



Tree Maintenance Plan

Sunland North

For:

Sunland North, Division 17
Sequim, WA

Submitted by:

Peninsula Urban Forestry, LLC



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1 EXECUTIVE SUMMARY

The Sunland North Community is a 15-20-year-old, planned single-family development within the greater Sunland Community area. Tree care and general landscaping are important to the members of the community. As such, the community has requested an in-depth characterization and maintenance plan for their community trees. The intent of this guide is to provide Sunland North neighbors, the Board of Directors, maintenance staff and contractors with knowledge, tools and confidence to successfully maintain trees.

Community trees are a vital part of a neighborhood. Shared trees, street trees and other green resources are all pieces of our functioning urban ecosystem. Trees improve air quality by absorbing pollutants and by releasing oxygen. They intercept harmful airborne particles, muffle urban noise and buffer seasonal winds. Their shade and transpiration cool the surrounding air and reduce heating and cooling costs of buildings and moderate the climate for humans. In addition to environmental benefits, trees benefit us mentally and socially. Humans are intimately connected with trees both in natural areas and within our communities. All these tree benefits and more grow exponentially with age. Proper tree planning and maintenance from the beginning will offer greater rewards for generations to come.

Peninsula Urban Forestry LLC crews inventoried the Sunland North Property in April of 2018. The crew counted 291 trees representing 19 different species across the community. An arborist and forester collected information on tree species, general tree height, general diameter, tree condition and what the trees purpose in the landscape was. The most abundant species were red flowering plum and Kwanzan cherry, both very common flowering horticultural cultivars. Within Sunland North are planned and installed small to medium sized non-native tree specimens, and also a few large, mature, native trees remnant of the old forests.

2 SUMMARY TABLES

General Tree Composition	Count	Percent of Total
Small evergreen	5	2%
Large evergreen	150	52%
Small deciduous	19	6%
Large deciduous	117	40%
Total	291	100%

Diameter at Standard Height Range (Inches)	Tree Count	Percent of Total
0-6	182	62%
7-12	76	26%
13-18	14	5%
19-24	14	5%
25+	5	2%
Total	291	100%

Diversity	Count
Family	6
Genus	18
Species	34

Recommended Maintenance	Count
Limb tip reduction	6
Canopy lifting	35
Reduce density	18
Restorative pruning	6
Remove fence posts	8
Structural pruning	58
Construction Monitoring	4
Pest treatment	8
Remove/Replace	34
None	138

3 INTRODUCTION

Michael Johnson representing the Sunland North Community ("Client") in Sequim Washington contacted Peninsula Urban Forestry LLC ("Consultant") to develop a community specific Tree Maintenance Plan. This guideline focuses on tree pruning, tree fertilization and general care of trees within Sunland North. Sunland North also wishes to include a list of trees currently planted within the landscape.

Our specific Scope of Services for this project:

- Develop community guidelines for tree pruning & maintenance within Sunland North.
- Guideline will be in a booklet format; easily accessible and usable to contractors and homeowners alike.
- Will include photos, diagrams and drawings to further educate on the national Best Management Practices for tree pruning and maintenance.
- Contents will include:
 - a. Types of pruning methods for different species/form of trees, i.e. pruning large trees, pruning small trees, hedging/pruning visual barriers, etc.,
 - b. Best times of year for pruning different trees,
 - c. Procedure for making proper, individual cuts, and
 - d. Best times to fertilize trees, and the appropriate fertilizers to use.
- Names and photographs of each tree within the Division 17 HOA.

Peninsula Urban Forestry, LLC consultants visited the property on April 4th, 2018. This report summarizes the data collected during our site reconnaissance and assessment, our conversations regarding the project, and our professional opinions and recommendations. The results and recommendations of this report represent our professional opinion compiled from on-site forensics, information provided to us, referenced material and our experience. Our recommendations are compiled with industry standards, best-available-science and currently accepted best management practices. This report is intended for the exclusive use of our Client and its agent and for specific application to the referenced property. Use this report to assist in future management decisions of subject plants and properties.

4 METHODS

The inventory process begins with identifying tree species. Without correct identification of species, other aspects of tree care are misunderstood. Our investigations include inspection for signs or symptoms of plant disease and pests. This includes fungal colonization, bacteria, moths, wood borers, aphids, and many other types of contamination. Within the landscape and environmental characteristics of the site, we evaluate degradation due to land use, nutrient deficiency, water resource issues, and other factors. Tree trunk diameter at four and a half feet above grade is determined, as well as the height of the tree.

We take note of the tree’s health, structure and form on a rating scale of excellent, good, fair, poor, very poor and dead. Later, these three values are averaged to give an assessment of tree condition. Which is also ranked as Excellent (6), Good (5), Fair (4), Poor (3), Very Poor (2) or Dead (1). When we discuss “pest” in our report, this pest could be insect, fungal or bacterial.

Below is a table of excellent and very poor qualifiers. It should be noted that no all the qualifying descriptions below are required for specific rating.

CONDITION COMPONENTS			
Category	Health	Structure	Form
<i>Excellent</i>	High vigor, nearly perfect health with little or no pest activity, defoliation, discoloration or twig/branch dieback.	Nearly ideal and free of defects. Failure is <i>improbable</i> .	Nearly ideal for the species, generally symmetric. Consistent with intended use.
<i>Fair</i>	Reduced vigor. Damage from insects or diseases can be significant and associated with defoliation but is not likely to be fatal. Foliage discoloration can be significant. Up to 50% twig dieback. May have some branch dieback.	A single significant defect or multiple moderate defects. Branch or trunk failure <i>possible</i> to <i>probable</i> . Defects would require multiple treatments over several years.	Major asymmetries/deviations from species norm and/or intended use. Impinging on infrastructure. Function and/or aesthetics are compromised.
<i>Very Poor</i>	Poor vigor. Low foliage density and poor foliage color are expressed. Potentially fatal pest. Significant twig and/or branch dieback.	Single or multiple severe defects. Branch, root or trunk failure <i>probable</i> to <i>imminent</i> .	Seriously detracts from aesthetics. Provides little or no function in the landscape. Significantly damaging infrastructure.

In addition to the trees condition, we also noted the landscape value and if relevant, the architectural function of the tree. Some of the architectural function of trees in Sunland North include acting as a short hedgerow, a visual barrier, a windblock, and an amenity tree. A short hedgerow is a short row of trees forming a hedge along the edge of a field. Trees form a visual barrier when they visually block sight between houses so neighboring dwellings are further separated by a tree barrier. Windblocks occur when a row of trees is planted perpendicular to the prevailing wind to reduce the wind speed around houses built in exposed locations. An amenity tree is a tree with recreational, functional, environmental, ecological, social, health, or aesthetic value rather than for agricultural and production purposes.

Lastly, we collected information on treatments for trees. Treatments for trees include pruning, removal, monitoring, fertilizer, or pest treatment. Below is a list of our recommended treatments. Treatment types are noted below.

Each tree has been stratified into Tree Management Units ("TMU"). These TMU's are simply for ease of tracking individual trees and are based off geographic location within the HOA. See attached map in Appendices for details of TMU's.

5 TREATMENTS

We surveyed numerous treatments applicable to different species. Rather than mapping out individual trees on a site plan, we describe treatments per tree groups. This is a simpler, and more time appropriate approach than taking GPS locations each tree individually and generating a map.

Treatment Type	Description
Limb tip reduction	Reduce length of branches by pruning to a lateral branch at least 1/3 the size of the parent branch. We recommend limb tip reduction on all trees which can impact pedestrian access or are currently <2 feet from a building. Branches 5 feet over a building are not a consideration. No more than 1/3 of a trees branches should be removed in this manner every three years.
Canopy lifting	Remove lower branches interfering with lawn mowers and transit. Prune lowest branches away fully. Cut close to the tree trunk but outside of the branch collar. We recommend canopy lifting all trees which can impact a riding lawn mower. No more than 1/3 of a trees branches should be removed in this manner every three years.
Reduce density	Remove branches that are redundant, unspaced, or where black soot or mold is growing. We recommend all spruce and all fir trees with black sooty mold (more information below) have branch densities reduced to treat the plant disease. No more than 1/3 of a trees branches should be removed in this manner every three years.
Restorative pruning	We recommend restorative pruning for all trees previously topped or inappropriately pruned. More information below.
Remove fence posts	Numerous trees have fence posts growing into their bark. These fence posts were installed as guys and bracing to hold up the trees after planting and should have been removed by the contractor years ago. We recommend the removal of all fence posts near trees.
Structural pruning	We recommend structural pruning applied to all of the street trees in Sundland North, except for the purple leaf plum as they are near the end of their lifespan. Structural pruning on the cherry street trees will increase their life and reduce chances of failure from wind, rain or ice.
Pest Treatment	See Issues & Recommendations below for pest treatment.
Remove/Replace	We recommend the removal and replacement of all purple leaf plums within 5 years. They are currently over their normal life span. See notes below in Issues & Recommendations.
Construction Monitoring	The large Douglas-firs nearby Sunland North’s new development should be monitored for construction damage. Please see “Construction Near Mature Trees” below.

6 HIRING PROFESSIONALS

In the North Olympic, there is no shortage of contractors to offer services like tree pruning, landscaping, hedging, removing trees and more. It can be confusing to know who is qualified, reliable and professional. Many homeowners choose to collect cost estimates from multiple contractors; however, price should not be the only deciding factor for whom to hire.

Arboriculture is a professional practice of the science and art of tree care. There are multiple organizations and certifications for arborists both nationally and internationally. Certified Arborists are specifically educated, trained, and tested on tree care science, plant physiology, tree biology, soil sciences, plant selection, and other important fields. Certified Arborists are required to retain professional classes keep up to date on best available science of tree care.

In the U.S., there are sets of Best Management Practices (“BMP”) and national standards developed for many tree related topics. The following organizations have all published BMPS and standards on tree pruning, tree fertilization, tree risk, site and soil selection, and disease control.

- American National Standards Institute
- Tree Care Association of America
- International Society of Arboriculture
- American Society of Consulting Arborists

Not all tree care contractors are Certified Arborists and similarly, not all Certified Arborists are tree care contractors. It’s important to understand what your tree objective is to understand who to employ.

Use the following table to determine which to choose for your project.

Certified Arborists

- Tree pruning
- Fertilization
- Identifying pests
- Treating for disease
- Tree installation
- Tree bracing and cabling
- Evaluating tree risk

Tree Care or Landscape Contractor

- Tree Removals
- Shrub and tree hedging
- Tree pruning when branches are <1”
- Lawn care
- Shrub installation

7 SUNLAND TREE ISSUES AND RECOMMENDATIONS

7.1 Monocultures

A monoculture is a large number of plants, in this case trees, of the same species, growing in a constrained area. Tree monocultures are how historical diseases like the Dutch elm disease and emerald ash borer decimated millions of city trees. Monocultures increase susceptibility to plant diseases and pests. The key to solving this problem is planting a diversity of trees and using the '10%-20%-30% Rule' (Santamour, 1990):

1. Plant no more than 10% of any species
2. Plant no more than 20% of any genus
3. Plant no more than 30% of any family.

Sunland North has specific issues with tree monocultures at the family level with Pinaceae (pine family) at 37% and Rosaceae (rose family) at 39%. Tree genus like Prunus (cherry and plum) is at 36% and within Prunus genus, at the species level the purple leaf plum has 12% and the Kwanzan flowering cherry has 21%).

- We recommend application of Peninsula Urban Forestry's applied Removal and Replacement and tree selection strategies to diversify and reduce homogeneity throughout the landscape.
- We recommend installation of more trees selected from the provided tree selection lists to diversity current landscape.

7.2 Homeowner tree topping and other pruning

We noted around a dozen trees within the landscape which had been pruned by homeowners or landscapers in ways inconsistent with pruning best management practices. In almost every scenario, the removal of the top of a tree or "topping" as it's now labeled, is entirely unadvised. Topping of trees increases safety concerns, reduces tree life, decreases benefits of trees, and most notably, topping looks unprofessional, untidy and reduces tree aesthetics. Tree topping is also historically known for reducing property values of homes nearby topped trees.

- We recommend the application of tree topping, tree disfigurement and tree mal-pruning be addressed in Sunland Covenants, Conditions and Restrictions.
- We recommend a training opportunity or class for residents of Sunland North who are interested in pruning trees.

7.3 Construction near mature trees

Soil, hydrology, environmental conditions and tree species all influence tree root spread and depth. Trees roots will always grow where the conditions are more favorable. The outer perimeter of branches, often referred to as the *dripline*, does not correspond to tree root width or location of roots whatsoever. This is a very common tree misunderstanding. A trees roots could extend up to ten times the extend of the dripline. To understand where roots exist requires experience and understanding of tree physiology.

In arboricultural best management practices and industry code, the Critical Root Zone ("CRZ") of a tree is determined by the tree trunk diameter, measured at 4.5 feet above grade ("DBH"). Generally, a tree's CRZ is equivalent to one foot of radius from the trunk for each inch of DBH. Protecting the CRZ from all soil disturbance and compaction will normally result in no adverse impact to the tree.

Incursion into the CRZ with any development activity, i.e. transit, storage, grading, filling, trenching, washing, burning, etc., should be restricted entirely. When full-restriction of the CRZ is incompatible with development plans, incursion into the CRZ should be limited to maximum of 30%. When further incursion is required, extensive Post Care Treatment efforts will be required to retain the tree.

Post Care Treatment includes such activities as; long periods of non-contact drip irrigation, hormonal root treatment to activate new growth, mulching, guy-wire stabilization. Multiple years of supplemental irrigation are normally required to retain large trees damaged by construction and development.

- We highly recommend annual monitoring of trees whose roots or soil have been impacted.
- We recommend any proposed development near a mature tree be evaluated and reviewed by Peninsula Urban Forestry arborists for tree preservation and retention potential, and for mitigation and post care treatment guidance.

7.4 Mowing over roots

In our survey, we noted numerous instances of tree roots damaged by lawn maintenance and mowing. Damage to trunks and roots by lawn equipment is the second most common fatality of landscape trees. The plants with this damage express worsened condition caused by vascular tissues and root tissues being disrupted. These trees now are more susceptible to pests and disease. Fungal organisms, both parasitic and saprobic, often find their way into trees by damaged and wounded roots.

Future damage can be avoided by very simple landscape management practices. A landscaper who cannot expressly manage the end of their string-line weed trimmer to reflect a tree trunk shouldn't be allowed to work in Sunland. A lawn mower who doesn't attempt to move around small trunks in the grass is equally as undesirable. Corrective practices are very simple to achieve and will extend trees life and their landscape and environmental equity greatly. Wood chip or bark mulch could be used to reduce the need for trimming grass directly up to a tree trunk.

- We recommend all landscapers and landscape installers in Sunland North sign a document affirming their understanding of tree root damages attributed to lawn mowing and string-lined weed whackers.
- We recommend enforcing a strict "no root damage" contract obligation to lawn caretakers.

7.5 Purple leaf plums and maladies

Purple leaf plums are short lived trees with many insect and disease issues. They are intolerant of the compacted soils commonly found in developments. Tree decline often begins when only 10-15 years old. They also often succumb to irreparable storm damage from wind and ice. Sunland North currently has at least 35 purple leaf plums all nearing the end of their life.

- We recommend a plan be in place to replace the purple leaf plum trees soon as they are approaching their decline timeline. Without a proper plan for their eventual removal, the streets where purple leaf plums are prevalent could be tree-less in a matter of a single season.

7.6 Entrance to MU7

At the entrance to TMU 7, near Mount Baker Drive and Blakely Blvd, the tree density is very high. Shore pine, Leyland cypress, Golden Princeton Norway maple and a few western redcedar hybrids are planted along a windbreak and visual barrier from north to south. At present, the Norway maples are all in poor health as they cannot grow as fast as the shore pine and Leyland cypress. Correct tree planting is essential in management landscapes. In our opinion, the near dozen Golden Princeton Norway maples were likely \$200 trees, required installation and irrigation, and will never display themselves prominently in the landscape due to improper planning.

There is not ample solution to the tree problem as is, removing some of the trees will relieve the density problems but that won't alter the planning procedure. A solution to the planning process is requiring landscapers and developers to use our planting lists attached this document. Proper selection and planning reduces installation and maintenance costs.

- We recommend future tree selection form the provided tree selection lists.
- We recommend not planting trees too dense for their eventual mature growth.

7.7 Black sooty mold on dense spruce tree leaves

Black sooty mold can cover tree limbs and leaves/needles. The mold is black and powdery or sooty in appearance. It looks very similar to black fireplace soot. This common pest is a complex of saprophytic fungi and bacteria living on aphid excrement. The disease is not parasitic, which means it will not kill trees, but the disease will cause an overall decrease in plant health.

Black sooty mold is caused by saprophytic fungi, which means that it does not feed on living plant tissue but on decaying organic material or in this case, insect secretions with high sugar content. Large amounts of black sooty mold growth can impair or reduce the rate of photosynthesis. Sooty mold is often an indication of sap sucking insects like aphids, white flies, or scales, which produce sugary secretions. The mold can grow on the sugary secretions or on sap or resin from wounds.

We noted black sooty mold on almost all the Picea and Abies or spruce and fir trees. The short, squat and dense branching habits of both open grown non-native spruce and open-grown non-native fir are ideal conditions for the disease.

- We recommend all spruce and true-firs (not Douglas-firs) be treated for the disease as a preventative measure and a spot application.
- Prevention and treatment are achieved through a measured formulation of a mancozeb type fungicide. ProtectDF is our mancozeb fungicide of choice. Applications shall be to manufacturers directions. Application and reapplication is recommended in spring to control black sooty mold.
- We also recommend spruce and true-firs be treated via pruning of dense branches to allow for sunlight penetration and airflow within the tree canopies. This pruning treatment will reduce the disease in trees.

7.8 Tent caterpillars on trees

We noticed both broadleaf plants and needled plants with current or historical infestations of tent caterpillars. The western tent caterpillar (*Malacosoma fragilis*) and the forest tent caterpillar (*Malacosoma disstria*) are found throughout the western United States and Canada. There are several species of tent caterpillars in the western United States, but all have similar life histories, habits and appearances. They are not common in most commercial orchards, but tents are conspicuous in abandoned trees or native habitats. They are considered a minor pest of fruit trees but can also habituate on other broadleaf and needled trees.

The forest tent caterpillar is found throughout North America. While the larvae do trail webbing wherever they go, this webbing does not function as a true tent. However, the webbing may completely cover limbs and foliage. When not feeding, the larvae gather in masses on branches or the tree trunk.

Tent caterpillars have one generation each year. Tent caterpillars overwinter as eggs, which hatch in spring when new foliage starts to appear. The young larvae move to a crotch and spin a dense web. This web gradually expands as the larvae grow and the feeding area required to sustain the colony increases. Larvae mature in 4 to 6 weeks and by mid-May through June can be seen wandering in search of places to pupate. Moths emerge in June and July, then mate and lay eggs, which hatch the following spring.

Tent caterpillars are attacked by numerous natural enemies, including birds, predaceous beetles and bugs, and parasitic wasps and flies. They are at times devastated by outbreaks of bacterial or viral diseases, especially if local populations become extremely dense. The potential for biological control of tent caterpillars is great and probably accounts for much of the mortality in native habitats.

- We recommend pruning away small and large tents of the western caterpillar can be pruned away and discarded into a landfill.
- Spot treatments with insecticides are also a good control method.
- We recommend using Astro insecticide for control of tent caterpillars. Applications shall be to manufacturer's directions.

***Fungicides and insecticides can be very dangerous to humans and animals. Caution must be applied when applying them.**

8 TREE PRUNING GUIDELINES

Sunland Tree Pruning Guidelines are condensed and site-specific adaptations from information compiled from the International Society of Arboriculture's Best Management Practices regarding Tree Pruning and the American National Standards Institute A300 Guidelines on Woody Plant Management.

8.1 Pruning Objectives

Why Do We Prune?

Pruning is the most common tree maintenance procedure. Landscape trees require a higher level of care to maintain their structural integrity and aesthetics than do trees in the wild. Improper pruning can create lasting damage and shorten the life of a tree. Proper pruning is the least expensive and most effective way to increase the duration and intensity of social and ecosystem benefits trees provide.

Reasons for Pruning:

Each cut performed to a tree has the potential to change its growth, structure, appearance and health. As such, no branch should be removed from a tree without a reason and associated objective. Some common objectives to pruning are to improve form, reduce risk, remove diseased and dead branches, increase visibility, and increase clearance. In many cases, small and large trees are pruned as corrective and preventative measures. Routine pruning and thinning of branches is not an effective objective and does not necessarily improve the health of a tree. Heavy pruning is often a significant health stress for a tree. It's best for the tree to prune minimal amounts of leaves and wood to reach your objective.

Some Common Pruning Examples at Sunland North	
<i>Pruning Reasoning</i>	<i>Pruning Objective</i>
Long branches extend into street or lawn mowing corridor.	Reduce length of branches until short enough to not reach street and lawn mowers.
Low branches block access to lawn mowing equipment.	Remove lowest branches increases height clearance below tree.
Branch is diseased, dead or damaged.	Remove damaged portion of branch to reduce associated risk of branch failure.
Two branch crossing over each other.	Select the least damaged and largest of the two branches, remove the other.
Branch growing towards and into tree canopy, rather than outside.	Remove improperly grown branches.
Very long branch is extended over common area.	Reduce risk associated with branch breaking by reducing the length of long branch by half.
Black sooty mold or fungi growing on trees leaves or needles.	Increase sunlight exposure and air penetration by removing redundant branches in dense areas. Remove entire branches, pruning to main trunk but preserving branch collar.
Tree branches are very dense, or they appear black with mold.	Increase sunlight exposure and air penetration by removing branches in dense areas. Remove entire branches, pruning to main trunk but preserving branch collar.
Tree has been topped, disfigured or mal-pruned.	Apply restorative pruning to tree. Restorative pruning is best accomplished by a Certified Arborist who understands tree restoration.
Improve tree structure and appearance	Perform structural pruning on tree to develop a clear, central trunk, subordinate branches competing for height with each other, reduce tight, acute angle branch unions and develop robust scaffold branches.
Develop shrub into a desirable shape.	Shearing and hedging should only be performed on shrubs and small trees. Shearing/hedging should only remove the outside 1 to 2 inches of foliage from a plant. Hedging further than 2 inches will normally expose the died out, brown interior of the shrub. Some evergreen trees do not regrow green leaves from deep hedging.

Proper Cuts for Limb Reduction

Reducing the length and height of branches is often preferred over complete branch removal. Complete branch removals, or a pruning cut against the trunk of a tree, are often larger in size and requires more time to heal than pruning further out on the branch. Furthermore, to reach your pruning objective, removal of the entire branch may not be necessary.

When reducing branches lengths or heights on deciduous tree branch, the pruner simply aims to remove the larger of two branches at specific branch union (split) (Figure 1.). Example: when presented with a branch that splits, the tree pruner will remove the *larger* of the two branches. The larger branch in this scenario is most often the branch growing upwards.

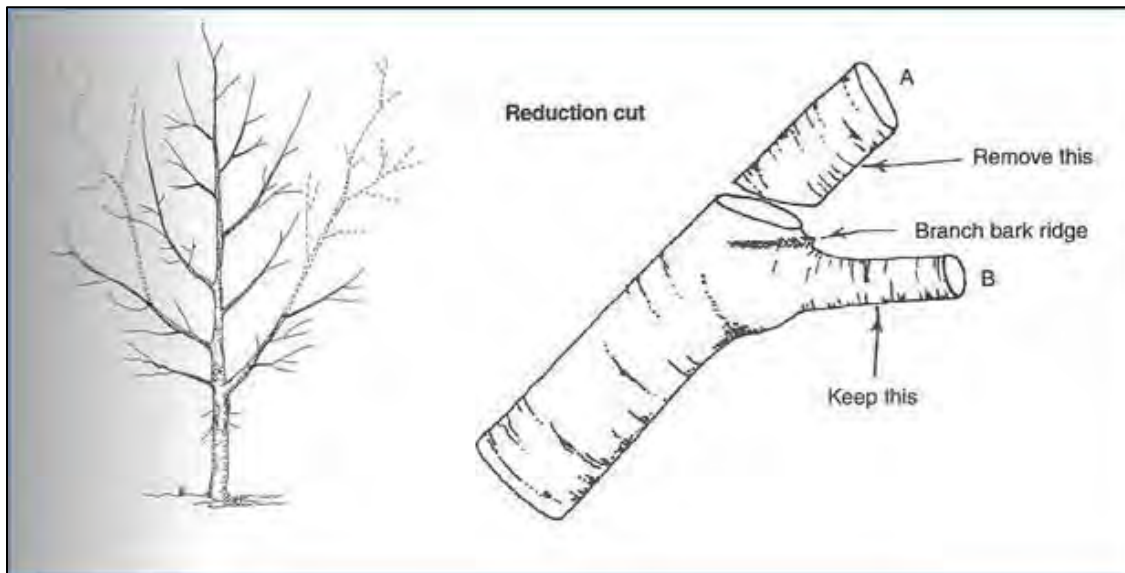


Figure 1: Illustration of reduction cuts from "An Illustrated Guide to Pruning" by Ed Gilman.

Proper Pruning Cuts

Care must be taken to cut just outside of the branch collar. Cutting outside the collar will increase likelihood the tree can “heal” the wound and prevent future disease and decay (technically called compartmentalization). (Figure 2.) Trunk or parent wood material is contained within the branch collar and it should not be damaged. Do not cut into or past the branch collar, and especially do not “flush cut” as is seen in Figure 2 as line C-X.

If a large limb is to be pruned, its weight should first be reduced. To successfully reduce weight of a limb it should be cut into pieces prior to the final cut outside the branch collar. The branch weight has a tendency to rip bark down the tree creating both an unsightly appearance and increasing damage to the tree. Standard practices have the tree pruner initiate their first cut about 12-18 inches away from the limbs point of attachment. Once the branch weight beyond the 12-18 inches has been removed, you can cleanly make a final cut just outside the branch collar without fear of bark tearing.

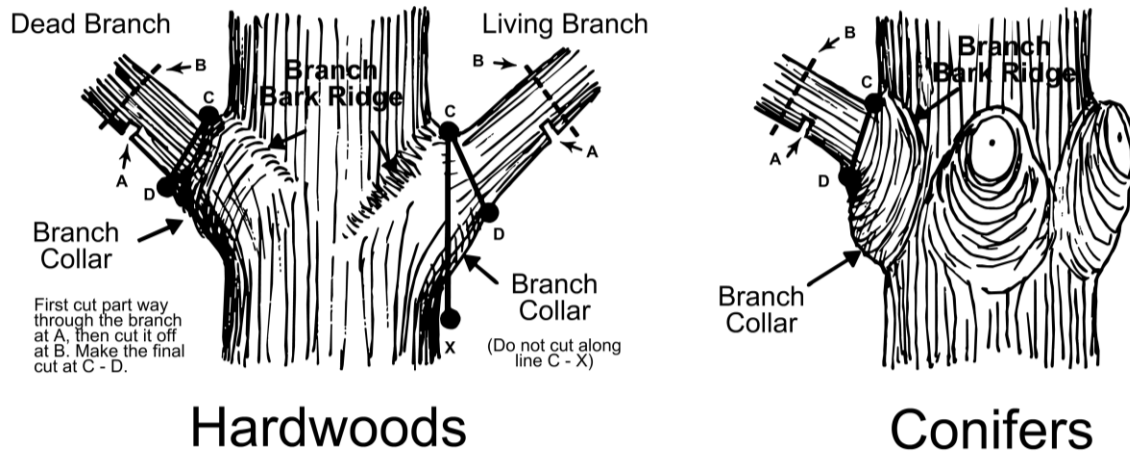


Figure 2: Illustration of branch collar cuts from Arbor Day Foundation.

www.arborday.org

8.2 When to Prune

Use the following table to identify when to prune trees:

Late Winter & Early Spring, before tree budding.	This is the best time to do any heavy pruning (no more than 25%), since this will stimulate the most growth out of any season. Ideal time to prune fruit and nut producing trees, and to heavily reduce the size of shrubs.
Late Spring & Summer, after budding.	Summer is the best time to remove weakly attached, dead, diseased limbs. Not advised to prune heavily during hot, dry spells when the trees are more prone to stress.
Late Summer & Early Fall, before leaf drop	Avoid heavy pruning during this time of year, as bacterial infections can spread more easily. Thinning and deadwood removal is O.K. To encourage larger, more vigorous fruits, thinning of existing branches to reduce the quantity of fruits can be done.
Late Fall & Early Winter, after leaf drop	Good time of year to begin heavy pruning if temperatures are dropping, to encourage new growth in the spring. Plants should be entering their dormant stage at this point in the year.
Winter, above freezing	Best time to prune most plants. Pruning will stimulate new growth in the spring.
Winter, below freezing	Avoid pruning tender or brittle wood to reduce the risk of shattering. Fruiting trees (including the libraries pear and cherry) should not be pruned if temperatures are below freezing.

Plant physiology, species, nutrient uptake, available water, time of year, and many other environmental factors play into tree pruning. By understanding some of these factors, Arborists make decisions on the timing, the methods, and the amount of foliage and wood to remove from the trees. Unlike mammals, trees do not heal, rather they compartmentalize or grow over their wounds. This compartmentalization is an essential function for the tree to remain health after pruning. Using arborists techniques, we encourage compartmentalization of tree wounds.

Prune living branches in the dormant season late or very early in spring before leaf formation. Within this time frame, wounds heal faster. Do not let pruning schedules lapse, as large branches mean large wounds that are difficult to compartmentalize, leaving the tree susceptible to disease.

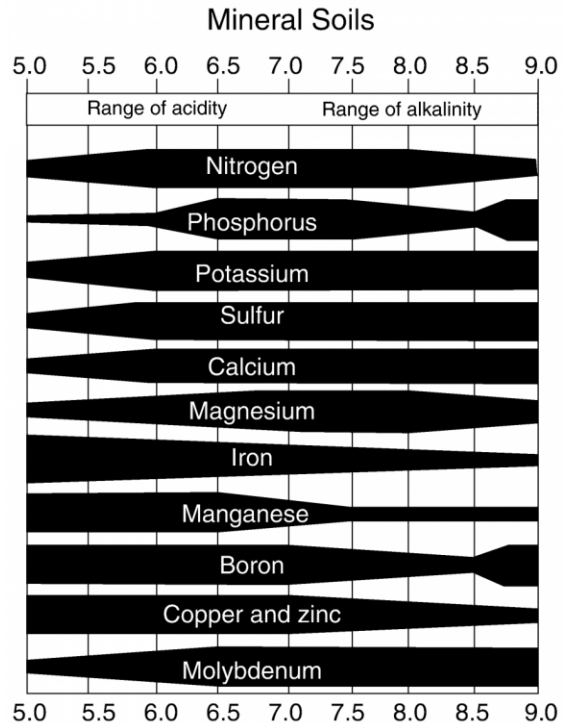
9 PLANT NUTRITION

There are over a dozen essential elements required for plant growth. These elements are separated into two categories: macronutrients and micronutrients. Macronutrients and micronutrients are in abundance in most soils unless the soils are severely degraded from top soil removal and construction. One soil type encompasses all of Sunland North, the Dungeness silt loam.

Macronutrients are your nitrogen, phosphorus, potassium (N:P:K) that are available in most every purchased fertilizer. Below is a list of the most common essential elements.

Macronutrients	Micronutrients
N – Nitrogen	Fe – Iron
P – Phosphorus	Mn – Manganese
K – Potassium	Cu – Copper
S – Sulfur	Zn – Zinc
Ca – Calcium	B – Boron
Mg - Magnesium	Cl – Chloride
	Mo – Molybdenum

Plant nutrition is a very complex subject with many factors. Such factors include soil pH, particle charge, soil composition (sand-clay-loam), soil texture-structure-porosity-chemistry, soil bulk density, organic composition, and other factors. Micronutrient or macronutrient conditions on plants are not commonly due to the soil lacking the nutrient, but rather, the soil lacking the characteristics to accommodate the transfer of nutrient to plant root. See Mineral Soils to the right for detail on how pH affects availability of nutrients.



ISA's Best Management Practices:
Soil Management for Urban
Trees, 2014.

Fertilization in any soil is generally not recommended for healthy trees with green color. Plants near or within a fertilized lawn, as Sunland North's lawn, the trees will absorb a portion of the fertilizer applied to the lawn. Given the fertilizer absorption from the lawn, unless trees express limiting micro or macronutrient deficiencies, the trees require no additional fertilization. If the trees are mulched with organic material, the decomposing organic material will also supply the trees with nutrients at a low, slow rate. Wood chip and bark mulch is the best long-term solution to tree fertilization. Any macronutrient deficiencies in Sunland North will be corrected by the application of lawn fertilizer

Below are some plants that differentiate susceptibility to micronutrient deficiencies

Iron deficiency susceptible:

- Oaks – especially pin and white
- Ericaceous plants – e.g. azalea, rhododendron
- Japanese black pine
- White pine
- Magnolia
- Photinia

Manganese deficiency susceptible:

- Birch
- Dogwood
- Maples – especially red and sugar
- Flowering cherry
- Sweetgum
- Sargent crabapple

9.1 Treating Deficiencies

The first step in treating nutrient deficiencies is to determine the exact cause of the problem. Without adequate testing treatment prescriptions are impossible to determine. This requires a soil or foliar nutrient analysis for micronutrients and soil pH measurement. While collecting the sample, the soil moisture should also be assessed. Determining if the soil is calcareous is also recommended while collecting the sample. Soils high in calcium carbonate (lime), or calcareous soils, can be tested by applying a drop of vinegar to the soil. If effervescence (bubbling) is seen with the vinegar, there are particles of lime in the soil and it is calcareous. Soil collections should be made under and near the tree and multiple times around a tree. Most soils are heterogeneous and as such, their properties will vary in close proximities.

If the soil pH, soil characteristics or moisture conditions are not correct for the plant species, replacement with a more suitable species may be the most practical solution. A list of plants that tolerate acidic, alkaline, sand, loam and clay soils is available from Peninsula Urban Forestry LLC.

When soils are simply low in a nutrient, the problem can be treated with additions of the nutrient to the soil. If the pH is below 6.0, the addition of a fertilizer is sufficient. Useful fertilizers include Milorganite for iron, iron sulfate or manganese sulfate (not magnesium sulfate - Epsom salt). If the pH is higher than 6.0, a chelate is required. Chelation of the nutrient prevents its conversion to insoluble forms.

If the cause of the problem is high pH - alkaline soil, the soil pH should be reduced with applications of sulfur. Chelates should also be added to increase the amount of nutrient available. Several applications of sulfur may be required to lower the pH to an acceptable level. Soil analysis should be repeated in subsequent years to determine the need for additional applications. If the soil is calcareous, it will be very difficult or practically impossible to adjust the soil pH. For trees with severe deficiencies, especially in areas with calcareous or very alkaline soils, an injection of iron and/or manganese directly into the tree is usually the best treatment option.

Injection of iron will typically green up medium and large trees within two to six weeks of application during the growing season. Trees may need to be retreated after two or three years when symptoms begin to reappear. A longer lasting option is to inject in the fall or during the dormant season using a higher rate of iron. Higher rates typically provide results for three to five years following treatment.

Manganese injections made during the growing season rarely result in rapid greening. Greening is usually seen the following year. Fall applications at a higher rate may produce longer lasting results. Injections should never be made in the spring until leaves are fully expanded or during droughts.

Soil treatments with sulfur and/or chelates should be made following injection to extend the efficacy of treatment. Apply mulch around plants to help reduce soil pH and increase root density. Mycorrhizal applications may increase root density and improve micronutrient and water absorption.

Fertilization Guidelines

Consider the tree's age, growth, and stress level. A visual inspection of the tree, examining it for any of the following factors will inform you that fertilization may need to occur:

- Chlorosis of the leaves or needles (yellowing)
- Decreased leaf size and retention
- Early fall color and leaf drop
- Reduced branch retention and growth
- Diminished plant vigor and growth

When selecting a fertilizer, it is important to note that there are many factors that affect nutrient uptake. Some of the main factors include:

- Fertilizer form (quick versus slow release)
- Soil type (ex: clay versus sand)
- Soil moisture and temperature
- Tree vigor

Fertilizer rates are dependent on tree species, soil type (current condition), and landscaping goals. Fertilizer rates are determined by root area, which is calculated by defining the area of the crown spread ($3.14 \times \text{radius}^2$). Trees should have fertilizer spread over an area twice as large as the crown spread. Do not concentrate the fertilizer around the trunk of the tree.

General Guidelines for Fertilization of Deciduous Trees:

- Use slow release fertilizer over quick release
- With turf: <1lb of N per 1,000 square feet
- Without turf: 2-4lb of N of per 1,000 square feet
- Do not exceed 6lb of N per year
- If lawn fertilizer is being applied near tree; do not exceed total lawn and tree fertilizer.

Unlike deciduous trees, coniferous trees need much lower rates of nutrients because they have adapted to lower nutrient environments. In natural ecosystems, forests recycle nutrients through decaying leaf and wood releasing nutrients to the soil and trees uptake the nutrients again. Additionally, mature trees rarely require fertilization as they have extensive root systems and established symbiotic relationships with soil microorganisms that assist them in procuring water and nutrients. Fertilization has been shown to affect the trees' relationships with soil microorganisms, so fertilization of mature trees should be carefully considered.

Furthermore, fertilization timing is important, and fertilizer should be applied before bud break and after leaf loss in deciduous trees. Do not fertilize plants unless adequate water is available, or if trees are in drought stress. Uptake of the fertilizer will not occur. Do not fertilize newly planted trees, as they do not have a substantial root system grown to support fertilizer uptake and fertilizers can deter root growth in newly planted trees. Do not use any lawn fertilizer containing 2,4-D, dicamba, or MCPP formulations under shade trees or other ornamental plants (Maleike, 1996). Be cautious when fertilizing areas with turf as excessive fertilization will burn the turf. While fertilization can increase tree vigor and growth, excess nitrogen can produce succulent shoots that are attractive to pests, which in turn, are a gateway for disease. Fertilization should be approached methodically to prevent over fertilization and subsequent increase in pest and disease infection.

10 REMOVAL AND REPLACEMENT STRATEGY

In an effort to receive as much benefit and equity a tree can provide, and to minimize costs associated with planting, maintenance, and potentially early removal, planting the *Right Tree in the Right Place* is essential.

Planning for eventual tree mortality and tree replacement is an important part of tree management. A Remove & Replacement plan only maintains a landscape for the long-term, but also reduces costs in the short-term. Planting the right tree in the right place ensures that the landscape is maintained, and maintenance costs are kept to a minimum. Correct plant choice is vital at the onset of development and landscaping to prevent future liabilities.

In our experience, landscaper installers and developers often choose the most inexpensive plants due to the low upfront costs. This action does not consider long-term maintenance costs, which are carried by homeowners and homeowner associations. We do not endorse landscaper installation crews or developers selecting trees unless they have a qualified horticulturalist or certified arborist on staff.

Besides choosing the right tree for the right place, proper planting of trees is indispensable for tree survival and vitality. First, a hole must be dug one and a half times as large as the root ball and deep enough to contain the entire root ball. Next, the edges of the hole must be scarified so that the tree pit edges are not on a single plane. Place the root ball in the hole, back fill by hand, and verify the tree root collar is above the soil level. Burying a tree's root collar is the third most often cause of tree mortality in landscaped areas. For more information, see the International Society of Arboriculture Best Management Practices and specifications for tree planting.

We've compiled a list of trees appropriate for the Sunland North development. Due to the large number of flowering cherry, purple plums and evergreen trees, we've selected a plant palette which will diversify and, in time, improve the landscape appeal of Sunland North.

We recommend installing trees from the following lists or recommended by another certified arborist or forester.

10.1 Tree Selection*Sites with <10 feet of growing space:*

Common Name <i>Scientific Name</i>	Form	Height x Width (ft)	Features
Crape Myrtle <i>Lagerstroemia</i> cultivars	Various	10x10	Fall color, Flowers, Texturized bark
Western redbud <i>Cercis occidentalis</i>	Various	10x15	Fall color, Flowers, Texturized bark
Strawberry tree <i>Arbutus unedo</i>	Oval	10x10	Unique fruits and bark
Rose of Sharon <i>Hibiscus syriacus</i>	Vase	10x10	Flowers
Cornelian cherry dogwood <i>Cornus mas</i>	Round	10x15	Flowers, Texturized bark
Japanese maple <i>Acer palmatum</i>	Oval	10x10	Unique appearance

Sites with 10-20 feet of growing space:

Common Name <i>Scientific Name</i>	Form	Height x Width (ft)	Features
Franklinia <i>Franklinia alatamaha</i>	Round	20x15	Fall color, Flowers
Dove tree <i>Davidia involuclrata</i>	Round	15x20	Fall color, Flowers
Snowbell, Pink Chimes, Japanese <i>Styrax japonicus</i> 'Pink Chimes'	Round	20x15	Flowers, Texturized bark
Tree Lilac, Japanese <i>Syringa reticulata</i>	Oval	25x20	Flowers, Texturized bark
Magnolia, Butterflies <i>Magnolia</i> 'Butterflies'	Pyramidal	20x15	Flowers
Zelkova, City Sprite <i>Zelkova serrata</i> 'JFS-KW1' P.A.F	Oval	25x15	Fall Color

Sites with 20-40 feet of growing space:

Common Name <i>Scientific Name</i>	Form	Height x Width (ft)	Features
Dogwood, Eddie's white wonder <i>Cornus nuttallii x florida</i> 'Eddie's White Wonder'	Pyramidal	35x20	Wildlife, Flowers
Dogwood, Starlight <i>Cornus kousa x nuttallii</i> 'KN4-43' PP16293	Oval	30x20	Fall colors, Wildlife, Flowers
Dogwood, Venus <i>Cornus x Venus</i> 'KN30-8' PP16309	Round	25x20	Fall colors, Wildlife, Flowers
Fringe Tree, Chinese <i>Chionanthus retusus</i>	Spreading	20x25	Fall colors, Wildlife, Flowers, Low pruning needs
Laurel, Bay <i>Laurus nobilis</i>	Pyramidal	30x20	Wildlife, Evergreen, Flowers, Leaves can be used in cooking
Maackia, Amur <i>Maackia amurensis</i>	Vase	35x25	Flowers, Textured bark, Free of serious pests & disease
Magnolia, Edith Bogue <i>Magnolia grandiflora</i> 'Edith Bogue'	Pyramidal	30x15	Evergreen, Flowers, Resists storm damage
Magnolia, Elizabeth <i>Magnolia acuminata</i> 'Elizabeth'	Pyramidal	30x15	Flowers, Low maintenance
Osage Orange, Fruitless <i>Maclura pomifera</i> 'White Shield'	Round	35x30	Fall Color, Hardy, Few pest or disease problems
Redbud, Forest Pansy <i>Cercis canadensis</i> 'Forest Pansy'	Spreading	20x25	Fall Color, Flowers
Serviceberry, Spring Flurry <i>Amelanchier laevis</i> 'JFS- Arb' PP 15304	Oval	30x20	Fall Color, Wildlife, Flowers

Sites with over 40 feet of growing space:

Common Name <i>Scientific Name</i>	Form	Height x Width (ft)	Features
Ash, Oregon <i>Fraxinus latifolia</i>	Round	70x40	Fall Color
Coast Redwood <i>Sequoia sempervirens</i>	Pyramidal	100x40	Evergreen, Textured bark
Red oak <i>Quercus rubra</i>	Round	55x30	Beautiful, large branch architecture. Wildlife.
Valley oak <i>Quercus lobata</i>	Round	60x40	Evergreen
Weeping willow <i>Salix matsudana x alba</i>	Round	50x40	Unique appearance.
Filbert, Turkish <i>Corylus colurna</i>	Pyramid	40x30	Wildlife, Nearly free of pests and disease
Oak, Blue <i>Quercus douglasii</i>	Round	45x30	Wildlife, Drought tolerant
Catalpa, Purple <i>Catalpa erubescens</i> 'Purpurea'	Oval	50x30	Flowers
Monkey Puzzle <i>Araucaria Araucana</i>	Pyramidal	65x25	Evergreen
Sassafras Tree <i>Sassafras albidum</i>	Pyramidal	45x35	Fall Color, Flowers

11 CLOSING

Work for this project was performed and this report prepared in accordance with generally accepted professional practices for the nature and conditions of work completed in the same or similar localities, at the time the work was performed. No warranty, expressed or implied, is made. Myself, nor Peninsula Urban Forestry, has any current or prospective interest in the plants or properties discussed. Acceptance of this report acknowledges receipt and agreement with Peninsula Urban Forestry's attached Assumptions & Limiting Conditions.

Thank you for the opportunity to evaluate the trees and landscape in Sather Park. We appreciate your business and look forward to working with you in the future. If you have questions now, or in the future, do not hesitate to contact us. Peninsula Urban Forestry appreciates answering any questions you may have.



John Bornsworth

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Plant Ecologist

ISA Board Certified Master Arborist® #PN-7955BM

ISA Municipal Arborist®

Tree Risk Assessment Qualified

Executive Advisory Panel, Washington Community Forestry Council

Peninsula Urban Forestry LLC

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APPENDIX A: TREE MANAGEMENT UNITS



APPENDIX A: GENUS COMPOSITION SUMMARY

Tree Family and Genus	Count	Percent of Total	Goal Percent of Total
Family Total	6	-	30%
<i>Genus Total</i>	19	-	20%
Species Total	291	-	10%
Altingiaceae	1	0.34%	<30%
<i>Liquidambar</i>	1	0.34%	<20%
Cupressaceae	45	15.46%	<30%
<i>Cryptomeria</i>	4	1.37%	<20%
<i>Cupressus</i>	10	3.44%	<20%
<i>Juniperus</i>	4	1.37%	<20%
<i>Sequoiadendron</i>	11	3.78%	<20%
<i>Thuja</i>	4	1.37%	<20%
<i>Xanthocyparis</i>	12	4.12%	<20%
Magnoliaceae	1	0.34%	<30%
<i>Magnolieae</i>	1	0.34%	<20%
Pinaceae	110	37.80%	>30%
<i>Abies</i>	11	3.78%	<20%
<i>Cedrus</i>	46	15.81%	<20%
<i>Picea</i>	27	9.28%	<20%
<i>Pinus</i>	19	6.53%	<20%
<i>Pseudotsuga</i>	5	1.72%	<20%
<i>Tsuga</i>	2	0.69%	<20%
Rosaceae	114	39.18%	>30%
<i>Crataegus</i>	1	0.34%	<20%
<i>Malus</i>	3	1.03%	<20%
<i>Prunus</i>	107	36.77%	>20%
<i>Sorbus</i>	3	1.03%	<20%
Sapindaceae	20	6.87%	<30%
<i>Acer</i>	20	6.87%	<20%

APPENDIX B: REFERENCES AND BIBLIOGRAPHY

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APPENDIX F: ASSUMPTIONS & LIMITING LIABILITIES

1. Any legal description provided to Peninsula Urban Forestry, LLC is assumed to be correct. Any titles and ownerships to any property are assumed to be good and marketable. Peninsula Urban Forestry, LLC assumes no responsibility for verification of ownership or locations of property lines, or for results of any actions or recommendations based on inaccurate information. It is assumed that any property is not in violation of any applicable codes, ordinances, statutes or other governmental regulations, unless explicitly stated otherwise.
2. Peninsula Urban Forestry, LLC assumes no responsibilities for legal matters in character. Peninsula Urban Forestry, LLC assumes all property appraised or evaluated is free and clear, and is under responsible ownership and competent management.
3. Any evaluation or assessment carried out was restricted to the property and the plants or landscapes within the Scope of Assignment. No assessment of any other plants or landscapes has been undertaken by Peninsula Urban Forestry, LLC. The conclusions of this report do not apply to any zones, landscapes, trees, plants, or any other property not explicitly covered in the Scope of Assignment.
4. The total monetary amount of all claims or causes of action the Client may have as against Peninsula Urban Forestry, LLC, including but not limited to claims for negligence, negligent misrepresentation, and breach of contract, shall be strictly limited to solely the total amount of fees paid by the Client to Peninsula Urban Forestry, LLC pursuant to the Agreement for Services as dated for which this Assignment was carried out. Further, under no circumstance may any claims be initiated or commenced by the Client against Peninsula Urban Forestry, LLC, or any of its directors, officers, employees, contractors, agents, or Assessors, in contract or in tort, more than 12 months after the date of this Assignment.
5. Although Peninsula Urban Forestry, LLC has taken care to obtain all information from reliable sources and to verify the data insofar as possible, Peninsula Urban Forestry, LLC does not guarantee and is not responsible for the accuracy of information provided by others
6. Peninsula Urban Forestry, LLC shall not be required to testify or attend court due to any report unless mutually satisfactory contractual arrangements are made, including payment of an additional fee for such Services as described in a Consulting Arborist Agreement.
7. Unless otherwise required by law, possession of this report or a copy thereof does not imply right of publication or use for any purpose by any other than the parties to whom it is addressed, without the prior expressed written or verbal consent of the Peninsula Urban Forestry, LLC.

8. Neither all or any part of the contents of this report, nor copy thereof, shall be conveyed to anyone, including the client, to the public through advertising, public relations, news, sales or other media, without prior expressed written consent of Peninsula Urban Forestry, LLC. Particularly as to value conclusions, identify of Peninsula Urban Forestry, LLC., or any reference to any professional society or to any initialed designation conferred upon Peninsula Urban Forestry, LLC as stated in its qualifications.
9. This report and any values expressed herein represent the opinion of the Peninsula Urban Forestry, LLC, and the Peninsula Urban Forestry, LLC's fee is in no way contingent upon the reporting of a specific value, a stipulated result, the occurrence of a subsequent event or upon any finding to be reported.
10. All photographs included in this report were taken by Peninsula Urban Forestry, LLC during the documented site visit, unless otherwise noted.
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