



Background and History

Lucia Pirzio-Biroli of Studio Ectypos Architecture contacted me and asked that I prepare an arborists report for the trees located at 4207 West Mercer Way, Mercer Island WA. She was representing her client Rahul Shinde, the owner of the subject property.

Assignment

- Visit the site to inventory and measure trees on the subject property which are within or adjacent to construction activity
- Inventory and measure neighboring trees with drip lines overhanging the subject property
- Prepare a tree protection plan in accordance with the guidelines set forth by the city of Mercer Island including establishment of tree protection zones for exceptional trees
- Provide additional guidance for protection of trees during and after construction
- Provide planting and aftercare recommendations based on required tree replacement per Mercer Island City code

Limits of the Assignment

The recommendations in this report are based on a visual examination of the trees. There may be conditions in the trees or tree roots which were not outwardly visible.

Purpose and Use of the Report

The arborist report is a municipal requirement for permit submission and will be used by contractors working in and around the trees identified in this report.



Testing and Analysis

The diameter of each tree was measured at four and a half feet above the ground, commonly referred to as **diameter at standard height (DSH)**. For trees located on a slope, the 4.5 feet is measured from the average of the highest and lowest ground points or, on very steep slopes where this is not possible, the lowest practical point on the uphill side. Where a tree splits into several trunks close to ground level, the DSH for the tree is the square root of the sum of the DSH for each individual stem squared. When branches interfered with measurement of DSH, the measurement was taken at the narrowest point below four and a half feet above the ground.

I affixed a metal number tag to every tree that was on or adjacent to the project. The property is quite large and contains a forested hillside. Trees suspected to have TPZs near the areas of disturbance were included in the inventory, others further down the slope were omitted. The six city owned birch trees (#1-6) growing in the right of way (ROW) had metal tags already placed on them. The tags contained faded numbers, I used an ink marker to refresh the numbers, but did not change them.

The **Trunk Formula Method** from the *Best Management Practices: Managing Trees During Construction Second Edition* was used to determine **critical root zones (CRZ)**, the **tree protection zones (TPZ)** were based on this calculation. Limits of allowable disturbance within the TPZ were assumed to be a maximum 25% of the overall TPZ, with modifications on a case by case basis.

Inventory

All trees, including trees on neighboring property, with drip lines within or near the proposed limits of disturbance were inventoried and tagged. Only those trees defined as “large trees” (10” DSH or greater) per Mercer Island City ordinance have been included in the following chart.

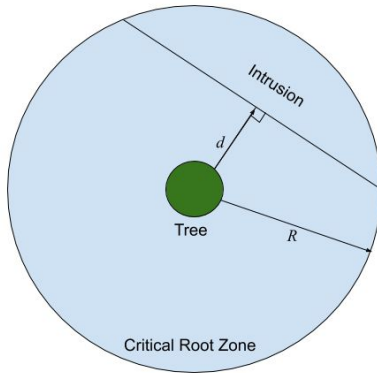
Please refer to **Appendix 1: Site Map** for tree locations and the approximate location of trees not included on the survey.



Tree Number	Species (latin)	Retention	DSH (inches)	"Large Tree"	Exceptional Tree	Over 24"	Ownership	Health/vigor	Structural Condition	TPZ Radius (inches)	% TPZ Intrusion
3	<i>Betula pendula</i>	No	10.9	Yes	No	No	Public	Low	Poor	N/A	N/A
6	<i>Betula pendula</i>	No	14.4	Yes	No	No	Public	Low	Poor	N/A	N/A
10	<i>Pseudotsuga menziesii</i>	Yes	14.3	Yes	No	No	Client	Normal	Good	172	25%
11	<i>Pseudotsuga menziesii</i>	Yes	12.1	Yes	No	No	Client	Normal	Good	145	25%
12	<i>Pseudotsuga menziesii</i>	No	14.1	Yes	No	No	Client	Normal	Good	N/A	N/A
13	<i>Acer macrophyllum</i>	Yes	26.2	Yes	No	No	Client	Normal	Good	393	6%
14	<i>Acer macrophyllum</i>	Yes	28.5	Yes	No	No	Client	Normal	Good	428	8%
24	<i>Acer macrophyllum</i>	Yes	39	Yes	Yes	Yes	West Neighbor	Normal	Fair	585	24%
25	<i>Arbutus menziesii</i>	Yes	36.8	Yes	Yes	Yes	West Neighbor	Low	Poor	662	34%
26	<i>Pseudotsuga menziesii</i>	Yes	33.5	Yes	Yes	Yes	West Neighbor	Normal	Good	503	34%
27	<i>Pseudotsuga menziesii</i>	Yes	29.6	Yes	Yes	Yes	West Neighbor	Normal	Good	444	28%
29	<i>Pseudotsuga menziesii</i>	Yes	36	Yes	Yes	Yes	West Neighbor	Normal	Good	540	20%
30	<i>Pseudotsuga menziesii</i>	Yes	36.9	Yes	Yes	Yes	West Neighbor	Normal	Good	554	9%



Observations



Tree Protection Zone intrusions were based on a one sided reduction in the size of the overall TPZ. % TPZ intrusion is shown as a percentage of the whole. These calculations are based on the chart in **Appendix 2: TPZ Intrusion Measurements**. The minimum distance to disturbance measurements listed correspond to the d value in the image to the right. R corresponds to the TPZ radius.

I am recommending removal of the city owned European birch trees (*Betula pendula*, #1-6) for several reasons. The first is that this is an inappropriate species to be located under utility lines. Several of the trees have been severely topped and are showing poor structure and vigor because of repeated utility clearance pruning. The larger trees have been forced to grow exclusively over the client's property with a significant lean. Additionally I noted the symptoms of bronze birch borer infestation in several of the taller trees. This insect has been causing widespread damage to the species and has led to doubts about the long term viability of the species in the region. Based on their inappropriate location as well as the insect infestation I recommend that this entire group of trees be removed and replaced with a species more appropriate to growth under utility wires. I do not anticipate a significant impact to the remaining trees from the removal of this group.

Douglas fir (*Pseudotsuga menziesii*, #12) will need to be removed due to proximity to construction. I do not anticipate a negative impact to the remaining group of Douglas firs.

Douglas firs (*Pseudotsuga menziesii*, #10 and #11) are in close proximity to the construction and a minor intrusion into the TPZ will be required. I have worked with Ms. Pirzio-Biroli to modify the limits of disturbance (**LOD**) to accommodate these trees and bring the TPZ intrusion down to the goal threshold of 25%. These are young and healthy trees and in my professional opinion they will not be significantly impacted by the intrusion.

I am confident that allowing a TPZ intrusion of 34% for Pacific madrone (*Arbutus menziesii* #12) will be acceptable. When I examined the tree I noted an extensive decay column in the lower bowl extending down into the root crown below ground. The roots on the east side of the tree appeared to be completely absent. The subject tree likely has very few roots located on my client's property and a TPZ intrusion of 34% is unlikely to negatively impact the subject tree.

Bigleaf maple (*Acer macrophyllum* #28) on the west neighbor's property is shown on the site plans as having a DSH of 40". I was unable to locate a tree of this size in or adjacent to the



noted location. I found a small grove of young maple trees, none large enough to qualify as a “large tree.” I do not anticipate an impact to this group of young trees.

Douglas fir (*Pseudotsuga menziesii* #26) has an intrusion of 34% which is over the 25% target. This tree has a notable lean to the east over the subject property. In my professional opinion the root density will be greater on the west side of the tree due to this lean, this includes the most important structural roots. Because of this fact I am comfortable allowing the additional encroachment on this tree.

Douglas fir (*Pseudotsuga menziesii* #27) is also above the threshold of 25% disturbance with a 28% disturbance. I have spoken with Ms. Pirzio-Biroli to maximize the size of the TPZ within the limits of the current design. Even though this is slightly over the target threshold of 25% this tree appears to be healthy and vigorous enough to withstand the disturbance.

Tree Protection Zone Requirements:

The City of Mercer Island provides guidance on tree protection zone layouts. Please see **Appendix 3: Tree Protection Zones Layout and Conditions**. Permanent fencing and signage complying with the guidelines shall be installed and all other conditions shall be followed. Fencing shall be installed prior to any ground disturbance and will remain in place for the duration of construction activities. The fencing may be removed when construction has been completed.

The tree protection zone shall consist of:

- A 5” deep layer of arborist wood chips should be installed inside the tree protection zones prior to the installation of fencing, care should be taken not to damage native plants or shrubs.
- Tree protection fencing shall consist of high density polyethylene fencing with 3.5”x1.5” openings, orange in color, and anchored by 2” by 6’ steel posts installed at 8’ o.c.
- A laminated 8.5” by 11” sign reading “Keep Out Tree Protection Area” must be installed every 50’ along the fence.
- Fencing shall be installed prior to demolition or ground disturbance and kept in place for the duration of construction.
- No soil disturbance or activity allowed within the fenced area: material storage/stockpiling, parking, excavation, dumping, or washing.
- These requirements may only be modified with the approval of the city of Mercer Island and the project arborist.



- Tree protection measures shall be inspected by the project arborist before the commencement of demolition or ground disturbance.

Roots outside of tree and vegetation protection zones:

If roots greater than one inch diameter are found outside of tree protection zone fencing, cut cleanly with a reciprocal saw or other cutting tool. Do not use excavation equipment to cut roots. Keep cut ends moist with a material such as wetted burlap until the area is backfilled.

Follow Up

After the completion of the construction project, trees should be inspected by a qualified arborist. Additionally trees should be monitored annually for three to five years. If it has been determined that construction has had a negative impact on the trees remedial steps should be taken to improve tree health. Those steps may include:

- Addition of mulch
- Watering
- Fertilization
- Removal and replacement of trees which are badly damaged or in an irreversible decline due to construction activities
- Development of a regular maintenance program to enhance tree health

Replacement trees

According to Mercer Island any trees that are cut pursuant to a tree permit shall be replaced on the subject property as specified below. The only exclusion is trees less than 10 DSH, not an exceptional tree, and not a replacement tree from another tree permit. While the Mercer Island tree code recommends a 1:1 replacement of trees under 10" DSH this is not a requirement. Based on my calculations **6 replacement trees** will be required. Replacement trees shall be located in the following order of priority from most important to least important:

1. On-site replacement adjacent to or within critical areas;
2. On-site replacement outside of critical areas adjacent to other retained trees making up a grove or stand of trees;
3. On-site replacement outside of critical areas; and,
4. Off-site in adjacent public right-of-way where explicitly authorized by the City.

Species – Replacement trees shall primarily be species native to the Pacific Northwest.



Size – All replacement trees shall be at least 6' tall for conifers and at least 1.5" diameter at the base for deciduous trees. Shrubs and bushes are not an acceptable replacement for trees. Smaller replacement trees are allowed if the applicant can demonstrate that smaller trees are more suited to the species, site conditions, neighborhood character, and the purposes of MICC 19.10 and that such replacement trees will be planted in sufficient quantities to meet the intent of MICC 19.10.

I recommend that four replacement trees be located on the critical slope downhill of the house and two be located on the public right of way. The trees located on the critical slope are to be native trees reflecting the makeup of the surrounding stand. This includes **two bigleaf maple (*Acer macrophyllum*)** and **two Douglas fir (*Pseudotsuga menziesii*)** meeting the size criteria listed above. I recommend a low-growing tree for the area under the utility lines on the ROW. **Two pacific yew (*Taxus brevifolia*)** are recommended, additional yew specimens may be planted in the ROW to create a privacy screen. These recommendations are meant only to reflect the minimum requirements, additional planting on the critical slope or within the ROW may also be performed.

Planting Guidelines

All tree planting work should be performed in accordance with the specifications set forth in the ANSI A300 (Part 6)-2012 Planting and Transplanting. Care should be taken to select good planting stock. Container grown, grow bag, and ball and burlap are all acceptable forms of planting stock. Trees should be inspected carefully for health and defects. Trees with defects such as girdling root(s), codominant leaders, or trees with roots that are severely container bound should be avoided. Be sure to pull back soil around the base of the tree and to open up burlap on ball and burlap trees to inspect for defects.

1. Identify the root flare. The trunk flare is where the trunk expands at the base of the tree. This point should be partially visible after the tree has been planted (see diagram). Remove excess soil from the top of the root ball prior to planting if the root flare is not visible.
2. Dig a shallow, broad planting hole. Holes should be 2 to 3 times wider than the root ball, but only as deep as the root ball. Digging a broad planting pit breaks up the surrounding soil and provides newly emerging tree roots room to expand.
3. Remove the containers or cut away the wire basket. Inspect container tree root balls for circling roots. Straighten, cut, or remove them. Expose the root flare, if necessary.
4. Remove soil from the root ball taking care not to damage the roots. Inspect for girdling or circling roots and straighten or prune the roots to correct these defects.
5. Place the tree at the proper height. Take care to dig the hole to the proper depth — and no more. The majority of a tree's roots develop in the top 12 inches (30 cm) of soil. If the tree is planted too deeply, new roots will have difficulty developing because of a lack of oxygen. In



poorly drained or heavy clay soils, trees can be planted with the base of the trunk flare 2 to 3 inches (5 to 7.5 cm) above grade. When placing the tree in the hole, lift it by the root ball, not the trunk.

6. Fill the planting hole with soil, lightly packing it in around the root ball.
7. Create a berm around the planting hole and soak the area inside the berm thoroughly with a hose.
8. Check the stability of the tree, if it is at risk of falling over, provide supplemental support, generally this consists of stakes connected to the tree with tree ties. The ties should be snug but not tight.
9. Place a two inch thick layer of wood chip mulch over the planting area.

Planting Aftercare

Trees need to be watered while they adjust to their new site and grow roots that will sustain them in the future. Watering is not meant to be permanent and the goal is to eventually wean the trees off of supplemental irrigation. Trees need to be watered April-October and I recommend two different systems for tree irrigation. Most trees need to be watered for two years after planting with occasional watering afterwards during periods of extended drought.

Watering bags: These are placed around the tree. Upright watering bags such as the one pictured work well for taller trees lacking low branches. There are also shorter, donut shaped watering bags for shrubs or trees with low branches. These bags can be provided by us but are also available at local nurseries as well as many online sources. Treegator is a well known name brand, but there are many similar alternatives.

- Watering bags should be filled once a week
- Watering frequency may be increased to twice a week during the height of the summer heat or if the tree is showing signs of drought stress
- Overwatering can also harm or kill trees, do not fill bags more than twice a week
- You will need to arrange for the bags to be filled if you plan to be away for more than a week during the watering period

Timed drip irrigation: There are many different systems available from local hardware stores and landscape suppliers. The goal is to have drip heads within 6" of the trunk. Sprinkler irrigation is ineffective for trees, trees need their own drip system.

- *Amount:* For every 1" caliper a newly planted tree should get 1 gallon of water per day. So a 2 inch tree should get 2 gallons of water per day.
- *Calibration:* You need to know how much water your system is putting out. Place your soaker hose or drip emitter into a 1 gallon bucket and time how long it takes to fill the



bucket. Remember, if you are watering multiple trees on the same line, you will have to multiply the number of trees.

- *First Year:* 15 minutes a day, every day, from the months of April through October.
- *Second Year:* 30 minutes, 3 times a week from April through October. Soaker hoses and drip emitters should also be moved further from the trunk in the second year.
- *Third Year and Beyond:* Water only during the hottest part of the year. In the Pacific Northwest, that's usually June, July, August and lately, September.
- This system, while more complicated and resource intensive than watering bags, requires little intervention other than spring setup and fall shutdown. No need to worry about your trees if you plan to be away for an extended period.
- Soil moisture should be occasionally checked to ensure proper watering, remember overwatering can harm or kill trees.

Stakes: Stakes should be removed after one full year. Give the tree a moderate wiggle after you remove the stakes. The trunk should flex. If you see the ground moving significantly there may be issues with anchorage and the tree should be professionally assessed.

Conclusion

If the guidelines set forth in this tree preservation plan are followed the negative impact of construction on the trees should be minimized. It is vital to educate all workers entering the site on the instructions outlined in this plan, the value of preserving the trees on the site, and the cost associated with replacing damaged trees. Monitoring and proper aftercare are also essential to the health of any trees affected by construction.

Glossary:

Critical Root Zone (CRZ): The area of soil around a tree where the minimum amount of roots considered critical to the structural stability or health of the tree are located.

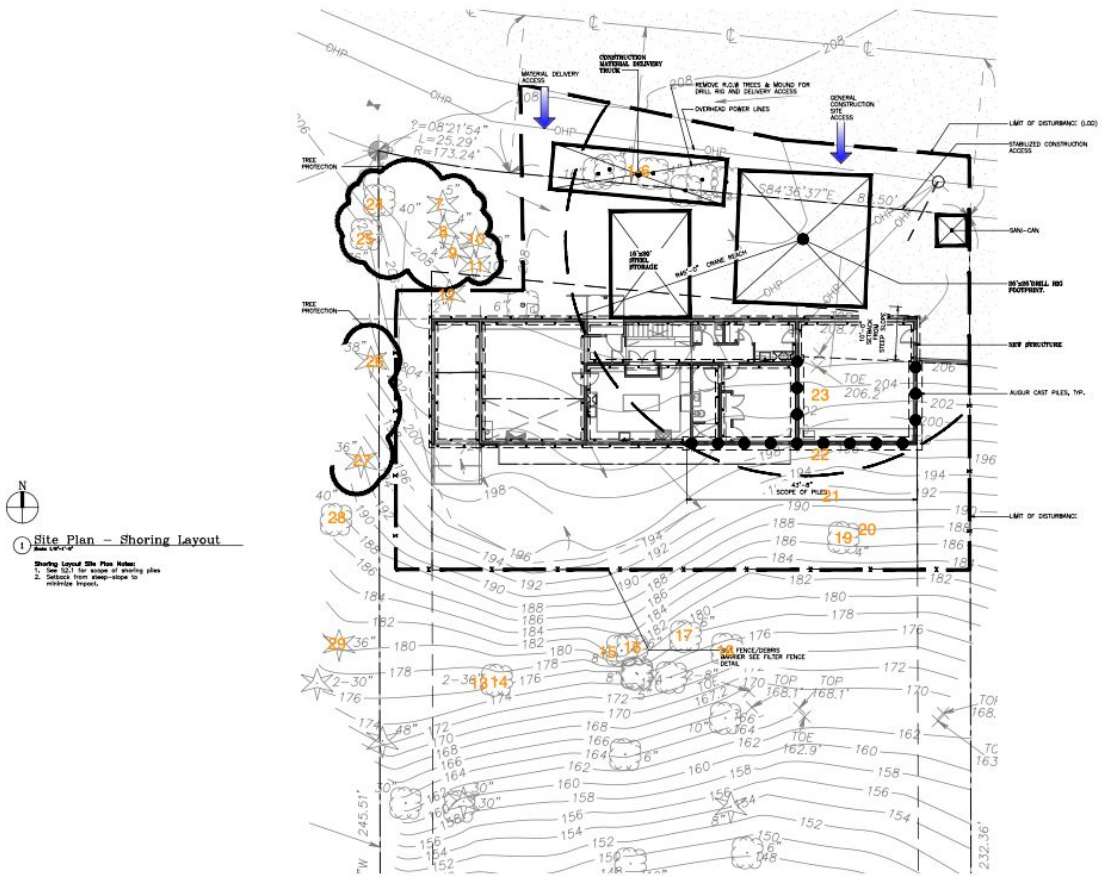
Diameter at Standard Height (DSH): The diameter of the trunk measured four feet six inches above the ground.

Limit of Disturbance (LOD): The boundary within which all construction, materials storage, grading, landscaping and related activities shall occur.

Right of Way (ROW): Public property associated with the abutting roadway.



Appendix 1: Site Map with tree numbers (please note TPZs have been modified on final plans, this map is only for tree locations)



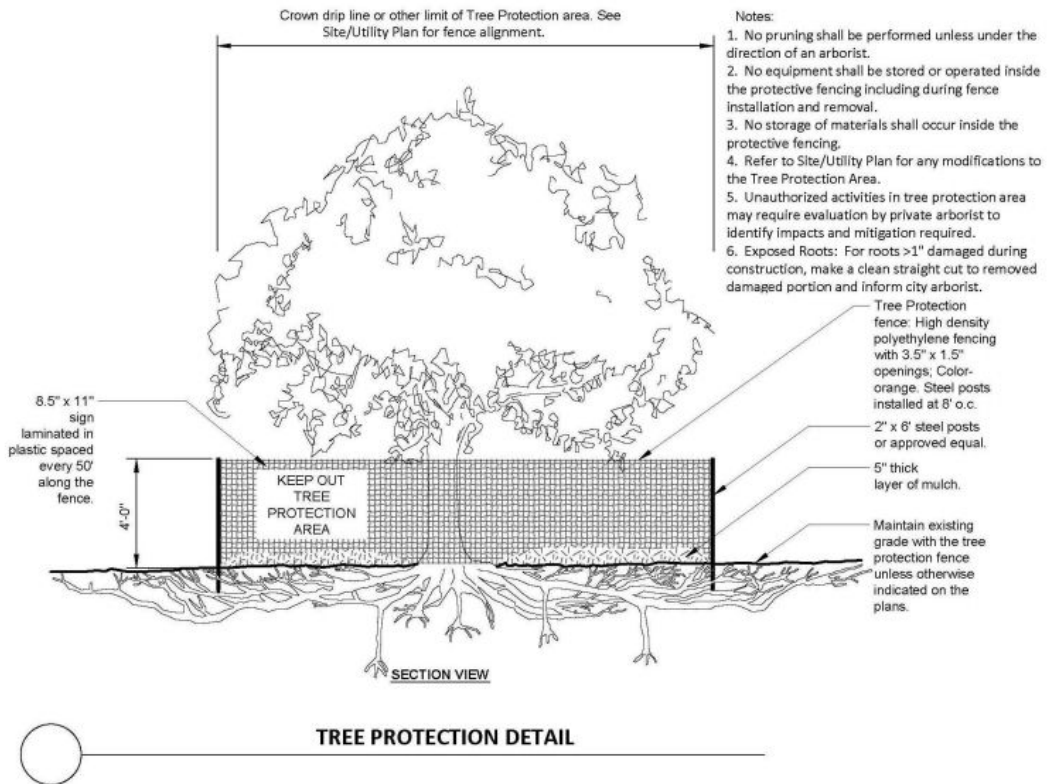


Appendix 2: TPZ Intrusion Measurements

Tree Number	Species (latin)	Minimum Distance to disturbance (inches)	TPZ Intrusion
10	<i>Pseudotsuga menziesii</i>	70	25%
11	<i>Pseudotsuga menziesii</i>	58	25%
13	<i>Acer macrophyllum</i>	309	6%
14	<i>Acer macrophyllum</i>	309	8%
24	<i>Acer macrophyllum</i>	248	24%
25	<i>Arbutus menziesii</i>	173	34%
26	<i>Pseudotsuga menziesii</i>	125	34%
27	<i>Pseudotsuga menziesii</i>	157	28%
29	<i>Pseudotsuga menziesii</i>	265	20%
30	<i>Pseudotsuga menziesii</i>	396	9%



Appendix 3: Tree Protection Zones Layout and Conditions





Appendix 4: Assumptions & Limiting Conditions

1. Any legal description provided to the consultant/appraiser is assumed to be correct. Any titles and ownerships to any property are assumed to be good and marketable. No responsibility is assumed for matters legal in character. Any and all property is appraised or evaluated as though free and clear, under responsible ownership and competent management.
2. Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible; however, the consultant/appraiser can neither guarantee nor be responsible for the accuracy of information provided by others.
3. The consultant/appraiser shall not be required to give testimony or attend court by reason of this report unless subsequent contractual agreements are made, including payment of an additional fee for such services as described in the fee schedule and contract of engagement.
4. Loss or alteration of any part of this report invalidates the entire report.
5. Possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without the prior written or verbal consent of the consultant/appraiser.
6. Neither all nor any part of the contents of this report, nor copy thereof, shall be conveyed by anyone, including the client, to the public through advertising, public relations, news, sales or other media, without the prior expressed written or verbal consent of the consultant/appraiser particularly as to value conclusions, identity of the consultant/appraiser, or any reference to any professional society or institute or any initial designation conferred upon the consultant/appraiser as stated in his qualification.
7. This report and values herein represent the opinion of the consultant/appraiser, and the consultant's/appraiser's fee is in no way contingent upon the reporting of a specified value, stipulated results, the occurrence of a subsequent event, nor upon any finding to be reported.
8. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.
9. Unless expressed otherwise: (1) information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection; and (2) the inspection is limited to visual examination of accessible items without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied, that problems or deficiencies of the plants or property in question may not arise in the future.



Appendix 5: Certification of Performance

I Allen Taylor, certify that:

- I have personally inspected the trees and property referred to in this report and have stated my findings accurately. The extent of the evaluation or appraisal is stated in the attached report and the Terms of Assignment.
- I have no current or prospective interest in the vegetation or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved.
- The analysis, opinions, and conclusions stated herein are my own and are based on current scientific procedures and facts.
- My analysis, opinions, and conclusions were developed and this report has been prepared according to commonly accepted arboricultural practices.
- No one provided significant professional assistance to me, except as indicated within the report.
- My compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other party nor upon the results of the assessment, the attainment of stipulated results, or the occurrence of any subsequent events.



Appendix 6: Curriculum vitae

Allen Taylor
Conservation Tree Care
12037 80th Ave S
Seattle Wa, 98178
206-486-3398

Education:

Bachelors of Science, Forestry, University of Vermont: Class of 2009

Certifications:

Tree Risk Assessment Qualification, International Society of Arboriculture

Board Certified Master Arborist (PN-7316B), International Society of Arboriculture

Registered Consulting Arborist (RCA #643), American Society of Consulting Arborists

Work Experience:

Ten years full time experience in the field of Arboriculture. Extensive experience pruning trees to enhance health and safety. Worked to remedy hazardous or failed trees or tree parts through pruning or removal. Experience evaluating tree health and impact on the surrounding environment including conducting basic tree risk assessments and assessing the impact of construction to trees. Member in good standing of the International Society of Arboriculture and the American Society of Consulting Arborists.

CITY OF MERCER ISLAND

COMMUNITY PLANNING & DEVELOPMENT

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TREE INVENTORY & REPLACEMENT SUBMITTAL INFORMATION

EXCEPTIONAL TREES

Exceptional Trees- means a tree or group of trees that because of its unique historical, ecological or aesthetic value constitutes an important community resource. A tree that is rare or exceptional by virtue of its size, species, condition, cultural/historical importance, age, and/or contribution as part of a tree grove. Trees with a diameter of more than 36 inches, or with a diameter that is equal to or greater than the diameter listed in the Exceptional Tree Table shown in MICC 19.16 under Tree, Exceptional.

List the total number of trees for each category and the tree identification numbers from the arborist report.

Number of trees 36" or greater _____

List tree numbers: _____

Number of trees 24" or greater (including 36" or greater) _____

List tree numbers: _____

Number of trees from Exceptional Tree Table (MICC 19.16) _____

List tree numbers: _____

LARGE REGULATED TREES

Large Regulated Trees- means any tree with a diameter of 10 inches or more, and any tree that meets the definition of an Exceptional Tree.

Number of Large Regulated Trees on site _____ (A)

List tree numbers: _____

Number of Large Regulated Trees on site proposed for removal _____ (B)

List tree numbers: _____

Percentage of trees to be retained ((A-B)/Ax100) note: must be at least 30% _____ %

RIGHT OF WAY TREES

Right of Way Trees- means a tree that is located in the street right of way adjacent to the project property.

Number of Large Regulated Trees in right of way _____

List tree numbers: _____

Number of Large Regulated Trees in right of way proposed for removal _____

List tree numbers: _____

Reason for removal: _____

TREE REPLACEMENT

Tree replacement- removed trees must be replaced based on the ratio in the table below. Replacement trees shall be conifers at least six feet tall and or deciduous at least one and one-half inches in diameter at base.

Diameter of Removed Tree (measured 4.5' above ground)	Tree replacement Ratio	Number of Trees Proposed for Removal	Number of Tree Required for Replacement Based on Size/Type
Less than 10"	1		
10" up to 24"	2		
Greater than 24" up to 36"	3		
Greater than 36" and any Exceptional Tree	6		
TOTAL TREE REPLACEMENTS			