TREE FROG
CONSULTING ARBORIST

To:	Tanya Nachia Somanna, Hoa Hoang
Job Site:	7929 E MERCER WAY 98040
Parcel:	3024059176
Subject:	Arborist Report
Date:	6/18/2021, 1/9/2023, 12/14/2023 (current)
From:	Andy Crossett, ISA Certified Arborist #PN-7375A, Qualified Tree Risk Assessor, WSNLA Certified Professional Horticulturist #2537

Assignment

Tanya Nachia Somanna of Warmmodern Living contacted me and asked that I prepare an arborist report for the trees located at 7929 E Mercer Way, Mercer Island WA. She was representing her client Hoa Hoang, the owner of the subject property.

*12/14/23 – Updated the report to address comments from Mercer Island.

A summary, tree protection timeline, tree table, site map, and photographic documentation can be found below under sections 1 - 5**.**

Where applicable, I have categorized risk based on the methodologies presented in the International Society of Arboriculture's Tree Risk Assessment (Best Management Practices).

My responsibilities were to provide the following:

A tree plan that includes a tree inventory, site plan, replanting information (if necessary), tree protection measures for on-site and off-site trees (where CRZ extends on-site), and recommendations that will meet the minimum city of Mercer Island tree code requirements.

Site Description

The 30,492 square foot lot is located at the end of an easement driveway north-west of East Mercer Way. The landscape is neatly manicured with well-defined garden beds that feature a mix of ornamental native/non-native shrubs and small trees. The home is located on the south-west portion of the property. The majority of the subject trees are located on a slope north-west of the home.

Subject Trees – Twenty-six (26) trees located on 7929 E Mercer Way.

1. Summary

Per MICC 19.10.060 2. A. "A minimum of 30 percent of trees with a diameter of 10 inches or greater, or that otherwise meet the definition of large tree, shall be retained over a rolling five-year period." I have identified and tagged 26 trees on-site. ~~No trees have been proposed for removal. 100% of the on-site trees will be retained and will therefore exceed the City of Mercer Island tree retention standards.~~ Two trees have been proposed for removal to accommodate the newly designed shoring wall located north-west of the home. This includes tree 64, a 22" DSH Douglas fir and tree 65, a 31" DSH Douglas fir. Ms. Nachia explained to me that the proposed disturbance is unavoidable as "the structural engineers and civil engineers for the house have recommended the new shoring wall to help with the stability of the slope and the new house. There is no alternative than to add this shoring wall for a new construction or any addition."

I have identified and measured all on-site trees to define their critical root zones and limits of disturbance. Approximations of the locations of the recommended protection measures have been included on the site map below. The majority of the on-site trees will not be significantly impacted by construction as they are located on the slope north of the home. However, there are a few notable exceptions to this:

Tree 62 is a 29" DBH bigleaf maple in good condition. ~~This tree will be impacted by the widening of the driveway and installation of retaining wall. The area of disturbance will occur in the southern portion of the dripline and represents 14.5% of the total dripline area. Per Trees and Development: A Technical Guide to Preservation of Trees During Land Development, bigleaf maple is listed with a "good" relative tolerance to root disturbances. Therefore, is unlikely the health or stability of the tree will be significantly impacted by construction.~~ The proposal to expand the driveway has been withdrawn, and there are no plans for any disturbances within the dripline of this tree.

Trees 63 (31"), **64** (22"), and **65** (31") are all Douglas fir in good condition. These trees will also be impacted by the ~~widening of the driveway and~~ installation of the shoring wall. This disturbance will occur on the south-east portion of each trees critical root zone. ~~The disturbance represents 13.9% of tree 63, 13.3% of tree 64, and 15.6% of their total dripline area.~~ Per Trees and Development: A Technical Guide to Preservation of Trees During Land Development Douglas fir is listed with a good tolerance to root pruning. ~~Therefore, is unlikely that the health of these trees will be significantly impacted by development. However, the trees are fully exposed to southern prevailing winds, and the proposed disturbance may impact their stability.~~ The expected disturbance to tree 63 is limited to the south-west corner of its outer critical root zone area. I do not believe the proposed disturbance will affect its health or stability. However, the disturbance may impact the health and will likely impact the stability of trees 63 and 64 as the disturbance will occur on the south side of their inner critical root zone. They are currently fully exposed to southern prevailing winds. In the event of failure, I believe they would likely fall north into the grove of retained and protected trees on the hillside, and have a low likelihood of falling south towards the Hoang's home and property. In my opinion, it is better to safely remove the trees now so as not to damage retained trees in the event of root failure.

As trees 64 and 65 are part of a protected grove, if they are to be removed, they will require 12 replacement trees. At least half the trees need to be Pacific Northwest natives. Recommended native conifers include Douglas fir, Western redcedar, and Sitka Spruce, or the generally smaller and slow growing shore pine and mountain hemlock. Native small deciduous trees could include Oregon crabapple, Vine Maple, Cascara, pacific dogwood.

Trees 58, 60, and 61 will be retained but are located within areas that may be impacted by construction activities and will therefore require tree protection fencing to ensure their critical root zones are protected.

A tree table has been included below (section 3) as well as a site map identifying the subject trees along with tree protection fencing and replanting information (section 5).

2. Tree Protection Timeline and Site Recommendations

Prior to construction, the following measures should be taken to ensure that trees are not damaged.

1) Project managers should review the contents of this report, including the International Society of Arboriculture's recommended tree protection measures found below under sections 7 and 8 of this report. Information contained herein should be relayed to workers and subcontractors.

2) To minimize soil compaction, 6 inches of medium fine mulch should be applied within the recommended tree protection zones of trees 58, 60, and 61 of this report. It should be kept at a minimum of 12 inches from the protected tree's trunk.

3) Once the mulch has been applied, tree protection fencing should be installed per the ISA recommended tree protection fencing detail below.

Additional site recommendations.

- Tree protection fencing and mulch should only be adjusted when access is required, such as, when scaffolding is utilized. Once the work has been completed, the fencing should return to its original placement.

- The following should be avoided within TPZ's: Stockpile construction materials or demolition debris, park vehicles or equipment, pile soil and/or mulch, contaminate soil from washing out equipment (especially concrete) and vehicle maintenance, and wound or break tree trunks or branches through contact with vehicles and heavy equipment.

- Post appropriate signage to help convey the importance of the TPZ to workers.

- **Make all necessary cuts to tree roots cleanly with sharp tools; never tear with a backhoe**. A clean cut encourages good wound closure and confines the spread of decay.

- Any necessary pruning **must** be performed by a qualified arborist that is on Seattle's registered tree service provider registry and shall conform to the techniques and standards specified in the current edition of ANSI A300.

- If required or requested, the project arborist shall supervise that the tree protection plan is being implemented.

3. Tree Inventory Table – Mercer Island

Tree ID	Parcel	Species	Type	DBH (Inches)	Average Dripline (diameter)	CRZ / Limits of Disturbance (radius)	Category	Overall Condition	Overall Risk Rating	Retained or Remove	Comments
59	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	27	30’	15’	Large	Good	Low	Retain	
Recommendation		Requires tree protection measures outlined in sections 8, 10, and 11.									
60	**3024059176**	Western Hemlock *Tsuga heterophylla*	Evergreen conifer	20	30’	15’	Large	Good	Low	Retain	
Recommendation		Requires tree protection measures outlined in sections 8, 10, and 11.									
61	**3024059176**	English Laurel *Prunus laurocerasus*	Evergreen	12	30’	15’	Large	Good	Low	Retain	
Recommendation		Requires tree protection measures outlined in sections 8, 10, and 11.									
62	**3024059176**	Bigleaf Maple *Aceer macrophyllum*	Deciduous	29	60’	30’	Large	Good	Moderate	Retain	~~Disturbance to occur 14’ – 6” from tree. Total area of dripline disturbance = 14.25%.~~ Disturbance no longer proposed.
Recommendation		Requires tree protection measures outlined in sections 8, 10, and 11.									
63	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	31	30’	15’	Large	Good	Moderate	Retain	~~Disturbance to occur 7’ – 9” from tree. Total area of dripline disturbance = 13.9%.~~ Proposed disturbance significantly reduced.
Recommendation		Requires tree protection measures outlined in sections 8, 10, and 11.									

Tree ID	Parcel	Species	Type	DBH (Inches)	Average Dripline (diameter)	CRZ / Limits of Disturbance (radius)	Tree Credits	Overall Condition	Overall Risk Rating	Retained or Remove	Comments
64	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	22	30′	7′	Large	Good	Moderate	~~Retain~~ Remove	~~Disturbance to occur 8′ – 3″ from tree. Total area of dripline disturbance = 13.3%.~~
Recommendation		Remove tree to remediate risk to hillside trees.									
65	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	31	30′	8′	Large	Good	Low	~~Retain~~ Remove	~~Disturbance to occur 5′ – 7″ from tree. Total area of dripline disturbance = 15.6%.~~
Recommendation		Remove tree to remediate risk to hillside trees.									
66	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	39	18′	9′	**Exceptional**	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
67	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	13	30′	15′	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
68	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	38	30′	15′	**Exceptional**	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									

TREE FROG LLC
https://www.treefrogllc.com/
PO Box 307, Duvall, WA 98019
[**P**] 206-310-8254 [**E**] andycrossett@hotmail.com

Tree ID	Parcel	Species	Type	DBH (Inches)	Average Dripline (diameter)	CRZ / Limits of Disturbance (radius)	Tree Credits	Overall Condition	Overall Risk Rating	Retained or Remove	Comments
69	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	23	25’	13’	Large	Good	Low	Retain	Trunk bows to the south, minor defect.
Recommendation		Will not be impacted by construction activities.									
70	**3024059176**	Bigleaf Maple *Aceer macrophyllum*	Deciduous	31	60’	30’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
71	**3024059176**	Bigleaf Maple *Aceer macrophyllum*	Deciduous	22	60’	30’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
72	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	47	40’	20’	**Exceptional**	Good	Low	Retain	Codominant tree – 24”, 40”.
Recommendation		Will not be impacted by construction activities.									
73	**3024059176**	Bigleaf Maple *Aceer macrophyllum*	Deciduous	55	60’	30’	**Exceptional**	Good	Low	Retain	Multi-stemmed tree – 38”, 40”.
Recommendation		Will not be impacted by construction activities.									

Tree ID	Parcel	Species	Type	DBH (Inches)	Average Dripline (diameter)	CRZ / Limits of Disturbance (radius)	Tree Credits	Overall Condition	Overall Risk Rating	Retained or Remove	Comments
75	**3024059176**	Bigleaf Maple *Aceer macrophyllum*	Deciduous	18	40’	20’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
76	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	20	30’	15’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
77	**3024059176**	Bigleaf Maple *Aceer macrophyllum*	Deciduous	10	40’	20’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
78	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	14	20’	10’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
79	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	30	30’	15’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									

Tree ID	Parcel	Species	Type	DBH (Inches)	Average Dripline (diameter)	CRZ / Limits of Disturbance (radius)	Tree Credits	Overall Condition	Overall Risk Rating	Retained or Remove	Comments
80	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	22	30’	15’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
81	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	28	30’	15’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
82	**3024059176**	Bigleaf Maple *Aceer macrophyllum*	Deciduous	10	40’	20’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
83	**3024059176**	Douglas fir *Pseudotsuga menziesii*	Evergreen conifer	20	30’	15’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									
84	**3024059176**	Bigleaf Maple *Aceer macrophyllum*	Deciduous	16	40’	20’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									

Tree ID	Parcel	Species	Type	DBH (Inches)	Average Dripline (diameter)	CRZ / Limits of Disturbance (radius)	Tree Credits	Overall Condition	Overall Risk Rating	Retained or Remove	Comments
85	**3024059176**	Western Hemlock *Tsuga heterophylla*	Evergreen conifer	12	20’	10’	Large	Good	Low	Retain	
Recommendation		Will not be impacted by construction activities.									

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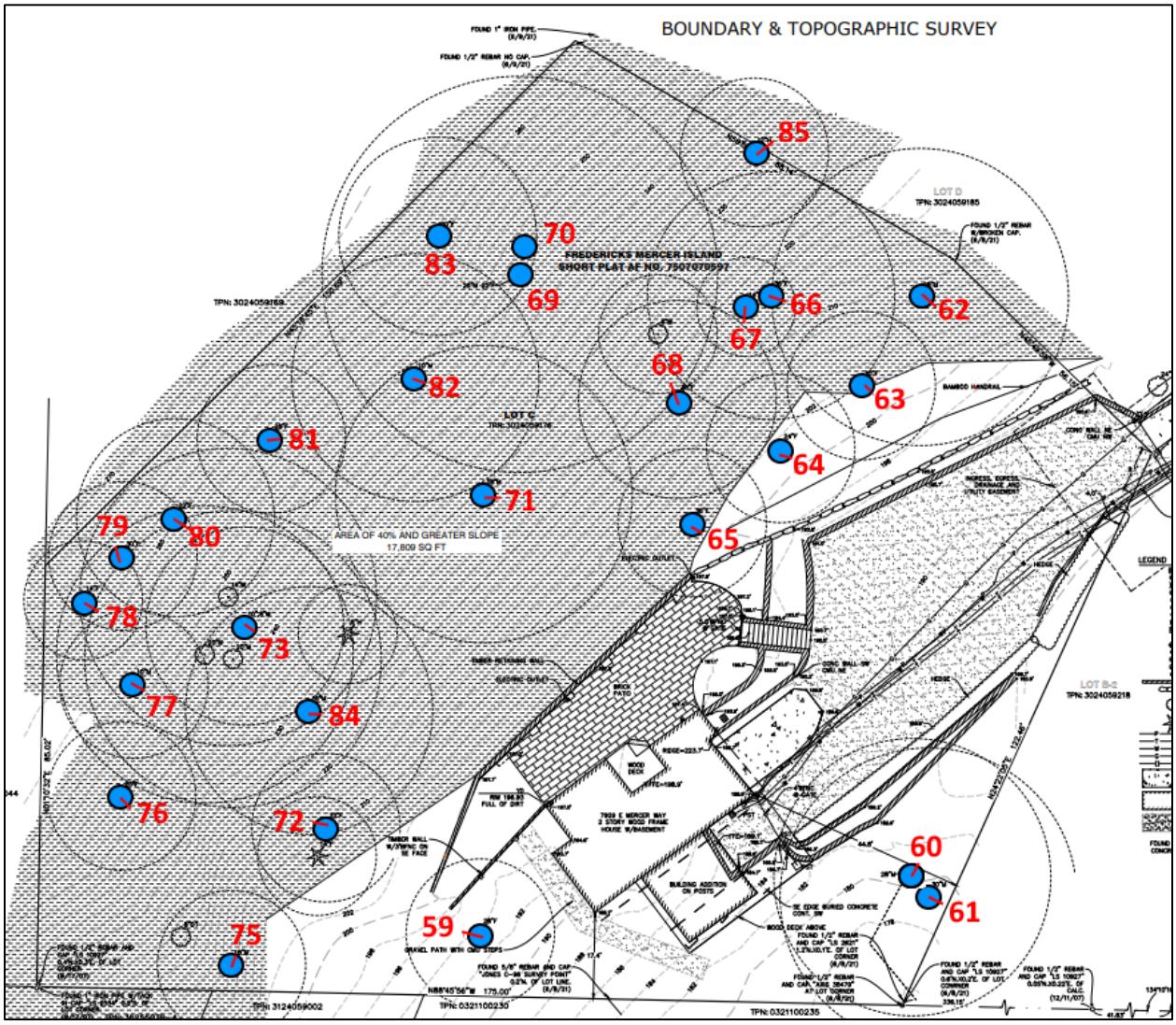
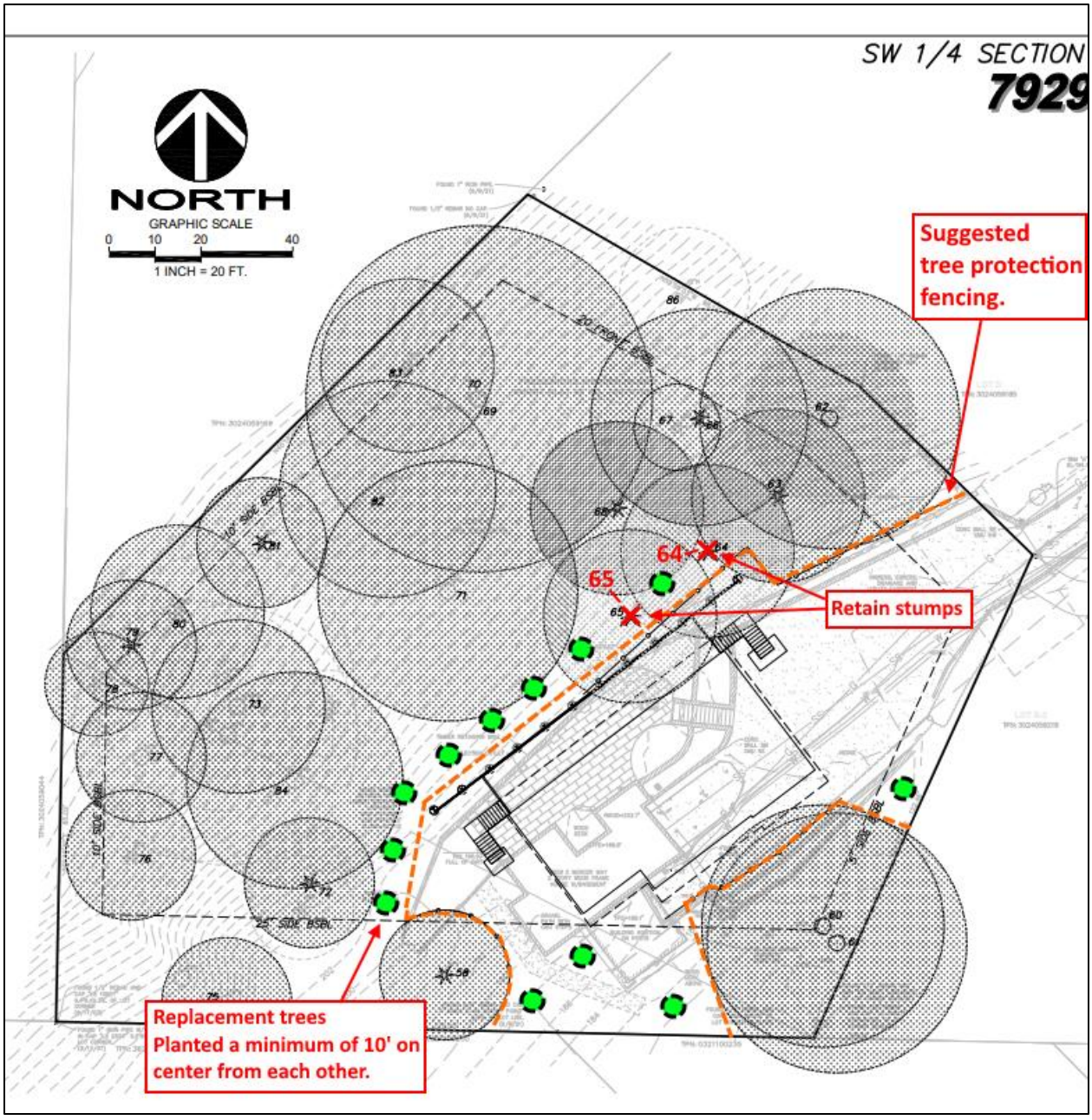
4. Site Map – Snipped from the provided survey.



5. Proposed Site Plan - Trees



6. Details of Risk Assessment

Level 2: Basic Assessment

A level 2 basic assessment is the standard assessment performed for tree risk. The assessment includes a detailed visual inspection of a tree and its surrounding site, and a synthesis of the information collected. The basic assessment involves walking completely around the tree – looking at the site, buttress roots, trunk, and branches. The tree is viewed from a distance, as well as close up, to consider crown shape and surroundings.

Methodology – When identifying potential hazard trees, I must consider a variety of factors that could contribute to failure. This can include the following: previous history of site failures, topography, site changes, prevailing wind direction and exposure, tree size and species, growth habit, overall vigor, the density and health of the foliage and crown, examination of root and root collar health, dead wood, hanging or broken branches, and evidence of disease-causing bacteria, fungi, or virus.

Tools Utilized: Binoculars, compass, hammer, diameter tape, clinometer, camera, soil probe.

Timeline – This assessment covers a five-year period and is based on conditions present at the time of the assessment.

7. Definitions:

DSH - Tree size is measured in Diameter at Standard Height (DSH) – standard forestry methodology for measuring tree size. Multi-stemmed trunk combined DSH determined by the square root of the sum of all squared trunk stems DSH.

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

Exceptional Trees are a tree or group of trees that because of unique historical, ecological, or aesthetic value constitutes an important community resource. An exceptional tree is a tree that is rare or exceptional by virtue of its size, species, condition, cultural/historical importance, age, and/or contribution as part of a tree grove. Trees with a diameter of more than 36 inches, or with a diameter that is equal to or greater than the diameter listed in the Exceptional Tree Table (see MICC 19.16.010) are considered exceptional trees.

Calculating DBH of Multi-Stemmed Trees – Multi-stemmed trunk combined DBH determined by the square root of the sum of all squared trunk stems DBH.

Driplines – Most trees in groves do not have symmetrical driplines. Therefore, drip line radius was measured in the quadrant assumed to be most affected by future disturbance or where most significant.

Limits of Disturbance – Limits of disturbance shall relate to either Critical Root Zone (CRZ) or Dripline Radius, due to exceedingly wide drip line radii on some trees being out of proportion to actual tree size. CRZ is measured at 1 foot of distance from center of trunk for every inch diameter at 4.5 feet above grade.

Risk – The combination of the likelihood of an event and the severity of the potential consequences. In the context of trees, risk is the likelihood of a conflict or a tree failure occurring and affecting a target, and the severity of the associated consequences – personal injury, property damage, or disruption of activities.

How people perceive risk and their need for personal safety is inherently subjective; therefore, risk tolerance and action thresholds vary. What is within the tolerance of one person may be unacceptable to another. It is impossible to maintain trees completely free of risk—**some level of risk must be accepted to experience the benefits that trees provide**.

Explanation of Tree Conditions as Defined by the ISA.

Poor – A tree described with a poor condition would have a combination of the following features: low vigor, sparse crown density, and few interior branches. The crown could be unbalanced or contain many dead twigs/branches. It may also have been topped, tipped, or mal pruned. The trunk could have cracks, cavities, conks/mushrooms, and evidence of decay within the tree.

Fair – A fair description would describe a tree with normal vigor and crown density. The tree may possess one or possibly two of the above listed qualities but overall is in decent health. Improvements of site conditions could improve the trees health.

Good – Trees listed in good condition will have high vigor with a thick crown density. It would have few, if any defects, and would be a good example of that specific tree.

Explanation of Risk Ratings as Defined by the ISA.

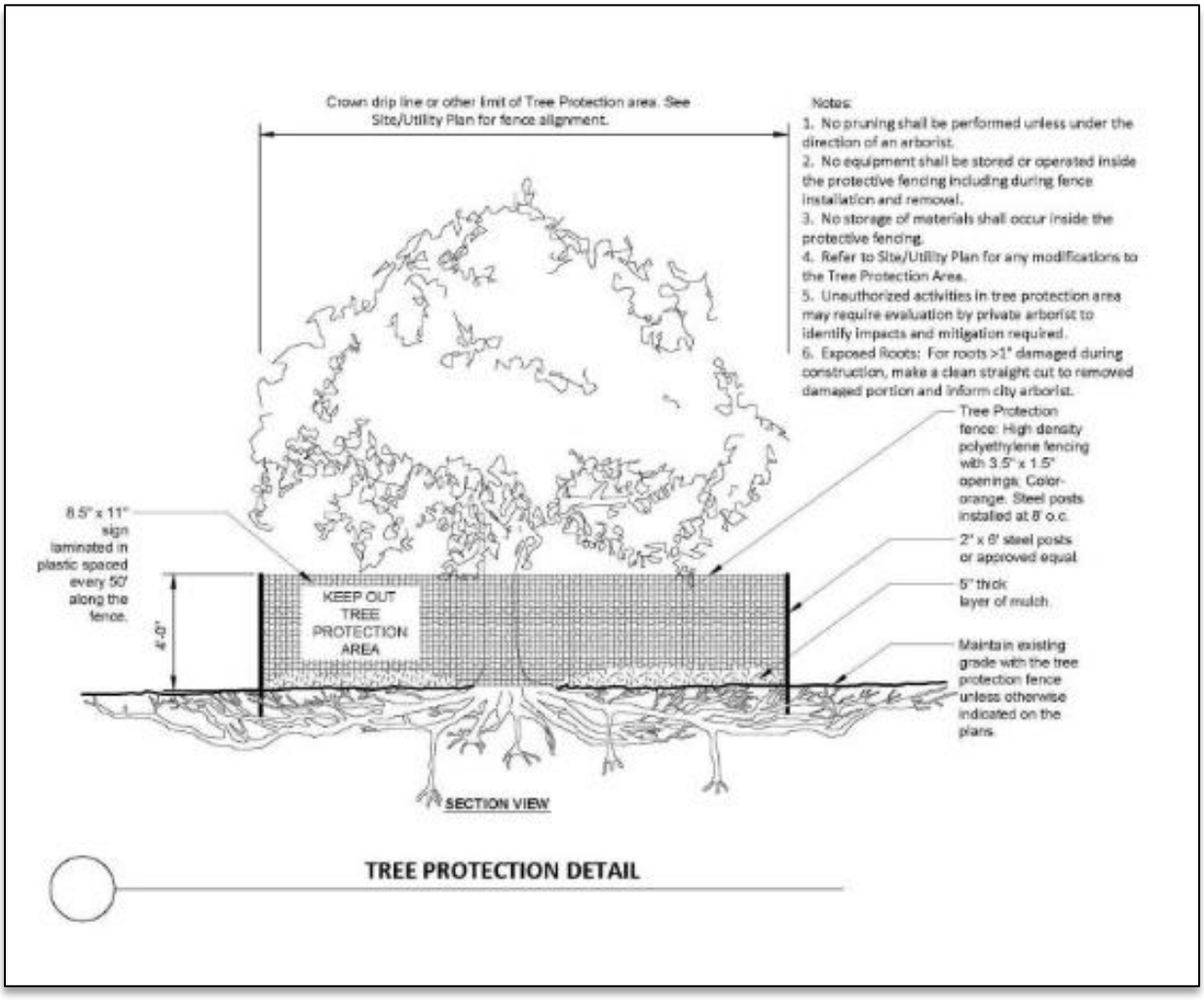
Low – The low-risk category applies when consequences are *negligible,* and likelihood is *unlikely*; or consequences are *minor,* and likelihood is *somewhat likely*.

Moderate – Moderate-risk situations are those for which consequences are *minor* and likelihood is *very likely* or *likely*; or likelihood is *somewhat likely,* and consequences are *significant* or *severe*.

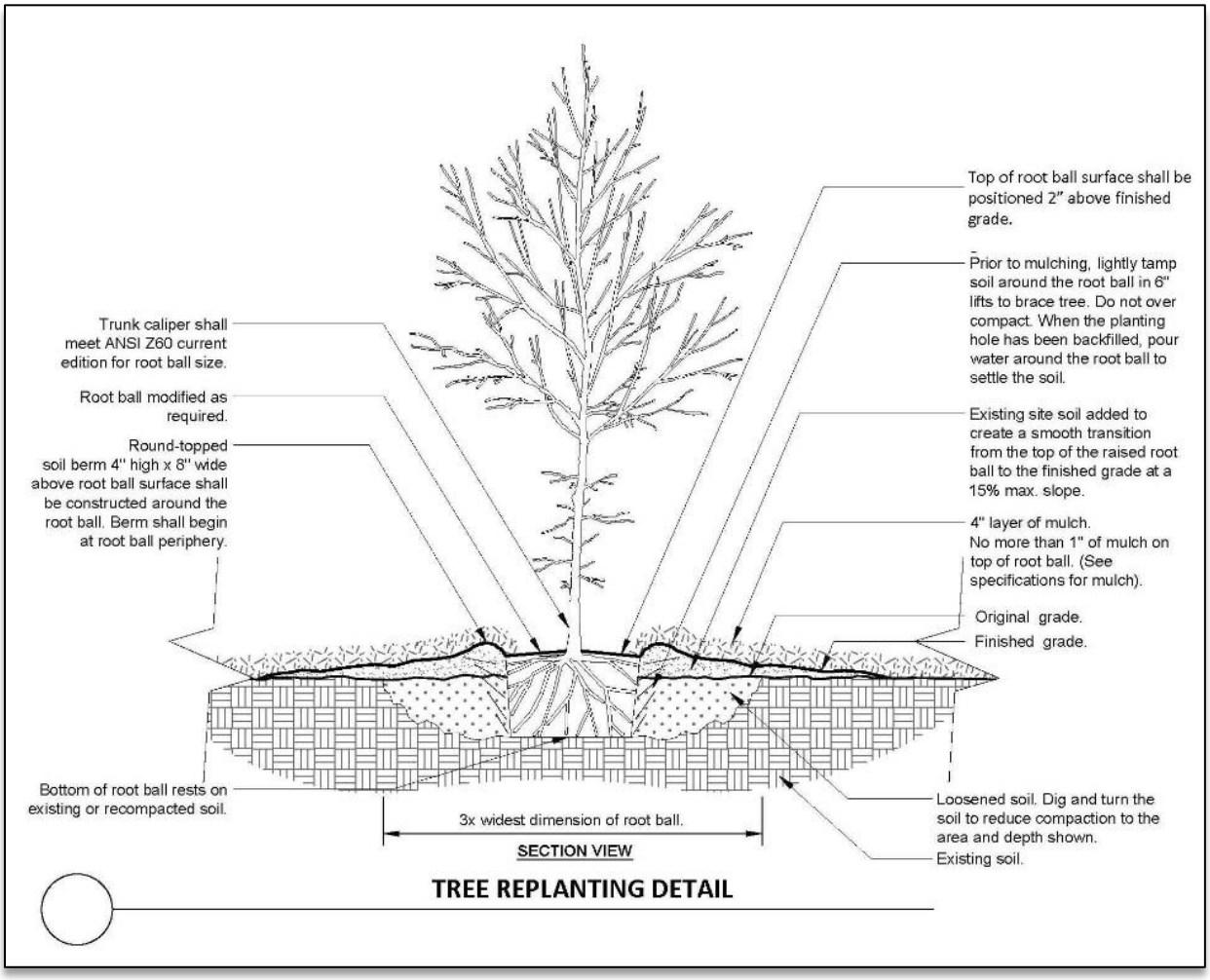
High – High-risk situations are those for which consequences are *significant* and likelihood is *very likely* or *likely*, or consequences are *severe,* and likelihood is *likely*.

Extreme – The extreme-risk category applies in situations in which failure is *imminent*, there is a *high* likelihood of impacting the target, and the consequences of the failure are *severe*.

8. ISA Recommended Tree Protection Fencing Detail



9. Mercer Island Tree Planting Detail



10. Mercer Island Tree Protection

19.10.080 - Tree protection standards.

A. To ensure long-term viability of trees identified for protection, permit plans and construction activities shall comply with the then-existing best management practices (BMP) — managing trees during construction, published by the International Society of Arboriculture, adopted by reference. The tree protection plan shall be prepared by a qualified arborist and the plan shall be reviewed for adequacy by the city arborist. All minimum required tree protection measures shall be shown on the development plan set and tree replanting/restoration/protection plan.

B. *Alternative methods.* The city arborist may approve construction-related activity or work within the tree protection barriers if the city arborist concludes:

1. That such activity or work will not threaten the long-term health of the retained tree(s); and
2. That such activity or work complies with the protective methods and best building practices established by the International Society of Arboriculture.

(Ord. 17C-15 § 1 (Att. A))

11. PNW ISA Recommended Tree Protection Information

The Pacific Northwest Chapter of the ISA Recommends the following for protecting trees from damage during construction.**https://pnwisa.org/page/protecting-trees-from-damage**

PROTECTING TREES FROM DAMAGE

Tree hazards are more easily prevented than repaired. Your efforts at prevention will be much less expensive and more successful than attempting to cure a damaged tree that is on its way to becoming a hazard.

CHOOSE WHICH TREES TO PROTECT

For fruitful damage prevention, you need to correctly identify which trees are worth saving. Many well-intentioned protection efforts fail because large old trees nearing the end of their lifespans were protected and younger trees weren't. Take time to look critically at your trees and decide what you want them to look like in 10-20 years. Some of your trees may be better off being removed; others may potentially become useful wildlife habitats. An ISA Certified Arborist can help you decide.

Trees don't exist independently of their environment. Trees in a group, known as a stand, grove, or patch, should be evaluated together as well as individually.

EVALUATING FOREST REMNANT STANDS

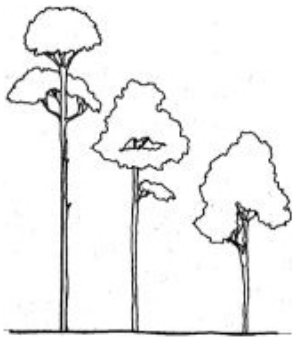
Stands, groves, or patches of native Pacific Northwest trees, such as Oregon white oak, Western red cedar, red alder, bigleaf maple, and Douglas fir, are often found in urban or urbanizing areas. These are remnants of the larger forests that previously covered the area. They may range from less than a quarter acre to several acres in size. Conservation of existing groves of native trees often provides greater economic and environmental benefit than preserving individual trees in the developing landscape. However, you should still evaluate the quality of the forest stand to determine if it is worth preserving.

EXCELLENT STAND PROTECTION ZONE

- Trees structurally support one another.
- Soil remains undisturbed.
- Wildlife uses are relatively unimpaired.
- Shady microclimate encourages natural woodland plants.
- Natural forest succession continues, and forest regeneration is ongoing.
- The stand is visually attractive.
- Ecological functions are relatively unimpaired.

Image: A stand to protect. Reproduced with permission by the City of Chattanooga.

POOR STAND PROTECTION ZONE



Scattered trees with a highly disturbed or missing understory may not be worth saving. A poor stand protection zone has the following characteristics:

- Trees blow over easily due to lack of support.
- Soil dries out and soil erosion occurs due to disturbed soils and lack of understory.
- Forest microclimate is disturbed.
- Sunlight and temperature are increased.
- Weeds and invasive species have taken over.
- Forest succession is interrupted, and little regeneration occurs.
- The stand is visually unattractive.
- Ecological functions are severely interrupted.

Image: A stand that may not be worth saving. Reproduced with permission by the City of Chattanooga.

PROTECTING FOREST STANDS

The best way to preserve a forest stand is to leave it alone. Fence the entire stand, grove, or patch to protect understory vegetation and soil as well as trees. Healthy soils require little if any fertilization, pesticides, or irrigation to support tree health.

When evaluating the members of a stand individually to see if they should be kept, consider whether or not the tree is on the edge of the group. These trees provide support and protection to the interior of the stand. If the tree in question is large and providing wind cover, do not remove it. Avoid removing vigorous, healthy trees and vegetation from the stand, and do not retain isolated single, tall, spindly trees; such trees are more likely to become structurally unstable, bend or blow over in storms, or become diseased and infested with insects.

PROTECTING INDIVIDUAL TREES

Tree protection involves activities designed to preserve and protect tree health by avoiding damage to a tree's roots, trunk, or crown. The best way to do this is protect not only the tree itself but also the ground covering its most important roots, known as the critical root zone.

CRITICAL ROOT ZONE PROTECTION

A critical step in retaining healthy trees is the protection of tree roots from disturbance. Each tree has a critical root zone (CRZ) that varies by species and site conditions. The International Society of Arboriculture defines CRZ as an area equal to a 1-foot radius from the base of the tree's trunk for each 1 inch of the tree's diameter at 4.5 feet above grade (referred to as diameter at breast height).

CRITICAL ROOT ZONE PROTECTION

A critical step in retaining healthy trees is the protection of tree roots from disturbance. Each tree has a critical root zone (CRZ) that varies by species and site conditions. The International Society of Arboriculture defines CRZ as an area equal to a 1-foot radius from the base of the tree's trunk for each 1 inch of the tree's diameter at 4.5 feet above grade (referred to as diameter at breast height).

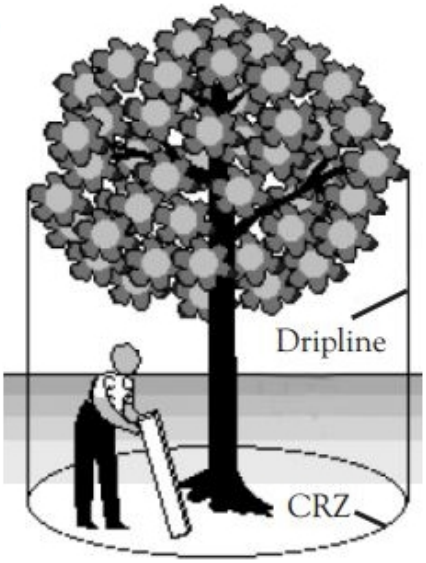
CRITICAL ROOT ZONE RADIUS DISTANCES CALCULATED BY TREE DIAMETER AT BREAST HEIGHT

Tree diameter	Critical root zone radius	Total protection zone diameter, including trunk
2 inches	2 feet	4+ feet
6 inches	6 feet	13.5 feet
20 inches	20 feet	42 feet
46 inches	46 feet	96 feet

Another common rule of thumb is to use a tree's drip line to estimate the CRZ (see figure). Evaluate both of these and choose whichever provides the larger CRZ.

Under certain circumstances, disturbing or cutting roots in a CRZ may be unavoidable. In such cases, the work should be done only under the on-site supervision of an ISA Certified Arborist.

Cutting or disturbing a large percentage of a tree's roots increases the likelihood of the tree's failure or death. Never cut tree roots that are more than four inches wide; roots that large are usually structural. Cutting them can destroy the stability of the tree, causing it to fall over!



If you must cut tree roots, do so cleanly with sharp tools. Never tear with a backhoe or other dull instrument. A clean cut encourages good wound closure and confines the spread of decay. If damage is severe, consider removing the tree because its stability may have been compromised.

Image: Using drip line to estimate critical root zone (CRZ). Reproduced with permission by the City of Chattanooga.

ACTIVITIES TO AVOID IN THE CRITICAL ROOT ZONE

The CRZ that should be protected from negative interactions. Avoid the following activities:

- Stockpiling construction materials or demolition debris
- Parking vehicles or equipment
- Piling soil and/or mulch
- Trenching for utilities installation or repair, or for irrigation system installation
- Changing soil grade by cutting or filling
- Damaging roots by grading, tearing, or grubbing
- Compacting soil with equipment, vehicles, material storage, and/or foot traffic
- Contaminating soil from washing out equipment (especially concrete) and vehicle maintenance
- Installing impervious parking lots, driveways, and walkways
- Attaching anything to trees using nails, screws, or spikes
- Wounding or breaking tree trunks or branches through contact with vehicles and heavy equipment
- Wounding trunks with string weed trimmers and lawn mowers
- Causing injury by fire or excessive heat

Some tree species are more tolerant of damage and disturbance in the CRZ than others. A tree's tolerance depends not only upon the species but also upon conditions present prior to and at the time of the damage. Tree health, age of the tree, soil aeration and moisture, the time of year the damage occurs, its severity, and the weather conditions prior to, during, and after the damage all contribute to the tree's response. An ISA Certified Arborist can analyze these variables and make specific recommendations to retain or recover a tree's health and safety during and after the construction process.

PROTECTING TREES FROM CONSTRUCTION

Tree protection during construction may be passive or active. Passive tree protection, most commonly used during the planning or post-development stages, simply means avoiding any disturbance or harmful activity near the tree. Active tree protection, by contrast, involves physical protective barriers and is generally required during any site disturbance that may impact your trees, such as grading, building or surface construction and maintenance, infrastructure and utility installation and maintenance, lawn renovation, and other landscape changes that may affect the structural integrity and stability of your trees.

While these practices are presented here as voluntary guidelines, some local jurisdictions have tree protection regulations that must be followed. Contact your local planning department for specific regulations for your area.

BEFORE CONSTRUCTION

The goal of tree protection is to help trees remain as healthy after you work around them as they were before you began. Plan and budget for tree conservation and protection as part of the development process, before construction begins. Optimally, tree protection should begin at least one growing season prior to the beginning of construction activities.

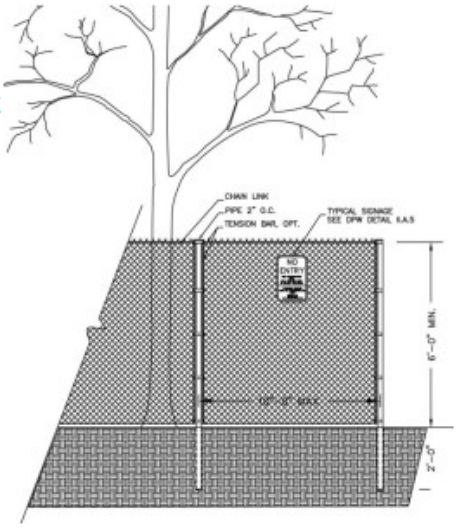
Start by making an inventory of the trees you will be working around. Include not just your trees but also your neighbor's trees, if working close to the edge of your property. Evaluate soil health and past site damage; you will need to incorporate that information into tree protection measures. If you are just working around one or two trees, you can do that by making a simple map listing the size, species, and health of each tree. If you have a lot of trees that need to be protected, it may make sense to hire an ISA Certified Arborist to develop the plan for you.

Take your tree information and overlay it with your construction plans to determine how much the planned activity will impact the tree. If the planned construction will have such an impact on the tree that it won't survive, either make the decision to remove the tree or change the construction project to avoid the tree. Consider the tree's location, species, quality, health, and benefits such as energy savings by shade or wind protection in order to make your decision. Remove trees that:

- Are within ten feet of the proposed building or structure
- Cannot be adequately protected
- Have less than a quarter of their total height composed of tree crown (tall and spindly)
- Have trunks that are more than a third wounded

Once you have identified which trees are in the path of your planned construction activities, put that information down on paper and communicate it to anyone you hire to work on the project. Reinforce your tree protection intentions by writing tree damage and noncompliance with tree protection clauses into any service contract. This should provide financial penalties to any contractor who damages your trees. If your property is large, engage maintenance staff in early decision-making and education about care of retained trees.

Install strong fencing around the CRZ and require the fence to remain in place for the life of the development project. This barrier can be a chain link or other type of fencing. Fencing protects both the root system and the trunk from being damaged.



Clearly identify the perimeter of the protection zone with highly visible signs.

Protect high-value trees with stem, branch, and root padding or wraps in addition to CRZ barriers.

To minimize soil compression across the property, establish one access route into the site and one exit route out of the site.

Complete preconstruction tree maintenance, including mulch, fertilization, supplemental irrigation as necessary, and pruning to remove dead, structurally weak, and low-hanging branches.

Image: Fencing for tree protection. Reproduced with permission by the City of Arlington, Virginia.

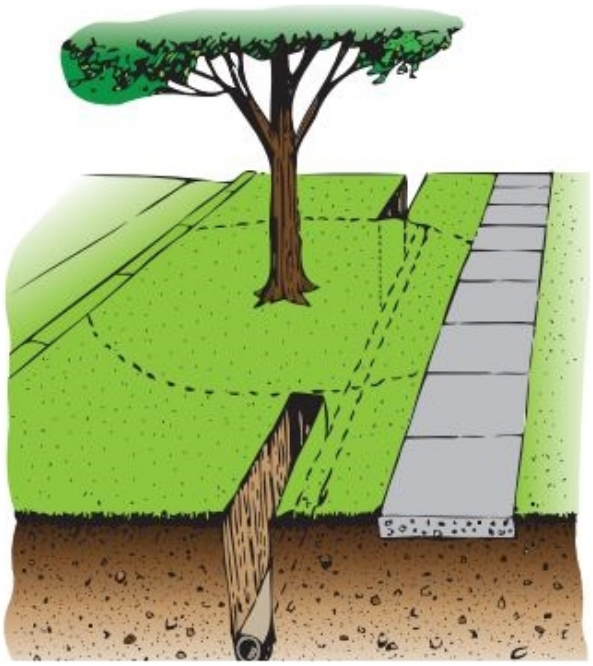
DURING CONSTRUCTION

Monitor compliance with tree protection requirements and the impacts of construction activities on tree health regularly during construction. If there are incursions into the root zone, ensure roots have been severed cleanly, enforce penalties, and reestablish the protection zone. Confer with your contractors to make sure that construction offices, vehicular parking, worker break sites, concrete washout areas or other pollutants, and material storage will remain outside of protected areas. Diligence in maintaining barriers and in enforcing your protection plan will pay great dividends at the end of the project when the tree is still healthy.

Following the guidelines laid out above will serve in most situations, but occasionally construction plans will require impingement on the CRZ.

TRENCHING

Trenching is a standard way to install utilities. **It is best to entirely avoid trenching through the CRZ** (see figure); such practice could severely destabilize a tree, as well as adversely affect its health through loss of roots. Workers performing such operations should understand that 85% of the mass of a tree's root system is located within the CRZ and that most of a tree's roots are within the top 18 inches of soil. Alter routes of underground infrastructure or use alternate methods such as pipe boring. Tunneling at least 18 inches beneath the root zone will prevent loss of critical root mass if underground utilities must unavoidably be placed within the CRZ.



A decision must be made as to where best to locate utility trenches. Planners and designers must be made aware that trenches may not cross a CRZ and design alternate alignments accordingly; such realignments are not the responsibility of the construction crew.

Best practices for trenching include the following:

- Protect the trunks of high-value trees from scraping and gouging to a height of at least eight feet.
- Keep equipment and excavated backfill on the side furthest from the tree, not against the trunk.
- Place excavated backfill on a plastic or canvas tarp outside the CRZ.
- Prune away jagged roots back to the trench wall closest to the tree. Use a handheld pruner or pruning saw to make sharp, clean cuts.
- Replace the backfill on the same day if at all possible. Cover exposed roots with wet burlap to prevent them from drying out; in hot dry conditions, small roots may be injured in as little as 30 minutes.
- Do not allow chemicals, trash, or other foreign debris to become mixed with the backfill.
- If earthwork specifications allow it, firm the backfill to the same compaction as the surrounding soil and no more.
- Water the backfill to prevent excessive root drying.

Image: Proposed trench through a critical root zone. Reproduced with permission by the City of Chattanooga.

GRADE OR GROUND LEVEL CHANGES

Grade changes should be avoided in order to prevent serious damage or death to a tree. Fill that is added over existing soils can smother and kill roots, or invite disease if piled around the trunk. Even temporary fills such as stockpiling mulch or soil in the CRZ of a tree for as little as several days during the construction process can have severe, long-term negative effects, though symptoms may not appear for several years.

The extent of injury from adding soil around a tree varies with the kind, age, and condition of the tree; the depth and type of fill; drainage; and several other factors. Maple, oak and evergreens are most susceptible, while elm, ash, willow, sycamore, and locust are least affected.

Little can be done to save trees that have been suffering from soil added over an extended period of time. It is prudent to consider possible damage that may occur to a tree and take alternative action before the fill is made; prevention is less expensive and more effective than attempting to correct the situation after damage has been done.

Best practices for fill operations include the following:

- Never place any fill or organic materials directly against the tree.
- Never compact the soil within the CRZ.
- If using no more than two to four inches of fill around existing trees, significant damage may be avoided if the fill has a coarser texture than the existing soil.

Less damage to a tree's roots is likely with a lowered grade than when it is raised, unless exposing or removing a great deal of the root mass. A general rule-of-thumb used by landscape architects is to remove no more than six inches of soil from the existing grade in the CRZ; however, this is dependent on the soils in which the tree is growing. A tree's roots may all exist in the top foot of a shallow soil; removing the top six inches would have tremendous negative impact in that case.

Best practices for removing soil include the following:

- Consider removal and replacement if the tree is young, in poor condition, an undesirable species, or very susceptible to insects and disease.
- Plan grade changes well in advance of construction using the appropriate method to prevent injury to desirable trees.
- Use retaining walls or terraces to avoid excessive soil loss in the area of greatest root growth.
- Spread mulch over the exposed root area when possible to help prevent soil erosion, reduce moisture loss, and keep soil temperatures lower.
- Provide supplementary water when rainfall is less than one inch per week.
- Prune roots to prepare the tree for root loss due to grade lowering. Root pruning is best left to an ISA Certified Arborist, who can take into account the variables necessary to reduce the stress of the pruning to the tree.

12. Certificate of Performance

I, Andy Crossett, certify that:

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

I further certify that I am a member in good standing of the International Society of Arboriculture (ISA) and an ISA Certified Arborist (#PN-7375A) and Tree Risk Assessment Qualified. I also am a Certified Professional Horticulturist through the Washington State Nursery and Landscape Association.

If you have any questions about this report, please contact me at 206-310-8254 or andycrossett@hotmail.com.

Andy Crossett

Literature References:

Dirr, Michael A. *Manual of Woody Landscape Plants Their Identification, Ornamental Characteristics, Culture, Propagation, and Use.* Stripes Publishing L.L.C., 2009

Smiley, E. Thomas, Nelda Matheny, and Sharon Lilly. *Tree Risk Assessment (Best Management Practices, Second Edition)*. Champaign: International Society of Arboriculture, 2017.

Dunster, Julian A., E. Thomas Smiley, Nelda Matheny, and Sharon Lilly. *Tree Risk Assessment Manual*. Champaign, Illinois: International Society of Arboriculture, 2013.

Shigo, Alex L. *A New Tree Biology: Facts, Photos, and Philosophies on Trees and Their Problems and Proper Care*. Shigo and Trees, Associates, 1986.

Nelda Matheny and James R. Clark. *Trees and Development: A Technical Guide to Preservation of Tress During Land Development*. International Society of Arboriculture, 1998.

Edward F. Gilman. *An Illustrated Guide to Pruning, Third Edition*. Cengage Learning; 3rd edition (August 8, 2011)

Referenced Municipal Code:

Tree Permits on Private Property
https://www.mercerisland.gov/cpd/page/tree-permits-private-property

Tree Protection During Construction
https://www.mercerisland.gov/cpd/page/tree-protection-during-construction

Chapter 19.10 – TREES
https://library.municode.com/wa/mercer_island/codes/city_code?nodeId=CICOOR_TIT19UNLADECO_CH19.10TR

13. Credentials & Experience

History

I first began working in the horticulture industry in 2002 at a landscaping company located locally in Bellevue, WA. After working in the field for a few years, as a laborer and a supervisor, I decided to pursue a formal education at Lake Washington Institute of Technology. I graduated in 2011 with a degree in Environmental Horticulture and immediately took the ISA and CPH exams to become a Certified Arborist and a Certified Horticulturist, respectively. I moved onto to work as a member of the Street Tree and Irrigation Department for the City of Bellevue. Tree Frog LLC started in 2013, when I began consulting part time in addition to working as head gardener at a seven-acre estate in Medina, WA. Tree Frog LLC has grown, and I have been consulting full time since 2017.

In my spare time, I enjoy spending time with my family and the animals on my small hobby farm.

Education

Lake Washington Institute of Technology – Associates Degree, Environmental Horticulture

My education from Lake Washington Institute of Technology's horticulture program focused on the following areas of study: botany, plant propagation, greenhouse management, soils, pruning, pest and disease management, landscape design, turf grass management, and plant identification.

Credentials

Certified Professional Horticulturist through the Washington State Nursery & Landscape Association #2537

In 1978, WSNLA created a two-pronged professional certification program that was known as the Washington Certified Nurseryman or Washington Certified Landscaper. In 2005, WSNLA revamped and upgraded the certification program and renamed the designation as Certified Horticultural Professional. With nearly 400 Certified Professional Horticulturists, the CPH program is the largest community of state certifications serving professional horticulturists in Washington State.

To earn a WSNLA Certified Professional Horticulturist credential, you must pass a written exam that tests your skills and knowledge as a horticultural professional based on study materials and practical applications.
You must provide the equivalent of one year of work experience (2000 hours) with a licensed nursery, landscape contractor or WSNLA-approved business or institution.

Certified Arborist and Qualified Tree Risk Assessor, through the International Society of Arboriculture #PN-7375A.

To earn an ISA Certified Arborist® credential, you must be trained and knowledgeable in all aspects of arboriculture. ISA Certified Arborist® have met all requirements to be eligible for the exam, which includes three or more years of full-time, eligible, practical work experience in arboriculture and/or a degree in the field of arboriculture, horticulture, landscape architecture, or forestry from a regionally accredited educational institute. This certification covers a large number of topics giving the candidates flexibility in the arboricultural profession. A code of ethics for ISA Certified Arborists® strengthens the credibility and reliability of the work force. This certification is accredited by the American National Standards Institute, meeting, and exceeding ISO 17024.

Continued Education

Trees and the Law **|** Report Writing for Arborists **|** Defensible Tree Appraisal **|** Developing Field Assessment Skills for Common PNW Tree Diseases **|** Climbing Safety Case Studies **|** WSNLA PROseries seminar Pest & Disease **|** Tree Disorder Diagnosis Online Workshop & Live Discussion **|** Why Trees Fail Online Workshop & Live Discussion **|** Arbor Chat: A Deep Dive Into the ISA Certified Arborist® Code of Ethics **|** Diagnosis & Disorder: General Diagnosis **|** Tree Biology: Anatomy **|** Arbor Chat - Coronet cuts: The simulation of natural fractures **|** Tree root physiology and urban soils – can't we just all get along? **|** Arboricultural Zombies - Myths That Will Not Die **|** Forged in Fire: Arborist Options Before & After the Fire **|** Forest Health Watch – working together to monitor, study and understand tree health issues in Pacific Northwest **|** Tree insect pest diagnosis and management **|** Homeowner knowledge and perceptions of tree care and preservation on residential properties **|** Managing the Trees Where People Live for Resiliency **|** Regenerative Pruning: Research on Overextended Trees, Practice on Hollow Trees **|** Machine Generated Report Writing **|** Tools We Use **|** Putting the MD Back in Tree Doctor **|** Building a Resilient Arboriculture and Urban Forestry Program in Rural Municipalities **|** Ethical Tree Care in the Urban Interface **|** What's pesky in the PNW… And what could be on its way? **|** Coping with heat: Community urban forest perspectives and experiences in Vancouver, Canada **|** Advancing Urban Forestry in the Pacific Northwest **|** Root Pruning **|** The Influence of Abiotic Factors on Street Tree Condition and Mortality in a Commercial-Retail Streetscape **|** Arborists and Wildlife: Retaining Trees for Wildlife Habitat **|** Tree Inventories **|** Biology and Identification of Fungi **|** Wood Decay Fungi Identification and Management **|** Container Type Affects Root Development **|** Tree Lightning Protection Systems **|** Advanced Tree Identification **|** Wood Chips and Compost Improve Soil Quality and Increase Growth of Acer rubrum and Betula nigra in Compacted Urban Soil **|** A Review of Spatial Variation of Allergenic Tree Pollen **|** The Cost of Not Maintaining the Urban Forest **|** Impacts of Wire Basket Retention and Removal **|** Effects of Root Severance by Excavation on Two Urban Tree Species

Volunteering

Dog Mountain Farm, CSA

Dog Mountain Farm serves the Snoqualmie Valley community and Seattle area by providing Certified Naturally Grown farm-fresh vegetables, fruit, eggs, herbs, and flowers. They also offer educational tours for schools and groups.

14. Assumptions & Limiting Conditions

a) A field examination of the site was made on **6/3/2021**. My observations and conclusions are as of that date.

b) Care has been taken to obtain all information from reliable sources. All data has been verified insofar as possible; however, the consultant/arborist can neither guarantee nor be responsible for accuracy of information provided by others.

c) Unless stated otherwise: 1) information contained in this report covers only those trees that were examined and reflects the conditions of those trees at the time of inspection; and 2) the inspection is limited to visual examination of the subject trees without dissection, excavation, probing, or coring. There is no warranty or guarantee, expressed or implied that problems or deficiencies of the subject tree may not arise in the future.

d) All trees possess the risk of failure. Trees can fail at any time, with or without obvious defects, and with or without applied stress. A complete evaluation of the potential for this (a) tree to fail requires excavation and examination of the base of the subject tree. Permission of the current property owner must be obtained before this work can be undertaken and the hazard evaluation completed.

e) Other trees with similar defects are standing in the neighborhood and have been so for some time. Trees are living biological organisms, and I cannot predict nor guarantee their stability or failure.

f) Sketches, drawings, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural report of surveys unless expressed otherwise. The reproduction of any information generated by architects, engineers, or other consultants on any sketches, drawings, or photographs is for the express purpose of coordination and ease of reference only. Inclusion of said information on any drawings or other documents does not constitute a representation by Tree Frog LLC as to the sufficiency or accuracy of said information.

g) The consultant/appraiser shall not be required to give testimony or attend court because of this report unless subsequent contractual arrangements are made.

h) Loss or alteration of any part of this report invalidates the entire report.

i) Unless required by law otherwise, possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the person to whom it is addressed, without the prior expressed written or verbal consent of the consultant/appraiser.