Superior NW Enterprises

September 18, 2020

Project: Pre-construction assessment for lot development at Villa Marbella Lot 6, Mercer Island, WA. Parcel number 8944220060.

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Objectives: Evaluate health of existing trees and establish criteria for the preservation of those to be retained. Update original inventory report from 11/24/19.

Description: The Villa Marbella Lot 6 property was purchased in August 2019 and the new owners would like to develop the parcel. As part of that process they were informed by the City of Mercer Island that they would need a full tree inventory and assessment. They reached out to Tree Harmony Arborists to fulfill this requirement. Tree Harmony in turn asked Superior NE for their assistance in completing the study.

The Lot 6 parcel has never been developed formally although there are two decks built on the north side of the lot which belonged originally to the 7275 house proper. All the trees present on the property have grown up in place. Lot 6 is a moderately sized parcel, 18,000 square feet in size, and it slopes continually to the south as shown in Figures 1 and 2. An enlargement of the center portion of the parcel is shown in Figure 3.

Site visits were made during November of 2019 and the trees were assessed as to their health, stability, and overall suitability for retention. The following itemized list begins at the NE corner of the center of the parcel and includes trees standing in the lower TRCT lot. The trees are shown in, and their numerical designations are reflected in, the first three figures listed above. Diameters were measured at the standard height of 54" above grade (DSH) during the 2019 site visits. Caliper measurements were made at 6" above grade. Heights were estimated.

1) Douglas Fir (*Pseudotsuga menziesii*) 22" DSH, 70' tall standing 8' W of a utility vault and 40' SSW of the SW corner marker for the 7251 property. It is 13' west of the edge of the asphalt for the private drive which curls around the south side of the parcel. The tree is in fair condition average new growth and color.

2) Douglas Fir 14.5" DSH, 45' tall standing 9' SSW or the #1 tree and 16' W of the private drive. The tree is subordinated to the #1 and #3 firs and has a limited canopy but good color.

3) Douglas Fir 29.5" DSH, 50' tall standing 15' SW of the #2 tree and 22' W of the private drive. It is in fair condition with normal new growth and color and a full low canopy.

4) Western Red Cedar (*Thuja plicata*) 16" DSH, 50' tall standing 10' S of the #3 tree. The tree is in below average condition and all its canopy is in the SE quadrant.

5) Western Red Cedar 8" DSH, 35' tall standing 7' W of the #4 tree and subordinated to it. It is in below average condition.

6) Silver Poplar (*Populus alba*) 21" DSH, 50' tall, 20' spread standing 11.5' W of the private drive and 16'S of the #4 cedar. It is in weak condition with a large canker near the base on its north side (Figure 4). The tree leans markedly to the south and it has a large scaffold extending over the drive.

7) Silver Poplar 20" DSH standing 5'SW of the #6 tree. It extends to the WSW at nearly 45 degrees and reaches out at 50'spreading 20' to the north and south. There is a 10" caliper lateral rising from the 6' mark which grows to the south. The tree is in fair health.

8) Western Red Cedar 24" and 24" DSH, separating from the base, 60' tall standing 15' W of the #5 cedar and 19' E of the NE corner of deck near the center of the lot. It is in fair condition.

9) Big Leaf Maple (*Acer macrophyllum*) 7" DSH, 40' tall, 12' spread to the north only. It is standing 10' N of the #8 tree and is growing out from under its canopy. The tree leans noticeably to the north and has a dug out area on its south side (Figure 5).

10) Big Leaf Maple 21" DSH, 50' tall, 20'spread to the south only. The tree stands 25'SW of the #8 cedar and 12' ESE of the #11 tree. The tree has large caliper deadwood present. It bifurcates at the 9' level, the 12" caliper subordinate spar extends to the SW, and the main grows vertical. It is in weak condition overall.

11) Big Leaf Maple growing out from under the SE corner of the center deck (Figure 6). The tree separates into three stems from the 30" level. The largest is 18" DSH and grows to the NE before turning vertical near the 8' mark finally reaching 55' tall with a 9' spread. The center stem leans to the south, is 10" DSH, goes to 40' tall, and has an 8' spread. The west side stem is 9" DSH, twists somewhat around the base of the deck before going vertical to 35' S with a 6' spread. The tree appears to be in fair health overall but has a compromised structure.

12) Flowering Dogwood (*Cornus florida*) 13" DSH, 40' tall, 12' spread standing 28' S of the north line, 15' N of the steep slope area, and 25' NW of the NW corner of the center deck. The tree is in good condition and an excellent example of the species.

13) Douglas Fir 18" DSH, 50' tall standing 20' WSW of the #12 tree at the edge of the steep slope. The tree exhibits average new growth and color.

14) Horse Chestnut (*Aesculus hippocastanum*) 23" DSH, 45' tall, 20' spread mainly to the NW standing 11' SSW of the #13 fir. The tree bifurcates at the 6' mark, the west stem extends at 45 degrees to the NW. It is in fair condition.

15) Big Leaf Maple 40" DSH, 75' tall, 24' spread standing 8' SE of the #14 tree and midway downs the slope. The tree is in weak condition. It has deadwood up to 10" caliper throughout the canopy and minimal new growth.

16) Douglas Fir 26" DSH, 90' tall standing 30' SSW of the #15 tree near the base of the slope. Its canopy spreads mainly to the south and extends down past the midpoint of the column. Tree is in fair condition.

17) Douglas Fir 14" DSH, 75' tall standing 13' NW of the #16 tree. It is in fair condition. There is ivy climbing its base.

18) Douglas Fir 18" DSH, 80' tall standing 8' SW of the #17 tree and about 10' E of the west side property line for Lot 6. Fair condition.

19) Big Leaf Maple 11" Cal, bifurcates at 40" mark into 9" and 10" DSH stems, 35' tall, 12' spread. It is growing under the #18 tree 8' SW of its base and 5' N of the SW corner marker for the subject property. It is in fair condition.

20) Stand of juvenile Big Leaf Maples with a scattering of volunteer plums. None of the trees exceed 9" DSH or 35' tall. The grove extends from the TRCT lot below Lot 6, up the west property line to nearly even with the west end deck, and west for at least 30'. The plants are in mixed condition and are only noted because of the size of their canopy cover. Not tagged

21) Big Leaf Maple 10" DSH, 35' tall, 8' spread standing in the neighboring 7301 property to the west. It is roughly 30' W of the SW corner of the larger deck and 25' W of the railroad tie retaining wall. It was noted because it was difficult to tell where the property line ran exactly. The tree appears to be in fair condition. Not tagged.

22) Pacific Madrone (*Arbutus menziesii*) roughly 20" and 24" DSH, 45' tall, 20' spread standing about 15' W of the #21 tree. It is in good health and was noted because it was a great example of the species. There is ivy growing up the main stems. Not tagged

Since the original inventory report was completed, RKK Construction has developed a plan set for the property. An excerpt showing the proposed location of the house and driveway is given in Figure 7.

Methods: Tree 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 that are at risk.

Analysis: There are two levels of impact at this site, primary and secondary. The primary area includes the environs immediately within the boundaries of the proposed new construction and the regions within ten feet of those boundaries. Trees #1-5, #8, #9, #12, #13, and #14 all stand within this region. Generally they would all be removed but trees #8 and #14 have somewhat special circumstances and will be discussed below.

The secondary impact area includes the trees which have root systems extending within the construction area. This region, the Critical Root Zone (CRZ), is a radial area extending out from the tree a distance equal to one foot per inch of diameter. For example, the #8 cedar, with a 33" composite DSH, has a theoretical 33' radial CRZ.

Typically intrusion within the Critical Root Zone is strongly discouraged by the tree care industry. However trenching type incursion, that is excavation that will occur along only one sector of a tree's CRZ, can reach significantly into the root growth area without having a detrimental long term effect. What does have to be absolutely protected is a tree's Structural Root Plate (SRP). This radial area is again related to the diameter inches of the tree in question but not quite in a direct proportion as in the CRZ. Figure 8 below illustrates the relationship.

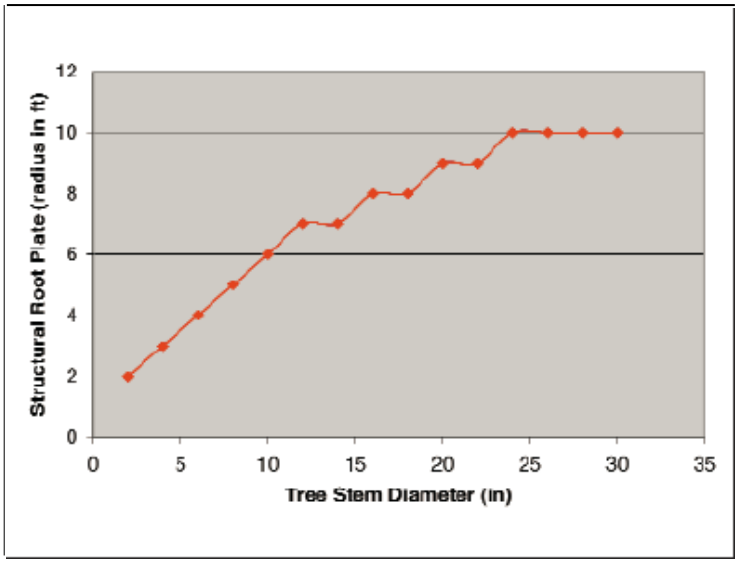

Figure 8. Size of the Structural Root Plate in relation to tree stem diameter. Note that the SRP levels off at 10' for any tree over 24" in diameter. (Coder, 1996)

In the case of the #8 cedar mentioned above, while the excavation for the proposed foundation will be at least 14' from its base, the cut for the driveway curves to within 10' in the NE quadrant, and the storm drain is shown coming as close as 7' from the base of the tree. From Figure 8 the Structural Root Plate for a 33" DSH tree is given as 10' so the foundation excavation work will be clear of the SRP, the driveway work will just graze it, and the trenching for the drain line will potentially cut 3' into it. This is not ideal for a large tree on the south side of the home and will likely create a destabilizing event.

The #14 chestnut (23" DSH) has a 9.5' SRP. The storm drain line is shown running 8' north of this tree and there is a drain junction box 15' off in its NW quadrant. But the excavation work will be at least 20' away.

No other trees will have their Structural Root Plates affected.

The chart shown in Figure 9 below is used to determine what percentage of a tree's Critical Root Area (CRA) will be affected by trenching type incursion. In general trees can sustain losses of up to 30% of the overall area within their CRZ without having long term detrimental results.

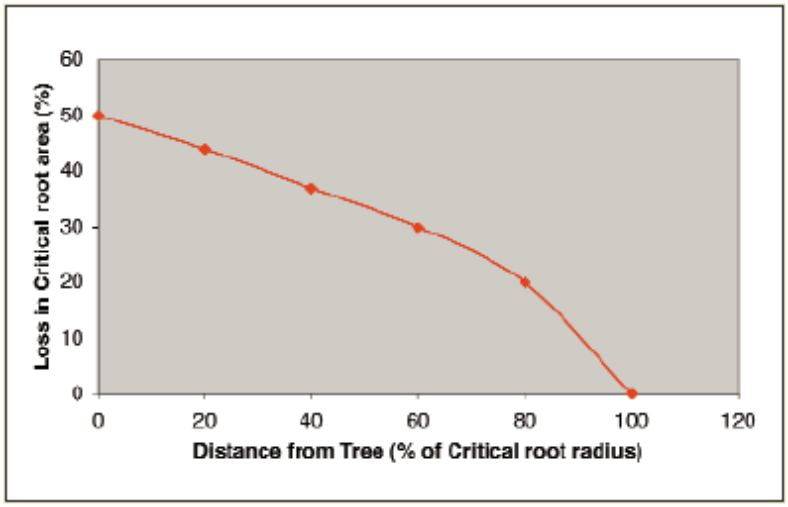

Figure 9. Chart giving the loss in critical root area as a function of the radial distance to the CRZ disturbance. (Coder 1996)

Using the #8 cedar as the example, if the trenching for the storm drain is 7' from the tree's base and it having a 33" DSH, there will be impact at a linear distance equal to 21% of the tree's CRZ (7'/33'). The chart shows that this could equate to a 45% loss of the cedar's Critical Root Area. But then the driveway work would notch out a chunk to the east side of the tree and the combination results in a loss of CRA in the neighborhood of 60%. Even if there was a way to install the storm drain without damaging the roots the foundation cut combined with the driveway work would still push the loss past 50% CRA.

The #14 chestnut (23" DSH) will theoretically experience impact at 35% CRZ for a loss of near 36% CRA. This will be too great for the tree as chestnut trees are more sensitive to disruption than some of the other species. If the drain line could be installed such that it does not impact the roots then this tree will experience little to no impact from the home construction.

The #15 maple has a 40" DSH and will be potentially impacted on two sides by the storm drain 17' to its north and the sewer line running 20' off through its SE quadrant. The storm drain trenching would create a loss of 34% of the maple's CRA. The sewer line trenching would result in a loss of 32%. Combined they would account for at least 60% of the maple's rooting space and would push this already struggling tree into a rapid decline cycle.

The proposed sewer line trench also crosses 11' off the base of the#26 fir. This could potentially result in a loss of 34% of the tree's Critical Rooting Area, just over its recommended survival threshold.

Recommendations: There does not seem to be a feasible way to safely retain the #8 cedar. Even though it qualifies as an Exceptional tree per MICC 19.16 it also qualifies for removal per MICC 19.10.06(3)(a) because attempting to retain it will create an unavoidable hazardous situation. The tree is too exposed, on the south side of the house, and will lose a significant portion of both its SRP and CRA.

If in any way possible it would be excellent to not cut the roots on the #14 (and potentially #15) tree when installing the storm drain. Perhaps using an air spade to open the trench (assuming it is not singularly deep) and then threading the pipe through the roots, just severing the minimal amount for clearance purposes, would be feasible.

The #14 tree is not currently listed as a removal. If a trench is cut for the drain line and it slices through this tree's SRP it most likely will have to be.

The same can be said for the #15 maple. Not trenching for the drain line helps preserve close to 34% of its Critical Rooting Area according to the chart in Figure 9.

Ideally the sewer line running past the #15 and #16 trees could be shifted somehow to prevent or minimize the impact to both trees. Perhaps once the existing side sewer stub line at the base of the slope is examined some thought could be made to adjusting the track of the line from the house to its attachment point. Maybe a joint could be added such that the line heads closer to due south and then cuts back toward the existing line from lower on the slope.

Typically tree protection fencing is set at the limit of the CRZs of the trees to be retained. In this instance the fence should run the full 20' off the #6 and #7 trees and then over to the deck which is going to be removed. From the west end of the deck it should follow the top of the slope making sure to stay at least 23' back from the #14 tree. It is acknowledged that setting the fence around the chestnut in this manner will cross through the building site. The purpose for this is to ensure that an arborist oversees the excavation which will occur near this tree. The fence should not be moved without the arborist present.

It may be that the roots from the #14 and #15 trees do not travel up into the existing 'yard' area at the top of the slope. This region may have been filled from when the original house was built on the neighboring lot to the north or it may have always had this conformation. Either way roots typically do not travel deeply underground and the trees may have spread laterally along the slope instead.

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 Scott Sinclair, Tree Harmony Arborists, Jason Koehler, RKK Construction, Mason and Shelly Helms, 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.

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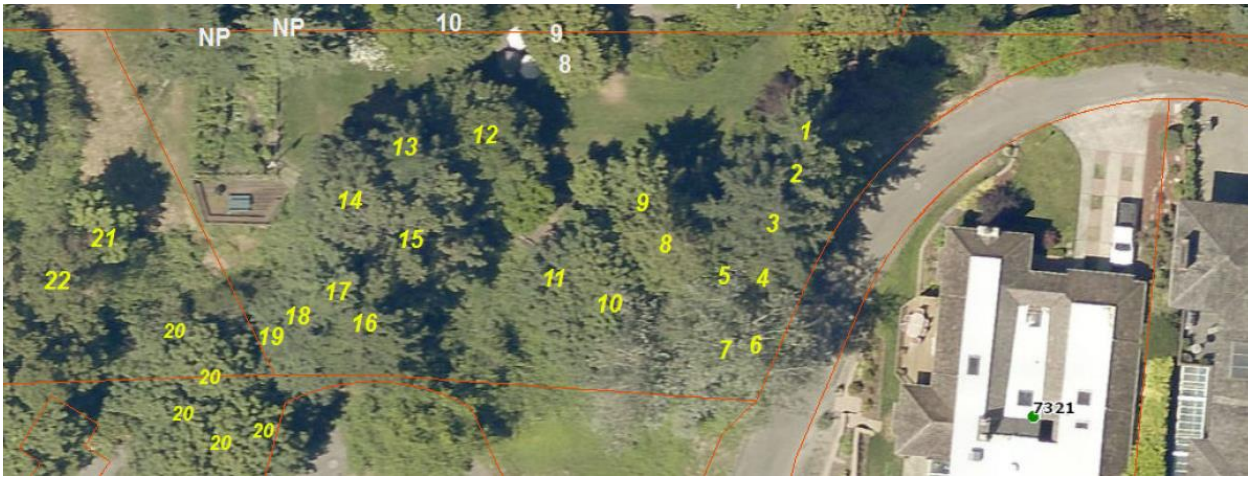

Figure 1. Aerial view showing the Villa Marbella Lot 6 property. The yellow numerals roughly indicate the locations of the trees listed in the Description section. Note that the #20 tree grove straddles an area designated as a TRCT lot and the 7301 property to the west. This grove was not indicated in the survey. The #21 and #22 trees are also located on the 7301 parcel. Three other trees, connoted as #8, #9, and #10 in white are listed in the report completed for the 7275 parcel. They stand quite close to the existing house on that lot.

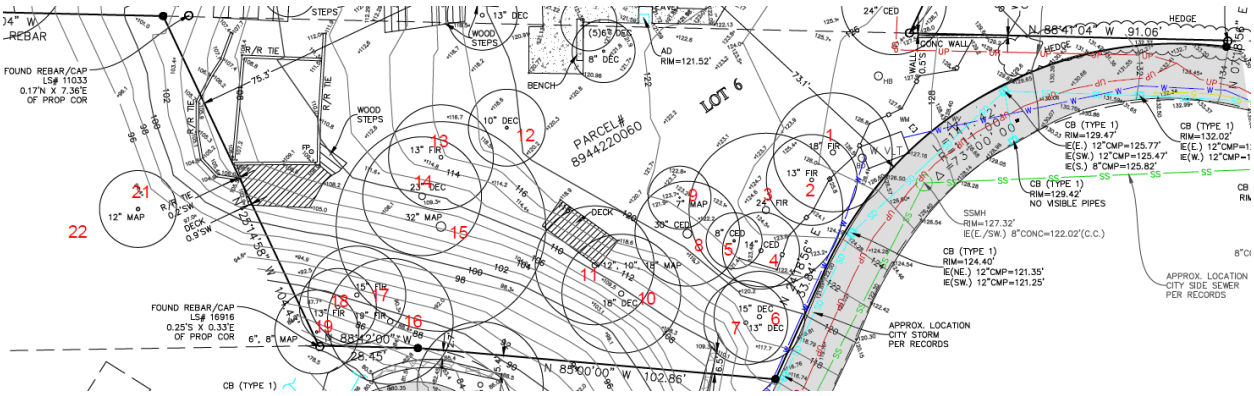

Figure 2. Excerpt from survey showing the rapid drop of the slope to the south. Note the two decks in the center of the image.

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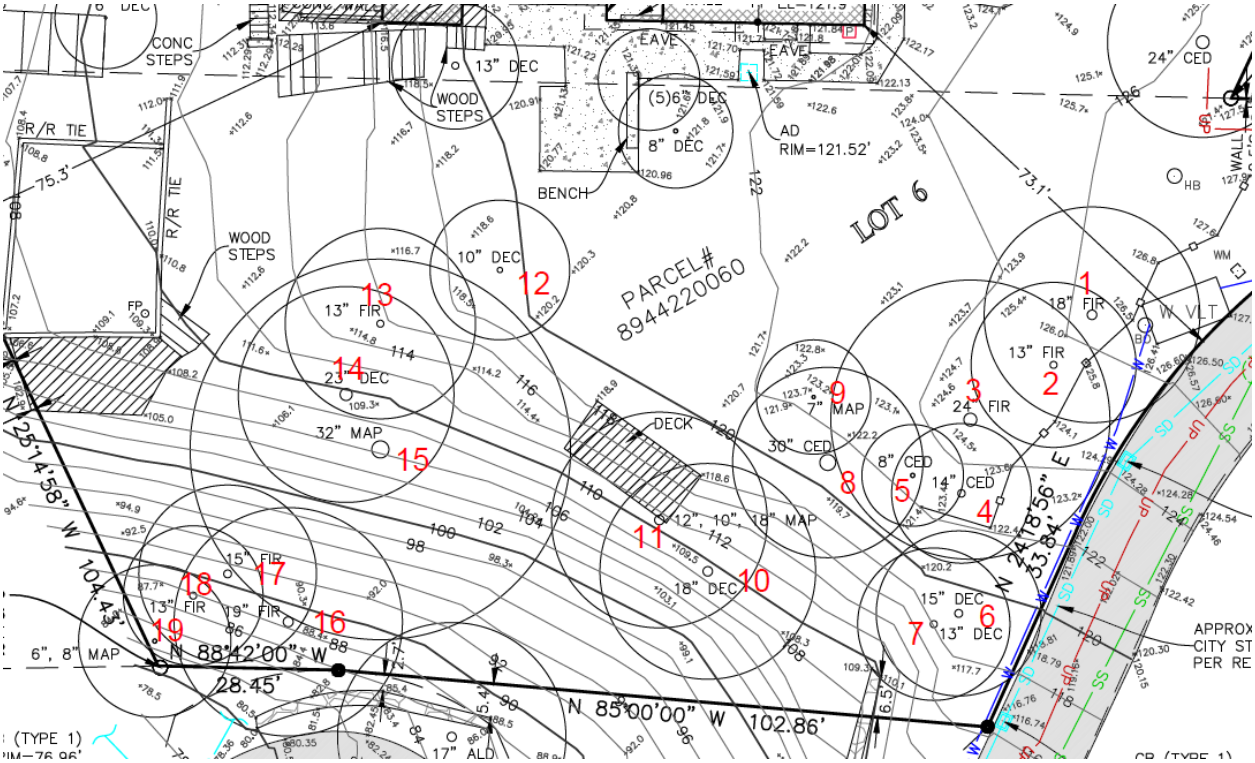

Figure 3. Enlargement of the formal survey with the trees labeled in red. Decks are more clearly seen in this image.

Figure 4. Photo of the canker on the base of #6 Silver Poplar.

Figure 5. Photo of hole at base of the#9 maple.

Figure 6. Photo of base of the #11 maple.

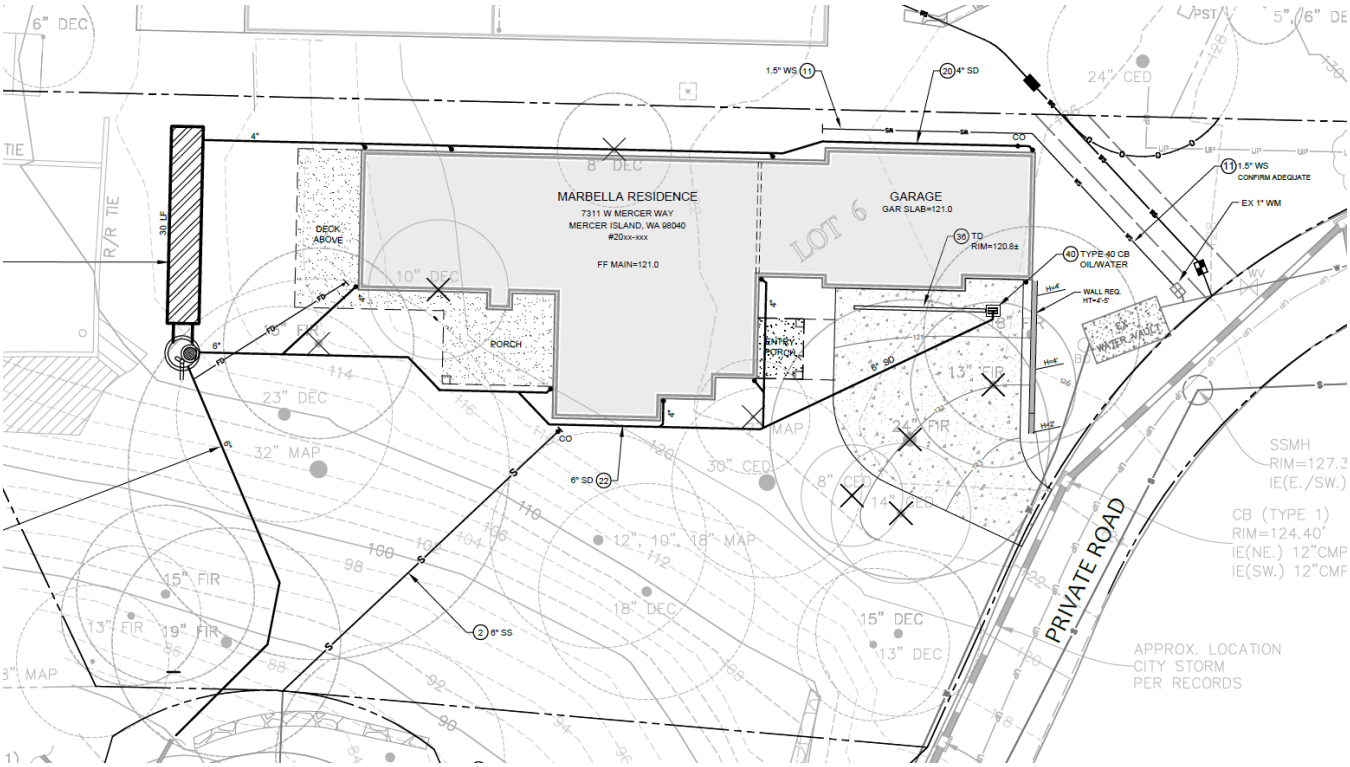

Figure 7. Excerpt from the proposed plan set showing location of new house in relation to the onsite trees. Note that the circles set around the trees do not indicate the extent of their Critical Root Zones necessarily. Some circles are close to representative. Others, like the one for the #15 maple are short by close to 15' radially. The sizes shown for each tree are also not always correct. Please refer to the Description section to ascertain the correct diameter for any tree in question.