Gilles Consulting
Brian K. Gilles
425-822-4994

REVISED TREE REPORT
AT

5637 E Mercer Way
Mercer Island, WA 98040

January 15, 2021

PREPARED FOR:
Bill Summers
P.O. Box 261
Medina, WA 98039

PREPARED BY:
GILLES CONSULTING
Brian K. Gilles, Consulting Arborist
International Society of Arboriculture:

- *ISA Certified Arborist # PN-0260A*
- *ISA TRAQ Qualified*
- *ISA TRAQ Certified Instructor*

American Society of Consulting Arborists:

- *ASCA Registered Consulting Arborist # RCA-418*
- *ASCA Tree & Plant Appraisal Qualified*
- *ASCA Tree & Plant Appraisal Certified Instructor*

fax: 425-822-6314
email: bkgilles@comcast.net
P.O. Box 2366 Kirkland, WA 98083

CONTENTS

EXECUTIVE SUMMARY

An original report was done on the trees in the proposed development area only. It was completed on July 14, 2020 and revised on August 30, 2020. Two things have happened since then. A few of the trees have fallen down on the lot. And, Mercer Island changed its code considerably regarding trees on development sites. This report now includes all of the trees on the subject property, one tree on adjacent property, and one tree in the adjacent right-of-way. In addition, the proposed house has been rotated and moved approximately five feet to the south and five feet to the west.

ASSIGNMENT

Bill Summers contracted with Gilles Consulting to re-evaluate the 14 trees of the original 2015 report and include the rest of the trees on the property at 5637 East Mercer Way on Mercer Island, Washington. The property is being considered for developed and the City of Mercer Island requires a new 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 Removal/Retention/Protection Plan as required by Mercer Island Code. In addition, Mr. Summers requested that I look at tree # 986 in relation to its retention and to the change in the proposed location of the house and its impact on the trees to be retained.

While the lot is large by Mercer Island standards, the buildable portion of the lot is small due to a stream, stream buffer, and steep slope area.

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

Photo # 2: A 2019 aerial photo with the property lines approximated. Taken from the King County Assessor's website.

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—for the 14 trees documented in 2015, and 571 through 595—for the 16 additional trees documented in 2020. 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, Boundary and Topographic* 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 the home at 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 # 3: 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, 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

The 40 trees included in this report can be summarized as follows:

- Ownership:

OWNERSHIP SUMMARY		
# of Trees	**Property**	**%**
1	Right-of-Way	2.5%
1	Adjacent Property	2.5%
38	Subject Property	95.0%
40	**Total:**	**100.0%**

- Viability:

VIABILITY SUMMARY		
# of Trees	**Condition**	**%**
4	Not Viable	10.0%
36	Viable	90.0%
40	**Total:**	**100.0%**

- Status:

TREE STATUS SUMMARY		
# of Trees	**Status**	**%**
7	Exceptional	17.5%
24	Large Tree	60.0%
5	Small Tree	12.5%
4	Non-Significant	10.0%
40	**Total:**	**100.0%**

- DBH:

2020 DBH SUMMARY		
# of Trees	DBH	%
5	9.9" <	12.5%
20	10.0" - 23.9"	50.0%
8	24.0" -- 35.9"	20.0%
7	36.0" >	17.5%
40	**Total:**	**100.0%**

Right-of-Way Tree

There is one right-of-way tree impacted by the project. It is tree # 988. It is a 16.1-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.

However, it is possible that permit requirements in the East Mercer Way right-of-way required by the City may result in the loss of this tree. This will need to be decided in the field once final locations and improvements are surveyed in.

Tree on Adjacent Properties

There is one tree on the adjacent property to the west; which is tree # 573.

- It is a 14.4-inch Big Leaf Maple in Good Condition.
- The tree is may yards up-slope from the proposed construction/disturbance zone.
- The tree protection fencing for the subject property trees upslope of the construction will adequately protect this tree.

Trees on the Subject Property

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 as summarized below.

- 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; these trees will be removed.
    - This fence should adequately protect them. They can remain.
- Please note that trees # 974, 975, 980, and 987 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 reduced, 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.

Trees on the Subject Property—Greater than 24 Inches Diameter

As noted above, on page 7, there 15 trees on the property that are 24-inches in diameter or greater.

- Not Viable Trees:
  - Trees # 974, 980, and 987 are Dying.
  - They are a hazard to life and property.
  - They are recommended for removal for safety.
- That leaves 12 trees 24-inches in diameter and greater.
  - Trees 974, 976, and 982 will need to be removed for house construction.
- That leaves 9 trees over 24 inches.
  - All 9 of these trees are in the undisturbed portions of the property and will be retained.

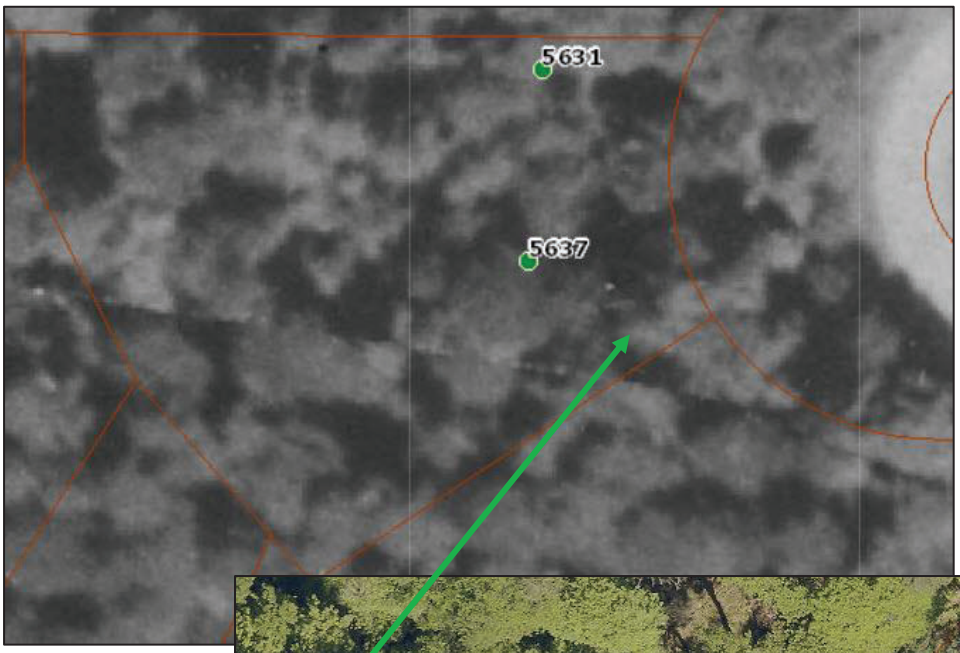
Trees on the Subject Property—Tree # 986

Tree # 986 is a special condition tree. It is a 40.7-inch diameter Douglas Fir tree in Fair Condition. This is the tree that was required to be retained in the 1977 short plat process.

The adjacent house at 5645 East Mercer Way, was built in 1980. Based upon the condition of this existing driveway and its level of oxidation, it is reasonable to surmise that the driveway has been in for 40 years.

It is also reasonable then to surmise that tree # 986 has adapted very well to the presence of the existing driveway. It is reasonable to conclude that the tree has adapted to the driveway and its pattern of runoff. It is also reasonable to surmise that the existing driveway has hindered root growth and development underneath it. Therefore, it is reasonable to conclude that placing some stormwater facilities under the new driveway addition can be done with minimal impact on the tree—if strict adherence to the *Tree Protection Measures,* that are outlined below. That is, the tree appears to have the current health, vigor, internal stored reserves, and wind-firmness, to tolerate some incursion into its dripline to add the new driveway and to construct the new home. Tree # 986 is the tree referred to in the 1977 short plat; after studying historical aerial photographs of the property, no other tree could realistically be referenced in the short plat. The second Conditions of Approval states, "2. That access and utility construction

on Lot A be located so as to save the 24" fir on Lot A, just north of proposed access easement." As indicated, this condition applies to Tree # 986.



Photos # 3 & 4: A 1936 aerial photo of the property in black and white. And, a 2019 color photo of the property.

Both photos taken from the King County Assessor's website.

Tree # 986 appears to be this tree.

The proposed driveway to access the proposed new house at 5637 is within a small portion of the dripline of this tree.

- This can be accomplished by suspending the driveway over an aeration system and then excavating as normal for the rest of the driveway construction up the slope to the new home.

RECOMMENDATIONS

I recommend 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. Indicated in *Attachment 4, Tree Protection Measures* below.

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.

Replacement Trees

Given the east facing slope of the property, the substantial forested hill to the west, replacement trees should be tolerant of shade and moist soils for at least a few weeks of the year. A few species to consider include:

- Evergreen Trees:
  - Western Red Cedar, *Thuja plicata*
  - Sitka Spruce, *Picea sitchensis*
  - Pacific Yew, *Taxus brevifolia*

- Deciduous Trees:
  - Red Alder, *Alnus rubra*

- Alaska Yellow Cedar, *Chamaecyparis nootkatensis*
- Big Leaf Maple, *Acer macrophyllum*
- Paper Birch, *Betula papyrifera*
- Oregon Ash, *Fraxinus latifolia.*

See the planting detail in *Attachment 5* for proper planting techniques.

Trees on the Subject Property—Impact of Removal on Remaining Trees
Given the topography of the property and the remaining trees ringing the lot, the removal of the central trees to build the new home should have little to no negative impact on the remaining 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 homeowner's 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 ensure 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,

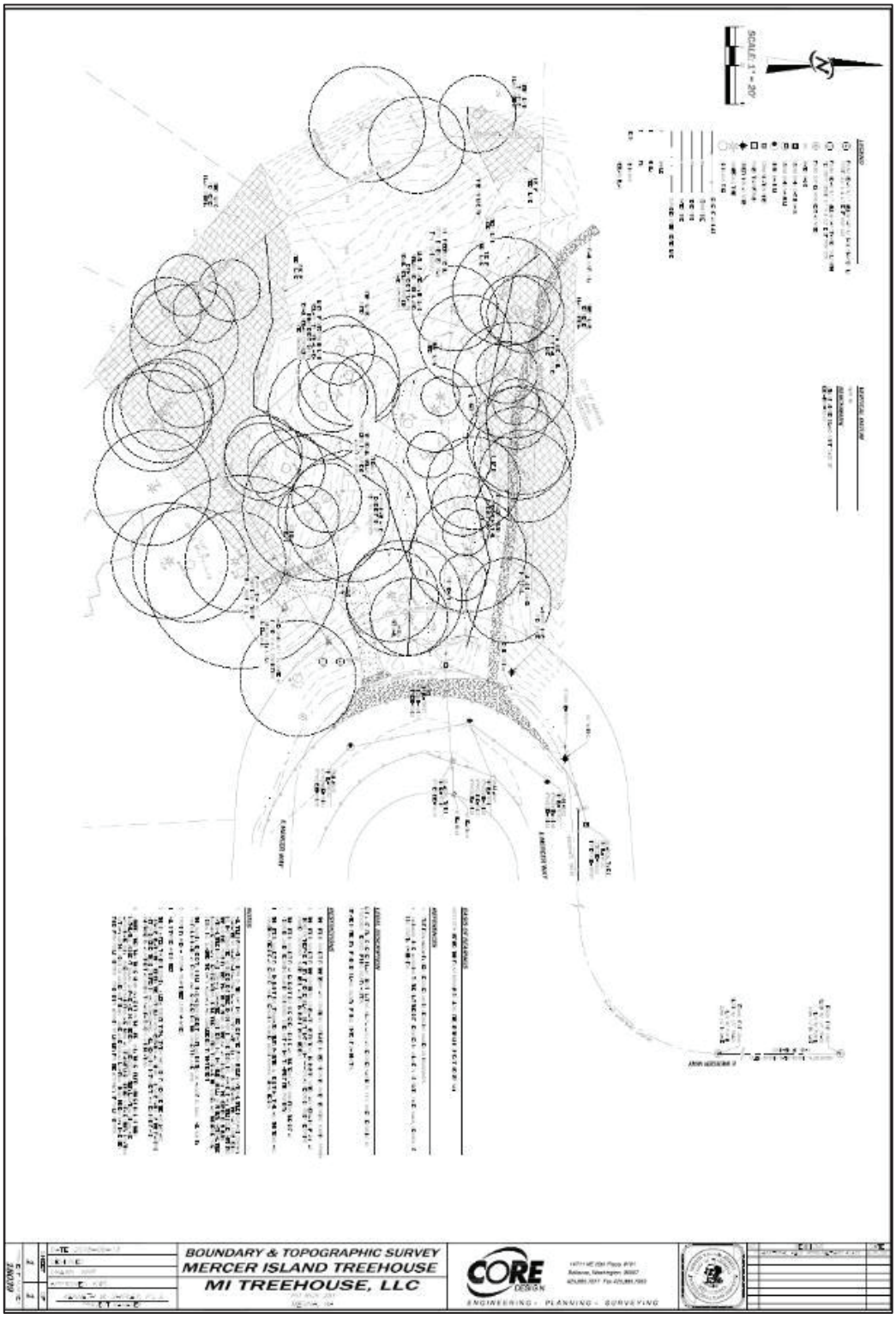
Brian K. Gilles, Consulting Arborist

- *International Society of Arboriculture:*
  - *ISA Certified Arborist # PN-0260A*
  - *ISA TRAQ Qualified*
  - *ISA TRAQ Certified Instructor*
- *American Society of Consulting Arborists:*
  - *ASCA Registered Consulting Arborist # RCA-418*
  - *ASCA Tree & Plant Appraisal Qualified*
  - *ASCA Tree & Plant Appraisal Certified Instructor*

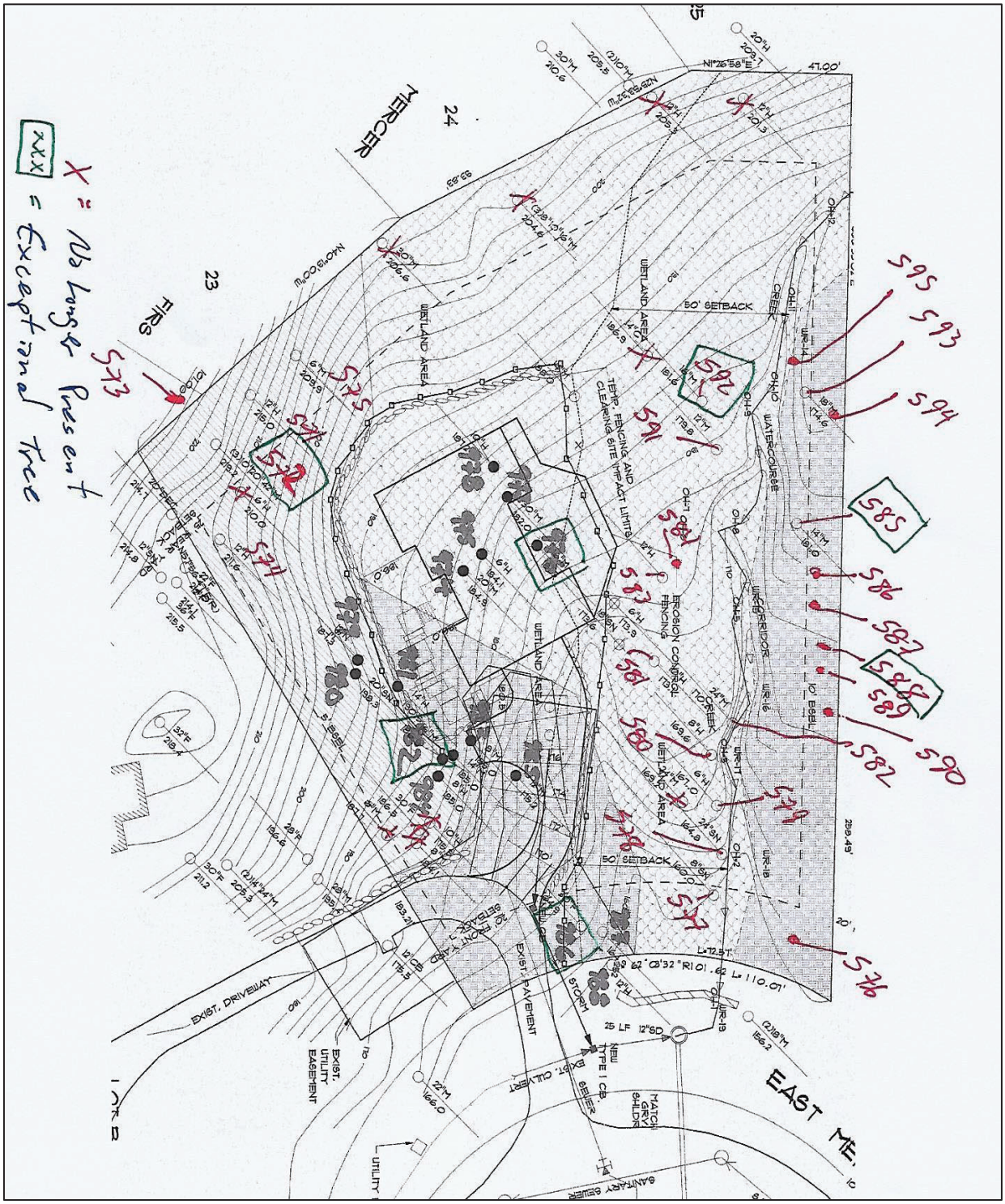
ATTACHMENTS

ATTACHMENT 1 - BOUNDARY & TOPOGRAPHIC SURVEY

Dated: 2018-06-13



Survey with Tree Numbers



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.	**#9**	***Symmetry:*** General shape of canopy and weight distribution of the tree around the trunk.
#2	***Tree Location:*** Relative placement of the tree.	**#10**	***Foliage:*** General description of foliage density that indicates tree health and vigor.
#3	***Tree #:*** The unique tag number of each tree.	**#11**	***Crown Condition:*** The most important external indication of tree health and vigor.
#4	***Species:***	**#12**	***Trunk:*** Description of trunk condition or abnormalities if any.
	BLM/Am Big Leaf Maple, *Acer macrophyllum*	**#13**	***Root Collar:*** The base of the tree where the trunk flares into the roots--deformities or problems are noted here.
	DF/Pm Douglas Fir, *Pseudotsuga menziezii*	**#14**	***Roots:*** Root problems are noted here.
	GF/Ag Grand Fir, *Abies grandis*	**#15**	***Comments:*** Additional observations about the tree's condition.
	RA/Ar Red Alder, *Alnus rubra*	**#16**	***Status:*** Whether the tree meets the size, health, and structural stability to be rated as *Significant or Non-Significant.*
	WH/Th Western Hemlock, *Tsuga heterophylla*	**#17**	**2015 Health Rating:** The health rating given the trees in the July 14, 2015 Arborist Report. On a scale from Dead, to Dying, to Poor, to Fair, to Good, to Very Good, to Excellent.
#5	***DBH:*** Trunk diameter @ 4.5' above average ground level.	**# 18**	**2020, Current Health Rating:** The health rating given the tree during site visits of August 2020.
#6	***Drip Line:*** The radius, the distance from the trunk to the furthest branch tips.	**#19**	**Viability:** Trees with a Health Rating of Dead, Dying, or Poor are *Not Viable. There are no treatments to bring them back to good health and structure. Trees rated Fair to Excellent are Viable .*
#7	***Limits of Disturbance:*** The boundary between the area of minimum protection around the tree and the allowable site disturbance determined by a qualified professional.	**#20**	***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.
#8	***LCR:*** *Live Crown Ratio* - the amount of live canopy expressed as a % of the entire tree height.		

Trees highlighted in **Red Ink** are Non-Viable Trees recommended for removal or conversion to Habitat Trees and Nurse Logs.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	W/in building footprint	974	BLM/Am	26.9"	27.2"	28'	n/a	n/a	n/a	n/a	30%	Min. Asym.	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.	Not Significant	Dying	Dying	Not Viable	Remove for safety
Subject Property	W/in building footprint	975	WH/Th	12.5"	14.6"	18'	n/a	n/a	n/a	n/a	85%	Min. Asym.	Average	Average	Straight	Exposed	Aerial	Growing out of nursing stump.	Large Tree, Regulated	Good	Good	Viable	Potential to retain with tree protection measures.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	W/in building footprint	976	BLM/Am	30.2"	34.5"	34'	n/a	n/a	n/a	n/a	40%	Min. Asym.	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.	Exceptional Tree	Good	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	W/in building footprint	977	BLM/Am	15.7"	17.9"	26'	n/a	n/a	n/a	n/a	65%	Maj. Asym.	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. Failed at base. Leans into canopy of 978.	Not Significant	Good	Dying	Not Viable	Remove for safety
Subject Property	W/in building footprint	978	WH/Th	9.3"	11.0"	18'	n/a	n/a	n/a	n/a	70%	Min. Asym.	Thin	Average	Straight	Bowed/ Exposed	Surface	Heavy foliar predation. Growing out of nursing stump.	Small Tree	Fair	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	W/in grading impact zone	979	DF/Pm	15.9"	17.4"	20'	n/a	n/a	n/a	n/a	90%	Maj. Asym.	Average	Average	Straight	No apparent defect	No apparent defect		Large Tree, Regulated	Fair	Fair	Viable	Potential to retain with tree protection measures.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	W/in grading impact zone	980	RA/Ar	28.1"	28.2"	20'	n/a	n/a	n/a	n/a	40%	Maj. Asym.	Average	Weak	Leans East severely	Exposed		Also tagged 20. Girdling rot on the north side up 15% of the tree.	Not Significant	Dying	Poor	Not Viable	Remove for safety
Subject Property	W/in grading impact zone	981	WH/Th	21.4"	23.5"	20'	n/a	n/a	n/a	n/a	90%	Maj. Asym.	Average	Average	Bowed	No apparent defect	No apparent defect	Bowed by tree number 980 because it is leaning against it.	Large Tree, Regulated	Good	Good	Viable	Potential to retain with tree protection measures.
Subject Property	W/in grading impact zone	982	BLM/Am	37.3"	39.8"	38'	n/a	n/a	n/a	n/a	65%	Min. Asym.	Dense	Healthy	Forked at 5.5'	Swollen	No apparent defect		Exceptional Tree	Good	Good	Viable	Potential to retain with tree protection measures.
Subject Property	W/in grading impact zone	983	WH/Th	8.4"	9.3"	18'	n/a	n/a	n/a	n/a	95%	Min. Asym.	Dense	Healthy	Straight	No apparent defect	No apparent defect		Small Tree	Fair	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	W/in grading impact zone	984	WH/Th	11.6"	12.9"	16'	n/a	n/a	n/a	n/a	90%	Maj. Asym.	Average	Average	Straight	No apparent defect	No apparent defect	Also tagged number 2	Large Tree, Regulated	Fair	Fair	Viable	Potential to retain with tree protection measures.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	W/in grading impact zone	985	BLM/Am	19.1"	21.3"	34'	n/a	n/a	n/a	n/a	70%	Min. Asym.	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.	Large Tree, Regulated	Fair	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	Below existing driveway	986	DF/Pm	38.2"	40.7"	24'	n/a	To the driveway	to the road shoulder	24'	30%	Gen. Sym.	Dense	Regenerating/ Healthy	Straight	No apparent defect	Restricted	Growing on the slope between the driveway and the stream. English Ivy up 100'.	Exceptional Tree	Good	Good	Viable	Potential to retain with tree protection measures.
Subject Property	Below existing driveway	987	BLM/Am	30.8", 20.0"	33.4" & 22.0"	30'	n/a	To the driveway	to the road shoulder	30'	90%	Maj. Asym.	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.	Not Significant	Good Health, Poor Structure	Good health with a poor structure	Not Viable	Remove for safety

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
EMW Right-of-Way	On far side of ditch	988	WH/Th	15.4"	16.1"	20'	n/a	To the driveway	to the road shoulder	20'	90%	Maj. Asym.	Average	Average	Straight	No apparent defect	Restricted	Growing on the slope between the driveway and the stream. Also tagged number 7.	Large Tree, Regulated	Good	Good	Viable	Potential to retain with tree protection measures.
Subject Property	South Slope	572	BLM/Am	-	34.6" & 43.1"	28'	15'	To S. P.L.	28'	28'	60%	Maj. Asym.	Average	Average	Fork at Base	Partially Exposed	-		Exceptional Tree	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	South Slope	571	WH/Th	-	16.8"	16'	16'	16'	16'	16'	85%	Min. Asym.	Average	Average	Leans N.	Exposed	-		Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.
Off Property	West of West P. L.	573	BLM/Am	-	14.4"	18'	18'	18'	18'	18'	65%	Min. Asym.	Average	Healthy	Typical	Partially Exposed	-		Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	South Slope	574	DF/Pm	-	18.3"	20'	14'	20'	20'	20'	85%	Min. Asym.	Average	Healthy	Straight	Partially Exposed	-	English Ivy up 85%. Near Neighbor's back yard.	Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	South Slope	575	BLM/Am	-	11.3" & 5.0"	16'	16'	16'	16'	16'	65%	Maj. Asym.	Average	Average	Fork at Base	Exposed	-		Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	N. P.L. above trail	576	BLM/Am	-	9.0"	22'	22'	22'	22'	22'	65%	Maj. Asym.	Average	Average	Slight Bow, Typical	No apparent defect	-		Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Stream	577	WH/Th	-	10.7"	12'	12'	12'	12'	12'	65%	Min. Asym.	Average	Average	Serpentine	Exposed	Restricted		Large Tree, Regulated	-	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Stream	578	BLM/Am	-	35.2"	30'	30'	30'	30'	30'	45%	Gen. Sym.	Dense	Healthy	Center Rot	Base Rot	Probable Root Rot	Open wound west side base up 22 feet with decay, Carpenter Ant infestation, and Woodpecker activity. Strong Reaction wood.	Large Tree, Regulated	-	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Stream	579	WH/Th	-	6.6"	12'	12'	12'	12'	12'	85%	Maj. Asym.	Average	Regen-Average	Serpentine	Exposed	Aerial		Small Tree	-	Fair	Viable	Potential to retain with tree protection measures.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	S. Side of Stream	580	WH/Th	-	12.6"	16'	16'	16'	16'	16'	90%	Maj. Asym.	Average	Healthy	Slight bow	Exposed	Aerial		Large Tree, Regulated	-	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Stream	581	WH/Th	-	9.1"	12'	12'	12'	12'	12'	30%	Maj. Asym.	Average	Broken Out	Straight	Exposed	-	Open wound southeast side base up 4 feet. Hypoxylon fruiting bodies near base.	Small Tree	-	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Stream	582	BLM/Am	-	26.7"	24'	24'	24'	24'	24'	35%	Gen. Sym.	Dense	Healthy	Fork at 16'	Exposed	-		Large Tree, Regulated	-	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Stream	583	WH/Th	-	21.8"	22'	22'	22'	22'	22'	95%	Gen. Sym.	Average	Average	Straight	Exposed	Aerial	Growing out of Nurse Log. Base is within 2 feet of # 584.	Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Stream	584	WH/Th	-	7.2"	10'	10'	10'	10'	10'	85%	Maj. Asym.	Thin	Average	Bowed	Exposed	Aerial	Base is within 2 feet of 583.	Small Tree	-	Fair	Viable	Potential to retain with tree protection measures.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	N. side of Stream	585	WH/Th	-	34.5 "	16'	16'	16'	16'	16'	45 %	Min. Asym.	Average	Average	Straight	Partially Exposed	-		Exceptional Tree	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	N. side of Stream	586	WRC/Tp	-	11.1 "	12'	12'	12'	12'	12'	90 %	Gen. Sym.	Dense	Healthy	Straight	Exposed	-		Large Tree, Regulated	-	Very Good	Viable	Potential to retain with tree protection measures.
Subject Property	N. side of Stream	587	BLM/Am	-	22.0 "	16'	16'	16'	16'	16'	45 %	Min. Asym.	Average	Regen - Average	Straight	Exposed	-		Large Tree, Regulated	-	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	N. side of Stream	588	BLM/Am	-	36.0 "	28'	28'	28'	28'	28'	50 %	Gen. Sym.	Average	Average	Serpentine, Typical	Exposed	-		Exceptional Tree	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	N. of trail on slope	589	BLM/Am	-	24.0 "	24'					65 %	Maj. Asym.	Dense	Healthy	Typical	Partially Exposed	-		Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	N. of trail on slope	590	BLM/Am	-	23.0"	24'					60%	Maj. Asym.	Dense	Healthy	Typical	Partially Exposed	-		Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Trail	591	BLM/Am	-	22.0"	24'					55%	Maj. Asym.	Average	Average	Fork at 16', Typical	Exposed	-		Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	S. Side of Trail	592	DF/Pm	-	37.0"	22'					45%	Min. Asym.	Dense	Healthy	Slight Lean SE	Swollen & Exposed	-		Exceptional Tree	-	Fair	Viable	Potential to retain with tree protection measures.
Subject Property	S. of Creek	593	BLM/Am	-	13.7"	18'					55%	Min. Asym.	Dense	Healthy	Leans E., Typical	Exposed	-		Large Tree, Regulated	-	Good	Viable	Potential to retain with tree protection measures.
Subject Property	South of Creek	594	BLM/Am	-	18.9"	20'					50%	Gen. Sym.	Dense	Healthy	Fork at 4' w/ decay in root.	Exposed	-		Large Tree, Regulated	-	Fair	Viable	Potential to retain with tree protection measures.

1	2	3	4	5		6	7 - Limits of Disturbance				8	9	10	11	12	13	14	15	16		17	18	19
PROPERTY	TREE LOCATION	TREE #	SPECIES	2015 DBH	2020 DBH	DRIP LINE	North	South	East	West	LCR	SYMMETRY	FOLIAGE	CROWN CONDITION	TRUNK	ROOT COLLAR	ROOTS	COMMENTS	STATUS	2015 Health Rating	2020, CURRENT HEALTH RATING	VIABILITY	RECOMMENDATION
Subject Property	S. Side of Trail	595	BLM/Am	-	28.0"	28'	n/a	n/a	n/a	n/a	80%	Min. Asym.	Dense	Healthy	Slight Lean E, Typical	-	-		Large Tree, Regulated	-	Good	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 LOCATION**—Relative placement of the tree on the lot.
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) **2015 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) **2020 DBH—**The k14 trees in the original report were re-measured to determine their current size.
7) **DRIP LINE**—the radius, the distance from the center of the trunk to the furthest branch tips.
8) **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.

9) **% 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.
10) **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.
11) **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.

12) **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.

13) **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.

14) **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.
15) **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.
16) **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.
17) **STATUS**—based upon the size of the trunk measured at DBH, and the condition of the tree, according to Mercer Island code, what is the tree status. They are rated as *Small Tree, Large Tree, Exceptional Tree,* or *Not Significant* if the tree is Dead, Dying, or in poor condition.
18) **2020, CURRENT HEALTH RATING**—A description of the tree's general health ranging from dead, dying, poor, senescent, suppressed, fair, good, very good, to excellent.
19) **VIABILITY**—As noted in # 17 above:
    i) Trees with a current health rating of Dead, Dying, or Poor are Not Viable.
    ii) Trees with a current health rating of Fair, Good, Very Good, or Excellent are Viable.
20) **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) **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.
    ii) **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.

ATTACHMENT 4 - TREE PROTECTION MEASURES

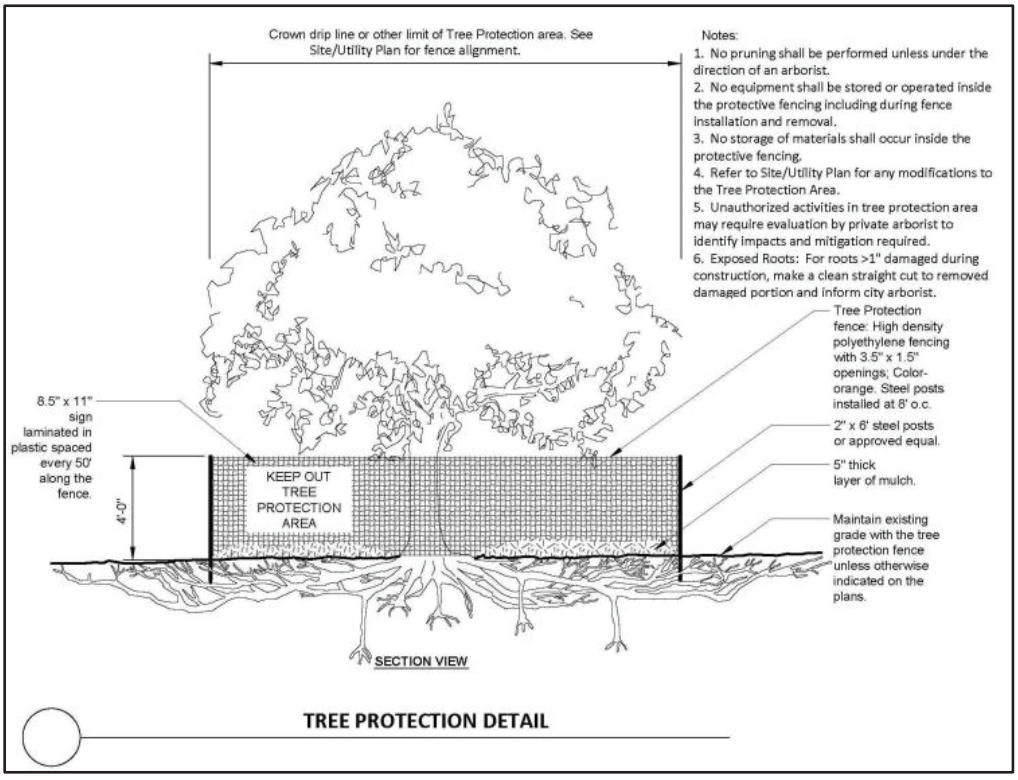
In order for trees to survive the stresses placed upon them in the construction process, tree protection must be planned in advance of equipment arrival on site. If tree protection is not planned integral with the design and layout of the project, the trees will suffer needlessly and will possibly die. 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. The Tree Protection Fences need to be clearly marked with the following or similar text in four inch or larger letters:



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

4. Clearing and Grubbing:
    a. When the proposed new driveway is to be cleared, all work within the dripline of the tree must be done by hand or with powered hand tools.
    b. The duff layer is to remain on site and must be left in as undisturbed condition as possible.
    c. When the new driveway is complete, the area outside the new driveway must be covered in a dense layer of straw to prevent erosion.

5. Excavation:
    a. When excavation for the stormwater utility improvements occur, the following procedure *must* be followed to protect the long-term health and survival of tree # 986.
        i. An International Society of Arboriculture, (ISA), *Certified Arborist* must be working with and control of all equipment operators.
    b. An Air Spade or Air Knife with operator and ground laborer must be present with shovels and rakes.
    c. Marking the Limits of Excavation:
        i. The site superintendent, the excavation supervisor, and the arborist are to agree upon the limits of excavation—specifically how close to the tree will the excavation of the driveway and the stormwater facilities be.
            1. Once agreed, a line will be painted on the ground to mark the limits of excavation.
    d. Creating a Trench:
        i. The air spade operator will begin blowing soil to excavate a trench at the limits of disturbance.
            1. The trench will be approximately 1-foot wide.
            2. When roots of 1-inch or greater are encountered, the ground laborer will jump into the trench and expose the roots with a hand shovel.
                a. This *must* be done carefully to minimize or eliminate3 any damage to the bark on the roots.
            3. The Certified Arborist will decide if the root can be cut/removed or tunneled underneath of.
            4. If the root(s) are to be cut, the arborist will cut the root(s) or will instruct the cutting with the most appropriate tool for the size of the root(s).
        ii. Once cut, the Certified Arborist will instruct the air spade operator to continue.
        iii. The air spade operator will continue exposing soil and the laborer will continue to carefully shovel out the trench.

iv. When new roots are encountered, the above process will be repeated.
v. This air spade/root exposure process will continue down until the Certified Arborist determines that there will be no more significant roots encountered or the excavation supervisor and the site superintendent decide that they are deep enough for the job at hand.

e. Once agreed on depth and how individual roots are to be managed, a hoe can take over the excavation.
i. The hoe must be placed outside the tree protection fence.
ii. All spoils are to be placed and managed outside the tree protection fence.

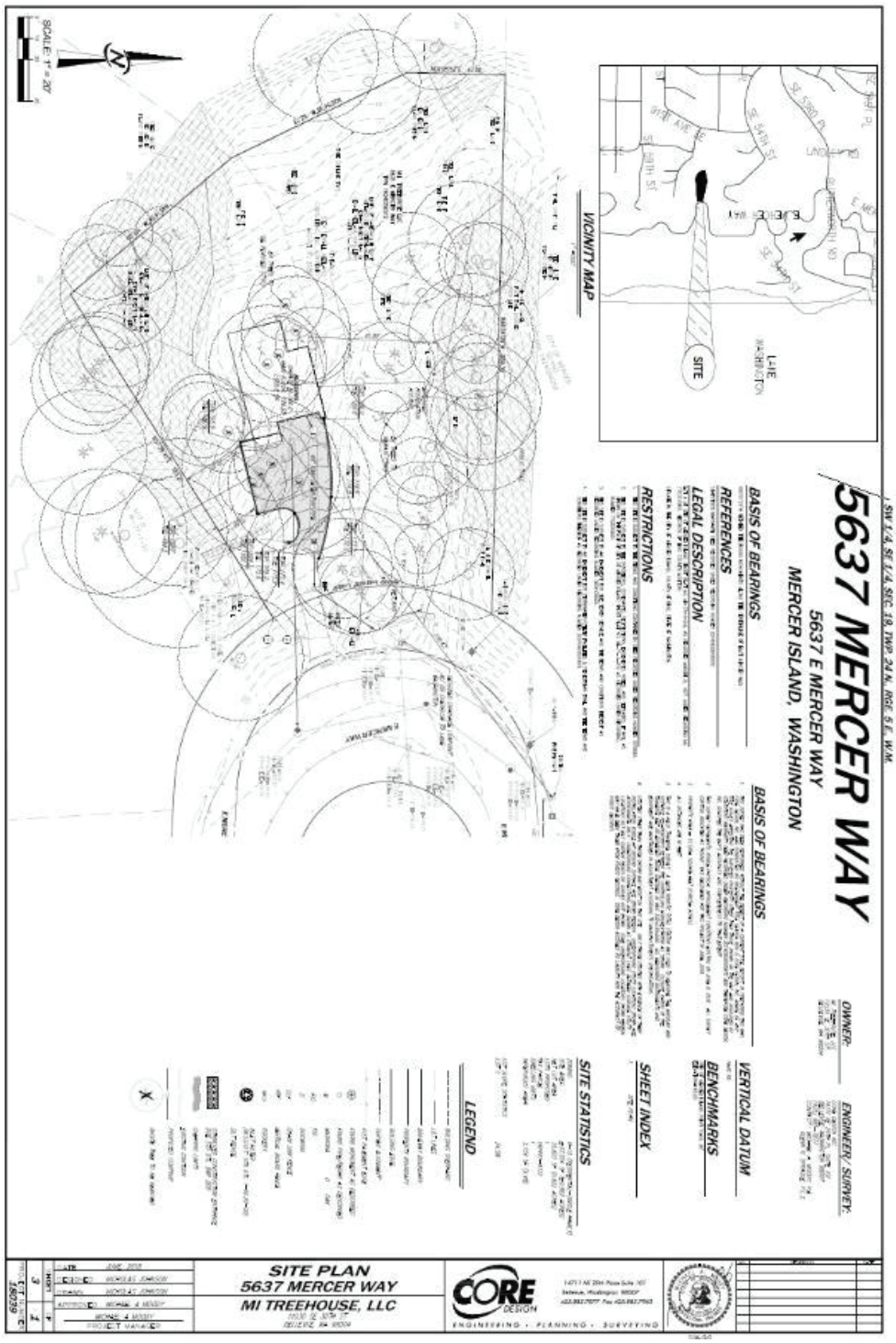
6. Backfill:
a. As soon as the stormwater improvements are complete, the trench must be backfilled immediately to minimize any soil erosion or moisture evaporation.

7. Driveway Construction and the Required Aeration System:
a. Within the dripline of tree # 986, the driveway must be built above the existing grade, on the top of the existing duff layer.
b. This portion of the driveway with the aeration system must be completed prior to any other work done for construction. Before any other clearing and grading is done.
c. The Aeration System:
i. Pipes:
1. 4" perforated pipe wrapped in landscape fabric will be utilized. (This is standard drain field piping.)
2. The pipes will be lain directly on top of the existing duff layer.
3. The pipes will be bedded in with a either pea gravel or ¾" crushed rock that is clean, no fines, no minus particles. (this is to provide a solid base but that allows air penetration.)
4. Th pipes will run north/south on 6-foot centers and east/west on 6-foot centers.
5. The pipes will be interconnected with functional joints.
6. The ends of the pipes will daylight out to the air at the edges of the proposed driveway.
7. The ends will be screened to prevent entry of vermin and debris.
ii. Layering:
1. The duff layer and undisturbed soil will be the bottom layer.
2. Next will be the pipes and gravel bedding layer.

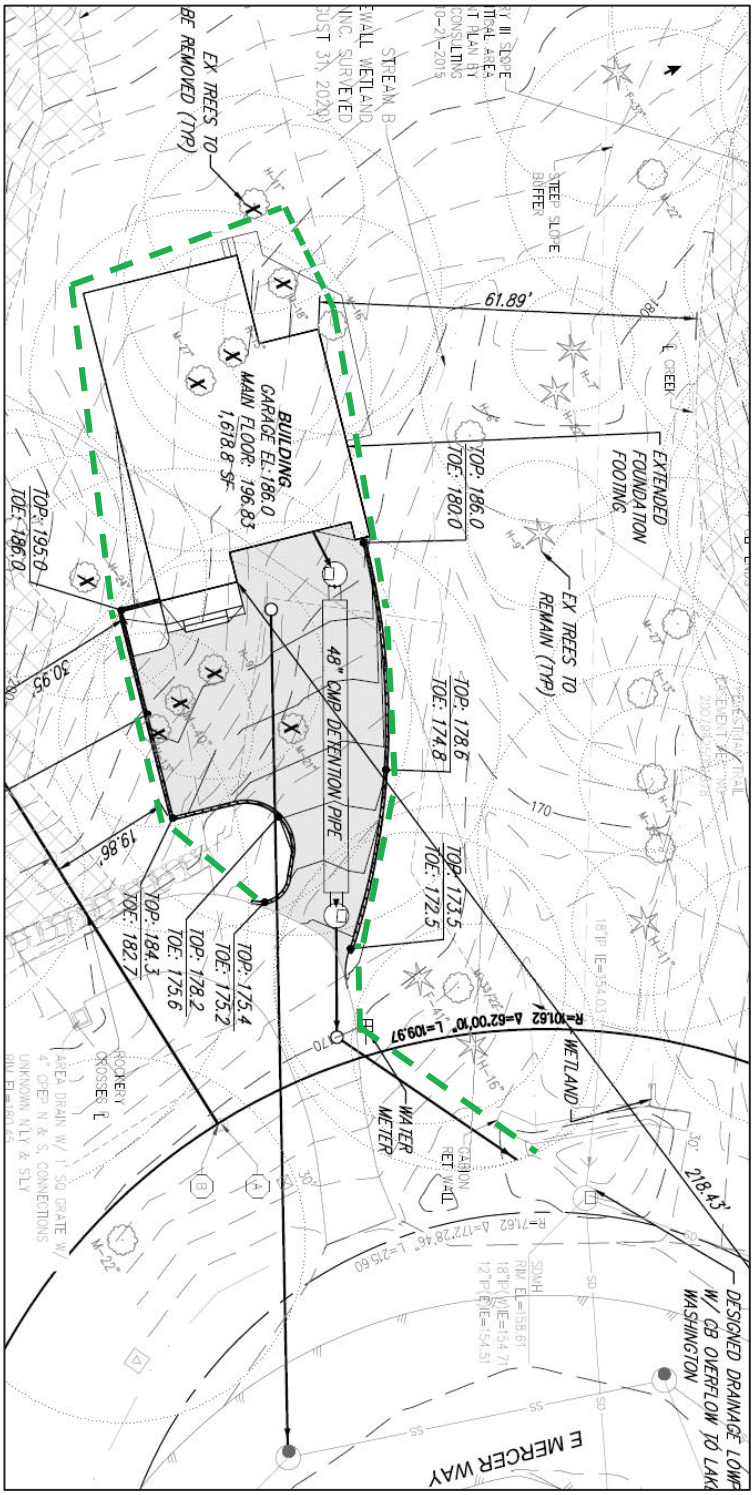
3. Next will be a layer of filter/landscape fabric that will allow air and water penetration.
4. Next the driveway surface, or a second layer of base material and then the driveway surface.

8. Putting Utilities Under the Root Zone:
    a. It could be that tunneling or boring under the root system of tree # 986 might be an option. If this is done within the dripline of tree # 986, the 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 of 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.

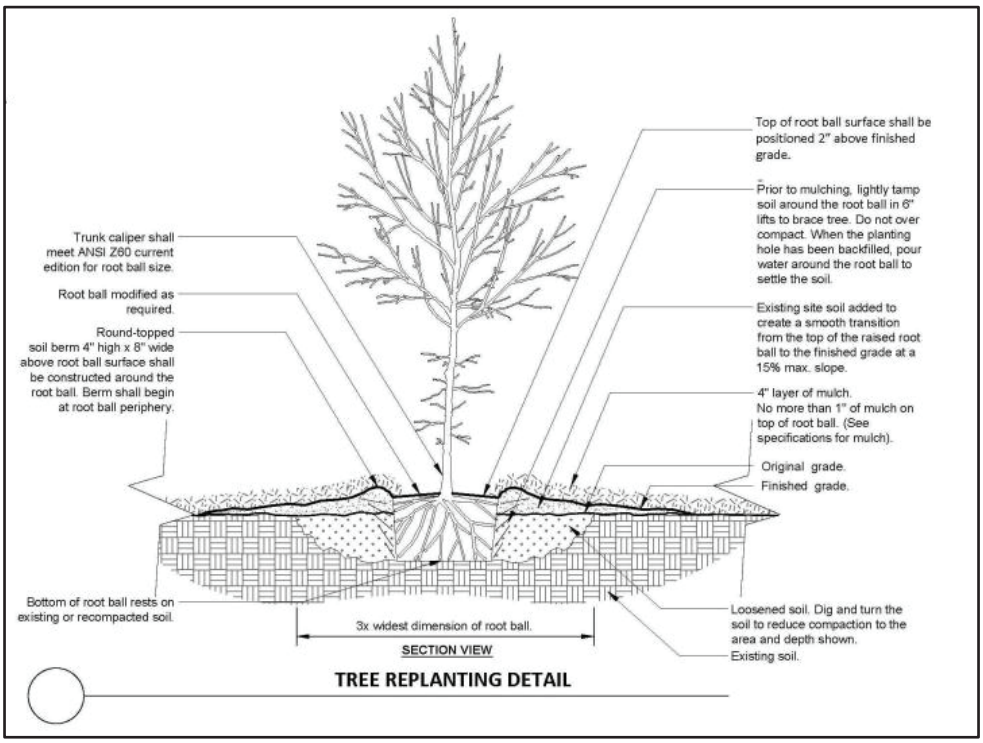
Proposed Site Plan:

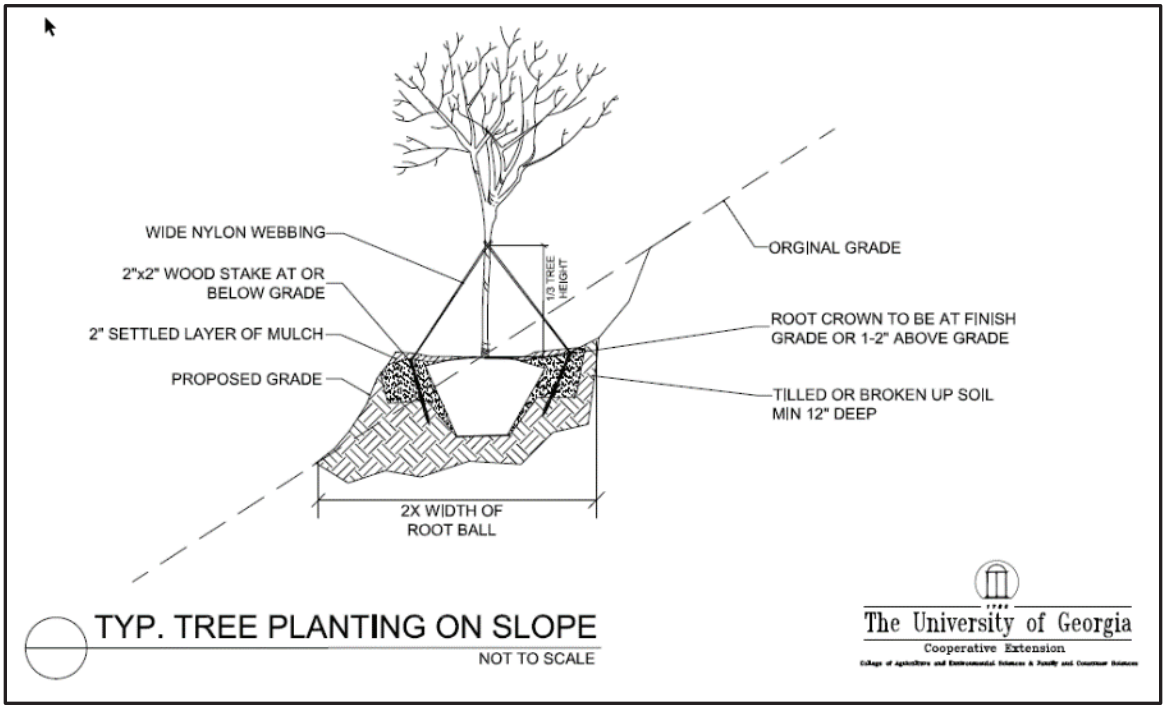


Approximate *Tree Protection Fence* locations: - - - - - -



ATTACHMENT 5 - TREE PLANTING DETAIL





ATTACHMENT 6 - BIBLIOGRAPHY

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.

2. Harris, Richard W, James Clark, and Nelda Matheny. *Arboriculture, Integrated Management of Landscape Trees, Shrubs, and Vines*. 4th ed. Upper Saddle River: Prentice Hall, 2004.

3. Johnson, Warren T. and Lyon, Howard H. *Insects That Feed on Trees and Shrubs*. Ithaca: Comstock Publishing Associates, 1991.

4. Matheny, Nelda P. and Clark, James R. *Evaluation of Hazard Trees*. 2nd ed. Savoy: The International Society of Arboriculture Press, 1994.

5. Matheny, Nelda P. and Clark, James R. *Trees & Development, A Technical Guide to Preservation of Trees During Land Development*. Savoy: The International Society of Arboriculture Press, 1998.

6. Mathews, Daniel. *Cascade -- Olympic Natural History.* Portland, Oregon: Raven Editions with the Portland Audubon Society, 1992.

7. Mattheck, Claus and Breloer, Helge. *The Body Language of Trees, A Handbook for Failure Analysis.* London: HMSO, 1994.

8. Pacific Northwest Chapter-ISA. *Tree Risk Assessment in Urban Areas and the Urban/Rural Interface.* Course Manual. Release 1.5. PNW-ISA: Silverton, Oregon, 2011.

9. Sinclair, Wayne A., Lyon, Howard H., and Johnson, Warren T. *Diseases of Trees and Shrubs*. Ithaca, New York: Cornell University Press, 1987.

10. Smiley, E. Thomas, Nelda Matheny, and Sharon Lilly, *Tree Risk Assessment Best Management Practices, ANSI A300 Part 9: Tree, Shrub, and Other Woody Plant Management—Standard Practices (Tree Risk Assessment a. Tree Structure Assessment).* The International Society of Arboriculture Press. Champaign. IL. 2011.

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