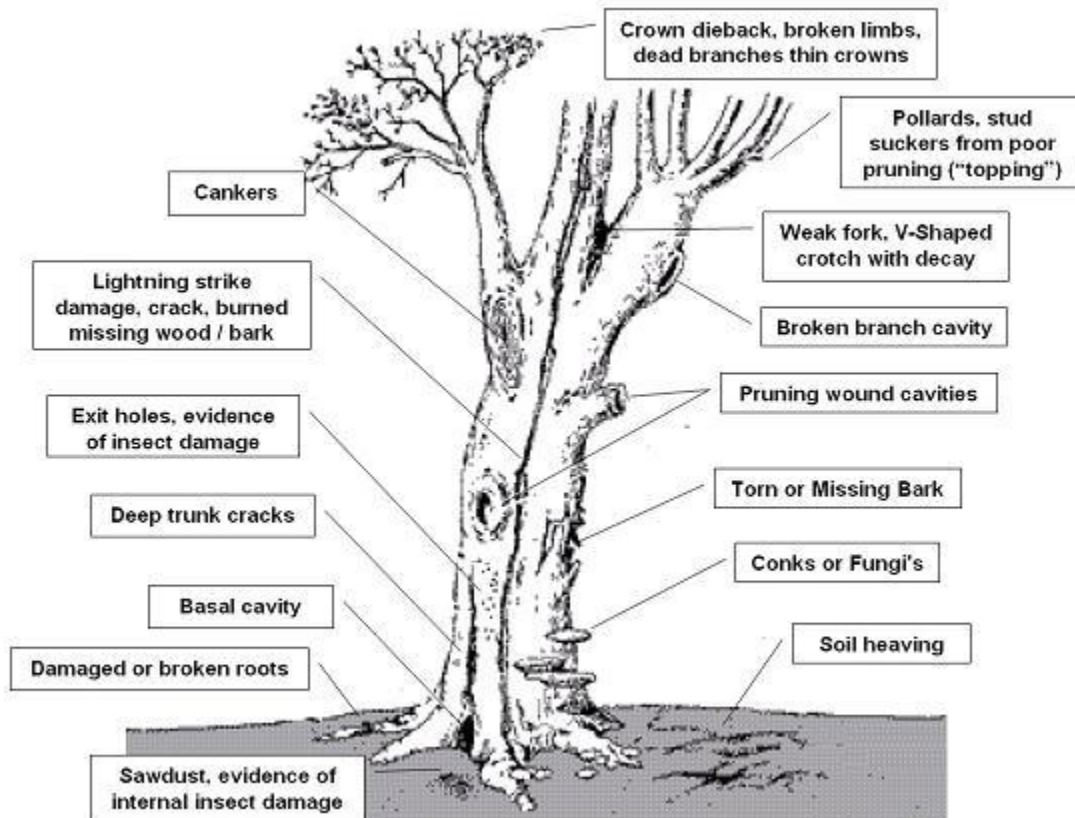


**Queen Mountain Platt  
4175 Iron Gate Road  
Tree Risk Assessment  
Township 38N, Range 3E, Section 8  
Bellingham, WA 98226**



**Prepared by:  
TGI Arboriculture Services  
Patrick J. Sullivan  
International Society of Arboriculture  
Certified Arborist # PN-7123A  
Certified Tree Risk Assessor  
Bellingham, WA  
February 10, 2022**

**Consultant**

Patrick Sullivan  
TGI Arboriculture Services  
Bellingham, WA 98225

**Client**

Jay Djindsa  
Queen Mountain LLC  
Bellingham, WA 98226

To Whom It May Concern:

This report is submitted in response to your request for arboriculture consulting services. I have been retained to evaluate the existing standing tree situation and tree risk assessment for human safety and personal property damage. The trees of concern are located on an undeveloped parcel of land addressed 4175 Iron Gate Road, in the city limits of Bellingham, WA.

The objective is twofold; to identify trees that may be retained during and after construction and to identify tree individuals that, while growing towards maturity, may present an imminent to probable danger to people and personal property after land clearing has occurred. We can accomplish our objective by collecting accurate tree heights, diameter at breast height (DBH), and orientation of the tree site in relation to planned homes, roads and paths with potentially high human activity. Applied to the environmental influences associated with the local area, such as wind events, saturated soils, adjacent trees and vegetation and their impacts, we will have good data for risk assessment. The overall goal is to improve safety by reducing risk, to promote native species and to improve aesthetics for the community.

If you have any questions concerning the submitted arborist report, please feel free to contact me. Thank you.

Patrick Sullivan  
ISA Certified Arborist #PN-7123A  
ISA Certified Tree Risk Assessor  
(360) 920-6285



## Introduction

This preliminary report is based on my site visits on January 5, 13, and 17<sup>th</sup>, 2022. A request has been made by the City of Bellingham for Queen Mountain LLC to provide initial consulting services to determine potential risk associated with current standing trees and the planned development activities. The overall goal is to improve public and private safety, to promote native species and to improve aesthetics for the community.

A survey line has been marked on the ground orientated north/south for approximately 1,230' in length, representing the west property edge. A survey line has been marked on the ground orientated east/west for approximately 1,230' in length, representing the north property edge. The survey line represents the area where the clearing and grading for development will occur. Trees located within 75' of the property line have been carefully assessed for retention of use in the planned community as potential street trees or residential trees. Twenty-seven trees were assessed for retention on the property.

The tree information contained in this report refers to the trees tallied in Table 1 and reflects the condition of the trees at the time of inspection on January 17, 2021. The inspection is limited to visual examination of the subject trees without excavation, probing, dissection, climbing or coring unless explicitly specified. There is no warranty or guarantee that deficiencies or issues of the subject trees may not arise in the future. Trees have been identified with pink flagging wrapped around the tree at breast height. Individual trees are assigned an identifier number from Q1 to Q27.

Table 1 is the tree inventory of the trees within 75' of property line edge. Tree dendrology, species, health and general condition are noted in the table. Tree data has been collected using a crew of three persons, clinometers, laser range finders, compass and Spencer's Logger's Tape Measures. Appendix 1 is a 1:2500 scale map of the property. The map identifies sampled tree locations and the location of existing property lines. Please allow a 30 foot error due to GPS availability. These trees will most likely be incorporated with the planned foot path along the western property line.

## Methods

Evaluation of tree health and structure has been conducted utilizing the International Society of Arboriculture (ISA) Visual Tree Assessment (VTA) methods. The basis behind VTA is the identification of symptoms, which the tree produces in reaction to an area of weakness or an area of mechanical stress. A tree reacts to mechanical and physiological stresses by growing more vigorously to re-enforce weak areas. Using the ISA tree risk assessment method, we can assign potential probability of failure to a tree. This method has been adopted from the U.S. Forest Service risk assessment approach and is currently considered the present standard of care.

## Background

4175 Iron Gate Road is located inside the northern city limits of Bellingham, east of Interstate 5. The parcel is South of King Mountain and west of Hannegan Road. It has a southwest aspect with partial views of Bellingham Bay and the San Juan Islands. The total area of the site is 1,572,643 square feet or 36.1 acres. The topography varies from 220 feet to 360 feet in elevation. The southeast quadrant is relatively flat with a grade of 0-3%. The northeast quadrant contains the steepest slopes ranging from 30-45%. The northwest quadrant contains the highest elevations on site. A ridge exists creating steeper slopes in the northwest corner of the property. The southwest quadrant runs downhill towards the southeast. Two timber types are present, a conifer dominated stand in the uplands and a hardwood dominated stand in the lower elevations. Seven wetlands exist in the northeast and southeast quadrants.

The City of Bellingham Aerial Imagery Viewer allows us to look at past activities on the property. In 1963 the parcel was cleared off in the northeast quadrant. The photo suggests a rock pit may have been developed. For the next two decades little to no human activity can be observed. Mature timber can be observed in a 1988 aerial photo. In the early 2000s the eastern portions of the land may have been used by an adjacent landowner as an organic waste area site. The waste areas are now overgrown with blackberry, red alder, birch and cottonwood.

## Existing Conditions on Site

Trees observed on site consist of Douglas fir (*Pseudotsuga menziesii*), western red cedar (*Thuja plicata*), western hemlock (*Tsuga heterophylla*), big leaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), black cottonwood (*Populus balsamifera*), paper birch (*Betula papyrifera*), and bitter cherry (*Prunus emarginata*). Timber composition consists of a mature conifer/hardwood mix and varies across the parcel. The timber types on site are a result of slope, water and human activity.

Douglas fir is the over story cohort. Tree heights range from 30 to 135 feet measured. Old conifer stumps are on site may indicate at least one entry for past timber harvest activities. Very little tree blow down has been observed in the conifer stands. Branch failures are evident as well throughout the stand. Failed branch sizes observed range from 0.25-3 inch in diameter.

The hardwoods display very similar tree architecture and growing patterns consistent with a growing site with high competition. First, there is a lack of taper, or change in diameter over the length of the trunk, branch and roots. This is important in the distribution of mechanical stress. When a tree height to diameter ratio is large or extremely slender, that tree part is more prone to failure. Second, there is live crown ratio, the height of the entire tree compared to the vertical extent of the live crown. Low live crown ratios commonly develop where trees grow in dense stands. Trees with poor taper and low live crown ratios are less likely to have uniform growth increments along the trunk. This is due to the amount of energy produced by the small amount of living crown. The removal of the proposed area will expose these poorly tapered trees to increased wind loads and altered wind dynamics. Therefore, hardwoods will not be recommended for retention.

Northeast Quadrant contains steep slopes that quickly flatten out as you approach the property line. Four wetlands are in the flats of the property. The steep slope consists of continuous conifer forest composed of Douglas fir and a small component of western hemlock. Red alder, maple or cottonwood may be found on site as well. The areas with 1-5% slope contain the wetlands. Trees in these areas are dominantly hardwoods with an occasional conifer tree individual.

Southeast Quadrant contains some hillside slopes but is mostly flat with a 1-5% slope. The quadrant is comprised mostly of wetlands, making hardwood trees dominant with an occasional large conifer individual present.

Northwest Quadrant contains two steep slopes. The larger of the two slopes has a southeastern aspect and ties into the slope of the Northeast quadrant. The smaller area with a steep slope is located in the northwest corner of the parcel. The two slopes meet and create a ridge line which runs southwest to the property line. Timber composition consists of a mature conifer/hardwood mix. The Douglas fir, red cedar and hemlock compose about 85% of the stand. Hardwood component is about 15% of the stand composition. The two areas containing slopes greater than 35-40% will not be utilized for construction.

Southwest Quadrant is a more consistent slope with a southeastern aspect. The slope ties in with the southeast quadrant and contains two small forested wetlands. Timber composition consists of a mature conifer/hardwood mix. The Douglas fir, red cedar and hemlock compose about 65% of the stand. Hardwood component is about 35% of the stand composition.

## Tree Risk Assessment

The conflict between construction development needs and tree preservation is often difficult. Construction activity often results in soil compaction, trenching, grade changes and other root zone disturbances. Residual trees on site require certain protection measures to reduce or eliminate root zone and main stem disturbances.

A Hazard Tree is defined as a tree that meets all the following criteria:

- a. A tree with a combination of structural defects and/or disease which makes it subject to a high probability of failure
- b. Is in proximity to moderate to high frequency targets (persons or property that can be damaged by tree failure)
- c. The hazard condition of the tree cannot be lessened with reasonable and proper arboricultural practices, nor can the target be removed.

Tree hazard potential is a function of tree species, size, defects and targets. Targets consists of people, property or activities that can be injured, damaged or disrupted by a tree failure. Targets are not present on site in year 2022. On this site, as individual trees are removed, the changing wind dynamics may create issues affecting stand stability as well as individual tree stability. Removing individual trees will reduce the risk associated with an individual tree but may increase the risk of wind throw by changing the dynamics in the stand as a whole. It is difficult retain mature trees after adjacent clearing has occurred. Low live crown ratio of the tree, wind exposure and root damage from heavy equipment can have high contributing factors to potential tree failure.

How risk is perceived by the current landowner and adjacent neighbors may be subject to opinion. Therefore, definitions from the Washington Department of Labor and Industries Standards should be used to quantify safety zones in relation to standing mature trees. First determine the height of the tree or the portion that would dislodge and add one half of its length. The hazard area forms a circle around the tree with a radius equal to 1 1/2 times the length of the total tree height, creating a potential strike zone. The goal of tree evaluation and risk management should be to preserve the greatest number of trees within acceptable safety requirements.

Identifying individual defects that lead to a high probability of failure and taking the least disruptive action to correct the potential for failure is recommended. It is impossible to maintain trees free from risk. Levels of risk can be quantified through likelihood of failure. Tree risk assessment has four categories for likelihood of failure:

1. Improbable- not likely to fail during normal weather conditions and may not fail in many severe weather conditions.
2. Possible- Failure could occur but is unlikely during normal weather conditions.
3. Probable- Failure may be expected during normal weather conditions.
4. Imminent -Failure has begun and most likely to occur in the near future.

A primary goal of tree risk assessment is to provide information about the level of risk posed by a tree over a specific time period. This is accomplished by two determinations.

1. The likelihood of failure, and evaluation of the structural conditions that may lead to failure, the potential loads on the tree and the trees' adaptations to weakness.
2. An evaluation of the likelihood that a tree or branch could strike people or property. Assessing the targets' values and potential damage can assist in creating an estimate of the consequences of failure.

Wind and the transfer of energy to trees is the main concern. Wind energy is absorbed by standing trees either by dissipation within the tree or transferred down to the roots and soil. Leaf and

twig movement dissipate most low wind energy. An increase in wind velocity will increase the size of branch structure that will experience movement. When wind forces are high enough to bend the trunk, greater amounts of energy are transferred down to the soil through the trunk and root system. When a tree lacks interior branching, there is less dissipation of energy within the crown, allowing more force to transfer to the trunk, leading to high amounts of stress in the trunk and root system. Most wind storms originate out of the south by southwest. Strong winds can also derive from the north by northeast. As the property begins to be cleared, tree canopies will have a larger “sail” effect. Larger “sail” effect coupled with periodically inundated soils may lead to failure

On this site, as individual trees are removed, the changing wind dynamics may create issues affecting stand stability as well as individual tree stability. When a mature stand of trees is selectively thinned for development, the remaining trees are more exposed to the influence of wind, and may suffer wind damage. Wind damage can range from broken twigs and limbs to the uprooting of the entire tree. The greater the degree of thinning and the denser the original stand, the greater the chances for wind damage to the residual trees.

Failure occurs when a load exceeds load carrying capacity. Expected loads on the residual stand will originate from wind, snow, rain and ice. Tree crown, shape, foliage density and soils must be considered for potential load bearing, identifying zones of weakness that can magnify the stress is important. Trees on site with tall height and narrow diameters are levers for wind forces. This effect can multiply the force, especially if zones of weakness are present. An unbalanced crown and low live crown ratios under wind loads can twist the tree creating torsion. Torsion stress can create tree part failure or vertical cracks in the trunk.

## Recommendations

The timber types on site vary. Recommendations for best management practices will be quadrant specific to address specific concerns for the planned development. A majority of the community will be constructed in the northwest and southwest quadrants. Access will originate from the east, off Richard Street. The access road will be built on an old road grade in an east/west orientation. The road will reach the toe of the hill and proceed to increase in elevation. A switchback will be utilized to access the northwest and northeast quadrants.

Northeast and southeast quadrants will have the least disturbance due to existing wetlands. The largest impact will be the new road rebuild and retention pond construction. Best practices for road operations and retention pond construction are to establish a centerline of the road and footprint for the pond. Once established, create a 35 foot right of way on each side of the road and 35 foot clearing around the retention pond. All trees and shrubs should be removed from this area. The clearing out of all vegetation in the right of way is very important for road establishment and pond maintenance. The space is needed for ditch lines, sewers, streetlights, bike lanes, sidewalks and areas for street trees. Once the right of way is cleared, it is recommended to have a certified arborist with tree risk assessment qualifications return to identify trees located within one tree length and a half, with potential to fall and strike the planned road and retention pond. The tree species and current conditions on site dictates three potential options to mitigate for future hazards:

1. Remove all hardwood trees within striking distance of the road and retention pond and replace with native and ornamental trees that will not exceed 20-30 feet in height.
2. Allow the large conifer tree individuals to remain when tree heights and tree leans prove safe.
3. Certified Arborist site visit to identify any potential hazard trees before development begins.
4. No action. Not recommended

Northwest and southwest quadrants will contain the highest level of development. Trees have been flagged in this area that meet criteria for advanced regeneration trees for a neighborhood. Native trees retained have good canopy structure and proper tree lean. These trees have been marked for retention but may need to be removed during the construction process for safety and construction practices. Please see Table 1.

Two polygons of mature conifer forests will remain on the steeper slopes. One stand in the northwest corner, the other stand straddles the northeast quadrant. Once the area for construction is cleared, it is recommended to have a certified arborist with tree risk assessment qualifications return to identify trees located within one tree length and a half, with potential to fall and strike the planned community. The tree species and current conditions on site dictates three potential options to mitigate for future hazards:

1. Remove all hardwood trees within footprint of planned community that have potential to strike people and personal property and replace with native and ornamental trees that will not exceed 20-30 feet in height.
2. Allow all flagged trees for retention to exist as yard and street trees
3. Certified Arborist site visit to identify any potential hazard trees before development begins.
4. Remove all trees. Not recommended

The tree recommendations are made addressing individual trees over many growing seasons. Tree issues addressed in this report are samples of the tree issues observed on this tract of land. In general, there appears to have been little to no maintenance on the trees. The planting of a conifer tree in an urban environment should only be considered if the planting site is appropriate. Conifer trees can grow to be of large stature on the landscape and can provide for high quality wildlife habitat but can present many potential hazards over time.

After removal of the trees and the completion of the development, it is recommended that native plants and trees be planted in their place. Suggested trees and shrubs to be planted in place of the removed trees range in height at maturity from ten to sixty five feet and are listed below.

Western Crabapple (*Malus fusca*) 9-40' tall  
Redoiser Dogwood (*Cornus stolonifera*) 6-20'  
Twinberry Honeysuckle (*Lonicera involucrate*) 3-10' tall  
Flowering Dogwood (*Cornus florida*) 15-40' tall  
Oregon Ash (*Fraxinus latifolia*) 30-65' tall



## Terms and Conditions

1. Care has been taken to obtain all information from reliable sources. The consultant can neither guarantee nor be responsible for the accuracy of information provided by others.
2. Consultant shall not be required to give testimony or to attend court by reason of any report unless subsequent contractual arrangements are made, including payment of additional fees.
3. Any legal description provided to the consultant will be assumed to be correct. No responsibility will be assumed for matters legal in character.
4. Missing pages or alteration of any report invalidates entire report.
5. Possession of a report does not imply right of publication without the prior expressed written or verbal consent of the consultant.
6. Sketches, diagrams, graphs and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.
7. This report expressed herein represent the opinion of the consultant and the consultant's fee is in no way contingent upon the reporting of a specified value, a stipulated result, the occurrence of a subsequent event nor upon any findings to be reported.
8. Unless expressed otherwise, the information contained in this report covers only those items that were examined and reflects the condition of those items at the time of inspection.
9. Inspection is limited to visual examination of accessible items on this property without dissection, excavation, or probing.

---

Patrick Sullivan  
ISA Certified Arborist PN-7123A



**Table 1. Tree Talley and  
Tree Characteristics.**

Tree ID	Species	Height (feet)	Diameter (inches)	Tree Characteristics
Q1	Douglas Fir	115	24	Live crown ratio 30% 1 degree lean to the north Overweighted canopy to the north
Q2	Douglas Fir	60	8	Live crown ratio 25% 1 degree lean to the north
Q3	Douglas Fir	30	7	Live crown ratio 60% 0 degree lean Top broken out
Q4	Douglas Fir	90	27	Live crown ratio 35% 1 degree lean to the north Overweighted canopy to the north Top broken out; response growth observed
Q5	Douglas Fir	67	10	Live crown ratio 45% 0 degree lean
Q6	Douglas Fir	40	7	Live crown ratio 40% 0 degree lean
Q7	Douglas Fir	40	6	Live crown ratio 30% 0 degree lean Broken top
Q8	Red Cedar	60	16	Live crown ratio 95% 0 degree lean
Q9	Douglas Fir	60	8	Live crown ratio 25% 1 degree lean to the north
Q10	Douglas Fir	140	26	Live crown ratio 50% 1 degree lean to the north Overweighted canopy to the northeast
Q11	Douglas Fir	120	20	Live crown ratio 25% 0 degree lean
Q12	Douglas Fir	70	11	Live crown ratio 25% 0 degree lean
Q13	Douglas Fir	69	11	Live crown ratio 20% 1 degree lean to the south Overweighted canopy to the north

Tree ID	Species	Height (feet)	Diameter (inches)	Tree Characteristics
Q14	Douglas Fir	83	14	Live crown ratio 65% 0 degree lean
Q15	Douglas Fir	135	35	Live crown ratio 35% 0 degree lean Overweighted canopy to the north
Q16	Douglas Fir	65	9	Live crown ratio 30% 1 degree lean to the northwest
Q17	Douglas Fir	65	9	Live crown ratio 30% 2 degree lean to the northwest
Q18	Red Cedar	62	16	Live crown ratio 90% 0 degree lean
Q19	Red Cedar	49	9	Live crown ratio 85% 1 degree lean to northwest
Q20	Douglas Fir	60	11	Live crown ratio 20% 3 degree lean to northeast
Q21	Douglas Fir	60	11	Live crown ratio 20% 1 degree lean to the south Overweighted canopy to the north
Q22	Douglas Fir	60	16	Live crown ratio 90% 0 degree lean
Q23	Red Cedar	50	12	Live crown ratio 35% 3 degree lean to the east
Q24	Red Cedar	25	6	Live crown ratio 20% 0 degree tree lean
Q25	Red Cedar	50	12	Live crown ratio 70% 2 degree lean to the north
Q26	Douglas Fir	50	12	Live crown ratio 20% 0 degree lean Top broken out
Q27	Red Cedar	40	15	Live crown ratio 90% 5 degree lean to the southwest Overweighted canopy to the southwest

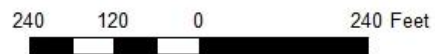
# Appendix A



Queen Mountain Platt  
1:2,500

### Legend

-  County Tax Parcels with Ownership
-  Survey - Section Lines
-  Survey - Township Lines
-  Individual Trees



## References

ANSI A300 (Part 1)- 2008 American National Standards Institute. American National Standard for Tree Care Operations: Tree, Shrub, and Other Woody Plant Maintenance: Standard Practices (Pruning). New York: Tree Care Industry Association, 2008.

Lilly, Sharon. Arborists' Certification Study Guild. Champaign, IL: The International Society of Arboriculture, 2001.

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

Pirone, P., Hartman, J., Sall, M. Tree Maintenance Sixth Edition. New York, 1988.