

Tree Protection and Retention Plan

for Northwood Elementary



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Assignment

I was hired to provide a tree retention plan for significant trees located at the Northwood Elementary School located at 9805 24TH ST E, Puyallup, WA 98371. The tree retention plan shall also show the location, species, and drip line of each significant tree that is intended to qualify for retention credit, and identify the significant trees that are proposed to be retained, and those that are designated to be removed. My report is to be based on the tree retention requirements in the Edgewood municipal code. (EMC 18.90.180)

Limits of Assignment

This tree retention plan address only the significant trees located within the lot boundaries of the Northwood Elementary School. These trees were identified in a previous tree inventory and clarified by the availability of a site plan showing where the new infrastructure will be located.

Unless stated otherwise, the information contained in this report covers only the trees I examined, and reflects the condition of these trees at the time of inspection. My inspection is limited to visual examination of the subject trees as prescribed for a level 2 Tree Risk Assessment in the *ISA Best Management Practices: Tree Risk Assessment: International Society of Arboriculture: 2011*.

Purpose and Use of the Report

This report will identify the significant trees that are being retained, which ones are being removed, and the required number of replacement trees that will be needed to offset any significant tree removal. This will be used during submittal of plans for review and approval to the City of Edgewood Department of Planning and Development.

Observations

There are a total of 23 existing significant trees within the boundaries of the site plan. Two of these, a red alder (tag #694) and a Douglas-fir (tag #695) will be removed during the development. Otherwise, the location of proposed infrastructure - entry drive, play areas, and parking lots have been situated to preserve the other significant trees I identified in my original survey. The following table shows all of the significant trees:

Tree Species	Tag #	DBH	CRZ	Height (feet)	Structure	Health	Suitability	Impact of Preservation on Construction
White birch <i>Betula pendula</i>	678	18	18	58	Fair	Good	Fair	Minor
red cedar <i>Thuja plicata</i>	679	45	45	75	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	680	23	23	63	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	681	28	28	27	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	682	29	29	53	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	683	25	25	72	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	684	16	16	50	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	685	18	18	42	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	686	24	24	55	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	688	21	21	75	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	689	31	31	75	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	690	26	26	70	Good	Good	Good	Negligible
red cedar <i>Thuja plicata</i>	692	35	35	67	Good	Good	Good	Minor
White birch <i>Betula pendula</i>	693	21	21	45	Good	Good	Good	Minor
red alder <i>Alnus rubra</i>	694	15	19	47	Poor	Good	Poor	Extreme
Douglas-fir <i>Pseudotsuga menziesii</i>	695	35	35	76	Excellent	Good	Good	Extreme

Tree Species	Tag #	DBH	CRZ	Height (feet)	Structure	Health	Suitability	Impact of Preservation on Construction
Coast redwood <i>Sequoia sempervirens</i>	701	27	27	50	Good	Good	Good	Minor
Douglas-fir <i>Pseudotsuga menziesii</i>	702	18	18	58	Good	Good	Good	Minor
Douglas-fir <i>Pseudotsuga menziesii</i>	704	26	26	78	Good	Good	Good	Significant
Douglas-fir <i>Pseudotsuga menziesii</i>	705	21	21	73	Good	Good	Good	Significant
Douglas-fir <i>Pseudotsuga menziesii</i>	706	15	15	76	Good	Good	Good	Significant
Douglas-fir <i>Pseudotsuga menziesii</i>	707	16	16	76	Good	Good	Good	Significant
Douglas-fir <i>Pseudotsuga menziesii</i>	708	16	16	77	Good	Good	Good	Significant

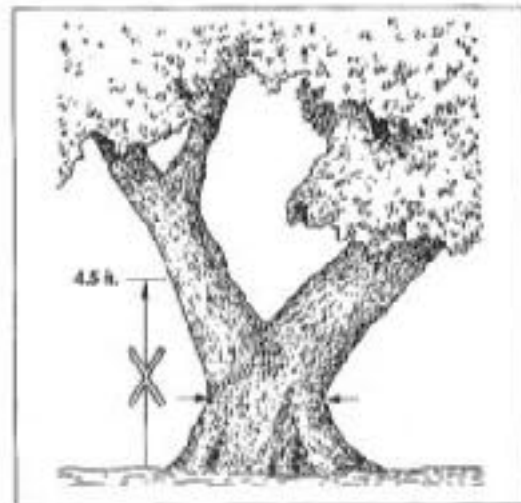
Analysis

Tree Measurement

I measured the tree at the smallest circumference at or below four and a half feet from grade with a forestry tape marked in tenths of feet. The opposite side of the tape is numbered to correspond to the diameter of the circle being measured around the tree. The girth of a tree is typically expressed in terms of the DBH (diameter at breast height); however, I use of the circumferential measurement CBH (circumference at breast height) as this gives a more accurate representation of the size of the tree since tree trunks are often not perfectly round.

Municipalities differ in regard to standards for girth measurement. If my assignment is governed by a municipal code I use whatever criteria is determined by the governing authority.

I used the TruPulse® 200 laser inclinometer to measure the height of the tree. The TruPulse® 200 measures the distance from the device to an object and the angle at which the devices being held. I used a vertical distance setting in comparison with a height measuring routine to assess tree heights. By comparing the two different modes, and taking at least three readings, I can measure tree heights accurately to within 6 inches. When using a ground-based height measuring device, assumptions must be made; that both the true grade level and the uppermost portion of the tree is observable and that the top of the tree is directly vertical from the base. If these conditions are not in evidence, measuring tree height becomes more difficult. (Van Pelt, 2003)



Visual Tree Assessment

I use a Visual Tree Assessment (VTA) method to evaluate tree health and structure. The VTA is an ordered analysis of a tree that observes current growing conditions and tree structure. I am able to compare a tree with other trees I have observed to note typical patterns and abnormalities that may be present. The observations are based on my knowledge of tree structure and conditions as well as my past experiences as an arborist. (Lilly, 2001)

Discussions

Condition and Structure Rating

Tree condition is typically described as a factor of overall health and the structure of the tree. These are based on an evaluation of the foliage and buds, small twigs, scaffold branches, the trunk, the trunk flare, any roots that may be visible and the general site condition around the tree.

Poor - These are trees that have poor health, major structural defects that influence potential stability. These trees will not likely survive on site long-term without extensive mitigation efforts. This category includes dead trees. (However, there are cases where a dead tree will have sufficient structure to warrant consideration as a standing dead snag for ecological purposes.)

Fair - Trees with fair health and structure will have some issues with vigor and may have some major structural defects. With extensive mitigation they can be retained but will likely need long-term management.

Good - Trees in good health and structure have only minor negative characteristics or even no visible defects. They are good candidates for retention and will need little if any follow-up care.

Excellent - Any tree in excellent health and structure is likely to be significant in terms of location, quality, or size. These may be young trees and will have a full crown with very good site characteristics.

Critical Root Zone

A Critical Root Zone (CRZ) is established based on a tree's condition and its size. The standard in the arboricultural industry is based on a calculation of one foot of protected radius for each inch of trunk diameter. This is then factored up or down based on a tree's age, species tolerance, and current condition. It is generally accepted that if this formula is used and adhered to, trees will survive a development process.

When considering which trees are best preserved in a development area, the CRZ can be implemented into site plans. Often it is recommended to preserve trees with overlapping CRZ to ensure the maximum numbers of trees are preserved. It is also important to note that smaller trees will have a much smaller CRZ needed and can be much easier to retain.

Suitability for Preservation

The species characteristics, potential longevity, health, structure, and age class of a tree are factors that determine how suitable a tree is for preservation. I rate these using a scale of poor, fair, good, or excellent. These are described below:

Poor - Trees in poor health and/or with significant structural defects that cannot be mitigated. These will likely decline regardless of attempts to preserve them. Often these are species of trees with undesirable landscape characteristics or are incompatible with the future site development.

Fair - Trees with a fair suitability rating will have some less than optimal conditions that can be mitigated with intense management. They will require greater areas of site protection and monitoring throughout the development process. It is probable that without this mitigation the tree will decline and/or have a shorter life span than a tree in good or excellent condition.

Good - Trees with good suitability for preservation will have good condition structural characteristics and will have a high likelihood of long-term survivability. They will still need to have tree protection but these will need less extensive if any mitigation besides root zone restrictions.

Excellent - Trees with an excellent suitability for preservation are those that have a very high likelihood of having a full life span. They are often smaller trees on development sites that will require limited root zone restrictions. These are likely to be species of trees with a high tolerance for many conditions.

Construction Impact Rating

Construction impact is a means of assessing how the actual development process will affect the condition and suitability of an individual tree for preservation. For example, a tree in good condition and that is suitable for preserving for other reasons may be located too close to an area on the site that will contain underground utilities and the only reasonable way of implementing the construction plans would result in too many roots being cut. Or the tree may be located in the middle of the new building footprint. In these cases the construction impact rating helps to guide whether or not changes can be made to the plan or if great effort should be made to preserve an otherwise suitable tree. I divide the construction impact rating into four categories:

Extreme - These are trees that will have an extreme impact on the construction process if they are required to be retained. Preservation will require drastic efforts or creation of an entirely new set of construction plans in order to successfully retain the tree.

Significant - Trees where retention could be considered but it will require more than normal efforts to successfully retain the tree. Examples would be trees where the majority of the CRZ is located within an area that will receive high use during construction and where no other means of access around the tree can be protected. These will require constant or frequent monitoring and mitigation of damage after construction occurs and may still not survive the development activities.

Minor - These are trees where normal tree protection will be required. Examples are trees where the CRZ can be fully protected even though construction personnel will need to pay attention to be careful not to violate any tree preservation restrictions.

Negligible - These are trees where normal tree protection will not impact the construction and development in any way. These will often be trees that are located some distance away from any area where construction will occur.

Tree Replacement Criteria

The Edgewood Municipal Code requires that any significant tree removed be replaced at a rate of 1.5 times to one of the total diameter inches of all trees removed. It also allows for existing trees between three and twelve inches in diameter that are retained to be counted against the on-site replacement requirements. This is similar to other municipal replacement guidelines in principal. Some areas require a calculation of tree “units” based on diameter calculations with either a minimum number of units required overall, or replacement of lost units.

Tree Preservation Fencing

Trees to be protected during construction must have physical barriers in place to prevent access to the area near the tree and to prevent disturbance of the roots within the protected area. The standard within the City of Edgewood is for “an area free of disturbance, corresponding to the drip line of the significant tree’s canopy shall be identified and protected during the construction stage with a temporary three-foot-high chain-link for plastic net fence. No impervious surfaces, fill, excavation, storage of construction materials, operations or parking of vehicles shall be permitted within the area defined by such fencing.” (EMC)

The Pierce County code calls for similar protection fencing. But in addition to fencing calls for signage to be posted that clearly identifies the tree protection area. (PCC 18J.15.130.C.1)

Within the tree care industry, the standard for care has become more stringent, with six-foot high protective chain-link barriers installed in a semi-permanent fashion. (See Appendix C)

Conclusions and Recommendations

Tree Removal and Replacement

The two significant trees to be removed have a combined measured DBH of 50 inches. Based on municipal replacement requirements at one and a half times the total measured diameter of the significant trees removed there will need to be at least 75 inches of replacement trees provided. The Edgewood Municipal Code requires all replacement trees to be at least two inches in diameter. There will also be three existing non-significant trees retained between three and twelve inches diameter whose combined diameters can be counted against the required replacement calculation. Therefore a minimum of 17 trees will need to be planted to offset the removal of the two significant trees. (See the following two charts)

Significant trees to be removed	DBH	
red alder #694	15"	
Douglas-fir #695	35"	
Total Replacement Diameter inches (DBH X 1.5)		75 Diameter Inches

Retained trees between 3 and 12" DBH	DBH	
birch #675	11"	
holly #687	11"	
Western hemlock #700	8"	
Western hemlock #703	12"	
Total Retained Diameter Inches		42 Diameter Inches

Based on the available site plane there will be in excess of 150 new trees installed during the landscaping portion of the project.

The development plans meet the city's requirements for tree retention and planting.

Tree Protection Plan

The purpose of a Tree Protection Zone (TPZ) is to protect all of the roots, both large, structural roots and fine, non-woody, absorbing roots from any damage. Therefore, any TPZ should be established at the beginning of the construction project and remain in place throughout the duration of the entire project. Specifically, the following guidelines should be followed:

- Follow municipal guidelines in establishing three-foot high protective barriers around all trees to be retained.
- Tree Protection Fencing should have signage at 10 foot intervals that state in unequivocal terms that access into the TPZ is prohibited. (See Appendix C for examples.)
- When possible create a wider zone of protection when preserving a group of trees, using the largest tree protection zone as a basis for protecting all the trees within a grouping. (See Appendix B for specific TPZ recommendations.)
 - Around the trees where there will be some encroachment into a CRZ the TPZ can be expanded in directions where there will be no need to encroach on the TPZ. For example, around the grouping of Douglas-fir trees located between the main parking lot and play area, the TPZ will be limited on the east and west by the sidewalk and asphalt pathway, however, the zone can be expanded in a north-south direction creating a larger area of TPZ.
- The tree protection around the grouping of trees #700 - 703 will need monitoring during the phase of construction that will involve demolition of the existing sidewalk, asphalt, and split-rail and chain-link fencing. The TPZ can be reduced during this phase sufficient to allow access for the demolition work and then reinstalled at the proper distances for the duration of the project. (See Image 1)
- The tree protection around the grouping of trees #704 - 708 will need monitoring during the phase of construction that will involve demolition of the existing asphalt walkways and chain-link fencing. The TPZ can be reduced during this phase sufficient to allow access for the demolition work and then re installed at the proper distances for the duration of the project. (See Image 1)
- All trees to be retained should have a layer of uncomposted wood chip mulch installed under their drip-line to a minimum depth of eight inches. This mulch layer should remain during the entire duration of the project and should be incorporated into the final landscaping portion of the project as well.
- There should be no grade changes in any of the Tree Protection Zones.
- If access is needed into a TPZ, a qualified arborist should be consulted and should monitor the trees and any construction activities during the period of time that the TPZ is being accessed.

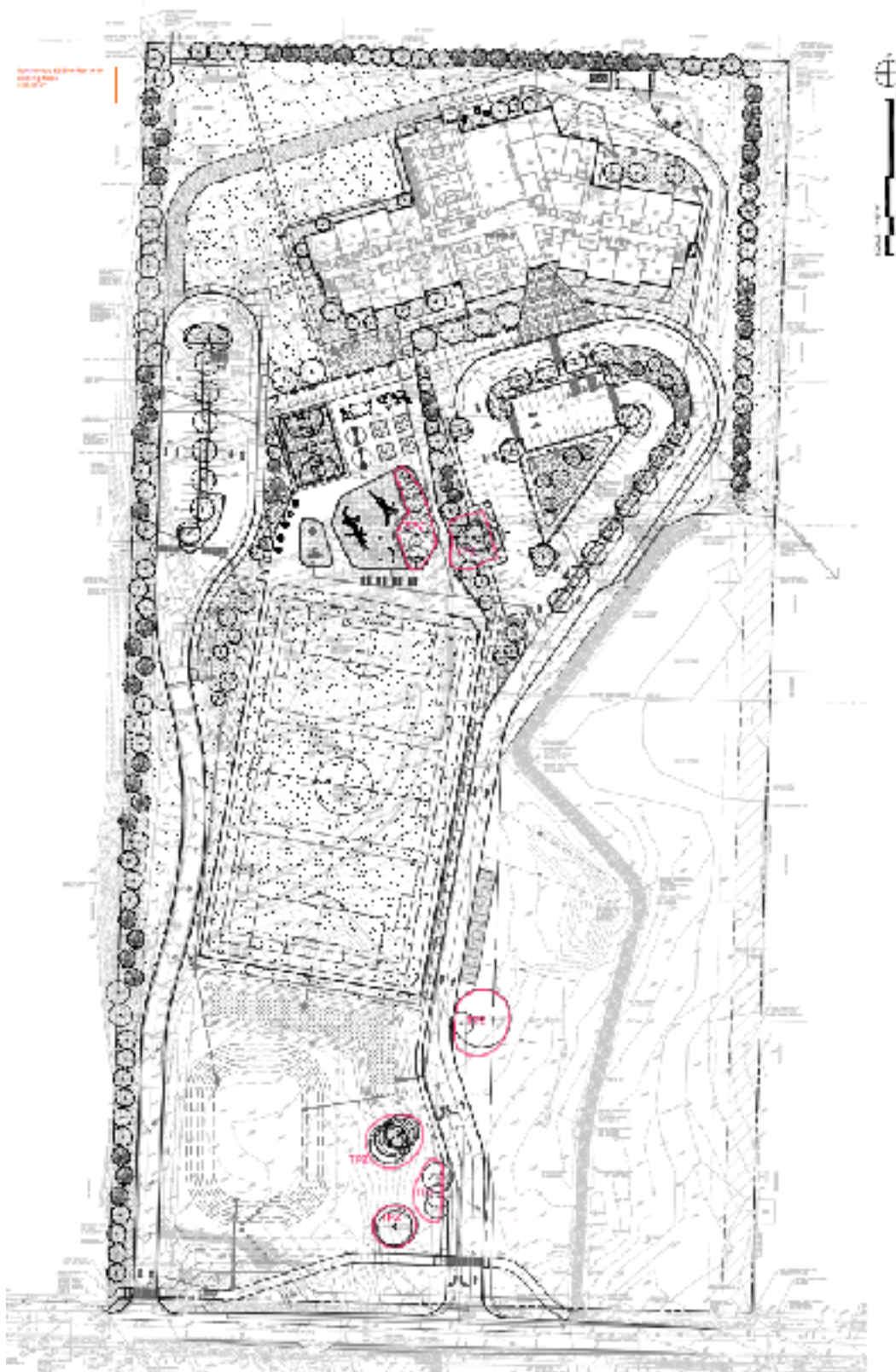


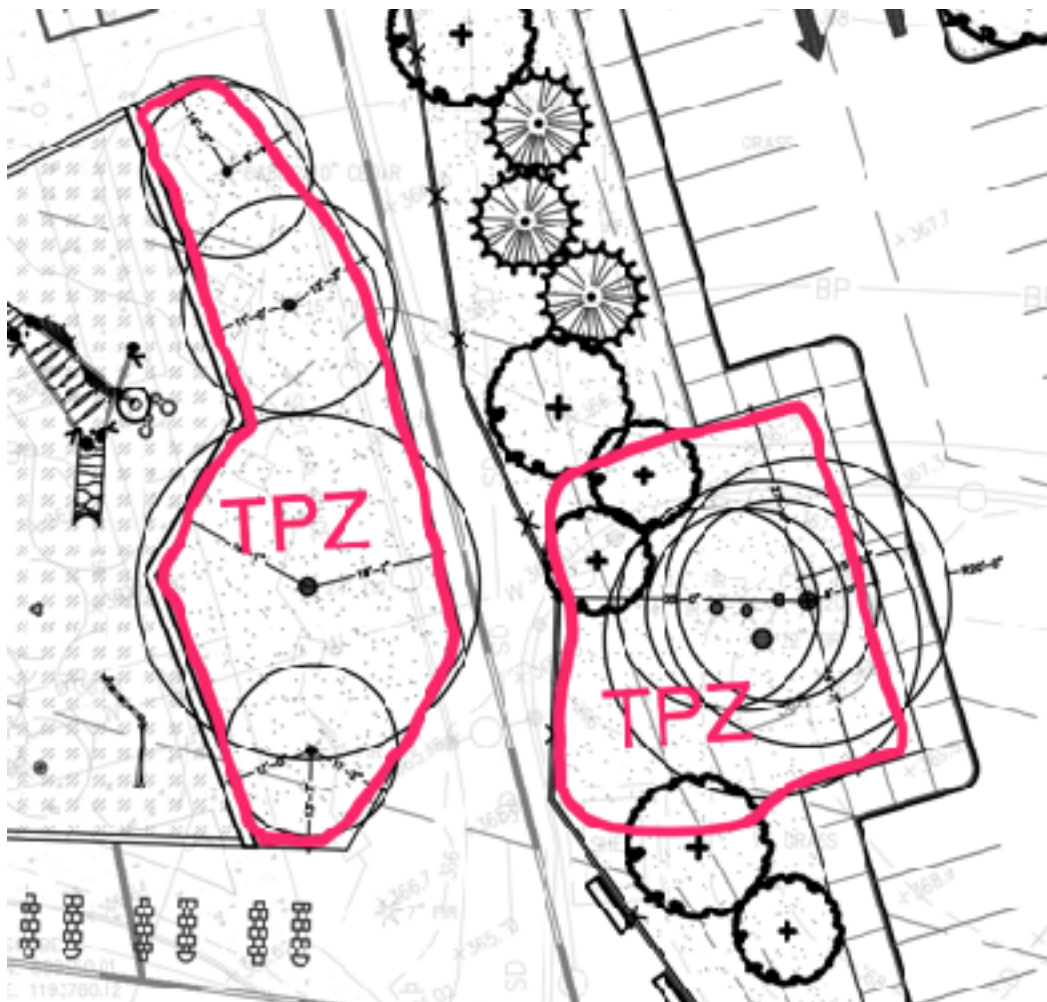
Image 1 - The Tree Protection Zones will eventually encompass areas where current infrastructure will need to be demolished as indicated by the arrows in the image above. A temporary TPZ can be installed around the trees to be retained until demolition is complete, after which the recommended TPZ can be installed.

Appendix A - Site Map



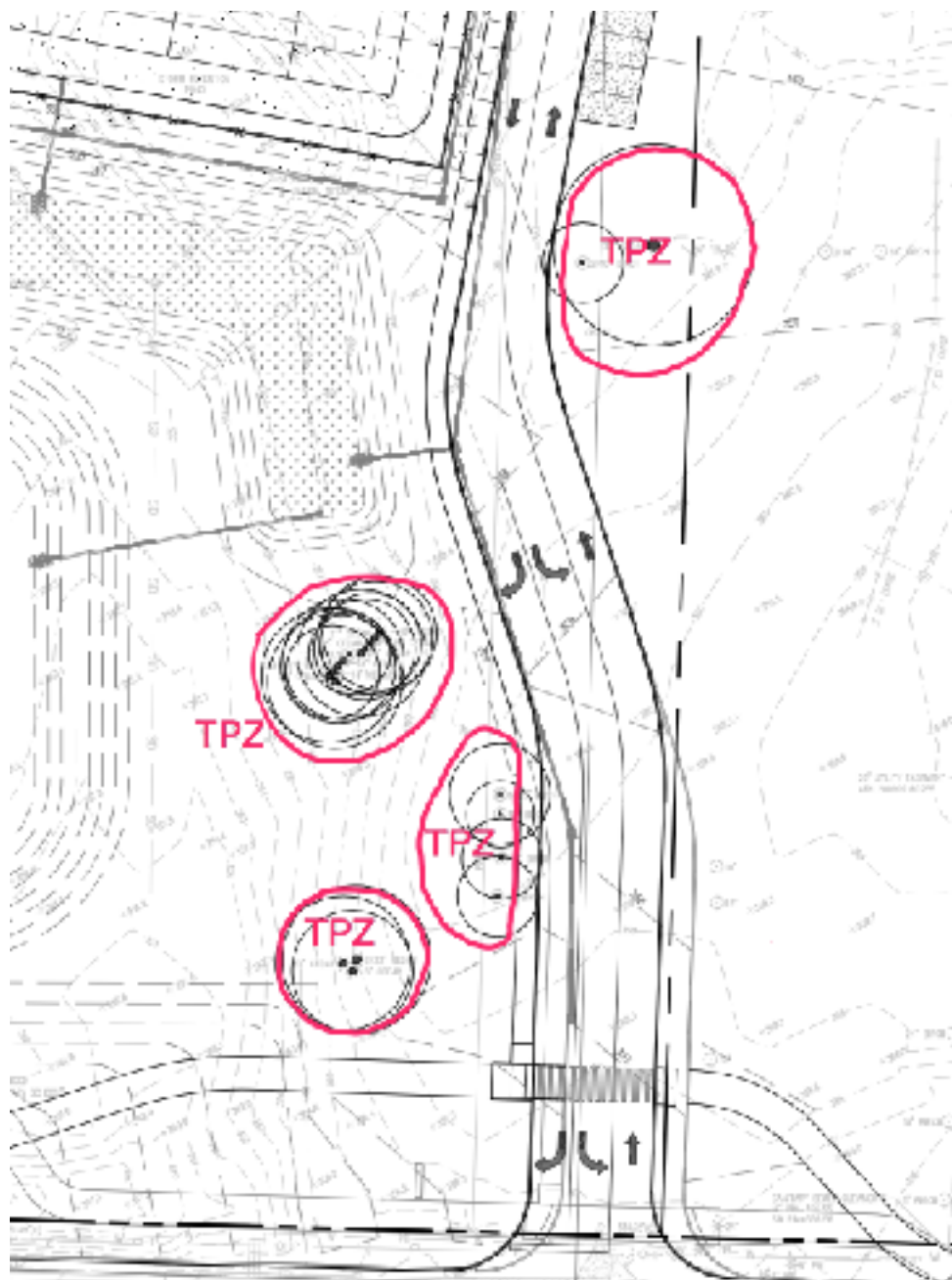
Appendix B - Site Plan with TPZ Details





Details for the Tree Protection Zones around Trees #700 - 708. The purpose of this image is to illustrate the asymmetrical area of a TPZ that will provide access for construction while preserving a maximum area of potential root zone for the greatest number of trees.

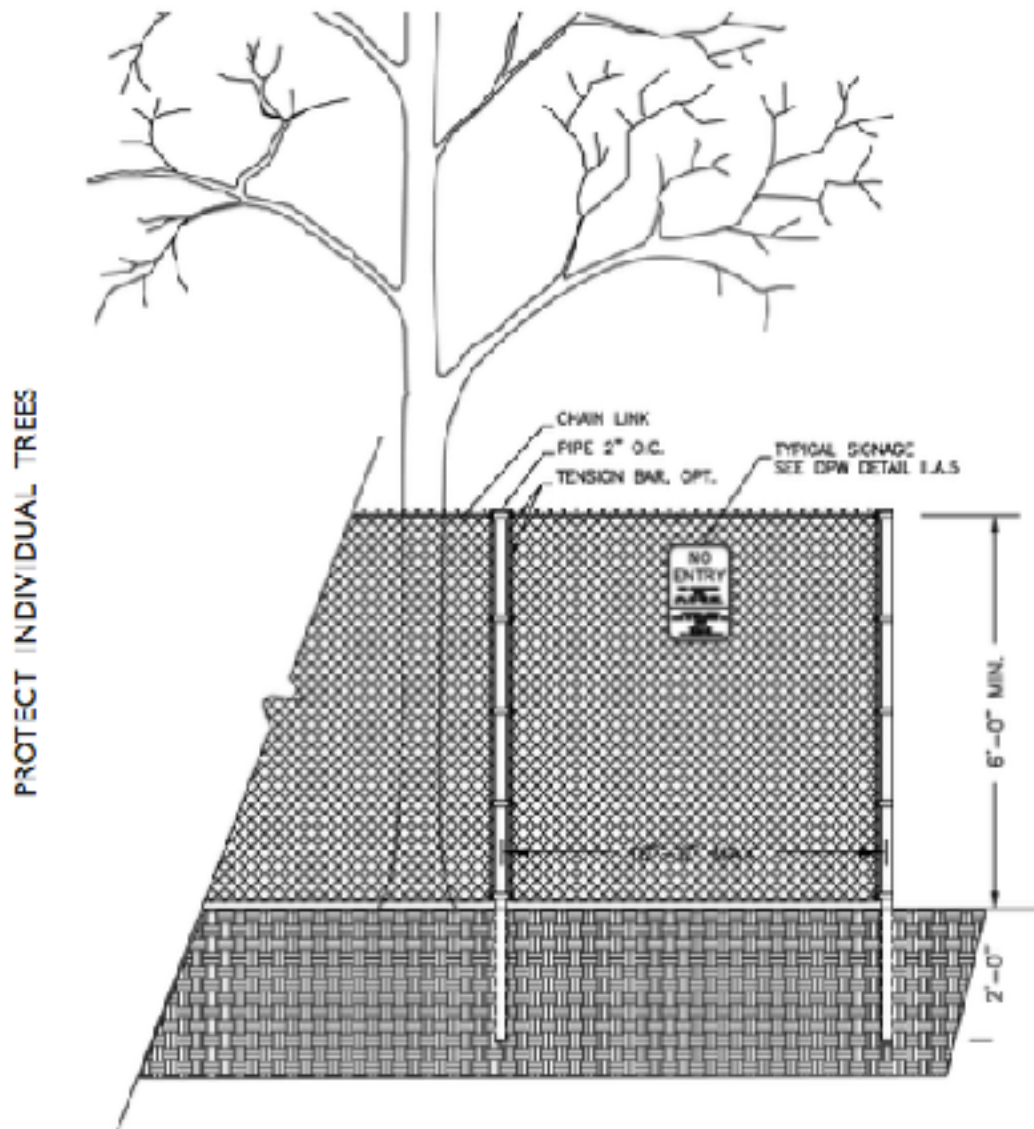
In both areas indicated by the red, hand-drawn line, the TPZ will need to be accessed for demolition of the existing infrastructure (sidewalks, etc...) and then reinstalled at the maximum allowable area as suggested above.



The hand-drawn, red lines above are suggested areas that will encompass the maximum amount of area for each TPZ.

Note the two Tree Protection Zones that will be nearest the access/entry road - These should be established with the sidewalk or roadway as one edge of the TPZ fencing and expanded beyond the dripline and/or CRZ measurement to account for a maximum area of protected root zone.

Appendix C - Tree Protection Fencing



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

NO ENTRY

Tree Protection Zone

ABSOLUTELY NO ACCESS

Appendix D - Bibliography

Accredited Standards Committee. ANSI A300 (Part 9)-2011 Tree Risk Assessment a. Tree Risk Assessment. Londonderry, NH: Tree Care Industry Association, 2011

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

Mattheck, K; Breloer, H. The Body Language of Trees, a Handbook for Failure Analysis. London England: Her Majesty's Stationary Office, 1994

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Van Pelt, Robert. Forest Giants of the Pacific Coast. Seattle, WA: University of Washington Press, 2001

Appendix E - Glossary

Arboricultural – Of or pertaining to the care of trees.

Cavities – Hollow areas in the trunk or branches of a tree.

Canopy – The part of a tree that contains foliage.

Conifers – A tree that produces cones as opposed to fleshy fruit.

Crown – The entire upper portion of a tree that contains branches, leaves, and stems, including dead parts.

Crown opacity – A reference to the amount of background light is visible through a tree's crown.

CRZ - CRZ is the acronym for the Critical Root Zone, an area determined to hold the bulk of a tree's roots, usually determined in conjunction with tree preservation.

Decurrent – Describes a tree that is more rounded in shape due to a loss of a single dominant stem.

Epicormic – Foliage and branches that have sprouted after a portion of the tree has broken.

Excurrent – Describes a very upright shape in a tree's growth due to a single dominant stem.

Growth rings – The yearly incremental growth that can be seen as rings in a stump.

Scaffold– The main structural limbs defining the canopy of a tree.

Soil horizons – The different layers of soil ranging from primarily organic material to primarily mineral content per the depth of the soil.

Structural roots – Large diameter roots that are integral to tree stability.

TPZ - An acronym for Tree Protection Zone, similar to a CRZ or Critical Root Zone, the TPZ is established with the intention of preserving or protecting as much or more of a CRZ as possible.

Trunk – The main woody part of a tree. For the purposes of this report this is the portion of the tree between the ground and the first branch.

Trunk flare – The area on a tree where the trunk and roots interface.

Vitality – A tree's ability to grow, reproduce, and adapt to its growing conditions.

Appendix F - Assumptions & Limiting Conditions

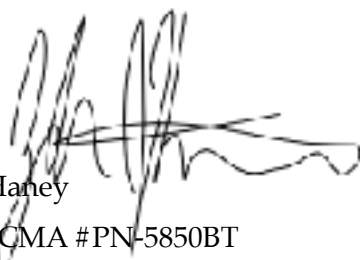
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2. Consultant assumes that the property and its used do not violate applicable codes ordinances statutes or regulations.
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10. Loss or alteration of any part of this agreement invalidates the entire report.

Appendix G - Certification of Performance

I, Zebadiah J. Haney, certify that:

1. I have personally inspected the trees in properties referred to in this report and have stated my findings accurately.
2. I have no current or prospective interest in the tree or the property that is the subject of this report and have no personal interest or bias with respect to the parties involved.
3. The analysis, opinions and conclusions as stated herein are my own and are based on current scientific procedures and facts.
4. My analysis, opinions, and conclusions were developed in this report has been prepared according to commonly accepted our board cultural practices.
5. No one provided significant professional assistance to me, except as indicated within the report.
6. My compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client or any other reporting 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 Registered Consulting Arborist® with the American Society of Consulting Arborists (ASCA) and that I adhere to the ASCA Standards of Professional Practice. I am a Board Certified Master Arborist®, a Certified Tree Worker Climber Specialist® and a Qualified Tree Risk Assessor through the International Society of Arboriculture (ISA). I have been involved with the practice of Arboriculture since 1999.



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