Tree Tech Consulting

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ISA Tree Risk Assessment
Qualified

December 2, 2020

Village of Arden Forest Committee
Ms. Carol Larson
2119 The Highway
Wilmington, DE 19810-4058

Subject: White pine assessment; Arden Green

Dear Ms. Larson:

As per your request, I met with you on October 9, 2020, to inspect the pine tree near Woodland Lane on the Arden Green. This tree has two main trunks that separate low on the tree, and you expressed concern for the structural integrity and safety of this tree. After a visual inspection and discussion, I suggested that further testing was needed to confirm the extent of internal decay at the base of the tree. You said you needed to get approval for the additional testing. I returned to the site on October 26 to complete resistance boring tests on the tree.

The tree is an eastern white pine (*Pinus strobus*), located near the edge of Woodland Lane (Figures 1 and 2). It is within Arden Green, next to the stone maze and near the playground area. The tree bifurcates at about 4.5 feet above the ground into two main trunks. These trunks measure 21 and 23 inches in diameter, at one foot above the main crotch. The smaller stem (Trunk #1) is closest to Woodland Lane and leans slightly to the northwest toward the road. Electric and communications utility wires run alongside Woodland Lane and pass within about 3 feet of the trunk.

The tree appears to be in good physiological health. Foliage color and density are normal for this species and time of year. There are no indications of twig and branch dieback or decline of the tree. I saw no indication of major pest or disease problems. The root flare at the base appeared normal, with strong buttress roots.

The main concern for this tree is its structural integrity. The main crotch between the two stems has a seam and ridge down both sides, extending to the ground (Figures 3 and 4). The seams are occluded by bark, but the wood may not be fused. I did not see clear evidence of actual spreading of the seam, however.

The area between the trunks, at the top of the crotch, has an opening about 2 to 3 inches wide. This represents a vascular-supply shadow, an area where the flow of sap is reduced to normal growth of the tree between trunks or limbs. As the trunks increase in diameter over time, the bark and wood between become gradually isolated from the vascular system and sap flow is reduced. In extreme cases, the bark and underlying wood may die. The gradual reduction of growth in this area can result in a gap between the limbs, as has happened on this pine tree. Water and debris trapped within the crotch can create conditions conducive to internal decay. The opening at the top of the crotch does not increase the extent of any internal decay: once decay fungi get into the tree, it will slowly progress regardless of any openings or their size, and filling cavities or sealing up holes will have little or no effect on the progress of decay. This opening and the internal cavity should be left as is.

The question of stability and safety of the tree depend on the extent of the defects and their locations within the tree. In this case, the two primary defects are the seams, representing a disconnection of solid wood between the trunks; and the internal decay within the base of the tree. These conditions are related, and both contribute to a possibility of tree failure, allowing one or both of the trunks to fall.

The risk of crotch failure depends on the amount of solid wood present, compared to the extent of the internal decay. Various methods are available for testing and detection of the decay inside the tree. Due to cost and equipment availability, I chose to use an IML Resi F-300 device for the tests. This device inserts a 2-millimeter drill probe into the tree at a constant rate, and records the resistance to the probe. The resulting charts are then analyzed. Higher resistance patterns indicate solid wood, while lower resistance is an indication of defects in the wood, such as decay, cracks, or other voids.

I tested the trunks about 8 to 14 inches below the top of the crotch, making a total of seven test borings: 4 tests into Trunk #1, and 3 tests in Trunk #2 (Figure 5). The resulting test strips are attached (Figures 6 and 7). These boring results are read from right to left, with zero resistance at the bottom and higher resistance toward the top. There are no specific measurements of pressure or resistance associate with these tests: the results are interpreted as the relative trends as the probe moves deeper into the wood. The maximum effective depth of the tests with this unit is 11.5 inches.

Of the seven test borings, only #1 showed indications of internal decay. This decay was at a depth of 7.5 inches from the beginning of solid wood under the bark. All other borings showed solid wood to the full depth of the probe. The probe depth was equal to or greater than half the diameter of either trunk.

Analysis of the test results indicate that the loss of strength due to the internal decay and the seams is still well below accepted thresholds. Trunk #1 (closest to road) has an estimated strength loss of less than 15 percent: the threshold is at least a 30 percent loss before the risk is considered of concern. Trunk #2 did not show any decay in the boring tests, although there is some decay associated with the crotch.

Mitigation

Although the risk of failure at the base of the pine tree is low to moderate, some mitigation is warranted because of the tree's location adjacent to a road, utility wires, and the park with a playground. The following recommendations are presented in order of importance.

Safety of the tree workers is paramount here because of the presence of charged electrical wires. I strongly recommend that all pruning and cabling work be done from a properly insulated aerial lift, that only certified electric utility tree workers perform the actual work, and that all appropriate safety standards be practiced.

The first step is some light pruning of the crown of the tree to slightly reduce the height, weight, and resistance to wind. The pruning reduces the stresses placed on the tree by wind and gravity, thereby reducing the risk of failure. Pruning should be done to remove no more than 8 to 10 feet of any branch, and no pruning cuts should exceed about 1.5 inch diameter branches. The pruning only need be done on the upper portion of the crown, except for a few lower branches that extend beyond the average crown limit. Several low branches that extend between or close to the communication wires and over the road can be removed entirely. Figures 1 and 2 include markers to indicate suggested pruning points and branch removals.

The second option to further reduce the risk of crotch failure is the installation of a support system between the two trunks, high in the crown. The support system should be placed 15 feet above the topmost electric wire. Two types of system are commonly used: a flexible synthetic fabric that is looped loosely around the main trunks, and a steel cable system. The latter system requires drilling through the trunks and installing steel eyebolts, then attaching a high-strength steel cable between the bolts. I recommend using the flexible system, although either can be used. The reasons for the flexible system are concerned with safety during installation above the electric wires, and a reduced risk of damage to the trees in the case of a lightning strike, again because of the nearby wires.

The third mitigation option is the installation of one or two large steel bolts placed through the crotch, as has been done on the nearby large oak tree. These bolts are installed by drilling holes through the full diameter of the base and perpendicular to the crotch and seam. A long threaded steel rod is inserted and secured with appropriate washers and nuts. This system prevents a widening of the seams and crotch, and more importantly prevent twisting or torquing of the two trunks. This reduces the risk of crotch failure even more than a cable alone.

My recommendation for now is that the tree be pruned and a crown support system be installed. The amount of decay and stability of the base is not yet at a level that stem bolts are needed. These can be added in the future if warranted.

Removal of the tree is a final option, of course. It is my professional opinion that this is not necessary at this time. Although the tree has some internal decay, it is not at a level of risk that is high or extraordinary. Even without mitigation treatments, the tree will not likely fail in the next few years.

Applying some treatments, especially the pruning and support cable options, the risk will be reduced further. I do recommend that the tree be inspected every one to two years in the future. Future pruning will be necessary as the branches continue to grow. Any support system must be inspected on a regular basis to assure its integrity, and may need to be replaced eventually. Most systems are good for 8 to 12 years or more, depending on type of materials used.

Please contact me if you have any questions about the tree or this report.

Sincerely,

Russell E. Carlson, RCA, BCMA
Tree Tech Consulting

Enclosure: Photographs, diagram, Resi trace scans

Figures 1 and 2: The white pine is growing close to Woodland Lane (red arrow points to base). It has two main trunks, with the top of the main crotch at about 4.5 feet above the ground. Electric and communications wires run under the tree's crown within less than 3 feet from the nearest trunk.

The short yellow lines indicate suggested branches and locations for light pruning. It is not necessary to make larger cuts to accomplish the desired reduction. The lines on Figure 2 show the low branches to be removed to clear the low wires.

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Figures 3 and 4: The crotch near the base is the result of the two trunks growing close together. A closed seam runs down each side, indicating that the wood of the trunks may not be fused between them. At the top of the crotch between the trunks is an opening to the internal cavity.

The red lines in Figure 4 below indicate the approximate location of the piths or 'centers' of the trunks. The trunks grew up from either two seeds or two leaders from a single seed.

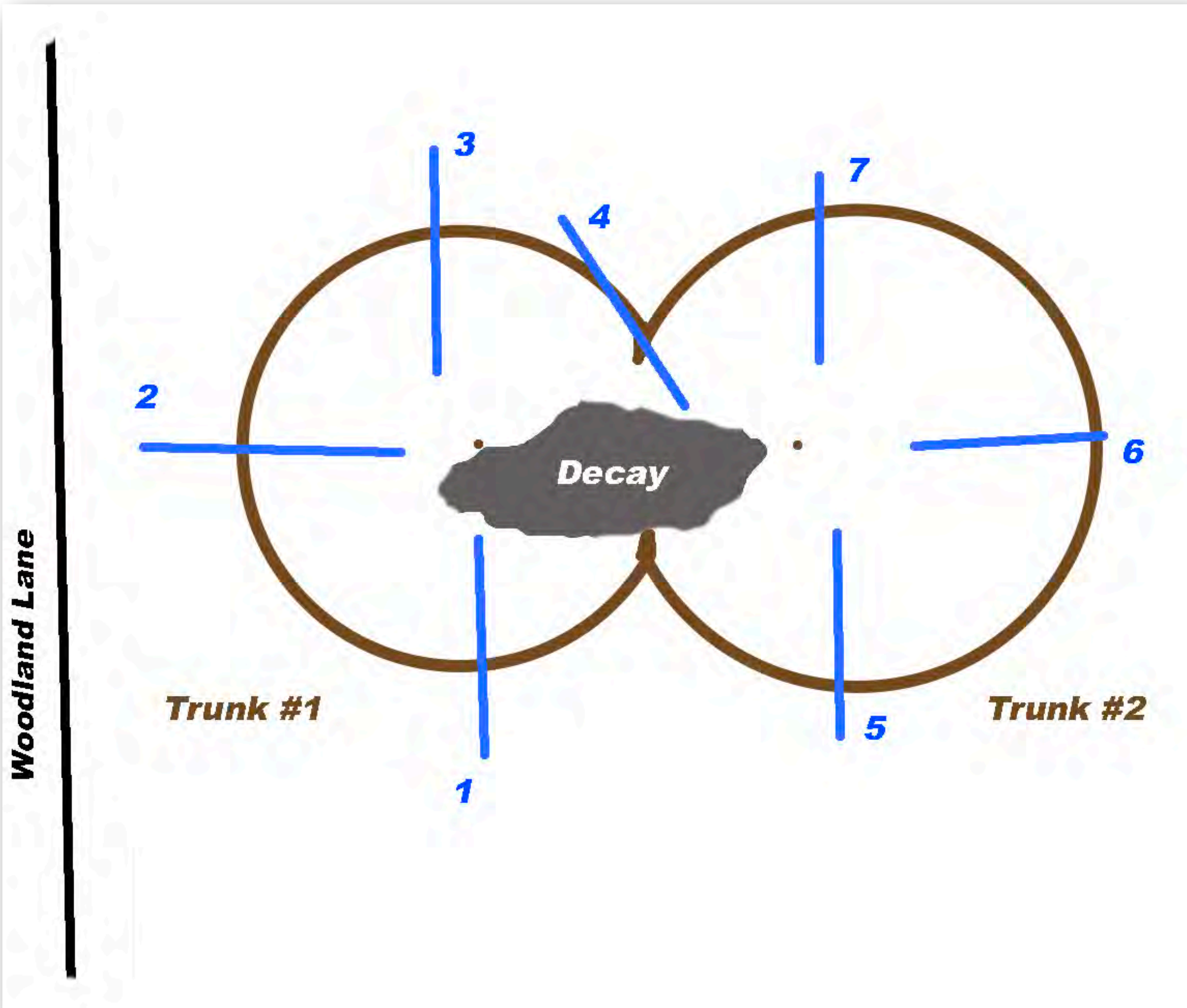

Figure 5: This diagram indicates the configuration of the two trunks looking down from above. The blue lines represent the locations of the test boring sites at about 4 feet above the ground. Each test site went to 11.5 inches deep from the outer bark. Only test site #1 encountered any decay. The dark grey area indicates the probable area of decay at this level in the tree. Lower on the trunk the decay probably spreads a bit wider, but still within the safety parameters.

Not to scale.

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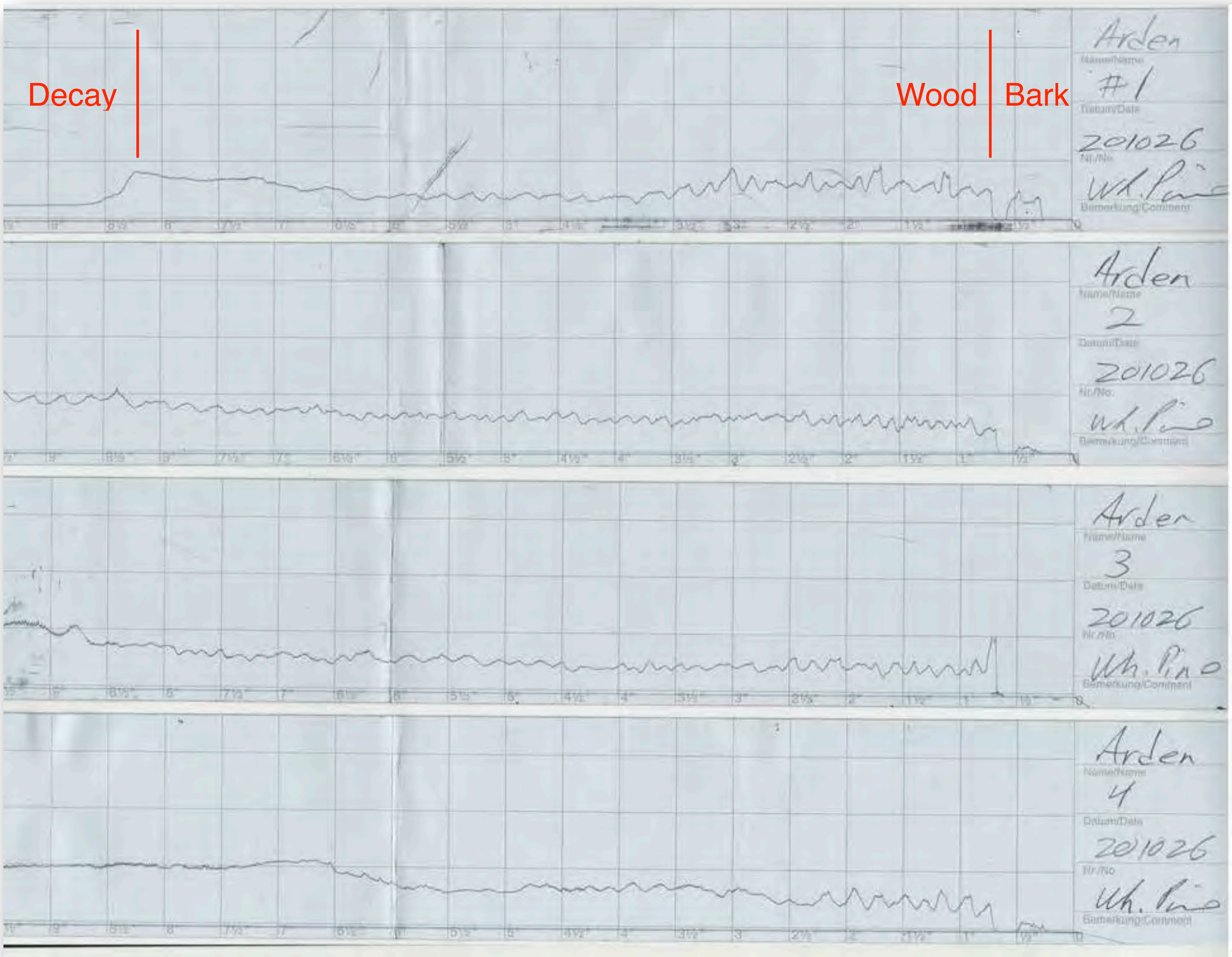

Figure 6: These are scans of the Resi probe traces for tests 1 through 4. The traces is read from right to left along the bottom. Level or upward trends indicate solid wood, sudden drops indicate lower resistance, representing decay. In trace #1, the decay shows up at about 7.5 inches from the beginning of solid wood. (All traces were continued to 11.5 inches from the start point, but were truncated due to scanning equipment limitations.)

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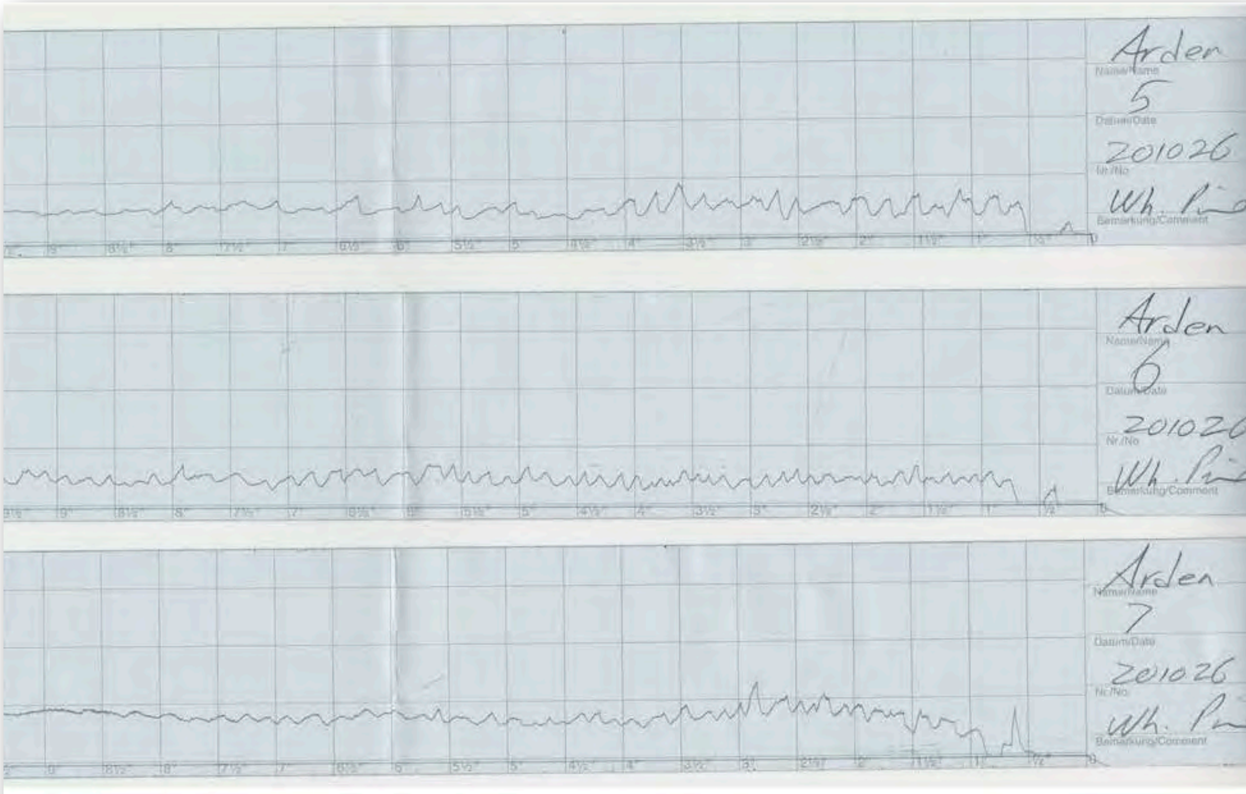

Figure 7: These are scans of the Resi probe traces for tests 5 through 7. See description for Figure 6.