rule 9.4.4.1.3 RD5 and 9.4.4.1.3 RD6. I defer to Council's planners and policy makers as to the appropriate wording for including in the rules a requirement for a Technician Arborist to be involved in tree protection management decisions for Significant and Qualifying Matter Trees.

89. With respect to the submitter's comment that, the definition of 'Tree protection zone radius' is highly subjective, lacks clarity and specificity, and is open to conflicting interpretation, I note that there is no definition for trunk diameter proposed in the PC14 version of Chapter 2: Abbreviations and Definitions.[23] In my opinion, there needs to be a definition included in PC14 for multi-trunk trees, such as pōhutukawa (*Metrosideros excelsa*).

90. Appended to this evidence as **Appendix A** is the definition of trunk diameter for single and multi-trunk trees that is included in the Australian Standard (AS4970:2009), which could be easily replicated for Christchurch's District Plan. Also appended to this evidence as **Appendix B** is an Excel spreadsheet that will compute the trunk diameter of multi-trunk trees, which I

[23] https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Provisions/Plan-Change-14-HBC-NOTIFICATION-Chapter-2-Abbreviations-and-Definitions.pdf

am happy to share with Council to disseminate as they wish to Significant Tree and Qualifying Matter Tree owners and arboricultural professionals in Christchurch, to assist with the necessary computations.

Submission 823 – The Catholic Diocese of Christchurch

91. The relief sought by this submitter relating to the scope of my evidence and expertise is to reinstate the existing Dripline Method and delete the proposed definition of 'Tree protection zone radius'.

92. The rationale for the relief sought is that:

    (a) "*This definition [Dripline] is deleted, evidently, on the basis that it will be replaced by a new definition of 'Tree protection zone radius'. The dripline definition is preferred on the basis that it is more readily understood.";* and

    (b) The definition ['Tree protection zone radius'] is complex and is open to conflicting interpretation. The definition of 'dripline' is preferred.

93. This submission is almost identical to that of Submission 814 – Carter Group Ltd. My comments in relation to submission 823 are the same as those I have made for Submission 814.

Submission 1011 - John Hardie on Behalf of Trustee of family trust

94. The relief sought by this submitter relating to the scope of my evidence and expertise is to remove the proposed insertion of the "*tree protection zone radius",* in Rule 9.4.4.1.3 (RD6) and instead maintain the existing rule requiring a 10 m setback from the predator-proof fence at Riccarton Bush. The submission relates specifically to number 48 Rata Street (legally described as described as Lot 375 DP 11261).

95. The rationale for the relief sought is that:

    "It is unworkable. It appears to apply to all trees are [sic] *not just the kahikatea tree. It would require all trees in the bush to be measured on a continuing basis because of a change in trunk diameter."*

96. My reading of the PC14 version of Rule 9.4.4.1.3 is that the 10 m setback restriction remains for this property's northern boundary.

RD6

b. In the case of the property at 48 Rata Street (legally described as Lot 375 DP 11261) the 10-metre restriction shall only apply to the northern boundary of that property.

97. Nevertheless, my comments in relation to this submission are the same as those for Submission 44 – The Riccarton Bush Trust, wherein a standard 10 m setback will be insufficient to protect the largest trees from construction impacts, e.g., those with a trunk diameter greater than 0.67 m (0.67 x 15 = 10 m).

98. Where the submitter remarks:

"It would require all trees in the bush to be measured on a continuing basis because of a change in trunk diameter"

99. This is precisely the point of using the Trunk Diameter TPZ method, so that a setback / zone of protection is set based on the specific site / tree characteristics. However, the tree(s) need not be measured on a continuing basis. I t need only be measured once, during the planning / design phase of a prospective development, as would be expected for any other planning application involving development around a significant tree.

100. Since the submission is specific to a single property, as has been reflected in Rule 9.4.4.1.3, *all trees in the bush* need not be measured, only those around the western and northern sides of the property, being those that border Riccarton Bush. I expect any competent consultant arborist to be able to carry out this task with little effort.

101. In my opinion, an optimum level of protection for the significant trees within Riccarton Bush around 48 Rata Street can be achieved by adopting the Trunk Diameter TPZ method. If a simple blanket approach is preferred, then the setback should, in my opinion, be 15 m from the trunk of any tree. Where the submitter remarks that *the 10 m setback was measured from a predator proof fence situated 4 m inside the Bush property*, the zone of protection / setback within 48 Rata Street would be 11 m from the boundary if the blanket setback of 15 m from the predator-proof fence is adopted.

Submission of the Christchurch City Council

102. The relief sought by the Council in relation to 9.4.4.1.3 (RD6) is to "decline the change to insert the 'tree protection zone radius" and maintain the 10 m setback control."

103. The rationale for the relief sought is that:

> *"The phrasing proposed for RD6 appears to have been an oversight, for the simple reason that there is no ability to measure tree trunk when the rule specifies that the trunk is the predator-proof fence. The original rule deliberately used the predator-proof fence as the base for measurement to make the measurement easier and uniform, and apply to mature trees as well as saplings that, without disturbance or damage will eventually grow. Another reason for using the predator-proof fence as a "base of a tree" within the old City Plan rules was that Riccarton Bush is treated as one entity, rather than a collection of individual trees within, and is shown as such on the maps. In this respect, a more appropriate control may simply be retaining the current controls due to the unique circumstances under which the Bush is protected in the Plan."*

104. The relief sought by this submitter is the same as that sought by Riccarton Bush Society. For the reasons discussed in 57 to 61 in relation to the Riccarton Bush Society, in my opinion the proposed replacement of the current 10 m setback from the predator-proof fence at Riccarton Bush with the new "tree protection zone radius" method in Rule 9.4.4.1.3 (RD6) will achieve a more optimum standard of tree protection, because a 10 m setback may be insufficient to afford adequate protection from development to larger trees around the perimeter of Riccarton Bush.

105. However, if a blanket approach (e.g., a setback from the predator-proof fence) is preferred for brevity and ease of use, then it is my opinion, that the setback should be at least 15 m, which is the maximum tree protection zone radius within the current best practice documents from Australia (AS4970:2009) and the United Kingdom (BS5837:2012), as well as proposed by PC14[24]. A 15 m setback will provide greater assurances that larger trees (e.g., with a trunk diameter of 0.9 m or more) on the perimeter of the forest will receive adequate protection from the impacts of development.

[24] **Tree protection zone radius** *means the protection area around a scheduled tree, which is equivalent to 15 times the trunk diameter at 1.4 m, where activities and development are managed to prevent damage to a scheduled tree. The maximum extent of a tree protection zone radius is restricted to 15 m.* https://www.ccc.govt.nz/assets/Documents/The-Council/Plans-Strategies-Policies-Bylaws/Plans/district-plan/Proposed-changes/2023/PC14/Provisions/Plan-Change-14-HBC-NOTIFICATION-Chapter-2-Abbreviations-and-Definitions.pdf

CONCLUSION

106. PC14 has identified certain Significant Trees and groups of Significant Trees within Appendix 9.4.7.1 of the District Plan as Qualifying Matter Trees and has proposed changes to certain rules in Subchapter 9.4 that relate to the protection of Significant Trees and Qualifying Matter Trees.

107. The proposed changes would replace reference to the Dripline with 'Tree protection zone radius' for Significant and Qualifying Matter Trees (9.4.4.1.3 (RD5)) and replace the 10 m setback for Significant Trees at Riccarton Bush with a TPZ radius (9.4.4.1.3 (RD5)). After reviewing the documents referenced in Paragraph 14 of this evidence, I conclude that:

    (a) The proposed change to Rule 9.4.4.1.3 (RD6) that replaces the standard 10 m setback from the predator-proof fence around Riccarton Bush with a tree protection zone radius equivalent to 15 times the trunk diameter of a tree, is appropriate because a 10 m setback may be insufficient to afford adequate protection from development to larger trees around the perimeter of Riccarton Bush. Alternatively, if a blanket approach to providing a setback is required for ease of use and enforcement, then it is my opinion that a 15 m setback is more appropriate.

    (b) The proposed change to Rule 9.4.4.1.3 (RD5) that replaces the Dripline Method with the Trunk Diameter tree protection zone radius, is an appropriate and necessary mechanism to afford protection to Significant Trees and Qualifying Matter Trees that meets the Objectives and Policies set out in the District Plan and is supported by current science and arboricultural best practice.

    (c) A provision within the rules relating to development and construction around Significant and Qualifying Matter Trees in Subchapter 9.4 that requires involvement from a Technician Arborist, should be included with PC14.

    (d) A new definition for trunk diameter is required for multi-trunk trees, such as pōhutukawa (Metrosideros excelsa). The definition of trunk diameter for single and multi-trunk trees that is included in the Australian Standard (AS4970:2009) could be adopted.

(e) Street trees should be protected from development by using the trunk diameter TPZ method and there should be a minimum setback of 3 m from all street trees.

11 August 2023

Andrew R. Benson (Ph.D., BSc, FdSc)

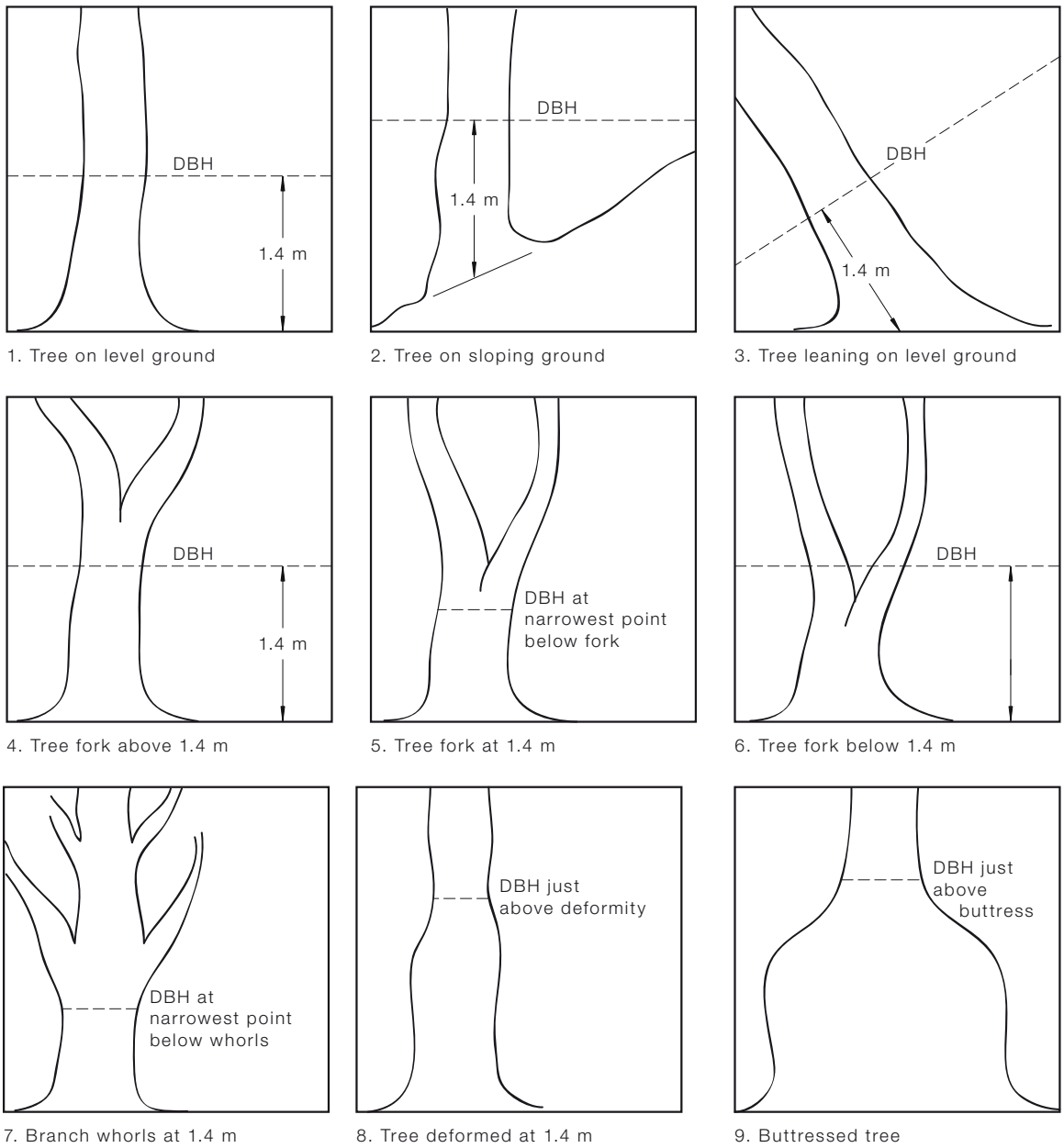
APPENDIX A – DIAMETER AT BREAST HEIGHT (DBH)

APPENDIX A

DIAMETER AT BREAST HEIGHT (DBH)

(Informative)

The diversity of trunk shapes, configurations and growing environments requires that DBH be measured using a range of methods to suit particular situations and Figure A1 provides examples.



NOTE: For example 6, the combined stem DBH may be calculated using the formula:

$$\text{Total DBH} = \sqrt{(\text{DBH}_1)^2 + (\text{DBH}_2)^2 + (\text{DBH}_3)^2}$$

FIGURE A1 MEASUREMENT OF DBH OF A TREE

APPENDIX B – TRUNK CIRCUMFERENCE & DIAMETER

Use this sheet if you are measuring trunk CIRCUMFERENCE
Measure the trunk circumference at 1.4 m above the ground
Only include trunks that have a circumference of 230 mm or more
Input all dimensions in millimetres

Trunk #	Circumference (mm)	Diameter (mm)
Trunk 1		
Trunk 2		
Trunk 3		
Trunk 4		
Trunk 5		
Trunk 6		
Trunk 7		
Trunk 8		
Trunk 9		
Trunk 10		
Trunk 11		
Trunk 12		
Trunk 13		
Trunk 14		
Trunk 15		
Trunk 16		
Trunk 17		
Trunk 18		
Trunk 19		
Trunk 20		

TRUNK DIAMETER IN METRES
0.00

TREE PROTECTION ZONE RADIUS IN METRES
0.0

Use this sheet if you are measuring trunk DIAMETER
Measure the trunk diameter at 1.4 m above the ground
Only include trunks that have a diameter of 75 mm or more
Input all dimensions in millimetres

Trunk #	Diameter (mm)
Trunk 1	
Trunk 2	
Trunk 3	
Trunk 4	
Trunk 5	
Trunk 6	
Trunk 7	
Trunk 8	
Trunk 9	
Trunk 10	
Trunk 11	
Trunk 12	
Trunk 13	
Trunk 14	
Trunk 15	
Trunk 16	
Trunk 17	
Trunk 18	
Trunk 19	
Trunk 20	

TRUNK DIAMETER IN METRES
0.00

TREE PROTECTION ZONE RADIUS IN METRES
0.0