Superior NW Enterprises

August 20, 2021

Project: Level 3 risk assessments for four large evergreens at 7845 SE 62nd Street, Mercer Island, WA. Parcel number 4094800130.

Contact: Cheryl McConnell 7845 SE 62nd Street, Mercer Island, 98040
Email – Cheryl.mcconnell@me.com

Objectives: Formal risk assessment of four Douglas fir trees at the site.

Description: The present house was built in 1970 and the semi-detached garage in 1971. The McConnell family took possession of the property in spring of 2007. They made limited changes to the landscaping and few if any to the hardscaping. The landscape upgrades included a garden patch area in the SE corner of the property with associated walking paths. The project appears to have been started around 2012 and was complete by 2013 (Figures 1-3).

Small stone retaining walls were laid down north to south by a previous owner in order to create planting beds. The western (lower) wall starts at the south fence where it is 16" high, runs at least 25' getting taller as it moves north, and ends at 30" high where it intersects with the timber frame staircase leading to the upper garden area. The second (upper) stone wall is 11-12' E of the first, starts out a single stone high at the fence (Figure 4), increases in height as it moves north to about 24" tall, and then wraps to the southeast of the existing garden shed where it is 26 in tall as shown in Figure 5.

The tiny garden shed is set at an angle such that its south corner is 27' N of the south fence. The end wall moves away to the northeast from the corner and the side wall moves off to the northwest. The shed is set on pier blocks slightly above the soil line. Stones from the end of the upper wall are set around the south end of the shed. An offshoot line of larger stones are used as a border at the north end of the flattened garden space and curve to the east stopping just short of the top of the steps.

The garden beds between and below the stone walls were renovated during the landscape project but the stone walls were left intact. The area above the upper stone wall was leveled so that raised garden beds could be set up in the corner (Figure 6).

During a conversation about a proposed accessory building the home owners are looking to build the subject of the condition of the existing tree arose. The arborist suggested that this report be generated independently of the construction impact report and the client agreed.

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Site visits were made near the end of July 2021. Of the seven trees which could potentially be impacted by the proposed construction four large fir trees were remarked as having potential structural integrity issues. The following itemized tree list begins in the center of the south side of the 7845 parcel and runs roughly counter-clockwise. The numerical designations for the trees are reflected in Figure 7. They match those given in the construction impact report for the project dated August 18, 2021. Diameters were measured at the standard height of 54" above grade (DSH) and caliper measurements were made at 6" above grade. Heights were estimated.

1. Douglas fir (*Pseudotsuga menziesii*) measured at the mid slope average level and found to be 35.5" DSH. Bark is rather heavy low on the column and the more realistic diameter is probably closer to 32 inches. Tree goes to 80' tall. The canopy is above the halfway point, rather dense, and exhibits abundant new growth and good color as shown in Figure 8. The top of the tree has a rather flattened aspect and may have broken out or the tree might have been topped. Tree stands 9' N of the fence, 13' W of the lower stone retaining wall. This is an Exceptional tree.

The core test taken low at the NW face revealed no indications of decay or otherwise compromised tissue. The white wood new growth ring was wide indicating abundant new tissue being laid down all the way to the base of the tree.

5. Douglas fir standing 34' N of the south fence line, 11' W of the east fence. The stair path curves around its base within 16" and slowly expands that distance (Figure 13). The large stones at the end of the path are just 38" to its south. Tree exhibits an abnormal basal morphology being narrow east to west and much wider north to south. It has two larger fungal bodies; one at 6' level and one at 8' (Figure 14), and then some smaller ones further up the stem which could not be picked up in a photo. Had a 22.5" DSH and is in the neighborhood of 95' tall. Canopy starts near the 40' level and exhibits average new growth and color.

The core tests were taken within 5" of the ground and the diameter of the tree was measured as being 32" at this level. The test on the east face revealed 6" of solid wood, then wood heavily impregnated with sap, after 4" more there was a decay core. Sap ran freely from the hole once the bit was removed. The test at the north face revealed 11" of solid wood then discolored and sap impregnated tissue to 15" depth. A test 3" N of the fungal body at the 6' level revealed 7.5" of solid wood then decayed tissue. A test through the fungal body showed 4.5" of fungal dissolved wood, then 3.5" of semi-solid wood, and then a mix of compromised and fully decayed tissue.

6. Douglas fir 29" DSH, 95' tall standing 5' N of the #4 cedar, 5.5' NW of the #5 fir, and the stair path wraps passes 18" N of its base. Tree has an area on the northwest face where sap is currently oozing. More likely to be a surface torsion fracture than a beam fracture as there is no indications on the off-side of a fracture plane. Average new growth and color throughout the canopy that comes down below the half way mark.

The core tests were taken where the base measured 37.5" diameter. The one in the NW face 6" off the fracture plane revealed 7.5" of clean solid wood then solid wood impregnated with sap to 15" depth. The SW test revealed 11" of solid wood, 1.5" of semi-compromised wood, and then full decay. The test on the east face revealed a normal profile to the full 15.5" depth of the bit.

7. Douglas fir 31.5" DSH, 100' tall standing 11' NW of the #6 tree, 24" N of the stair path, and 11' nearly due north of the #3 sequoia. Average new growth and color in a canopy that comes about to the halfway point. One of this tree's roots is visible stretching along the side of the garden shed which indicates they are passing mostly unimpeded by the path (Figure 15). This is an Exceptional tree.

Core test at the south face 5" above grade revealed a completely normal profile to the full 15.5" bit depth.

Methods: Tree risk assessment is both an art and a science. To properly perform, an arborist must have an extensive background in biology, tree mechanics, and tree structure that is equal parts academic and field knowledge. It takes years of study to recognize and correctly diagnose the subtle signs trees exhibit before their failure, whether it be partial or total. The process begins with a visual inspection (visual tree assessment, VTA) which is followed up as necessary with soundings, core testing, and/or other detection means. Each tree is examined and evaluated according to several factors including species type, size, vigor, injuries present, root and grade disturbance, deadwood, location and extent of decay, stem taper, exposure, and targets which are within the strike radius.

The International Society of Arboriculture (ISA) has published a Best Management Practices bulletin to aid in their tree risk assessment program which has become the definite standard worldwide. This methodology for risk matter assessment has fully supplanted the old ISA model. While focusing on a qualitative analysis the program is still based on three aspects of tree risk; failure potential, size of part failing (potential of damage from impact), and target rating. The aspects are scaled as follows. Failure potential (FP) can be imminent, probable, possible, or improbable. Target rating (T) is based on frequency of occupancy and is listed as very low, low, medium, or high. Selections are made in each of the first two categories and a likelihood of target impact found. It can be rated as unlikely, somewhat likely, likely, or very likely as shown in Figure 9. Obviously a level of null risk does not exist if a tree is present. For practical purposes however, arborists assume that if there is no target, the tree poses little or no risk.

The consequences of the failure, usually a function of size of the failed part, are listed as negligible, minor, significant, or severe. Combining the likelihood of a tree failure event with the consequences of that event allows a trained arborist to assign a level of risk to a given tree's situation. There are four acceptable categories within the model; Low, Moderate, High, or Extreme. The highest level, extreme, can only be assigned when the likelihood of failure and impact is high (very likely) and the consequences are severe (see Figure 10).

Risk Assessments: Only catastrophic basal failure or uprooting was considered for these trees. Trees which uproot or have basal failures cannot strike targets outside their own height in anything less than hurricane force winds.

The #1 and #7 firs have **improbable likelihoods of catastrophic failure** based on their clean basal profiles which are indicative of good integrity at the root crown and few if any compromised structural roots. If either did fail they would have **high likelihoods** of landing on one of the four surrounding homes. This places the #1 and #7 trees in the **unlikely to fail and impact** row in the second matrix. Even though the **consequences** would be **severe** should the trees happen to fail they are still designated as **low risks**.

The #5 fir was diagnosed with the onset of *Phellinus pini* a common fungal pathogen of the Douglas fir in our area. Once present the fungus only advances within the tree, often rapidly, and will result in catastrophic failure. Because of the current degree of decay in the #5 fir it is listed as having a **probable likelihood of catastrophic failure.** Its placement in the center of the subject and neighboring homes gives it a **high likelihood** of striking one of them. This places the cedar in the **likely to fail and impact** category**.** The **consequences** would be **severe** and the #5 fir is therefore listed as being a **high risk.**

The #6 Douglas fir had 15.5" sidewalls over two-thirds of the column and a small pocket of decay offset to the southwest. This means the narrowest point still had a 67% sidewall and the other areas have at least an 87% sidewall threshold. In general trees with greater than 30% sidewall thickness are deemed as not having lost a significant degree of their strength.

The issue with this tree is the fracture plan and the degree to which it may compromise the integrity of the tree. The degree of sap filled wood and its depth in the trees points to the torsion fracture event having occurred when the tree was fairly young. It is likely that the 1962 Columbus Day storm did the initial damage and the wound was exacerbated by other storms up to and including the 2006 Hanukkah Day event. The tree has been laying down reaction wood along the path of weakness but not to such an extent that the base is amorphous in shape.

Taking all this into account along with the solidity of the wood tissue and overall health of the tree it is deemed as having a possible **likelihood of catastrophic failure** in the worst case. Like the others its placement in the center of the subject and neighboring homes gives it a **high likelihood** of striking one of them should it fail. This places the cedar in the **somewhat likely to fail and impact** row in the second matrix**.** The **consequences** would be **severe** and the #6 fir is therefore categorized as being a **moderate risk** according to the tables.

Recommendations: The #5 fir is significantly compromised and should be slated for removal within the next 12 months.

The #1 tree has branches that are somewhat over extended. These will become increasingly prone to failure from storm wind force loads. It would beneficial for the tree to have the ends of these branches carefully pruned back to bring them in line with the others in their vicinity. The tree should not be thinned as it needs all the energy it can generate from its limited canopy.

The #7 tree also has a few areas of over extension which could be addressed. It is fine otherwise.

The #6 tree should be monitored at least every other year. It has some large deadwood and over extended branches that could be addressed at the same time as the others.

Removing the #5 fir will create space for the #4 cedar (refer to other report) and should help with it maturing with a strong structure.

Waiver of Liability Because the science of tree risk assessment is constantly broadening its understanding, it cannot be said to be an exact science. Every tree is different and performing tree risk assessment is a continual learning process. Many variables beyond the control, or immediate knowledge, of the arborist involved may adversely affect a tree and cause its premature failure. Internal cracks and faults, undetectable root rot, unexposed construction damage, interior decay, and even nutrient deficiencies can be debilitating factors. Changes in circumstance and condition can also lead to a tree's rapid deterioration and resulting instability. All trees have a risk of failure. As they increase in stature and mass their risk of breakdown also increases, eventual failure is inevitable.

While every effort has been taken to provide the most thorough and accurate snapshot of the trees' health, it is just that, a snapshot, a frozen moment in time. These findings do not guarantee future safety nor are they predictions of imminent events. It is the responsibility of the property owner to adequately care for the tree(s) in question by utilizing the proper professionals and to schedule future assessments in a timely fashion.

This report and all attachments, enclosures, and references, are confidential and are for the use of the McConnell family, Ben Humphrey, Heliotrope Architects, and their representatives only. It may not be reproduced, used in any way, or disseminated in any form without the prior consent of the clients concerned.

Anthony Moran, BS
ISA Certified Arborist
Qualified Tree Risk Assessor
#PN-5847A

Figure 1. Aerial imagery from 2007 showing the subject and surrounding properties.

Figure 2. Aerial photo circa 2012 showing the hardscaping in the south end of the 7845 yard.

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Figure 3. Aerial from 2013 showing the yard improvements in the SE corner.

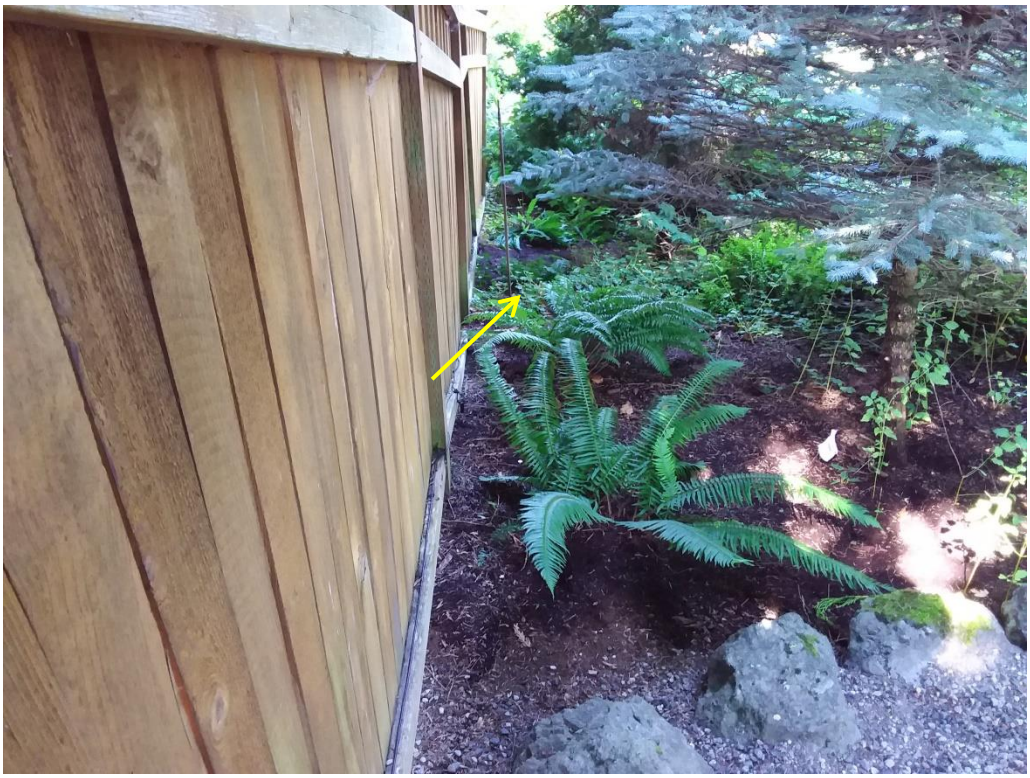
Figure 4. Looking west down the south fenceline. The stones at the south end of the upper retaining wall are shown at the bottom of the image. The lower wall starts where the yellow arrow points.

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Figure 5. Looking NW at where the upper stone retaining wall curves to the south of the garden shed. The #3 sequoia is in the center of the frame.

Figure 6. Looking south across the upper area where the raised garden beds were located. They had been here close to 10 years. The upper wall is just visible at the right side of the image (yellow dashed line).

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Figure 7. Aerial photo circa 2019 showing the existing house and the rough locations of the trees noted in the report.


Figure 8. Looking up and SW at the canopy of the #1 fir. Note the branches reaching out beyond the length of the others in their vicinity.

Figure 9. The matrix used to estimate the likelihood of a tree failure impacting a specific target.

Likelihood of Failure	**Likelihood of Impacting Target**			
	Very Low	**Low**	**Medium**	**High**
Imminent	Unlikely	Somewhat Likely	Likely	Very likely
Probable	Unlikely	Unlikely	Somewhat Likely	Likely
Possible	Unlikely	Unlikely	Unlikely	Somewhat Likely
Improbable	Unlikely	Unlikely	Unlikely	Unlikely

Figure 10. Risk rating matrix showing the level of risk as the combination of likelihood of a tree failing and impacting a specific target, and severity of the associated consequences.

Likelihood of Failure and Impact	**Consequences**			
	Negligible	**Minor**	**Significant**	**Severe**
Very likely	Low	Moderate	High	Extreme
Likely	Low	Moderate	High	High
Somewhat likely	Low	Low	Moderate	Moderate
Unlikely	Low	Low	Low	Low

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