Ask the Arborist

Chris Benton
021 256 7400
chris@askthearborist.co.nz

ARBORICULTURAL REPORT: TREE RISK ASSESSMENT
WESTERN SPRINGS FOREST – PINE STAND
August 2019

Introduction

1. This is a report setting out my findings of a tree risk assessment of the stand of *Pinus Radiata* growing on the southern aspect of West View Road ("the Stand"). The stand forms the Western Springs Forest (the "Forest") in the northern corner of Te Wai Orea – Western Springs Lakeside Park. I conducted the tree risk assessment during July and August 2019 at the request of the Society for the Protection of Western Springs Inc ("the Society").

Qualifications and Experience

2. I gained a Certificate in Horticulture from Christchurch Polytech, a New Zealand Certificate in Arboriculture and diploma level passes in Professional Arboricultural Practice, Advanced Tree Biology and Mechanics, Arboricultural Specialist Practices, Tree Inspection and Hazard Analysis, Tree Management 1 and 2, Classification and Identification of Trees, Managing Tree Health and Amenity and Tree Evaluation 1 and 2 from Waikato Polytechnic (now Wintech), finishing three years of full time study in 1998.

3. I began my arboricultural career as a climbing arborist in 1996 with the Hamilton City Council. As Operations Manager with Asplundh Tree Expert (NZ) Ltd in the early 2000s I managed the delivery of all the major municipal arboricultural contracts in the Auckland area including to Auckland City Council prior to its super city status. I have been Parks Arborist for North Shore City Council and have gained significant experience in the management of public trees in parks and reserves.

4. I have more than 12 years' professional New Zealand experience as a Consulting Arborist and am currently a director of Ask the Arborist Limited, an arboricultural consultancy company which I established in 2007. I have gained significant experience as a Consulting Arborist, managing trees for both private clients and local councils, including consultation relating to planting, removal, pruning and maintenance work. I have also previously managed a large number of employees, overseeing their work in accordance with appropriate health and safety regulations

5. I have been an assessor for the New Zealand Arboricultural Association, in which capacity I assessed arboricultural firms, including Treescape, against NZAA preferred contractor accreditation criteria for their ability to carry out arboricultural work for clients including local councils. I convened the New Zealand Arboriculture Association conference in 2004, have been engaged by the Ministry of Justice (Disputes Tribunal) to act as an arboricultural investigator, and by insurance companies to investigate landowner negligence where tree failures are the subject of insurance claims.

6. I confirm that I have the proficiencies and key competencies set out at page 4 of the New Zealand Arboricultural Association Inc. Best Practice Guide for Safety Requirements in New Zealand Arboricultural Requirements. I have knowledge of use and application of agrichemicals. I have read the Code of Conduct for Expert Witnesses, including amendments. I agree to comply with this Code. I confirm that the issues addressed in this statement are within my area of expertise. I have not omitted to consider material facts known to me that might alter or detract from the opinions expressed in this report.

7. I note that I am a resident of 45 Garnet Road, Westmere, and live within walking distance of the Stand and have walked in the Stand, where practicable, most days for the last 17 years. I have made submissions to the Commissioners about the Stand in a letter dated 19 March 2019 (annexed hereto and marked "B"). I do not believe this creates a conflict of interest.

Methodology of tree risk assessment

8. I viewed the Stand on more than 24 occasions starting on 3 July 2019 and finishing on July 24 2019 to undertake a robust assessment of each tree in the Stand. I carried out a Visual Tree Assessment ("VTA") to do this. A VTA is a recognised tree health and risk assessment procedure.

9. I approached each tree using the Basic Tree Risk Assessment Form prepared by the International Society of Arboriculture ("ISA Form"). I have attached an example of the ISA Form - 2017 to this report. The ISA Form is designed primarily as an assessment tool for trees within the built-up landscape. I have used it in this case as it is an industry standard system for assessing tree health and structure and provides a categorizable assessment outcome, that other industry professionals can look at, verify and calibrate. The ISA Form allows for proper tree management because it forces the assessor to look at every aspect of the tree and its environment to make a reasoned decision that is best for the tree and the surrounding environment.

10. It took me on average approximately 20 minutes to undertake an individual assessment of each tree in the Stand. During that assessment I identified and recorded recognisable predispositions to failure that may exist within each Monterey

Pine tree growing within the stand. Essentially I was considering and assessing any weaknesses within their structures or growing environments that may make them susceptible or predisposed to failing during extreme weather events.

11. It's fairly well understood that a very high percentage of tree failures occur as a result of loadings and structural failures e.g. high wind velocities and rain deluge experienced during extreme weather events. Extreme weather events stress and exert pressures on predispositions to failure that may exist within a trees structure. These structural predispositions are generally recognizable by a trained and experienced arborist. Among other biometric data I assessed the health and structure of each tree in accordance with the ISA Form and as follows:

    a. I looked for decay within the base of the tree by striking the trunk and root crowns of each tree with a hammer. Trees make a range of resonant sounds and a dead tree will make a different sound to that of a live tree., Decay beneath the surface of the bark will sound soft and dull where a dry, standing, undecayed tree will ring and make a sound like I have hit a solid almost metallic sounding structure.

    b. I approached and gave each tree an individual number and took note of each tree's general characteristics, including its assessed height (I would take a formal measure if I was taking an action on the tree), crown spread , trunk diameter, angle and direction of lean and the relative location of each trees. This provided information that allowed me to formulate an idea of each trees relative stature.

    c. I identified any possible targets for the tree in the event that it were to fail. Using a one-hundred metre tape measure, I identified whether targets were located within the drip-line of the tree (this is the distance between the trunk and where the extent of the crown occurs) or within one, or one-point-five lengths, of the tree. If a target is located within one length of the tree, it could be hit by a toppling tree and if it is within one-point-five lengths of the tree, the risk is that it could be hit by the fracturing of branches being thrown out from the crown of a toppling tree. If the target is outside one-point-five lengths of the tree, it is not recognised as a danger. This step was useful in the elimination of a fairly high number of trees that were not identified as posing a risk to identified targets.

    d. I observed and made note of any site factors that may give a tree a heightened predisposition to failure. This included noting any history of failures that may have occurred in close proximity to the subject tree or any recognisable, shared predispositions to failure that may exist within the trees structure or location. I considered the topography of the land and assessed the soil and structural condition of the area where the tree was located for any reasons that may make it difficult for each tree to remain structurally sound.. I made note of any recent or historic changes that might alert an observer to an increased likelihood of tree failure such as erosion within watercourses. , where neighbouring trees that have recently failed and might change the distribution of the wind bearings amongst the trees, and the installation of infrastructure such as sewer lines.

e. I used fairly high powered binoculars to observe signs of tree health, including , vigour, and foliage colour and cover. I noted relative levels of dead foliage within live foliage and noted whether foliage was stunted or yellowing. These observations provided me with an indication of how health was affecting the risk profile of the tree.

f. I observed loading factors, including each trees exposure to wind, its form and crown density. (While foliage density is an important indicator it should be noted that trees will often abscise and reduce foliage levels if faced with strong wind loadings. This appears as an adaptive measure that reduces the possibility of structural failure caused when a full, healthy crown creates high wind loadings during strong winds. I also identified and noted any tree defects and conditions that may make failure more or less likely. This section required me to identify any recognisable predispositions to failure that may be within the tree. I identified things like pruning histories (as a poor pruning cut can allow for rot to enter or insect burrowing), cracks, poor trunk or branch forms, missing bark areas or signs of stem, crown and root decay. To do this I made close observations of each trees trunk, roots and root collar, as each tree part poses different risk factors.

g. Finally, based on what I had identified within each tree and using the data accumulated by filling out the ISA form, I assessed and calculated the risk presented by each individual tree.

12. I consider this process provides a fairly thorough, industry-standard tree assessment because, among other things, it allows the structured identification of the various ways that a tree may have a predisposition to fail. Except in a relatively few cases trees do not tend to spontaneously fail of their own accord. They often fail due to one or more external events (such as wind forces, flooding, severe weather events or even improper pruning) acting on the existence of failure predispositions. Failure can also become more likely if the tree has been weakened in some way that would make it likely to fail e.g. if it has been undermined or contains high levels of decay.

Normally tree failure is a combination of failure. It is my view that most predispositions that would cause a tree to fail are observable by an arborist and are relatively easily recognisable features of a tree and its location.

13. As part of my tree assessment I inspected a total of 218 trees. I then gave each tree an overall tree risk rating from four options Low "L", Moderate "M", High "H" and Extreme "E". I have provided a sample of a completed ISA-2017 form for a Low, Moderate and High tree risk assessment with accompanying photos. These are Trees T146 (H), T11 (M) and T179 (L).

14. The Society arranged to have a professional drone operator fly over the Western Springs Forest to record the canopy. This allowed me to observe the canopy from above and to observe the canopy health, spread and vigour which was in some cases difficult to evaluate from ground level. Viewing this footage allowed me to observe the way dead trees within the stand were located throughout the stand, how the crowns were connecting and the areas were there have been tree removals. Of interest was to see how the cleared areas were affecting other trees, which I refer to below.

15. As is well understood, pine needle growth is directed towards the sun, and the drone footage offered a unique opportunity to observe the canopy health and vigour of the Stand. The footage tends to indicate that the Stand presents with a healthier position than can be observed from the ground.

16. Each assessed tree has been geolocated using GPS. The geolocated markers for each tree were then overlayed over a Google Earth map, and the satellite imagery was enhanced using drone photography to enhance the ground imagery more than would otherwise be available. It should be noted there are some limitations to GPS in regard to exact location by a matter of metres.

17. It should be noted that I had my methodology and a randomised sample of my risk assessments peer reviewed by Craig Webb, Consultant Arborist, who I understand is preparing a separate report.

My preliminary tree risk assessment findings of the Stand

18. Below is a table setting out my key findings of the tree risk assessment of the Stand. This table shows my risk ratings and mitigation options for each tree in the Stand. It is worth noting that this table contains mitigation options for every tree in the Stand, however mitigation will not be needed for a fairly large number of the trees as they do not have associated high value targets and would not hit identified static targets if

they were to fail.[1] The tree risk assessment considers tree mitigation and management options such as tether installation, deadwood removal, branch reduction or removal, height reduction and in some cases, tree removal. There is also at least one photograph per tree to provide a visual record of my observations. The Table is set out below:

Table of Preliminary Findings – Western Springs Forest Pine Stand – Tree Risk Assessment, July 2019		
Risk Rating	**Number of Trees**	**Percentage of Stand**
Extreme	1	<1%
High – Extreme	1	< 1%
High	7	3%
Medium-High	1	<1%
Medium	36	17%
Low-Medium	23	11%
Low	148	68%
Totals	**218**	**100%**

19. According to the table above, 94% of the pine trees are stable (low-medium risk) and pose no more risk than trees growing within any normal forest. The remaining 6% which I have assessed as having potentially serious issues are able to be managed using ground-based tree management techniques. In my assessment, only 4 trees are in need of immediate tree works. These are trees **T10, T68, T78, T114.**

20. **Tree 10 (E)** is a tree close to the upper track with a hanging branch from April 2018 Category 2 Storm, that needs removing. Once that branch is removed the tree becomes low risk.

21. **Tree 68 (E)** is currently hanging in two other trees as it's root base is compromised and is situated half way down the walking track, just behind the elephant enclosure. This tree needs removing and once this tree is removed there will be no risk. I note that T68 toppled from its roots during the storms in the week of 12 August 2019.

22. **Tree 78 (H-E)** is a totem at the bottom end of the walking track, just a bit further down from tree 68. It is 3m from the path and has been topped at 14m. This tree is dead and contains decay in the stem. Once this tree is removed it will pose no risk.

---

[1] The first column is the number I have assigned to the trees with numbered plastic tags and is numbered in sequential order. In the second column, I have set out previous tree numbers which have been spray painted on the trees by other operators in order to assist in cross-referencing with other previous reports. Not all trees have a spray painted number, or the number is no longer legible.

23. **Tree 114 (H-E)** is in the south-east corner of the Stand near the stadium wall. This is one of the fire damaged trees that has been known to Council for a number of years. Whilst it poses little risk to the pathway, it has considerable decay in the base of its trunk and root collar. This tree requires removal and once removed will pose no risk.

Other professional arborist observations of the Forest and Stand

24. I have observed, out of professional interest, the Forest and Stand nearly every day (except for rain days), seven days a week for approximately 17 years as I have walked in the forest every day (where possible) during that time. I have taken it upon myself to enter and observe the forest immediately following large storm events to observed any trees that may have fallen or been damaged. These observations have allowed me to form clear opinions on the reasons why trees within the stand have failed. Those visits meant that I have been able to observe failure predispositions before and after failure has occurred. This puts me in a unique position to review the status of the Stand vis-à-vis deterioration. While a great deal of observable deterioration within the Forest and Stand is unconcerning as it appears natural. I have been concerned with what I consider to be unnecessary tree works and unsupportable tree removals over the last 10 years or so.

25. The undergrowth I have seen is in generally good condition, good health and appears typically formed. It is considered normal for undergrowth to be suppressed because it does not get as much sun as the upper canopy. However, without the crown cover provided by the pine tree, it is likely that a large portion of the undergrowth would wither and die from exposure to intense sunlight from which the pine trees are currently protecting them; it should be noted that a fairly high percentage of the trees in the native undergrowth are punga trees (Cyathea dealbata and C.medullaris) which can be extremely light and heat sensitive. It should also be noted that were the canopy trees to be felled and removed the area will be increasingly vulnerable to high temperatures and low winds, during summer. This will tend to cause the clay-based soil where the stand grows to dry up quickly leaving the remaining vegetation with reduced access to sufficient water.

26. I have observed only one toppled, live tree in the Forest since the April 2018 Category 2 storm (T68).

27. The tree rings I have observed on felled timber in the area shows a fairly normal pattern of girth increase for trees of this stage of their development. Older trees tend to work with less incoming energy because they tend to have smaller crowns. Especially when growing in a forest grouping. As the surface area of a trees architecture gets larger, their rings tend to get closer together. Because these trees

are reaching their climax potential their stem, root and branch architecture is largely settled. This is because trees continually grow, extend and optimise their shapes and engineering in response to the environmental stresses they experience on a second by second basis.

28. It may be helpful to make a comment about thinning of the stand and windfall issues. While the thinning of trees can cause their neighbouring trees to fail, this is not always the case. It is necessary to look at each situation and the different factors that exist within each tree, tree group and within each stand of trees. The land topography where the Stand is located slopes fairly steeply to the south. This tends to protect it from strong winds emanating from the north and north east because the hill drops off and a high proportion of the trees are below the line of extreme wind forces when it is coming from that direction. The Stand is most susceptible to winds from the east and west, where there have been a relatively high level of planned and historic removals.

29. It is important not to conflate "heavily reduced canopies" with death or poor health. It is common for trees to lose their canopies in times of stress. For example, in summer, pine trees will hold more orange needles as there is limited access to water due to the weather (an external event) but in the winter, as I am seeing now, the pine trees are particularly verdant as there is not a scarcity of water. Furthermore as the trees achieve their climax sizes it is normal for any shaded branches to be naturally abscised. This is because these branches tend to be of little or no value to the tree. This tends to mean that only the very uppermost branches are collecting energy from the sun and it is my opinion that this is why these particular trees present with relatively small crown sizes that are held high.

30. In my opinion, the Stand contains normal, natural levels of fungi and wood digesting insects, which feed on dead wood. From my close observations of the Stand, I can state the wind has blown over trees that have a predisposition to fail. In my opinion, from this close observation of the Stand, tree mortality is not being unnaturally accelerated by fungal infection or insect tunnelling.

31. Heart rot is often detectable by hitting the tree with a hammer and listening for the sound (as I have explained at paragraph 11.a above). Further, internal decay and/or borer and termite tunnelling is often an observable trait within a tree. For example, acutely angled branch stubs can retain water and might feature as an ingress site for fungi and insects. While I have tested the trees with a hammer to listen for sounds that would indicate insect tunnelling or internal decay there are limitations on this test that require climbing inspections to further assess the potential for decay.

32. In addition, it is generally accepted that a tree that has heart rot will continue to stand and is structurally sound so long as one third of the radius of the stem is still alive and unaffected by heart rot (Claus Mattheck and Helge Breloer *The body language of trees: a handbook for failure analysis,* The Stationery Office, 6th ed, 2006). In that circumstance, management, not removal, is often the best option. This could include tethering the tree to suitable points on nearby trees and observing the changes. Decisions can then be made relating to the ongoing management of that tree.

33. I have recommended the removal of a number of trees. Based on my observation of the Stand, it is possible to remove and manage these trees through ground based operations and/or through use of helicopter. I note that many of the trees in the Stand have the structural integrity to be removed by helicopter. If they do not, which an arborist can test for, the trees can be removed by other means, including the use of ziplines which markedly decreases any shock-loading on the tree.

34. The above tree risk assessment findings for the Stand are interesting in the light of the 1988 Ministry of Forest report on the same pine stand provided to the Auckland City Council. The findings from my tree by tree risk assessment are broadly consistent with the findings in the Ministry of Forest report. I note the Ministry of Forest report described the Stand to be in a relatively sound state and expected it to live a further twenty to sixty years. This is consistent with my findings which indicate that the Forest and Stand is behaving in what I would characterise a normal pattern for a Forest.

35. Finally, it may be helpful to make a comment regarding the life span of Monterey pines. I have not been able to find any conclusive research or information on the lifespan of radiata pines in New Zealand, as it appears most of the available research is carried out on pines planted for commercial reasons which are harvested at around 25-30 years of age. It is also difficult to be too determinative about the life span of a forest because of the complexity of a forest eco-system and the particular conditions inherent to that forest.

36. The closest relative to New Zealand *Pinus radiata* are Monterey pines in California. It is often cited that these Monterey pines have an age of 90-100 years. However, it is worth noting that Californian Monterey pines are not subject to the same environmental conditions that New Zealand radiata pines are, living in areas that have less wind and rain, and more sunlight. I am aware of *Pinus radiata* in New Zealand that are planted in botantic gardens or elsewhere that are known to survive for at least 150 years and this is occurring as single trees or a few trees. It is possible,

then, that a large number of the trees within the Stand are likely to continue to stand, with adequate management, for at least another two decades or longer.

Conclusion

37. Due to time constraints I have not been able to comment on all issues relating to the Forest and Stand in this report however I am happy to do so upon request.

Christopher Benton, Arborist
19 August 2019