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EVALUATION OF SELECTED TREES AT

5637 E Mercer Way
Mercer Island, WA 98040

July 14, 2015

PREPARED FOR:

Bill Summers
P.O. Box 261
Medina, WA 98039

PREPARED BY:

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CONTENTS

EXECUTIVE SUMMARY

While there are many more trees on the property, fifteen trees were evaluated as part of this report. Fourteen are on the subject property; one is on the East Mercer Way right-of-way.

ASSIGNMENT

Bill Summers contracted with Gilles Consulting to evaluate the trees at 5637 East Mercer Way on Mercer Island, Washington. The property is being considered for developed and 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 can be utilized to create a Tree Removal/Retention/Protection Plan as required by Mercer Island Code.

While the lot is large by Mercer Island standards, the buildable portion of the lot is small due to an active stream, stream buffer, and steep slope area. Therefore, only those trees in the immediate impact area are included in this report. The other trees will be protected by the "Limits-of-Disturbance" fences.

Photo # 1: A Google Earth image of the site and the surrounding community.

METHODOLOGY

To evaluate the trees and to prepare the 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 also followed the protocol of the International Society of Arboriculture (ISA) for Visual Assessment (VA) that includes looking at the overall health of the trees 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.

Tree Tags

The trees were tagged and numbered 974 through 988. 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, Site Plan*/Survey for an orientation to the site and the approximate location of the trees.

OBSERVATIONS

The subject property lies to the west of and above East Mercer way on a sharp bend in the road. It is a fairly wooded lot that has a public trail traversing the property along the northern side. The property has an existing driveway the forks sharply to the south to allow access to 5645 E. Mercer Way.

Tree species on the property include Douglas Fir, Big Leaf Maple, Western Hemlock, Red Alder and Western Red Cedar. Tall shrubs/small trees include Indian Plum, Red Elderberry, and the Salmonberry. Ground cover species include Sword fern, Maiden Hair Fern, Wood Fern, Devils Club, Stinging Nettles, Pacific Buttercup, Trillium, Horse Tail, Plantains, Foam Flower, Trailing Blackberry, and Bracken Fern.

There are a few invasive species spread across the entire ravine that encompasses multiple properties. A few individuals are on the subject property. They include English Ivy, English Holly, English laurel, and Himalayan blackberry.

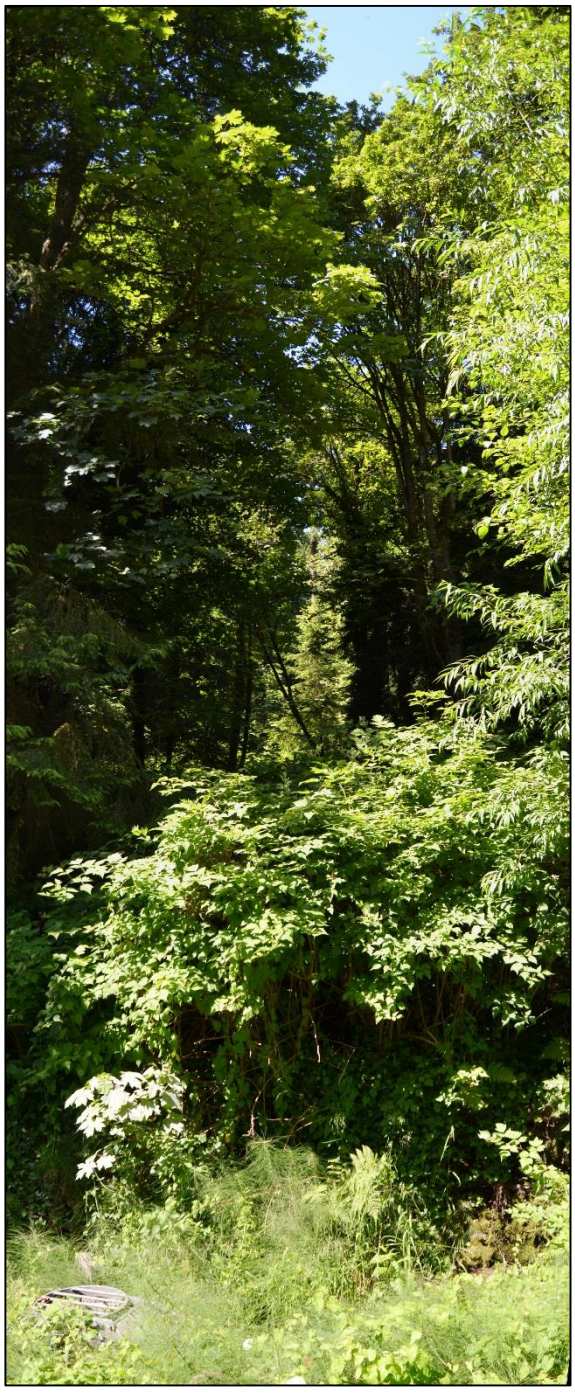


Photo # 2: A view from the shoulder of E Mercer Way looking up into the wooded lot that is 5637.

Note the storm drain cover in the lower left of the photo at the bottom of the ditch.

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 AND CONCLUSIONS

Right-of-Way Trees

There is one right-of-way tree impacted by the project. It is tree # 988. It is a 15.4-inch Diameter Western Hemlock in Good Condition. It can be adequately protected by having the *"Limits-of-Disturbance"* fence extend east from the property line to the road shoulder and extend slightly north above the Storm drain inflow device.

Trees on Adjacent Properties

There are no trees on adjacent properties impacted by the proposed project.

Trees on the Subject Property

There are 14 trees on the subject property that are in or near the impact/development zone. Their current health rating can be summarized as follows:

CURRENT HEALTH RATING SUMMARY		
# of Trees	**Current Health Rating**	**% of Total**
0	Dead	0.0%
2	Dying	14.3%
2	Poor	14.3%
6	Fair	42.9%
4	Good	28.6%
0	Very Good	0.0%
0	Excellent	0.0%
14	**Total # of Trees**	**100.0%**

Those trees located within the building food print, the driveway, or the grading area required for the improvements, are recommended for removal. Given the soils and soil moisture on the slope of the property, I concur with the recommendation to remove all the trees that are recommended for removal.

Please refer to *Geotechnical Engineering Study, Proposed Residence, 5637 East Mercer Way, Mercer Island, Washington, G-3827* prepared by GEO Group Northwest, Inc. of Bellevue, Washington dated March 12, 2015. In the summary cover letter, Engineer William Chang, PE, states that there is considerable groundwater seepage. It is my judgment that the excavation required for the grading of the site to complete the driveway, the house, the walkways, and most importantly, the detention vault, all of the trees near the grading and excavation, even though not immediately within excavation area will be negatively impacted and potentially left unstable.

Trees within the building footprint include trees # 974, 975, 976, 977, and 978. They are recommended for removal. Trees impacted by the grading and detention vault excavation include trees # 979, 980, 981, 982, 983, 984, and 985. Trees # 986 and 987 are north of the existing driveway and north of the proposed *"Limits-of-Disturbance"* fence. This fence should adequately protect them. They can remain. Please note that trees # 974, 975, and 980 are either Dying or in Poor Condition. They are already recommended for removal for safety. Tree # 987 is the large Maple tree immediately south of the existing driveway. It has considerable decay in the lower trunks and base. Left as it is, and with the removal of the other 11 trees, this tree could be vulnerable to stronger storm forces and could fail. However, the tree may not need to be completely removed. It is my judgment that if the tree was severely reduce, say by 35% to 40%, it could remain at an acceptable level of risk. It will be important to inform the new homeowners to have the tree re-pruned once every seven to ten years for safety.

RECOMMENDATIONS

I agree that trees 974 through 985 should be removed for safety and for the construction of the new home. I recommend extending the *"Limits-of-Disturbance"* fencing to protect tree # 988 in the East Mercer Way right-of-way. The remaining trees will be adequately protected by the *"Limits-of-Disturbance"* fencing.

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 4, 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 the stability of a slope. The recommendations in this report are to reduce the risk of catastrophic tree failure only. It is not a guarantee against severe erosion or landslide. Tree, shrub, and groundcover roots cannot prevent deep-seated landslides from occurring. If a severe landslide occurs, all trees and vegetation will be swept away as part of the landslide. It is strongly recommended that a qualified geotechnical engineer be retained to review the recommendations involved in this report and the condition of the slope itself.

There are also 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 slope stability. While I have used every reasonable means to examine the slope and all relevant factors, this tree management plan represents my opinion of the situation at this point in time. These findings do not guarantee future safety nor are they predictions of future events. It is the property owner/project manager's responsible to engage the services of a qualified geotechnical engineer to ascertain the conditions of the slope and actions that will enhance or destabilize the slope.

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.

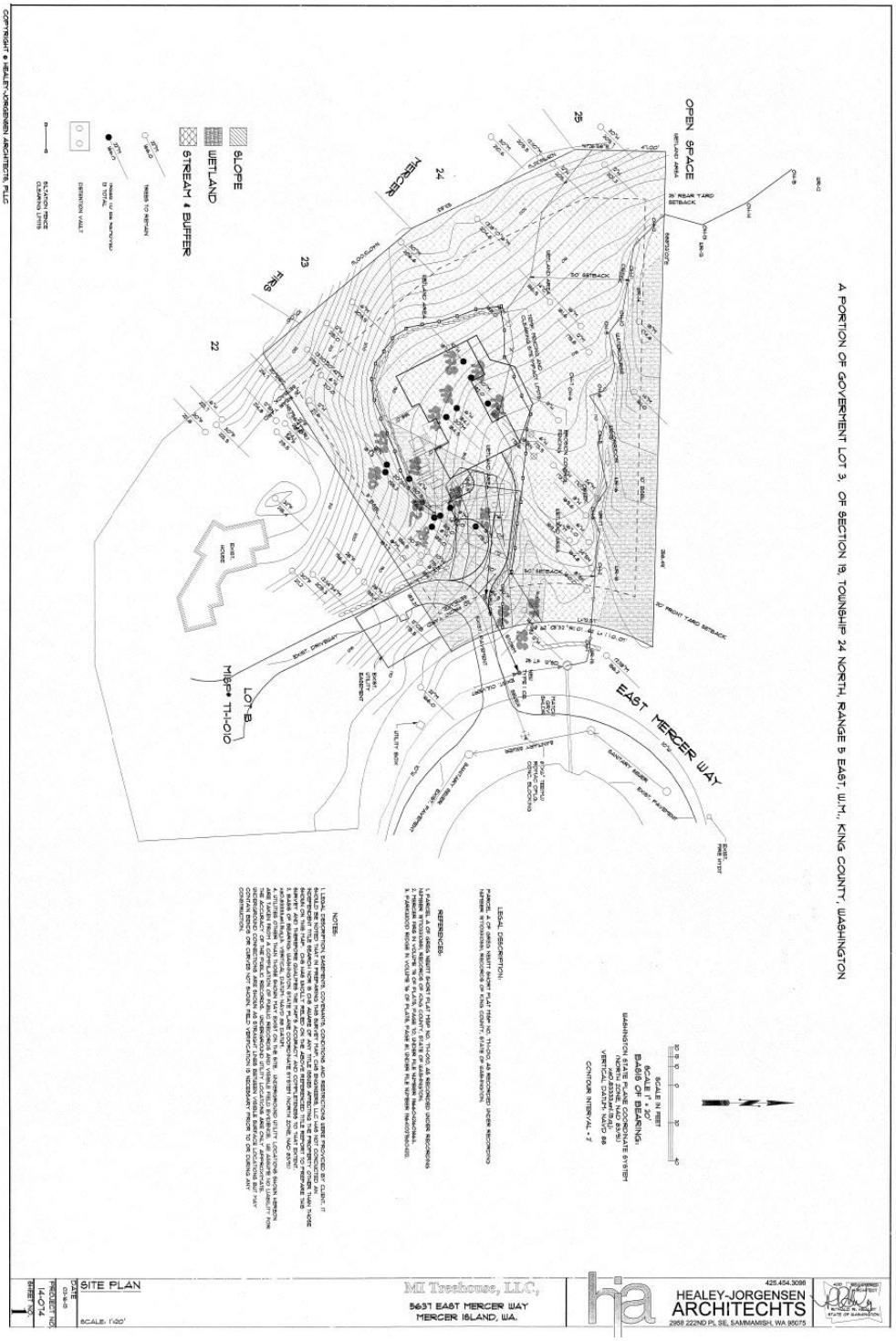
Thank you for calling Gilles Consulting for your arboricultural needs.

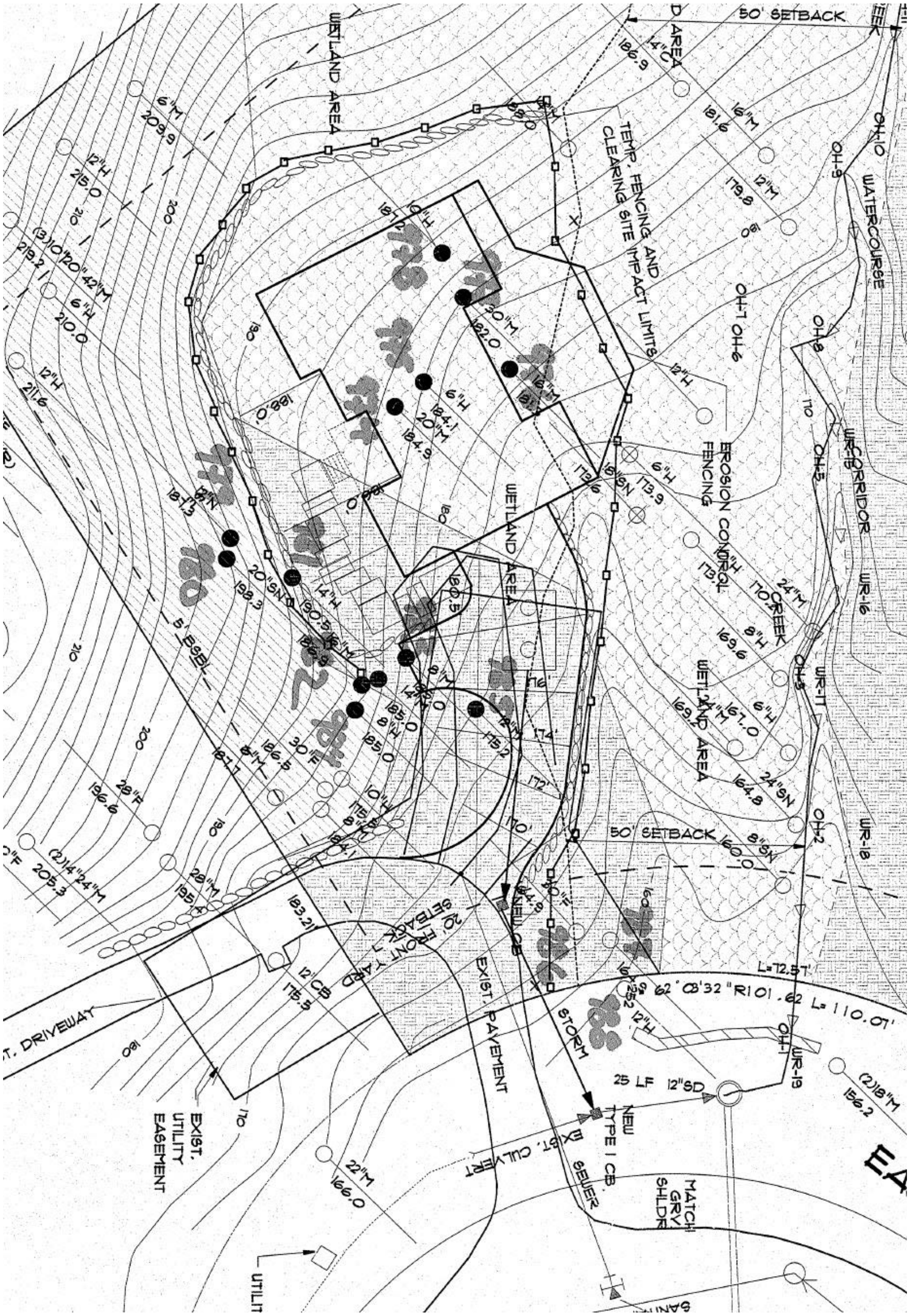
Sincerely,

Brian K. Gilles, Consulting Arborist
ISA Certified Arborist # PN-0260A
ASCA Registered Consulting Arborist # RCA-418
ISA TRAQ Qualified
ISA TRAQ Certified Instructor

ATTACHMENTS

ATTACHMENT 1 - SITE PLAN WITH TREE NUMBERS




50' SETBACK
WETLAND AREA
TEMP. FENCING AND CLEARING SITE IMPACT LIMITS
WATERCOURSE
EROSION CONTROL FENCING
CREEK
WR CORRIDOR
10' FRONT YARD SETBACK
EXIST. PAVEMENT
STORM
25 LF 12"SD
NEW TYPE I CB
EXIST. CULVERT
SEWER
MATCH GRVL SHLDR
EXIST. UTILITY EASEMENT

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 tre		
#2	***Tree Location:*** Relative placement of the tree.		
#3	***Tree #:*** The unique tag number of each tree.		
#4	***Species:***		
	BLM/Am	Big Leaf Maple, *Acer macrophyllum*	
	DF/Pm	Douglas Fir, *Pseudotsuga menziezii*	
	GF/Ag	Grand Fir, *Abies grandis*	
	RA/Ar	Red Alder, *Alnus rubra*	
	WH/Th	Western Hemlock, *Tsuga heterophylla*	
#5	***DBH:*** Trunk diameter @ 4.5' above average ground level.		
#6	***Drip Line:*** The radius, the distance from the trunk to the furthest branch tips.		
#7	***Limits of Disturbance:*** The boundary between the area of minimum protection around the tree and the allowable site disturbance determined by a qualified profess		

#8	***LCR:*** *Live Crown Ratio* - the amount of live canopy expressed as a % of the entire tree height
#9	***Symmetry:*** General shape of canopy and weight distribution of the tree around the trunk.
#10	***Foliage:*** General description of foliage density that indicates tree health and vigor.
#11	***Crown Condition:*** The most important external indication of tree health and vigor.
#12	***Trunk:*** Description of trunk condition or abnormalities if any.
#13	***Root Collar:*** The base of the tree where the trunk flares into the roots--deformities or problems are noted here.
#14	***Roots:*** Root problems are noted here.
#15	***Comments:*** Additional observations about the tree's condition.
#16	***Current Health Rating:*** A description of general health ranging from dead, dying, poor, fair, good, very good, to excelle
#17	***Status/Recommendation:*** This is an estimate of whether or not the tree is of sufficient health, vigor, and structure that it is worth consideration of retention.
# 18	***Status:*** Whether the tree meets the size, health, and structural stability to be rated as *Significant or Non-Significant.*

1	2	3	4	5	6	7 -- LIMITS OF DISTURBANCE				8	9	10	11	12	13	14	15	16	17	18
PROPERTY	TREE LOCATION	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	CURRENT HEALTH RATING	RECOMMENDATION	STATUS
Subject Property	W/in building footprint	974	BLM/Am	26 .9"	28'	n/a	n/a	n/a	n/a	30'	Minor asymmetry	Average	Regenerating / Average	Center rot	Previous failure/ Base rot	Previous failure/ Root rot	Hypoxylon topping wound at 44'. English ivy at 50% of the tree.	Dying	Remove for safety	Non-Significant
Subject Property	W/in building footprint	975	WH/Th	12 .5"	18'	n/a	n/a	n/a	n/a	85'	Minor asymmetry	Average	Average	Straight	Exposed	Aerial	Growing out of nursing stump.	Good	Potential to retain with tree protection measures.	Significant
Subject Property	W/in building footprint	976	BLM/Am	30 .2"	34'	n/a	n/a	n/a	n/a	40'	Minor asymmetry	Dense	Healthy	Forked at 5'/ Center rot	Base rot/ Partially exposed	Restricted / Root rot	Growing next to water seep long the hillside. English Ivy at 50% of the tree.	Fair	Potential to retain with tree protection measures.	Significant
Subject Property	W/in building footprint	977	BLM/Am	15 .7"	26'	n/a	n/a	n/a	n/a	65'	Major asymmetry	Dense	Average	Forked at 16'/ Center rot	Previous failure/ Base rot	Previous failure/ Root rot	Open wound on the south side of the tree from the base up 9'. Carpenter and infestation, Woodpecker activity, Rot pocket in branch collar wounds, dead branch cavity.	Dying	Remove for safety	Non-Significant

1	2	3	4	5	6	7 -- LIMITS OF DISTURBANCE				8	9	10	11	12	13	14	15	16	17	18
PROPERTY	TREE LOCATION	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	CURRENT HEALTH RATING	RECOMMENDATION	STATUS
Subject Property	W/in building footprint	978	WH/Th	9.3"	18'	n/a	n/a	n/a	n/a	70'	Minor asymmetry	Thin	Average	Straight	Bowed/ Exposed	Surface	Heavy foliar predation. Growing out of nursing stump.	Fair	Potential to retain with tree protection measures.	Significant
Subject Property	W/in grading impact zone	979	DF/Pm	15.9"	20'	n/a	n/a	n/a	n/a	90'	Major asymmetry	Average	Average	Straight	No apparent defect	No apparent defect		Fair	Potential to retain with tree protection measures.	Significant
Subject Property	W/in grading impact zone	980	RA/Ar	28.1"	20'	n/a	n/a	n/a	n/a	40'	Major asymmetry	Average	Weak	Leans East severely	Exposed		Also tagged 20. Girdling rot on the north side up 15% of the tree.	Poor	Remove for safety	Non-Significant
Subject Property	W/in grading impact zone	981	WH/Th	21.4"	20'	n/a	n/a	n/a	n/a	90'	Major asymmetry	Average	Average	Bowed	No apparent defect	No apparent defect	Bowed by tree number 980 because it is leaning against it.	Good	Potential to retain with tree protection measures.	Significant
Subject Property	W/in grading impact zone	982	BLM/Am	37.3"	38'	n/a	n/a	n/a	n/a	65'	Minor asymmetry	Dense	Healthy	Forked at 5.5'	Swollen	No apparent defect		Good	Potential to retain with tree protection measures.	Significant
Subject Property	W/in grading impact zone	983	WH/Th	8.4"	18'	n/a	n/a	n/a	n/a	95'	Minor asymmetry	Dense	Healthy	Straight	No apparent defect	No apparent defect		Fair	Potential to retain with tree protection measures.	Significant
Subject Property	W/in grading impact zone	984	WH/Th	11.6"	16'	n/a	n/a	n/a	n/a	90'	Major asymmetry	Average	Average	Straight	No apparent defect	No apparent defect	Also tagged number 2	Fair	Potential to retain with tree protection measures.	Significant
Subject Property	W/in grading impact zone	985	BLM/Am	19.1"	34'	n/a	n/a	n/a	n/a	70'	Minor asymmetry	Average	Average	Typical	Exposed	No apparent defect	English ivy up 85% of the tree. Also tagged tree number 1. Tree is growing next to the old road cut at the top of the bank.	Fair	Potential to retain with tree protection measures.	Significant
Subject Property	Below existing driveway	986	DF/Pm	38.2"	24'	n/a	To the driveway	to the road shoulder	24'	30'	Generally symmetrical	Dense	Regenerating / Healthy	Straight	No apparent defect	Restricted	Growing on the slope between the driveway and the stream.	Good	Potential to retain with tree protection measures.	Significant

1	2	3	4	5	6	7 -- LIMITS OF DISTURBANCE				8	9	10	11	12	13	14	15	16	17	18
PROPERTY	TREE LOCATION	TREE #	SPECIES	DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	CURRENT HEALTH RATING	RECOMMENDATION	STATUS
Subject Property	Below existing driveway	987	BLM/Am	30.8', , 20.0' '	30'	n/a	To the driveway	to the road shoulder	30'	65'	Major asymmetry	Average	Average	Center rot/ Typical	Base rot	Restricted / Root rot	Growing on the slope between the driveway and the stream. Also tagged number 6. Part of the trunk was removed from the south side with a decay from Armillaria. Rot pocket in the branch collar wounds along with sap sucker activity. Dead branch cavity.	Good health with a poor structure	Consider a severe prune to reduce failure potential and schedule re-pruning once every 7 to 10 years.	Non-Significant
EMW Right-of-Way	On far side of ditch	988	WH/Th	15.4"	20'	n/a	To the driveway	to the road shoulder	20'	90'	Major asymmetry	Average	Average	Straight	No apparent defect	Restricted	Growing on the slope between the driveway and the stream. Also tagged number 7.	Good	Potential to retain with tree protection measures.	Significant

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 LOCATION**—Relative placement of the tree.
3) **TREE #**—the unique tag number of each tree.
4) **SPECIES**—this describes the species of each tree with both most readily accepted common name and the officially accepted scientific name.
5) **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"'.
    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.
        (1) Every effort is made to distinguish between a single tree with multiple stems and several trees growing close together at the bases.
6) **DRIP LINE**—the radius, the distance from the trunk to the furthest branch tips.
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 **N**o **A**pparent **D**efects.
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) **CURRENT HEALTH RATING**—A description of the tree's general health ranging from dead, dying, poor, senescent, suppressed, fair, good, very good, to excellent.
16) **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 - 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 Fences will need to be placed around each tree or group of trees to be retained.
    a. Tree Protection Fences are to be placed according to the attached drawing at a distance of not less than 5 feet outside the dripline of the tree or group of trees to be saved.
    b. Tree Protection Fences must be inspected prior to the beginning of any demolition or construction work activities.
    c. Nothing must be parked or stored within the Tree Protection Fences—no equipment, vehicles, soil, debris, or construction supplies of any sorts.

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

3. 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

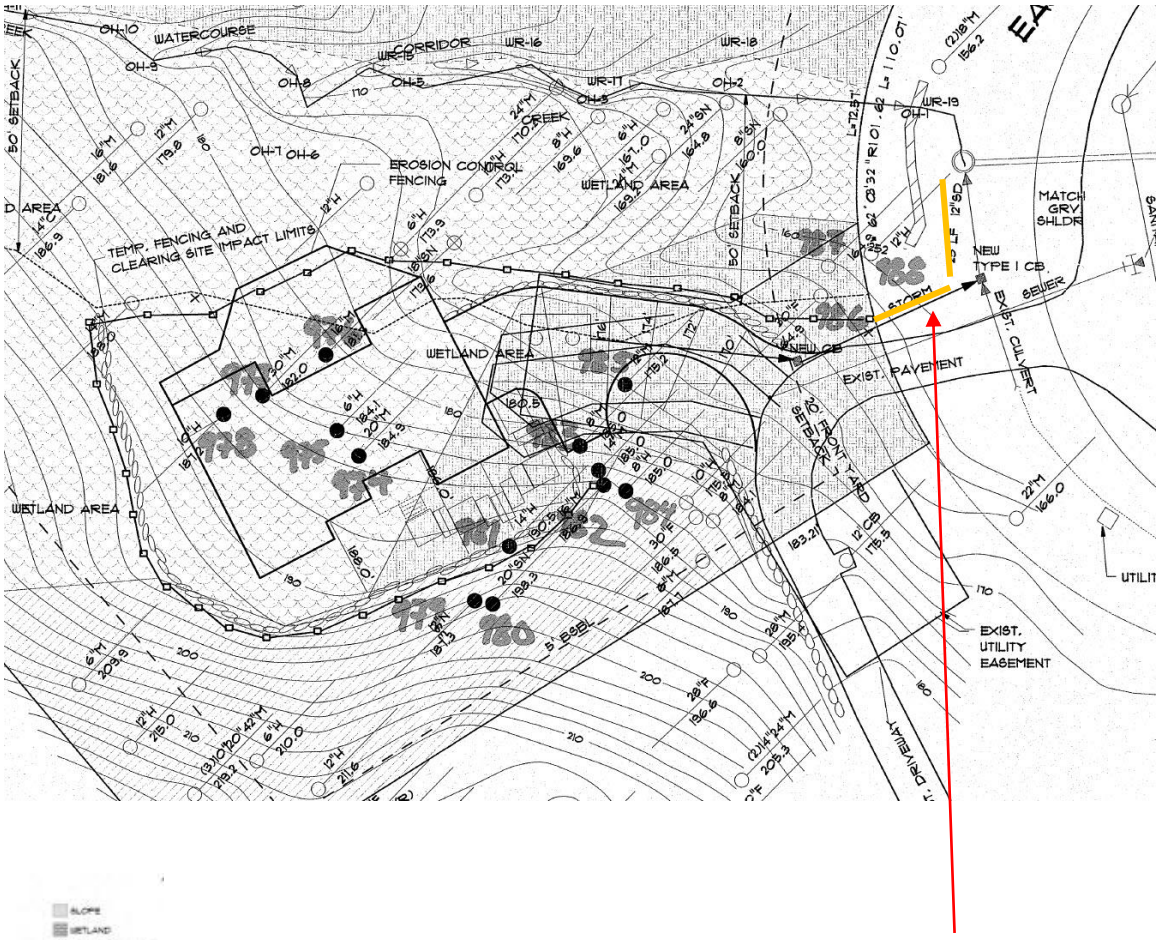
    Any questions, call Mercer Island Code Compliance
    @ 206-275-7709, Jimmi.Serfling@Mercergov.org"

4. 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.

5. 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:
    a. 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).
    b. The hoe must be placed to "comb" the material directly away from the trunk as opposed to cutting across the roots.
        i. Combing is the gradual excavation of the ground cover plants and soil in depths that only extend as deep as the tines of the hoe.

c. When any roots of one inch diameter or greater, of the tree to be retained, is struck by the equipment, the Certified Arborist should stop the equipment operator.
d. The Certified Arborist should then excavate around the tree root by hand/shovel and cleanly cut the tree root.
    i. The Certified Arborist should then instruct the equipment operator to continue.

6. Putting Utilities Under the Root Zone:
    a. Boring under the root systems of trees (and other vegetation) shall be done under the supervision of an ISA Certified Arborist. 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.
    b. 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.
    c. 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 the tree. 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) then cover the area with two to three inches composed materials. The composted material will act as a mulch to minimize evaporation and will also stimulate the microbial activity of the soil which is another benefit to the health of the tree.
    b. Water the tree to a depth of 18 to 20 inches. I recommended leaving the water on the soaker hoses for six to eight hours and then digging down to determine how deep your water is penetrating. Then adjust accordingly. It may take a good two days of watering to reach the proper depth.
    c. Once the water reaches the proper depth, turn off the hoses for four weeks and then water again. Water more often when temperatures increase—every three weeks when temperatures exceed 80 degrees and every two weeks when temperatures exceed 90 degrees. This drying out of the soil in between watering is important to prevent soil pathogens from attacking the trees.



Extend the "Limits-of-Disturbance" fence to the edge of the shoulder

ATTACHMENT 5 - REFERENCES

1. Dunster, Dr. Julian A., R.P.F., M.C.I.P. *Documenting Evidence, Practical Guidance for Arborists*, First Choice Books, Victoria, BC, Canada. 2014.

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11. Watson, Gary W., and Neely, Dan, eds. *Trees & Building Sites*. Savoy: The International Society of Arboriculture Press, 1995.