

Gilles Consulting

— Brian K. Gilles —

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EVALUATION OF TREES AT

**4825 East Mercer Way
Mercer Island, WA 98040**

September 19, 2017

PREPARED FOR:

**Sang Hou
7022 East Mercer Way
Mercer Island, WA 98040**

PREPARED BY:

GILLES CONSULTING

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EXECUTIVE SUMMARY

A total of 38 trees were evaluated, documented, and included in this report.

PROPERTY SUMMARY		
Property	# of Trees	Percent
Subject Property	36	94.7%
Off Property	2	5.3%
Total	38	94.7%

STATUS SUMMARY		
Status	# of Trees	Percent
Significant	19	52.8%
Not Significant	17	47.2%
Total	36	100.0%

VIABILITY SUMMARY		
Status	# of Trees	Percent
Viable	25	69.4%
Non-Viable	11	30.6%
Total	36	100.0%

ASSIGNMENT

Sang Hou contracted with Gilles Consulting to evaluate the trees at 4825 East Mercer Way. The property is currently undeveloped and is being considered for development of a new single family home. The City of Mercer Island requires an analysis of the trees as part of the permit process. This report provides the analysis. The information in this report must be utilized to create a Tree Retention and Protection Plan as required by Mercer Island Code.

METHODOLOGY

To evaluate the trees, as well as to prepare this report, I drew upon my 30+ years of experience in the field of arboriculture and my formal education in natural resources management, dendrology, forest ecology, plant identification, and plant physiology. I followed the protocol of the International Society of Arboriculture (ISA) for tree risk assessment. Published in 2011, the *Best Management Practices, Tree Risk Assessment, ANSNI A300 Part 9* was developed to aid in the interpretation of professional standards and guide work practices based upon current science and technology. Using this process,

now called the *Tree Risk Assessment Qualification*, or TRAQ for short, I performed a Level Two assessment which included looking at the overall health of the tree as well as the site conditions. This is a scientifically based process to look at the entire site, surrounding land and soil, as well as a complete look at the trees themselves.

In examining each tree, I looked at such factors as: size, vigor, canopy and foliage condition, density of needles, injury, insect activity, root damage and root collar health, crown health, evidence of disease-causing bacteria, fungi or virus, dead wood and hanging limbs.

Failure

While no one can predict with absolute certainty which trees will or will not fail, we can, by using this scientific process, assess which trees are most likely to fail and take appropriate action to minimize injury and damage.

Tree Tags

The trees were tagged and numbered 901 through 938. The tags are made of shiny aluminum approximately one inch by three inches in size and are attached to the tree with staples and a one foot strip of brightly colored survey tape. The tags were placed as high as possible to minimize their removal and were generally placed on the backsides of the trees as inconspicuously as possible. Please refer to *Attachment 1, Critical Areas Mitigation Plan/Existing Conditions Plan* for an orientation to the site and the approximate location of the trees.

Missing Trees

There were a few trees that were not included on the survey. They were labeled with the next number in the sequence and then their approximate location was indicated on the included site plan. These trees may need to be surveyed to determine their exact location in relation to the proposed site improvements and their retainability.

OBSERVATIONS

The property is located on the west side of East Mercer Way at a hair-pin turn just south of E. Mercer Highland Drive. The King County Assessor's office lists the lot as 26,761 square feet. The property slopes sharply up hill from East Mercer Way to the western property lines. There is a stream and wetland along the northern property line. The property is currently covered with a typical set of species common to lowland Puget Sound. Species observed include:

- Tree Species:

Big Leaf Maple, <i>Acer macrophyllum</i>
Douglas Fir, <i>Pseudotsuga menziesii</i>
Red Alder, <i>Alnus rubra</i>
Western Hemlock, <i>Tsuga heterophylla</i>
Western Hazelnut, <i>Corylus cornuta</i>
Western Red Cedar, <i>Thuja plicata</i>

- Small Trees and Tall Shrubs:

Red Elderberry, <i>Sambucus racemosa</i>
Vine Maple, <i>Acer circinatum</i>
Western Hazelnut, <i>Corlys comuta</i>

- Small Shrubs and Ground Cover Plants:

Devil's Club, <i>Oplopanix horridum</i>
Bracken Fern, <i>Pteridium aquilinum</i>
Foam Flower, <i>Tiarella wherryi</i>
Horse Tail, <i>Equisetum speciosa</i>
Maidenhair Fern, <i>Adiantum aleuticum</i>
Oregon Grape, <i>Mahonia nervosa</i>
Salmon Berry, <i>Rubus spectabilis</i>
Stinging Nettle, <i>Urtica dioica</i>
Sword Fern, <i>Polystichum munitum</i>
Trailing Blackberry, <i>Rubus ursinus</i>

- Invasive Species:

English Holly, <i>Ilex aquifolium</i>
English Ivy, <i>Hedera helix</i>
English Laurel, <i>Prunus laurocerasus</i>
Himalayan Blackberry, <i>Rubus armeniacus</i>

In an effort to present the information and conclusions for each tree in a manner that is clear and easy to understand, as well as to save paper, I have included a detailed spreadsheet, [Attachment 2, Tree Inventory/Condition Spreadsheet](#). All the same information from the ISA Tree Hazard Form is included in this spreadsheet and the attached glossary. The descriptions on the spreadsheet were left brief in order to include as much pertinent information as possible and to make the report manageable. The attached glossary provides a detailed description of the terms used in the spreadsheet and in this report. It can be found in [Attachment 3, Glossary](#). A brief review of these terms and descriptions will enable the reader to rapidly move through the spreadsheet and better understand the information.

DISCUSSION

Right-of-Way Trees

There are no right-of-way trees impacted by this project.

Trees on Adjacent Properties

While there are a few trees with canopies that overhang the subject property, none of these trees will be impacted by the proposed new family home.

Trees on the Subject Property

Thirty six of the trees are on the subject property. They can be summarized as:

STATUS: 19 of the trees have the minimum size or more, the current health, vigor, structural stability, and wind firmness to be considered *Significant Trees*.

STATUS SUMMARY		
Status	# of Trees	Percent
Significant	19	52.8%
Not Significant	17	47.2%
Total	36	100.0%

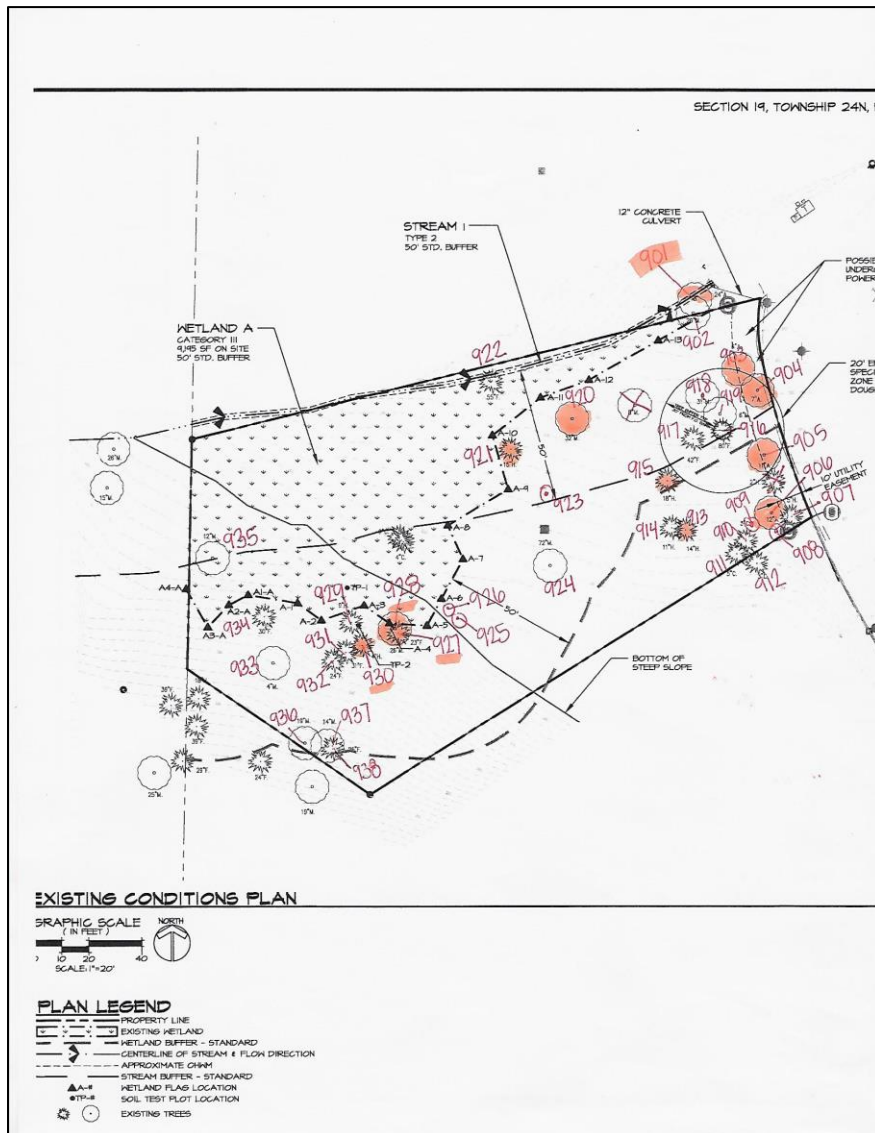
CURRENT HEALTH AND VIABILITY: 25 of the 36 trees are rated as being in Fair, Good, Very Good, or Excellent Condition. Therefore, those 25 are all *Viable*. The remaining 11 trees have structural defects or internal decay in advanced enough stages that the trees are potentially hazardous. The summary of Current Health Ratings is as follows:

CURRENT HEALTH RATING SUMMARY of Subject Property Trees		
Rating	% of Trees	%
Dead	0	0.0%
Dying	1	2.8%
Poor	10	27.8%
Fair	9	25.0%
Good	16	44.4%
Very Good	0	0.0%
Excellent	0	0.0%
Total:	36	100.0%

Therefore, the eleven trees that are Poor or Dying are *Non-Viable Trees*.

VIABILITY SUMMARY		
Status	# of Trees	Percent
Viable	25	69.4%
Non-Viable	11	30.6%
Total	36	100.0%

Exhibit # 1: The Existing Conditions Plan from Talasaea Consultants, Inc. showing the eleven *Non-Viable* Trees. It is obvious that many of the trees are within striking distance of the proposed driveway and home. Many of these trees will need to be reduced for safety. Some can be allowed to fall on their own if they do not have a target. Some can be converted into Habitat Trees, Nurse Logs, and Brush Piles to benefit erosion control and desirable urban/suburban wildlife. Please refer to *Attachment 6, Habitat Tree, Nurse Log, and Brush Pile Creation and Benefits* for important information.



Additional Testing

- Root Exposure and Evaluation:
 - In 2007 and 2008, when the property was previously being considered for development, the Development Services Department determined that the only place for the driveway was on the south side of trees # 916 and 917.
 - These are the 78.4-inch diameter and the 43.5-inch diameter Douglas Fir trees at the top of the rise near the road.
 - In an effort to determine whether or not this could be done, Pat See, of See's Tree's and Excavation Inc. was hired to perform an *extensive* exposure of the roots on the south side of the two Firs.
 - His undated report from early 2008 was well done and shows where the buttress roots are on the north side of the trees.
 - Please refer to *Attachment 4, RE: Root crown evaluation for the large Douglas Fir tree located at 4825 E. Mercer Way, Mercer Island, WA* for details.
 - This work was very well done and the information is still relevant and useful today. We know where the main roots are based upon this work and we know that they have had 10 years of growth so we know they are larger.
 - Therefore, I chose not to replicate the work at this time.

- Trunk Decay Analysis:
 - Instead, I thought it more important to determine the internal state of the two trunks to determine whether there was so much internal decay the they were not worthy of retention.
 - Mr. Hou agreed to hire Kurt Fickeisen of Symbiosis Tree Care to perform a sonic tomograph near the base of each of the Fir trees to determine if decay is present, and; if so, how much. From this information we can determine whether or not the two monster trees are worthy of retention at all.
 - On Wednesday, September 13, 2017, I met Mr. Fickeisen at the subject property and he performed the two tests.
 - The results of the tests indicate a small amount of decay in the southwest side of the larger tree, # 916.
 - As a pair the two trees appear solid and wind firm at this time.
 - Therefore, they are worthy of retention and will require extraordinary protections during the development of the property.
 - Please refer to *Attachment 5, Report from Symbiosis Tree Care*, dated September 18, 2017 for details.

CONCLUSIONS

The eleven non-viable trees can be managed for safety and aesthetics. The trees in the buffer can be retained with extra ordinary *Tree Protection Measures*, (outlined below). Some trees will need to be removed for the construction of the driveway and the new home. Trees in the buffer and up the slope that are healthy can remain.

RECOMMENDATIONS

In my professional opinion, the retention of trees # 916 & 917, the two large Firs, and the construction of the driveway on the south side of the trees can be accomplished with extra-ordinary tree protection measures that include a modified driveway construction.

This modification will include several major changes from the normal poured in place driveway.

- First, the driveway must be installed prior to the utilities and the rest of the improvements.
- Second, the clearing within the dripline of the two Fir trees must all be done by hand and limited to removal of vegetation and duff only. The soils must remain.
 - An air spade will be effective supporting this work with minimal damage to the tree roots.
- Third, the driveway will need heavily reinforced with re-bar.
 - The driveway must be strong enough that it does not flex or sink under the weight of construction or delivery vehicles, or even the weight of the driveway over time under the force of gravity.
- Fourth, a series of pier supports made of steel reinforced concrete to support the driveway.
 - This is work that must be done by an air spade and hand shovel within the driplines of the two Fir trees to create these piers.
 - The excavation for the piers must be done with an absolute minimum of damage to the bark of the roots.
 - The steel of the piers must be tied to the steel of the driveway.
 - 12-inch sonotubes will be adequate and easily installed between the major roots. An engineer may want to be consulted to ensure adequate steel and concrete is combined to achieve the goals.

Tree Protection Measures

In order for trees to survive the stresses placed upon them in the construction process, tree protection must be planned in advance of equipment arrival on site. If tree protection is not planned integral with the design and layout of the project, the trees will suffer needlessly and possibly die. With proper preparation, often costing little or nothing extra to the project budget, trees can survive and thrive after construction. This is critical for tree survival because damage prevention is the single most effective treatment for trees

on construction sites. Once trees are damaged, the treatment options available are limited.

The minimum Tree Protection Measures in Attachment 9, Tree Protection Measures are on three separate sheets that can be copied and introduced into all relevant documents such as site plans, permit applications and conditions of approval, and bid documents so that everyone involved is aware of the requirements. These Tree Protection Measures are intended to be generic in nature. They will need to be adjusted to the specific circumstances of your site that takes into account the location of improvements and the locations of the trees.

WAIVER OF LIABILITY

There are many conditions affecting a tree's health and stability, which may be present and cannot be ascertained, such as, root rot, previous or unexposed construction damage, internal cracks, stem rot and more which may be hidden. Changes in circumstances and conditions can also cause a rapid deterioration of a tree's health and stability. Adverse weather conditions can dramatically affect the health and safety of a tree in a very short amount of time. While I have used every reasonable means to examine these trees, this evaluation represents my opinion of the tree health at this point in time. These findings do not guarantee future safety nor are they predictions of future events.

The tree evaluation consists of an external visual inspection of an individual tree's root flare, trunk, and canopy from the ground only unless otherwise specified. The inspection may also consist of taking trunk or root soundings for sound comparisons to aid the evaluator in determining the possible extent of decay within a tree. Soundings are only an aid to the evaluation process and do not replace the use of other more sophisticated diagnostic tools for determining the extent of decay within a tree.

As conditions change, it is the responsibility of the property owners to schedule additional site visits by the necessary professionals to ensure that the long-term success of the project is ensured. It is the responsibility of the property owner to obtain all required permits from city, county, state, or federal agencies. It is the responsibility of the property owner to comply with all applicable laws, regulations, and permit conditions. If there is a homeowners association, it is the responsibility of the property owner to comply with all Codes, Covenants, and Restrictions (CC&R's) that apply to tree pruning and tree removal.

This tree evaluation is to be used to inform and guide the client in the management of their trees. This in no way implies that the evaluator is responsible for performing recommended actions or using other methods or tools to further determine the extent of internal tree problems without written authorization from the client. Furthermore, the evaluator in no way holds that the opinions and recommendations are the only actions required to insure that the tree will not fail. A second opinion is recommended. The

client shall hold the evaluator harmless for any and all injuries or damages incurred if the evaluator's recommendations are not followed or for acts of nature beyond the evaluator's reasonable expectations, such as severe winds, excessive rains, heavy snow loads, etc.

This report and all attachments, enclosures, and references, are confidential and are for the use of the client concerned. They may not be reproduced, used in any way, or disseminated in any form without the prior consent of the client concerned and Gilles Consulting.

Thank you for calling Gilles Consulting for your arboricultural needs.

Sincerely,



Brian K. Gilles, Consulting Arborist
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ASCA Registered Consulting Arborist # RCA-418
ISA TRAQ Qualified
ISA TRAQ Certified Instructor

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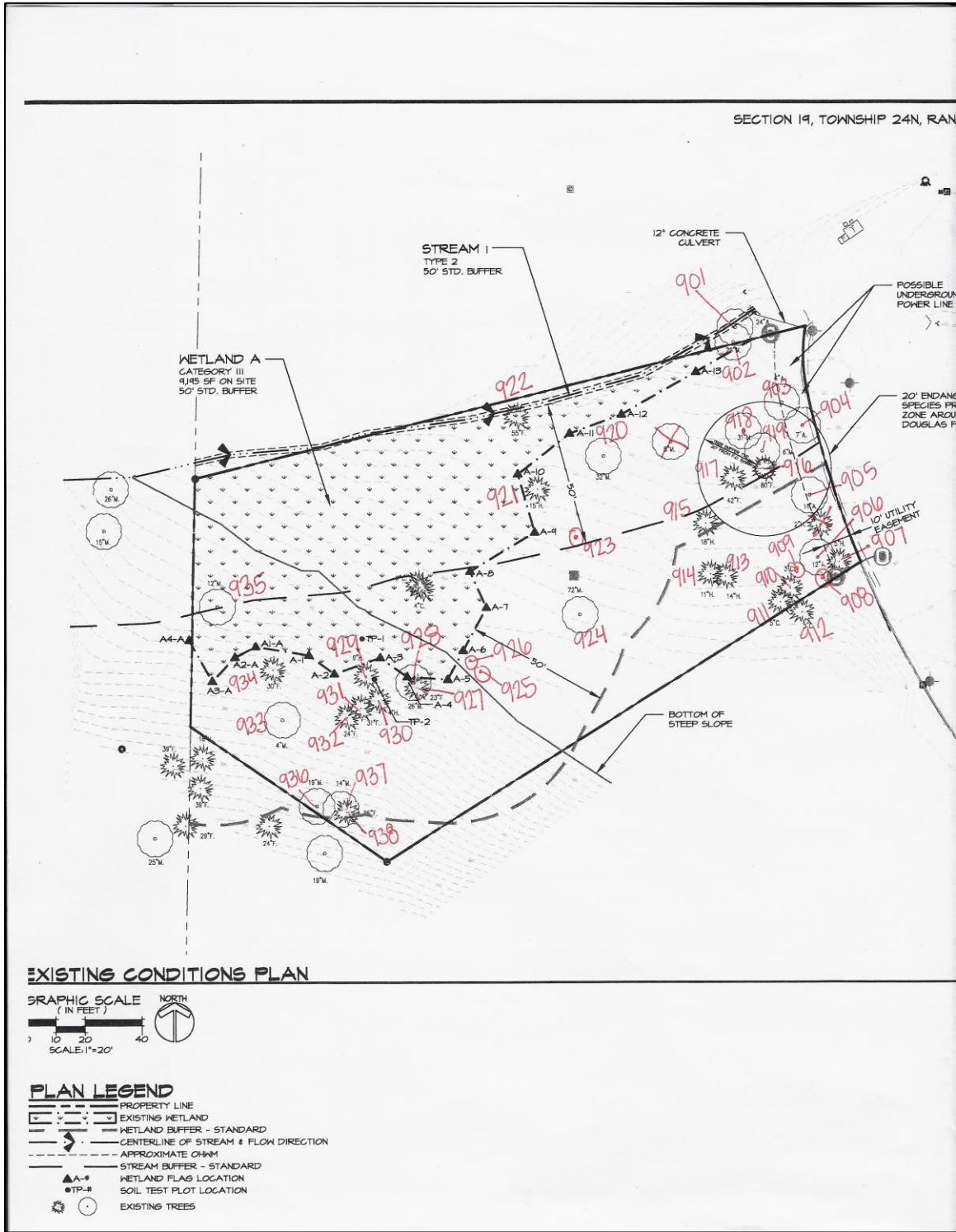
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ATTACHMENT 1 - EXISTING CONDITIONS PLAN



ATTACHMENT 2 - TREE INVENTORY/CONDITIONS SPREADSHEET

ABBREVIATED LEGEND--SEE GLOSSARY IN REPORT ATTACHMENTS FOR GREATER DETAIL	
#1	Property: Whether the tree is on or off the Subject Property, or a Right-of-Way tree.
#2	Tree #: The unique tag number of each tree.
#3	Species:
	BLM/Am <i>Big Leaf Maple, Acer macrophyllum</i>
	DF/Pm <i>Douglas Fir, Pseudotsuga menziesii</i>
	RA/Ar <i>Red Alder, Alnus rubra</i>
	WH/Th <i>Western Hemlock, Tsuga heterophylla</i>
	WHn/Cc <i>Western Hazelnut, Corylus cornuta</i>
	WRC/Tp <i>Western Red Cedar, Thuja plicata</i>
#4	DBH: Trunk diameter @ 4.5' above average ground level.
#5	Drip Line: The radius, the distance from the trunk to the furthest branch tips.
#6	Limits of Disturbance: The boundary between the area of minimum protection around a tree and the allowable site disturbance as determined by a qualified professional
#7	LCR: <i>Live Crown Ratio</i> - the amount of live canopy expressed as a % of the entire tree height
#8	Symmetry: General shape of canopy and weight distribution of the tree around the trunk.
#9	Foliage: General description of foliage density that indicates tree health and vigor.
#10	Crown Condition: The most important external indication of tree health and vigor.
#11	Trunk: Description of trunk condition or abnormalities if any.
#12	Root Collar: The base of the tree where the trunk flares into the roots--deformities or problems are noted here.
#13	Roots: Root problems are noted here.
#14	Comments: Additional observations about the tree's condition.
#15	Status: A "significant" tree is either a tree in good health structure that is 6.0 inches in diameter or greater measured at 54 inches.
#16	Current Health Rating: A description of general health ranging from dead, dying, poor, fair, good, very good, to excellent.
#17	Viability: A significant tree that is in good health with a low risk of failure due to structural defects, is relatively wind firm if isolated or remains as part of a grove, and is a species that is suitable for its location.
#18	Recommendation: This is an estimate of whether or not the tree is of sufficient health, vigor, and structure to consider retaining.

Trees highlighted in **red ink** are non-viable trees recommended for some form of management for safety.

1	2	3	4	5	6 -- LIMITS OF DISTURBANCE					7	8	9	10	12	13	14	15	16	17	18
PROPERTY	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	Status	CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Off property to north	901	BLM/Am	26.5"	0'	NA	NA	NA	NA	0%	None	None	Broken out	Broken out at 12', center rot	Base rot	Rot	Carpenter ant infestation. English ivy up 100%. Stapled to base of 902.	Not Significant	Dead	Non-viable	Allow to fall
Off property to north	902	BLM/Am	30.0"	26'	26'	26'	26'	26'	35%	Gen. Sym.	Dense	Healthy	Forked at 26'	Exposed	Aerial	Growing out of nurse stump.	Significant	Fair	Viable	Potential to retain with Tree Protection Measures

1	2	3	4	5	6 -- LIMITS OF DISTURBANCE					7	8	9	10	12	13	14	15	16	17	18
PROPERTY	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	Status	CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject property	903	RA/Ar	6.0"	18'	NA	NA	NA	NA	15 %	Maj. Asym.	Average	Weak	Leans east over road, center road	Base rot	Rot	Growing out of bank. Rot pockets in branch collar wounds.	Not Significant	Poor	Non-viable	Remove for safety
Subject property	904	RA/Ar	8.9"	20'	NA	NA	NA	NA	12 %	Maj. Asym.	Thin	Broken out	Broken out	Partially exposed	Restricted	Leans over road.	Not Significant	Poor	Non-viable	Remove for safety
Subject property	905	RA/Ar	10.1"	20'	NA	NA	NA	NA	35 %	Maj. Asym.	Average	Weak	Center rot	Base rot	Rot	Carpenter ant infestation. Woodpecker activity.	Not Significant	Dying	Non-viable	Remove for safety
Subject property	906	RA/Ar	13.8"	24'	NA	NA	NA	NA	60 %	Maj. Asym.	Thin	Regenerating weak	Previously topped at 22'	Partially exposed	NAD	Leans east over roadway.	Not Significant	Poor	Non-viable	Remove for safety
Subject property	907	WH/Th	6.1"	16'	16'	South property line	16'	16'	75 %	Maj. Asym.	Thin	Overtopped	Straight	Partially exposed	NAD		Not Significant	Fair	Viable	Potential to retain with Tree Protection Measures
Subject property	908	WHn/Cc	6.6"	16'	16'	South property line	16'	16'	45 %	Maj. Asym.	Average	Average	Forked at base	NAD	NAD		Not Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	909	BLM/Am	6.1"	13'	13'	South property line	13'	13'	30 %	Min. Asym.	Average	Average	Straight	Pistol butt base	NAD		Not Significant	Good	Viable	Potential to retain with Tree Protection Measures

1	2	3	4	5	6 -- LIMITS OF DISTURBANCE					7	8	9	10	12	13	14	15	16	17	18
PROPERTY	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	Status	CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject property	910	WRC/Tp	3.9"	10'	10'	South property line	10'	10'	95%	Min. Asym.	Average	Average	Straight	Partially exposed	NAD		Not Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	911	BLM/Am	4.6"	14'	14'	South property line	14'	14'	25%	Gen. Sym.	Dense	Healthy	Forked at 2'	Partially exposed	NAD		Not Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	912	WRC/Tp	8.8"	12'	12'	South property line	12'	12'	98%	Min. Asym.	Dense	Healthy	Slight bow	Exposed	NAD		Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	913	WH/Th	17.1"	20'	NA	NA	NA	NA	65%	Maj. Asym.	Thin	Weak	Serpentine	Exposed	Aerial		Not Significant	Poor	Non-viable	Habitat at 12'
Subject property	914	WH/Th	11.1"	12'	12'	12'	12'	12'	50%	Maj. Asym.	Dense	Healthy	Straight	Exposed	Aerial		Significant	Fair	Viable	Potential to retain with Tree Protection Measures
Subject property	915	WH/Th	16.3"	14'	NA	NA	NA	NA	40%	Min. Asym.	Thin	Regenerating weak	Center rot. Previously topped at 36' with decay	Base rot	Rot		Not Significant	Poor	Non-viable	Remove for safety

1	2	3	4	5	6 -- LIMITS OF DISTURBANCE					7	8	9	10	12	13	14	15	16	17	18
PROPERTY	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	Status	CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject property	916	DF/Pm	78.4"	40'	40'	40'	Roadway	40'	65%	Gen. Sym.	Average	Regenerating average	Straight	NAD	NAD		Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	917	DF/Pm	43.5"	30'	30'	30'	Roadway	30'	50%	Maj. Asym.	Average	Broken out	Slight lean northwest	Partially exposed	NAD		Significant	Fair	Viable	Potential to retain with Tree Protection Measures
Subject property	918	BLM/Am	25.6"	36'	36'	36'	36'	36'	65%	Min. Asym.	Dense	Healthy	Forked at 22' with included bark	Swollen	NAD		Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	919	BLM/Am	6.3"	14'	14'	14'	14'	14'	35%	Maj. Asym.	Average	Average	Forked at base, bowed	Partially exposed	NAD		Not Significant	Fair	Viable	Potential to retain with Tree Protection Measures
Subject property	920	BLM/Am	29.7"	28'	NA	NA	NA	NA	80%	Min. Asym.	Average	Regenerating average	Center rot	Base rot	Rot	Carpenter ant infestation. Open wound on the east side from the base up 9 feet.	Not Significant	Poor	Non-viable	Remove for safety
Subject property	921	WH/Th	15.5"	20'	20'	20'	20'	20'	98%	Min. Asym.	Average	Average	Straight	Exposed	Aerial	Growing out of nurse stump.	Significant	Good	Viable	Potential to retain with Tree Protection Measures

1	2	3	4	5	6 -- LIMITS OF DISTURBANCE					7	8	9	10	12	13	14	15	16	17	18
PROPERTY	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	Status	CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject property	922	DF/Pm	55.5"	30'	30'	30'	30'	30'	40%	Gen. Sym.	Average	Average	Straight	Exposed	Restricted		Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	923	FCh/Ps p	12.3"	16'	16'	16'	16'	16'	60%	Min. Asym.	Average	Average	Forked at 3 & 6'	Partially exposed	NAD		Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	924	BLMA m	72.0"	46'	NA	NA	NA	NA	60%	Gen. Sym.	Dense	Healthy	Forked at 6'	Exposed	NAD	English ivy up 60%. Dead branches in canopy. Decay column in trunk.	Not Significant	Poor	Non-viable	Remove for safety
Subject property	925	DF/Pm	42.3"	32'	32'	32'	32'	32'	40%	Min. Asym.	Dense	Healthy	Straight	Exposed	NAD	English ivy up 85%.	Significant	Fair	Viable	Potential to retain with Tree Protection Measures
Subject property	926	WRC/T p	8.5"	7'	7'	7'	7'	7'	85%	Maj. Asym.	Average	Average	Serpentine	Exposed	NAD	Base is growing out of tree 925.	Significant	Fair	Viable	Potential to retain with Tree Protection Measures

1	2	3	4	5	6 -- LIMITS OF DISTURBANCE					7	8	9	10	12	13	14	15	16	17	18
PROPERTY	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	Status	CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject property	927	DF/Pm	30.0"	16'	NA	NA	NA	NA	12 %	Maj. Asym.	Average	Weak	Bowed	Base rot	Rot	Carpenter ant infestation. English ivy up 95%.	Not Significant	Poor	Non-viable	Remove for safety
Subject property	928	BLM/Am	40.0"	38'	NA	NA	NA	NA	75 %	Min. Asym.	Dense	Healthy	Center rot, serpentine	Base rot	Rot		Not Significant	Poor	Non-viable	Remove for safety
Subject property	929	WH/Th	10.0"	14'	14'	14'	14'	14'	85 %	Maj. Asym.	Average	Average	Straight	Exposed	Aerial	Growing out of nurse stump.	Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	930	WH/Th	5.8"	9'	NA	NA	NA	NA	70 %	Maj. Asym.	Thin	Weak	Bowed	Exposed	Aerial		Not Significant	Poor	Non-viable	Remove for safety
Subject property	931	DF/Pm	39.1"	32'	32'	32'	32'	32'	45 %	Min. Asym.	Dense	Healthy	Straight	NAD	NAD		Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	932	DF/Pm	30.6"	26'	26'	26'	26'	26'	40 %	Maj. Asym.	Average	Average	Slight bow	NAD	NAD		Significant	Fair	Viable	Potential to retain with Tree Protection Measures

1	2	3	4	5	6 -- LIMITS OF DISTURBANCE					7	8	9	10	12	13	14	15	16	17	18
PROPERTY	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	Status	CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject property	933	BLM/A m	9.4"	22'	22'	22'	22'	22'	85 %	Maj. Asy m.	Average	Average	Slight lean north	Partially exposed	NAD		Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	934	DF/Pm	34.0"	30'	30'	30'	30'	30'	45 %	Gen. Sym.	Dense	Healthy	Straight	NAD	NAD		Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	935	BLM/A m	10.9"	20'	20'	20'	20'	20'	65 %	Min. Asy m.	Average	Average	Typical	Exposed	Aerial	Growing adjacent to wetland.	Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	936	BLM/A m	24.0"	28'	28'	28'	28'	28'	65 %	Maj. Asy m.	Average	Average	Typical	Partially exposed	NAD	English ivy up 16 feet.	Significant	Good	Viable	Potential to retain with Tree Protection Measures
Subject property	937	BLM/A m	35.0"	28'	28'	28'	28'	28'	65 %	Maj. Asy m.	Average	Average	Slightly serpentine	Partially exposed	NAD	English ivy up 85%. Large hanger in canopy.	Significant	Fair	Viable	Potential to retain with Tree Protection Measures

1	2	3	4	5	6 -- LIMITS OF DISTURBANCE					7	8	9	10	12	13	14	15	16	17	18
PROPERTY	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	Status	CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject property	938	DF/Pm	50.0"	30'	30'	30'	30'	30'	40 %	Gen. Sym.	Average	Average	Straight	Partially exposed	NAD		Significant	Fair	Viable	Potential to retain with Tree Protection Measures

ATTACHMENT 3 - GLOSSARY

Terms Used in This Report, on the Tree Condition / Inventory Spreadsheet, and Their Significance

In an effort to clearly present the information for each tree in a manner that facilitates the reader's ability to understand the conclusions I have drawn for each tree, I have collected the information in a spreadsheet format. This spreadsheet was developed by Gilles Consulting based upon the *Tree Risk Assessment in Urban Areas and the Urban/Rural Interface* course manual and the *Tree Risk Assessment Form*, both sponsored by the Pacific Northwest Chapter of the International Society of Arboriculture, and the *Hazard Tree Evaluation Form* from the book, *The Evaluation of Hazard Trees in Urban Areas*, by Matheny and Clarke. The descriptions were left brief on the spreadsheet in an effort to include as much pertinent information as possible, to make the report manageable, and to avoid boring the reader with infinite levels of detail. However, a review of these terms and descriptions will allow the reader to rapidly move through the report and understand the information.

- 1) **PROPERTY**—Whether the tree is on or off the Subject Property, or a Right-of-Way tree.
- 2) **TREE #**—the unique tag number of each tree.
- 3) **SPECIES**—this describes the species of each tree with both most readily accepted common name and the officially accepted scientific name.
- 4) **DBH**—Diameter Breast Height. This is the standard measurement of trees taken at 4.5 feet above the average ground level of the tree base.
 - i) Occasionally it is not practical to measure a tree at 4.5 feet above the ground. The most representative area of the trunk near 4.5 feet is then measured and noted on the spreadsheet. For instance, a tree that forks at 4.5 feet can have an unusually large swelling at that point. The measurement is taken below the swelling and noted, e.g. '28.4" at 36"'.
 - (1) Every effort is made to distinguish between a single tree with multiple stems and several trees growing close together at the bases.
 - ii) Trees with multiple stems are listed as a "clump of x," with x being the number of trunks in the clump. Measurements may be given as an average of all the trunks, or individual measurements for each trunk may be listed.
- 5) **DRIP LINE**— the radius, the distance from the trunk to the furthest branch tips.
- 6) **LIMITS OF DISTURBANCE**— The boundary between the area of minimum protection around a tree and the allowable site disturbance as determined by a qualified professional. Distances from the center of the trunk were derived on a case by case basis looking at the unique circumstances of each property and each tree on that property.
- 7) **% LCR**—Percentage of Live Crown Ratio. The relative proportion of green crown to overall tree height. This is an important indication of a tree's health. If a tree has a high percentage of Live Crown Ratio, it is likely producing enough photosynthetic activity to support the tree. If a tree has less than 30% to 40% LCR, it can create a shortage of needed energy and can indicate poor health and vigor.
- 8) **SYMMETRY**—is the description of the form of the canopy, i.e., the balance or overall shape of the canopy and crown. This is the place I list any major defects in the canopy shape, e.g. does the tree have all its foliage on one side or in one unusual area? Symmetry can be important if there are additional defects in the tree such as rot pockets, cracks, loose roots,

weak crown, etc. Symmetry is generally categorized as Generally Symmetrical, Minor Asymmetry or Major Asymmetry:

- i) Gen. Sym.—Generally Symmetrical. The canopy/foliage is generally even on all sides with spacing of scaffold branches typical for the species, both vertically and radially.
 - ii) Min. Asym.—Minor Asymmetry. The canopy/foliage has a slightly irregular shape with more weight on one side, but appears to be no problem for the tree.
 - iii) Maj. Asym.—Major Asymmetry. The canopy/foliage has a highly irregular shape for the species with the majority of the weight on one side of the tree. This can have a significant impact on the tree's stability, health and hazard potential—especially if other defects are noted such as cracks, rot, or root defects.
- 9) **FOLIAGE/BRANCH**—describes the foliage of the tree in relation to a perfect specimen of that particular species. First the branch growth and foliage density is described, and then any signs or symptoms of stress and/or disease are noted. The condition of the foliage, or the branches and buds for deciduous trees in the dormant season, are important indications of a tree's health and vigor.
- i) For Deciduous trees in the dormant season:
 - (1) The structure of the deciduous tree is visible.
 - (2) The quantity and quality of buds indicates health, and is described as good bud set, average bud set, or poor bud set. These are abbreviated in the spreadsheet as: gbs, abs, or PBS.
 - (3) The amount of annual shoot elongation is visible and is another major indication of tree health and vigor. This is described as:
 - a) Excellent, Good, Average, or Short Shoot Elongation. These are abbreviated in the spreadsheet as ESE, GSE, ASE, or SSE.
 - ii) For evergreen trees year round and deciduous trees in leaf, the color and density of the foliage indicates if the tree is healthy or stressed, or if an insect infestation, a bacterial, fungal, or viral infection is present. Foliage is categorized on a scale from:
 - (1) Dense—extremely thick foliage, an indication of healthy vigorous growth,
 - (2) Good—thick foliage, thicker than average for the species,
 - (3) Normal/Average—thick foliage, average for the species, an indication of healthy growth,
 - (4) Thin or Thinning—needles and leaves becoming less dense so that sunlight readily passes through; an indication that the tree is under serious stress that could impact the long-term survivability and safety of the tree,
 - (5) Sparse—few leaves or needles on the twigs, an indication that the tree is under extreme stress and could indicate the future death of the tree,
 - (6) Necrosis—the presence of dead twigs and branchlets. This is another significant indication of tree health. A few dead twigs and branches are reasonably typical in most trees of size. However, if there are dead twigs and branchlets all over a certain portion of the tree, or all over the tree, these are indications of stress or attack that can have an impact on the tree's long-term health.
 - (7) Hangers—a term to describe a large branch or limb that has broken off but is still hanging up in the tree. These can be particularly dangerous in adverse weather conditions.
- 10) **CROWN CONDITION**—the crown is uppermost portion of the tree, generally considered the top 10 to 20% of the canopy or that part of the canopy above the main trunk in deciduous trees and above the secondary bark in evergreen trees.

- i) The condition of the tree's crown is a reflection of the overall health and vigor of the entire tree. The crown is one of the first places a tree will demonstrate stress and pathogenic attack such as root rot.
 - ii) If the **Crown Condition** is healthy and strong, this is a good sign. If the crown condition is weak, broken out, or shows other signs of decline, it is an indication that the tree is under stress. It is such an important indication of health and vigor that this is the first place a trained forester or arborist looks to begin the evaluation of a tree. Current research reveals that, by the time trees with root rot show significant signs of decline in the crown, fully 50% or more of the roots have already rotted away. **Crown Condition** can be described as:
 - (1) Healthy Crown—exceptional growth for the species.
 - (2) Average Crown—typical for the species.
 - (3) Weak Crown—thin spindly growth with thin or sparse needles.
 - (4) Flagging Crown—describes a tree crown that is weak and unable to grow straight up.
 - (5) Dying Crown—describes obvious decline that is nearing death.
 - (6) Dead Crown—the crown has died due to pathological or physical injury. The tree is considered to have significant stress and/or weakness if the crown is dead.
 - (7) Broken out—a formerly weak crown condition that has been broken off by adverse weather conditions or other mechanical means.
 - (8) Regenerated or Regenerating—formerly broken out crowns that are now growing back. Regenerating crowns may appear healthy, average, or weak and indicate current health of the tree.
 - (9) Suppressed—a term used to describe poor condition of an entire tree or just the crown. Suppressed crowns are those that are entirely below the general level of the canopy of surrounding trees which receive no direct sunlight. They are generally in poor health and vigor. Suppressed trees are generally trees that are smaller and growing in the shade of larger trees around them. They generally have thin or sparse needles, weak or missing crowns, and are prone to insect attack as well as bacterial and fungal infections.
- 11) **TRUNK**—this is the area to note any defects that can have an impact on the tree's stability or hazard potential. Typical things noted are:
- i) FORKED—bifurcation of branches or trunks that often occur at a narrow angle.
 - ii) INCLUDED BARK—a pattern of development at branch or trunk junctions where bark is turned inward rather than pushed out. This can be a serious structural defect in a tree that can and often does lead to failure of one or more of the branches or trunks, especially during severe, adverse weather conditions.
 - iii) EPICORMIC GROWTH—this is generally seen as dense thick growth near the trunk of a tree. Although this looks like a healthy condition, it is, in fact the opposite. Trees with Epicormic Growth have used their reserve stores of energy in a last ditch effort to produce enough additional photosynthetic surface area to produce more sugars, starches and carbohydrates to support the continued growth of the tree. Generally speaking, when conifers in the Pacific Northwest exhibit heavy amounts of Epicormic Growth, they are not producing enough food to support their current mass and are already in serious decline.

- iv) **INTERNAL STRUCTURAL WEAKNESS**—a physical characteristic of the tree trunk, such as a **kink, crack, rot pocket, or rot column** that predisposes the tree trunk to failure at the point of greatest weakness.
 - v) **BOWED**—a gradual curve of the trunk. This can indicate an Internal Structural Weakness or an overall weak tree. It can also indicate slow movement of soils or historic damage of the tree that has been corrected by the curved growth.
 - vi) **KINKED**—a sharp angle in the tree trunk that indicates that the normal growth pattern is disrupted. Generally this means that the internal fibers and annual rings are weaker than straight trunks and prone to failure, especially in adverse weather conditions.
 - vii) **GROUND FLOWER**—an area of deformed bark near the base of a tree trunk that indicates long-term root rot.
- 12) **ROOT COLLAR**—this is the area where the trunk enters the soil and the buttress roots flare out away from the trunk into the soil. It is here that signs of rot, decay, insect infestation, or fungal or bacterial infection are noted. **NAD** stands for **No Apparent Defects**.
- 13) **ROOTS**—any abnormalities such as girdling roots, roots that wrap around the tree itself that strangle the cambium layer and kill the tree, are noted here.
- 14) **COMMENTS**—this is the area to note any additional information that would not fit in the previous boxes or attributes about the tree that have bearing on the health and structure of the tree.
- 15) **STATUS**—Kirkland Codes states that a “significant” tree is at least 6” in diameter measured at 4.5’ above the average ground level, is in good health, structural stability, and is wind firm.
- 16) **CURRENT HEALTH RATING**—A description of the tree’s general health ranging from dead, dying, poor, senescent, suppressed, fair, good, very good, to excellent.
- 17) **VIABILITY**— a significant tree that is in good health with a low risk of failure due to structural defects, is relatively wind firm if isolated or remains as part of a grove, and is a species that is suitable for its location.
- i) Please note that many trees may be listed as “Non-Viable” due to poor health, poor structure, or the tree may be below the size threshold for a “Viable Tree.” However, it is worth examining the Non-Viable Trees to determine if any or all of them can be left on the property. They can add significant benefit to the landscape and contribute to wildlife habitat.
- 18) **RECOMMENDATION**— this is an estimate of whether or not the tree is of sufficient health, vigor, and structure that it is worth retaining. Specific recommendations for each tree are included in this column. They may include anything from pruning dead wood, mulching, aerating, injecting tree-based fertilizer into the root system, shortening into a habitat tree or wildlife snag, or to completely removing the tree.
- i) **Monitor:** “Monitor” is a specific recommendation that the tree be re-evaluated on a routine basis to determine if there are any significant changes in health or structural stability. “Monitor annually” (or bi-annually, tri-annually, etc.)” means the tree should be looked at once every year (or every 2 or 3 years, etc.) This yearly monitoring can be a quick look at the trees to see if there are any significant changes. Significant changes such as storm damage, loss of crown, partial failure of one or more roots, etc. require that a full evaluation be done of the tree at that time.
 - ii) **Potential to retain with tree protection measures:** means that the tree appears to have the internal resources, the health and vigor, structural stability, and the wind firmness to be able to withstand the stresses of construction if development requirements and construction requirements allow.

- iii) **Habitat or Remove:** means that the tree has a high potential to fail and cause either personal injury or property damage—in other words the tree has been declared a hazard tree and should be dealt with prior to the next large storm. If it is at all possible the recommendation is to leave some of the trunk standing for wildlife habitat and some of the trunk on the ground as a nurse log. The height of the standing habitat tree depends upon the size of the tree, the condition of the tree, and the distance to a probable target. It should be short enough so that when it does fail years in the future it will not cause personal injury or property damage. Nurse logs can be laid horizontally across the slope to aid with erosion control and to provide microenvironments for new plantings. The nurse logs meaning to be steak to prevent their movement and potential harm to people. If for some reason this is not possible that should be removed for safety.

NOTE: TREES WITH THE SAME DESCRIPTION AND DIFFERENT RATINGS:

Two trees may have the same descriptions in the matrix boxes, one may be marked “Significant,” while another may be marked “Non-Significant.” The difference is in the degree of the description, i.e., “early necrosis” versus “advanced necrosis” for instance. Another example is “center rot” or “base rot”. In a Western Red Cedar tree, the presence of low or even moderate rot is not significant and does not diminish the strength of the tree. However, low levels of rot in the base of a Douglas Fir tree, in an area known to have virulent pathogens present, is highly significant and predisposes that tree to windthrow.

ATTACHMENT 4 - SEE'S TREE'S REPORT

Mar 17 08 04:32p

PAT & MARTA

425-488-4283

p. 1

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seestreesandexcavate@hotmail.com

Contractors # SEESTTE952NW

Jeff Skall
11218 SE 64th St
Bellevue, WA 98006
425-941-9090

RE: Root crown evaluation for the large Douglas Fir tree located at 4825 E. Mercer Way, Mercer Island, WA.

Mr. Skall:

In accordance with your request, on February 27, 2008, we performed a root crown evaluation on the large Douglas fir tree that is located on the east end of the property that you have under contract to purchase at 4825 E. Mercer Way. The tree, I believe, is designated as a habitat tree in the April 15, 2007, Eagle Management Plan prepared by the Washington Department of Fish & Wildlife (WDFW).

Scope of Work

The purpose for doing the root crown evaluation is to establish if there are roots present from the large Douglas fir tree in the area proposed for excavation for your new proposed driveway. If roots were identified during the investigation, we were to identify the quantity of the roots, the location of the roots, and the size of the roots. In addition, using my experience and education, I was to render a professional opinion as to whether or not any roots identified were likely to mortally injure the tree.

We measured a distance of 20 feet from the trunk of the tree and 10 feet west from the community road to a point where the proposed wall starts. We measured 15 feet along the radius from the tree to the location of the west end of the proposed cut wall. This generally represented the area of the wall to be constructed on the north side of the driveway. The investigation was done using an air spade so as not to damage the tree roots.

Investigative Work

Mr. and Mrs. Skall were present onsite during the investigation as were several neighbors that Mr. Skall allowed to observe the investigative work. In addition, another arborist, Mr. Scott Baker, was present, hired by the neighbors to observe.

We commenced the investigative work by using the air spade to remove soils. The depths that were achieved approximated those of the wall heights proposed adjacent to the driveway. During the investigation, we identified roots from two trees; a hemlock that had fallen over and the large Douglas fir. The hemlock roots were rotting, indicative of a broken root as a result of the tree failure.

After performing the evaluation, only 3 Douglas fir roots of any size were discovered in the area in question. The roots were identified in two locations; two roots that were

Mar 17 08 04:33p

PAT & MARTA

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p. 2

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intertwined on the western end of the investigative trench and one root on the eastern end of the trench.

The two intertwined roots on the western end of the wall area are approximately 4 inches and 3 inches in diameter, respectively. The roots are located approximately one foot below the surface (see photo 1) Immediately south of the trench, the roots push toward the surface, requiring that these roots will need to be cut in order to construct the proposed driveway improvements.

The third root, located on the eastern end of the trench, is approximately 3 inches in diameter. This root is approximately 24 inches deep, but is located at the deepest point of the proposed driveway excavation (see photo 2). As a result, this root will also need to be cut for the excavation for the proposed driveway.

Conclusions and Recommendations

The driveway will be just under 20% grade which is generally considered to be steep for residential access. Cuts will be required on each side of the driveway with wall installation also required. My review of the plan indicates that the design has taken into consideration all possible compromises to minimize impact to the large Douglas fir tree in order to construct a driveway on the south side of the property.

It is my opinion that removal of these 3 roots (if done by cutting them and not letting them be torn), the tree should not only survive, but recover quite well and that the new driveway could go in at its current location. Mr. Baker, the other certified arborist hired by the neighbors, agreed on-site that cutting the 3 identified roots would not likely mortally injure the large Douglas fir tree. The previously identified 20 foot radius from the trunk of the tree delineated in Mr. Skall's plan should provide an adequate setback for the tree, providing a reasonable chance for survival, while allowing for a modest driveway. It is my recommendation to go ahead and proceed with the installation of the driveway. I also recommended to Mr. Skall that he put additional rebar in the driveway to help distribute vehicle weight, minimizing opportunities for compaction around the potential deeper roots. If any additional roots or underground obstructions are found during the excavation, please call me for further guidance.

Pat See



International
Certified Arborist

Pat See
PN-1463
Expires 6-30-2009

ISA Certified Arborist
See's Trees and Excavation, Inc.

Mar 17 08 04:33p

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p. 3

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WAIVER OF LIABILITY:

There are many conditions affecting a tree's health and stability which may be present and cannot be ascertained, such as, root rot, previous or unexposed construction damage, internal cracks, stem rot and more which may be hidden. Changes in circumstances and conditions can also cause a rapid deterioration of a tree's health and stability. While I have used every reasonable means to examine these trees, this evaluation represents my opinion of the tree health at this point in time. These findings do not guarantee future safety nor are they predictions of future events.

Thank you for considering us for you're arboricultural needs. I hope this report answers your questions. Please call me if I can provide more information or be of further service.

Sincerely,

Patrick See
ISA Certified Arborist
PN-1463







ATTACHMENT 5 - SYMBIOSIS TREE CARE REPORT



Kurt Fickeisen
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Gilles Consulting
Brian Gilles
P.O. Box 2366
Kirkland, WA 98083

September 18, 2017

Dear Mr. Gilles,

4825 East Mercer Way in Mercer Island Washington is undeveloped property. Single family homes are located nearby and plans call for building a house on the 4825 property. Prior to construction, Gilles Consulting evaluated property trees.

The evaluation identified two mature Douglas fir (*Pseudotsuga menziesii*) (Figure-1). A prior inspection identified locations south of the trunk with significant Douglas fir roots, but information regarding internal trunk wood structure is unknown.

Preservation of these firs is desired, but construction for the new home may take place nearby.

On September 13 2017 Kurt Fickeisen from Symbiosis Tree Care came to the 4825 property and tested the lower trunk of the two fir trees with an impulse tomography unit. This letter contains a report providing information on internal strength of trees. In addition comments for mitigating conflicts during future construction are provided. Please see Assumptions and Limitations for this report (Assumptions and Limitations).

Summary

The trunks of two Douglas fir trees were tested for internal decay on property at 4825 East Mercer Way. While signs of defects or strength decline are present, both trees retain sufficient strength to make trunk failure improbable on the lower trunk. Protecting tree roots during planned construction can help maintain this risk level.

Observations

Trunks of the eastern and western Douglas firs are in close proximity at root crown level (Photo-1). Since the trees are identical species and no signs of disturbance were noted at grade level, roots connections below grade are likely

- The eastern fir has greater girth and height above grade level

For information on trunk health, structure, and signs indicating defects below grade both trees received internal tomography testing at 48-inches above grade (Photo-2, Photo-3).

Arbortom Testing

An Arbortom was employed for impulse tomography testing. The device places sensors in trunk xylem. Striking sensors with a hammer sends sound waves through structural wood. Each sensor records sound wave travel time. If travel time is rapid, wood decay or cavities are not present between sensors. If defects or cavities are present, sound must travel greater distances between sensors.

Sensor travel time is recorded with colors on a display monitor. A green color indicates rapid rates of travel and decay or defects are unlikely. If defects or defects are present colors change first to yellow and then to orange and finally red.

Eastern Fir

Nine sensors were placed on eastern fir trunk wood and travel times were recorded with eight impacts or strikes on each sensor (Figure-2A).

Test results are provided in Figure-2B (Figure-2B) and indicate

- Rapid rates of travel on the northern and southeastern sides of the trunk
- Slow rates of travel on the western side of the trunk
- Intermediate rates of travel in the central trunk

While some strength is lost is present, if forces are applied from the southwest, the tree retains between 55 and 63-percent of structural strength based on Figure-2C (Figure-2C).

Western Fir

Eight sensors were placed on western fir trunk wood and travel times were recorded with eight impacts or strikes on each sensor (Figure-3A).

Test results are provided in Figure-3B (Figure-3B) and indicate

- Rapid rates of travel on the northern and southern sides of the trunk
- Reduced rates of travel on the southwestern and northeastern sides of the trunk
- Rapid to intermediate rates of travel in the central trunk

While some strength is lost if forces are applied from the southwest, the tree retains between 82 and 86-percent of structural strength based on Figure-3C (Figure-3C).

Discussion

In the region significant storm forces from winds typically come from the south or southwest. While both tested fir trees are mature they are protected by other mature Douglas fir trees to the south and west of the tree

- Some adjacent trees are on the same property, but other trees are on neighboring properties

Conclusion

Failures of both eastern and western trunks are improbable near ground level at this time. Structural problems are small. Both tree maintain more than 50-percent of structural wood free of defects.

When construction takes place, implementing measures to reduce impacts of new structures such as driveways can help maintain an improbable failure risk associated with root and root crown decline or damage.

Recommendations

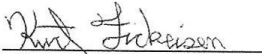
Protect the tree from construction impact under the canopy of the tree.

If a driveway must be installed under the tree canopy due to site constraints, evaluate plans and materials used for the driveway. Use of material and techniques that reduce or eliminate risks of structural root damage is preferred.

Consider designing and installing a driveway elevated above pavement and or one that allows for water penetration of soil.

If you have questions about the contents of this report contact Symbiosis Tree Care.

Sincerely



Kurt Fickeisen

International Society of Arboriculture™ (ISA) Certified Arborist # RM-451A

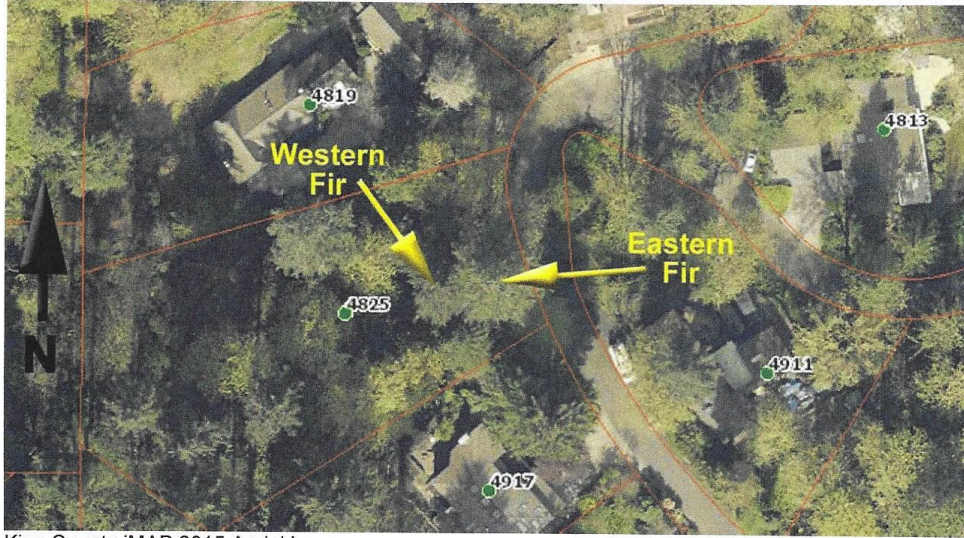
ISA Tree Risk Assessment Qualified

American Society of Consulting Arborists Registered Consulting Arborists© # 472



asca AMERICAN SOCIETY of
CONSULTING ARBORISTS

Figure-1



King County iMAP 2015 Aerial Image

Figure-2A

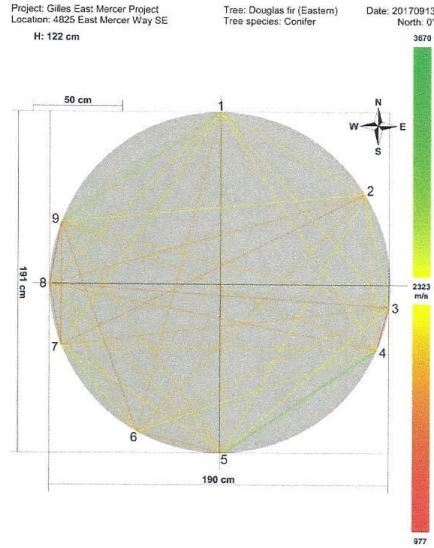


Figure-2B

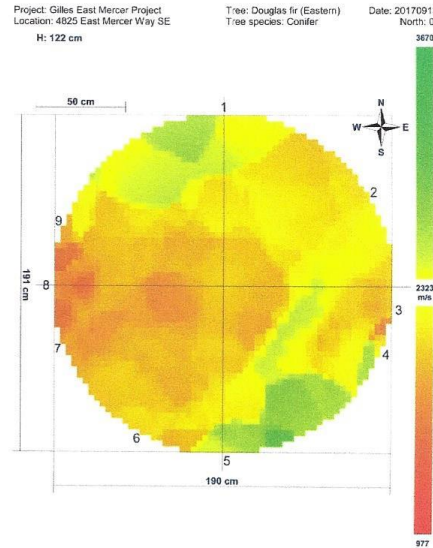


Figure-2C

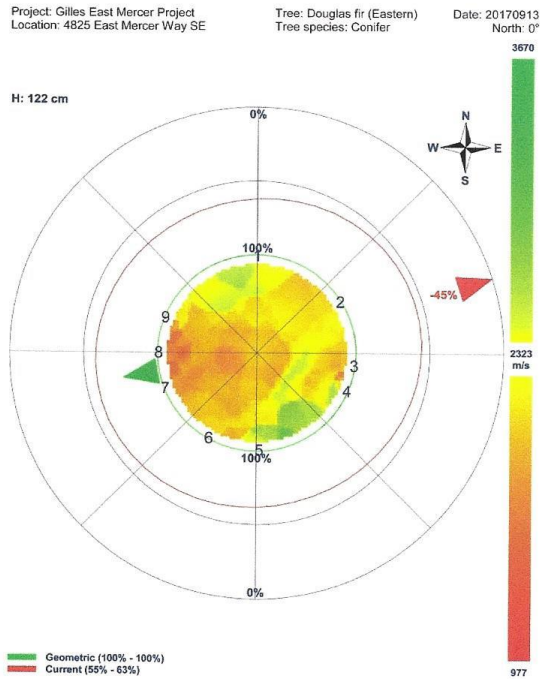


Figure-3A

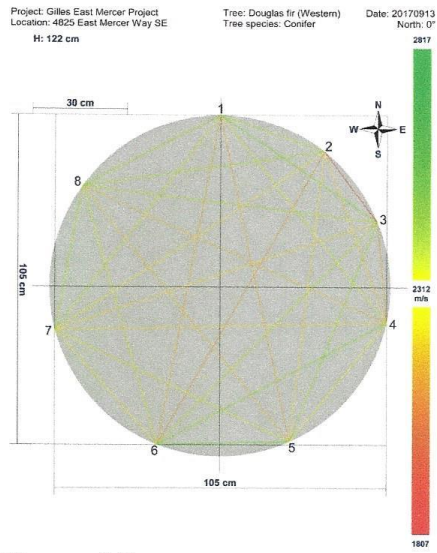


Figure-3B

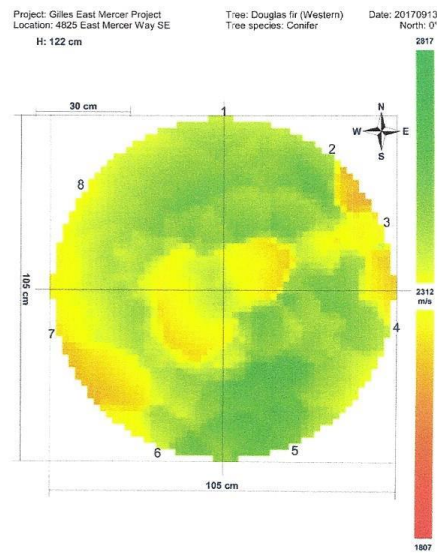


Figure-3C

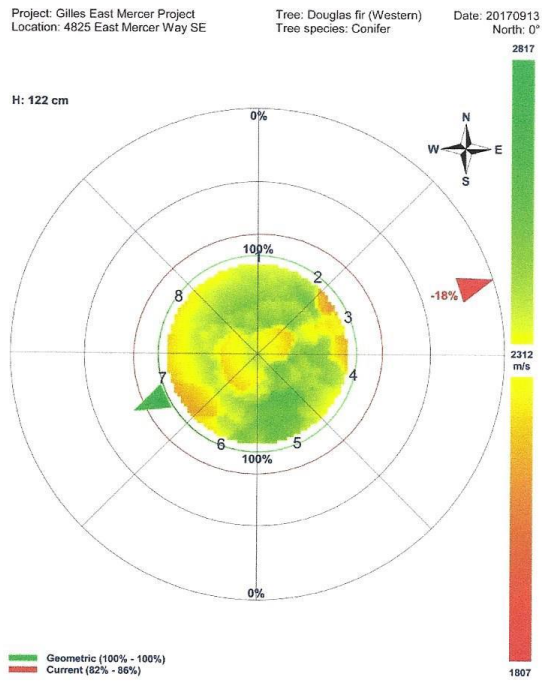
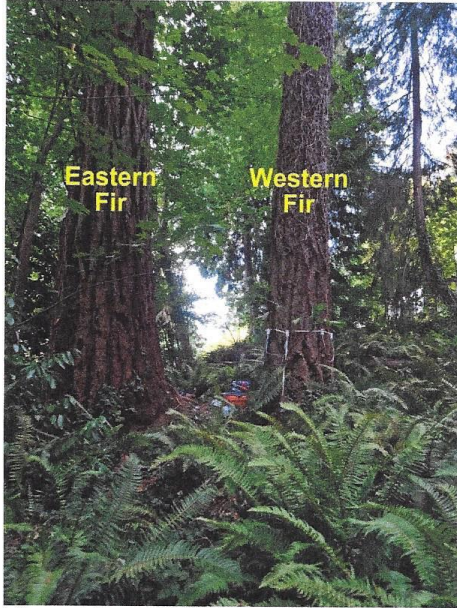


Photo-1



Viewed From North

Photo-2

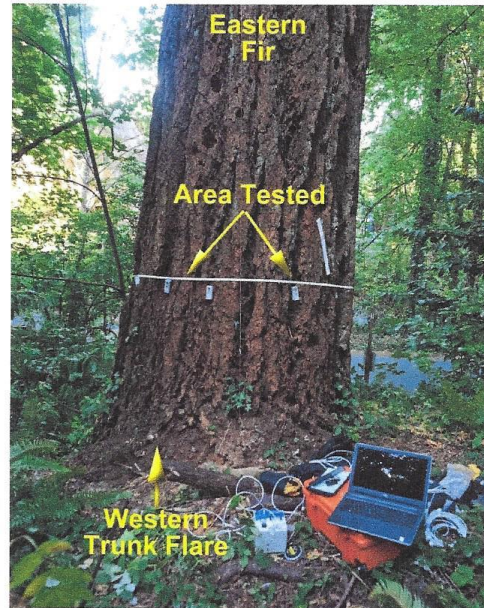
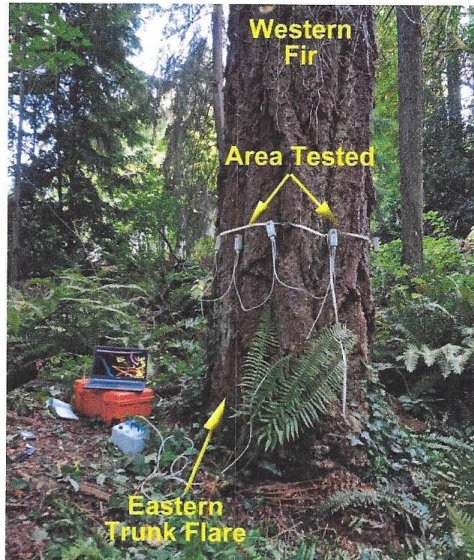


Photo-3



Assumptions and Limitations

ASSUMPTIONS AND LIMITING CONDITIONS

Kurt Fickeisen

International Society of Arboriculture (ISA) Certified Arborist #RM 451A

ISA Tree Risk Assessment Qualification

American Society of Consulting Arborists Registered Consulting Arborist #472

Owner Symbiosis Tree Care LLC

1. Any legal description provided to the consultant 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.
2. All existing liens, encumbrances, and assessments, if any, have been disregarded (unless otherwise noted), and the trees are evaluated as though free and clear, under responsible ownership and competent management. It is assumed that no violations of applicable governmental regulations have occurred.
3. Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible, however, Symbiosis Tree Care can neither guarantee nor be responsible for the accuracy of information.
4. Symbiosis Tree Care shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in our fee schedule and contract of engagement.
5. Loss or alteration of any part of this report invalidates the entire report.
6. This report shall be used for its intended purpose only and by the parties to whom it is addressed. Possession of this report does not include the right of publication.
7. Neither all or 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 Symbiosis Tree Care.
8. This report and any values expressed herein represent the opinion of Symbiosis Tree Care. Our fee is in no way contingent upon any specified value, a result or occurrence of a subsequent event, nor upon any finding to be reported.
9. 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.
10. 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.
11. There is no warranty or guarantee, expressed or implied that problems or deficiencies of the tree or other plant or property in question may not arise in the future.
12. The right is reserved to adjust tree valuations, if additional relevant information is made available.

ATTACHMENT 6 - TREE PROTECTION MEASURES

In order for trees to survive the stresses placed upon them in the construction process, tree protection must be planned in advance of equipment arrival on site. If tree protection is not planned integral with the design and layout of the project, the trees will suffer needlessly and will possibly die. With proper preparation, often costing little, or nothing extra to the project budget, trees can survive and thrive after construction. This is critical for tree survival because damage prevention is the single most effective treatment for trees on construction sites. Once trees are damaged, the treatment options available are limited.

The following minimum Tree Protection Measures are included on three separate sheets so that they can be copied and introduced into all relevant documents such as site plans, permit applications and conditions of approval, and bid documents so that everyone involved is aware of the requirements. These Tree Protection Measures are intended to be generic in nature. They will need to be adjusted to the specific circumstances of your site that takes into account the location of improvements and the locations of the trees.

TREE PROTECTION MEASURES

1. Tree Protection Fencing:

- a. Tree Protection Fences will need to be placed around each tree or group of trees to be retained.
 - i. Tree Protection Fences are to be placed according to the attached drawing.
 - ii. The area inside the fences is the *Tree Protection Zone*.
 - iii. The area outside the fences is the work zone or the construction zone.
 - iv. Tree Protection Fences must be inspected prior to the beginning of any demolition or construction work activities.
 - v. Nothing must be parked or stored within the Tree Protection Fences—no equipment, vehicles, soil, debris, or construction supplies of any sorts.
- b. Signs:
 - i. The Tree Protection Fences need to be clearly marked with the following or similar text in four inch or larger letters:

“TREE PROTECTION FENCE

DO NOT ENTER THIS AREA

DO NOT PARK OR STORE MATERIALS

WITHIN THE PROTECTION AREA

**Any questions, contact Mercer Island Code Compliance
at:**

@ 206 275-7605. Or,

codeenforcement@mercergov.org

2. Cement Trucks:

- a. Cement trucks must not be allowed to deposit waste or wash out materials from their trucks within the Tree Protection Fences.

3. Canopy Pruning:

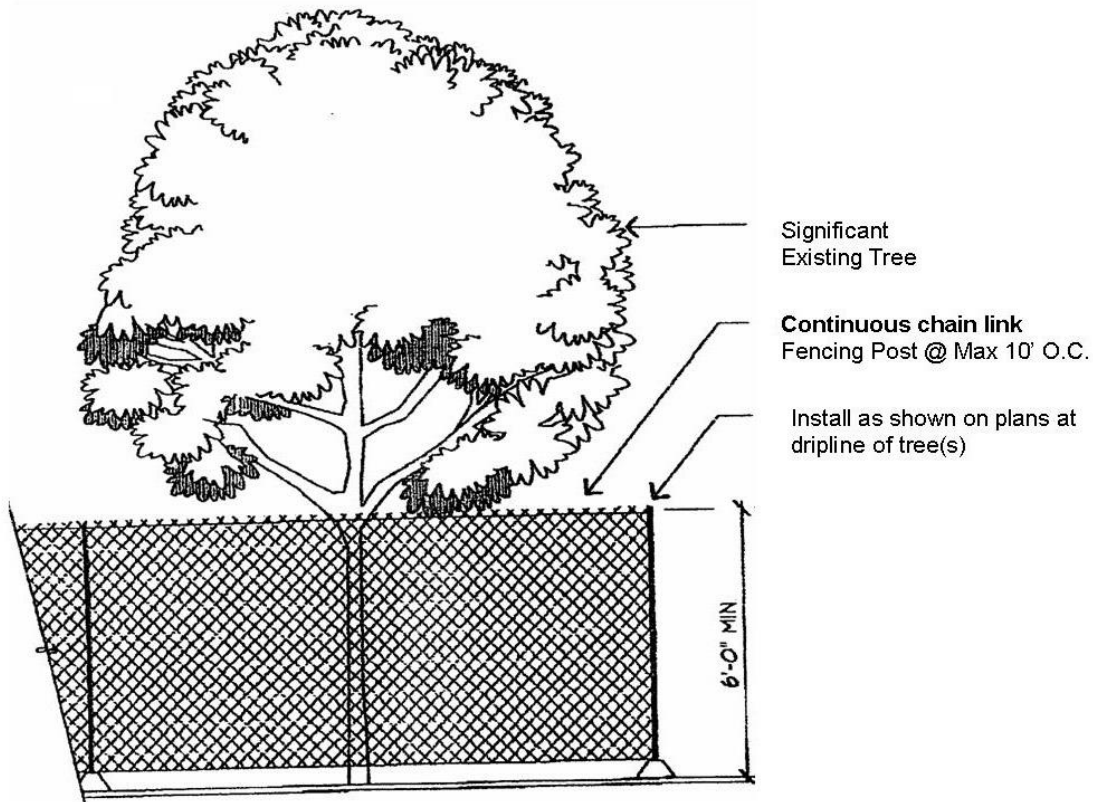
- a. If the canopies of any of the trees to be retained need to be pruned for clearance or safety, the work must be done properly.
- b. “Properly: means that the pruning *must* be done by an International Society of Arboriculture, (ISA) Certified Arborist using current industry standard pruning techniques. (ANSI A300 Pruning Standards and ANSI Z131.1 Safety Standards as well as all OSHA, WISHA, and local standards must be followed.)
- c. The pruning *must* be done using clean climbing techniques to allow tip pruning and the smallest cuts possible.
- d. Plant debris can be chipped and utilized on site for the mulch under the trees.

5. Excavation:

- a. When excavation occurs near trees that are scheduled for retention, the following procedure must be followed to protect the long term survivability of the tree:

- b. An International Society of Arboriculture, (ISA) Certified Arborist must be working with all equipment operators.
 - i. The Certified Arborist should be outfitted with a shovel, hand pruners, a pair of loppers, a handsaw, and a power saw (a “sawsall” is recommended).
 - ii. The arborist must also have an *air spade* and compressor to blow the soil away and expose the roots for proper root pruning.
 - c. Root Exposure and Pruning:
 - i. Once roots are exposed, the position of each sonotube within the driplines can be determined.
 - ii. Once determined, the Certified Arborist can cleanly cut any small roots to allow for the sonotubes to be correctly installed.
6. Putting Utilities Under the Root Zone:
- a. If it is necessary to place utilities within the dripline, it must be accomplished with trenchless technology such as boring under the root systems of trees (and other vegetation). This work shall be done under the supervision of an ISA Certified Arborist.
 - b. This is to be accomplished by excavating a limited trench or pit on each side of the critical root zone of the tree and then hand digging or pushing the pipe through the soil under the tree. The closest pit walls shall be a minimum of 7 feet from the center of the tree and shall be sufficient depth to lay the pipe at the grade as shown on the plan and profile.
 - c. Tunneling under the roots of trees shall be done under the supervision of an ISA Certified Arborist in an open trench by carefully excavating and hand digging around areas where large roots are exposed. No roots 1 inch in diameter or larger shall be cut.
 - d. The contractor shall verify the vertical and horizontal location of existing utilities to avoid conflicts and maintain minimum clearances; adjustment shall be made to the grade of the new utility as required.
7. Watering:
- a. The trees will require significant watering throughout the summer and early fall in order to survive long-term. An easy and economical watering can be done using soaker hoses placed three feet from the trunk of the tree and spiraled around each tree.
 - i. One 75-foot soaker hose per tree is adequate. It is best to place the soakers using landscape staples, (available from HD Fowler in Bellevue for pennies apiece).
 - b. Water the tree to a depth of 18 to 20 inches.
 - i. I recommended leaving the water on the soaker hoses for several hours and then digging down to determine how deep your water is penetrating. Then adjust accordingly to reach the proper depth of water penetration.
 - ii. Do not overwater. Too much water can be disastrous on a steep slope.
 - c. Once the water reaches the proper depth, turn off the hoses for four weeks and then water again.

- i. Water more often when temperatures increase—every three weeks when temperatures exceed 80 degrees and every two weeks when temperatures exceed 90 degrees.
- ii. This drying out of the soil in between watering is important to prevent soil pathogens from attacking the trees.



Six-foot high temporary chain link fence shall be placed as shown on plans. Fence shall completely encircle tree(s). Install fence posts using pier blocks only. Avoid driving posts or stakes into major roots.

Make a clean straight cut to remove damaged portion of root for all roots over 1" in diameter damaged during construction. **All** exposed roots shall be temporarily covered with damp burlap and covered with soils the same day, if possible, to prevent drying. If not possible, burlap must be kept moist at all times.

Work with the protection fencing shall be done manually. No stockpiling of materials, soil, debris, vehicle traffic, or storage of equipment or machinery shall be allowed within the limit of the fencing.

Cement trucks must not be allowed to deposit waste or wash out materials from their trucks within the Tree Protection Fences.

The area within the Tree Protection Fencing must be covered with wood chips, hog fuel, or similar materials to a depth of 8 to 10 inches. The materials should be placed prior to beginning construction and remain until the Tree Protection Fencing is taken down.

Proposed Site Plan, Impacts, & Mitigation Plan, provided by Talasaea Consultants,
 Approximate locations of *Tree Protection Fences* _____



ATTACHMENT 7 - HABITAT TREE, NURSE LOG, BRUSH PILE CREATION AND BENEFITS

There are occasions where hazardous trees need not be completely removed. Shortening is the preferred method in these types of areas rather than complete removal. Standing dead trees, also known as “*vertical structure*” in forest ecology terms, provide important wildlife habitat. Recent studies at the University of Washington have shown that the third most significant reason for the decline of songbirds in the Puget Sound region is the lack of standing dead trees, nurse logs, and brush piles. (The primary reason for the decline of desirable wildlife is loss of habitat. The second reason is predation by dogs, cats, Grey Squirrels, and Opossums.)



These studies reveal that as many as 54% of desirable urban wildlife utilize standing dead trees, nurse logs and brush piles on the ground in one or more important life cycle. For instance, Black Capped Chickadees must excavate a new cavity every spring in order to successfully mate and produce a brood of off spring.

The opportunity exists here to remove the dangerous portions of these trees and leave the snags standing for wildlife. You can also place the upper trunk sections carefully on the ground as nurse logs. The logs, if in contact with the ground, soak up moisture and release it slowly throughout the summer. This supports plants and animals in the immediate area. Brush piles strategically placed for birds and mammals to use as safe areas also have important wildlife benefits. These two measures have the added benefit of reducing the cost because a tree service does not need to do as much clean up or removal.

The tree service selected can spend a few extra minutes on the each snag to make the cut like it was snapped off in the wind—jagged and irregular. This enhances the aesthetic of the tree.



spend
top of
look

This
appeal

VALUE OF BRUSH PILES

In general, the concept of shelter is important to urban wildlife. In his book, *Landscaping for Wildlife in the Pacific Northwest*, Wildlife Biologist Russell Link writes, “Shelter, (also called cover) is a place to raise young, hide from predators, and avoid the heat, cold, and wind. Shelter also provides a place to feed, play, and rest safely. The quality of shelter is particularly important for young animals in a nest. Unlike an animal that can flee when a predator approaches, young birds or small mammals must rely entirely upon the cover and the camouflage of the nest itself.”

Different birds and mammals will use different parts of the brush pile as Table 1 Wildlife that use and average-size brush pile from page 123 of Mr. Link’s book notes:

TABLE 1. WILDLIFE THAT USE AN AVERAGE--SIZE BRUSH PILE			
Birds That Will Use the Inside of the Brush Pile:	Birds That Will Use the Outside of the Brush Pile:	Mammals That Will Use the Inside of the Brush Pile:	Reptiles and Amphibians That Will Use the Base of the Brush Pile:
Bushtits	Grouse	Chipmunks	Alligator Lizards
Chickadees	Hummingbirds	Cottontail Rabbits	Salamanders
Dark-eyed Juncos	Jays	Fox	Snakes
Flycatchers	Pheasants	Ground Squirrels	Toads
Golden-crowned Sparrows	Robins	Mice	Turtles
Grouse	Song Sparrows	Rabbits	
Pheasants	Towhees	Shrews	
Quail	Warblers	Skunks	
Song Sparrows	White-Crowned Sparrows	Voles	
Thrushes	Woodpeckers	Weasels	
Towhees		Woodrats	
White-Crowned Sparrows			
Wrens			

For instance, insects will be attracted to the inside of brush piles that will become food or other animals. “The inside of the pile can also protect wildlife from sun, rain, and predators. During strong winds, birds that would ordinarily use an evergreen tree for evening shelter may instead use a brush pile located on the ground out of the wind. Far into a pile, mammals and some birds find nesting cover in the tight network of strong twigs. The outside, where the sticks protrude from the pile, provides places for birds to perch and sign, preen, and catch insects. If the base of the pile contains large limbs or logs, salamanders, snakes, and lizards may hibernate there. Ants, worms, beetles, and other insects will life and feed in the rich soil beneath a pile.

When snow covers a brush pile, a complex array of snow free spaces and runways provides important habitat for protection and foraging by small mammals.” From pages 122 & 123, *Landscaping for Wildlife in the Pacific Northwest* by Russell Link.

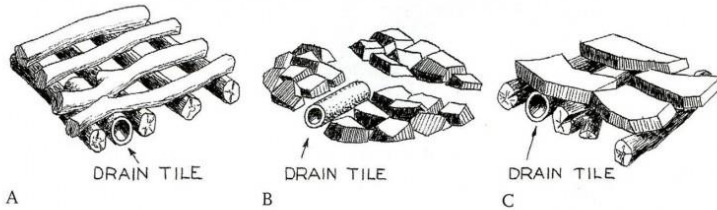
Brush piles can be simple hand thrown piles of bio-debris and rocks or they can be large designed piles.



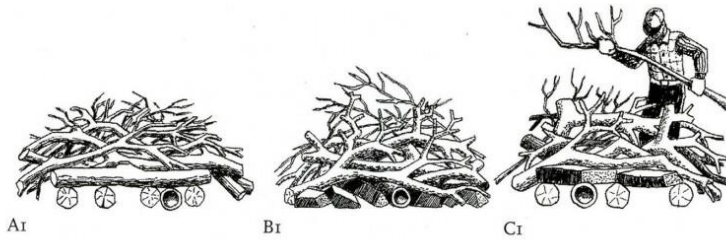
An example of a simple Christmas tree brush pile.



A large brush pile from many trees piled together. This one is older with the foliage all fallen from the branches and twigs. But, it can provide cover for years.



A schematic design for three more complex brush piles.



ATTACHMENT 8 - BIBLIOGRAPHY

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