Teragan & Associates, Inc.

Terrence P. Flanagan **Arboricultural Consultants**

Oregon White Oak (*Quercus garryana*)
Evaluation of Tree
Tree Protection Plan
Kronberg Park
February 21, 2012

Prepared for:

Wendy Hemmen, PE
City of Milwaukie
6101 SE Johnson Creek Blvd.
Milwaukie, OR 97206

Prepared by:

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Summary

It is possible to retain this tree during the construction of the Tri-Met Milwaukie line. It should be realize that given the very large equipment and materials that will be used to construct the line and the bridge that is to be just west of this tree, it will be a difficult process that will take extra time, care and funding to pull off successfully.

The subject tree of this report is a mature tree that is healthy with very few defects that are significant . If the tree was not to be impacted by construction, it would have a safe, useful life of many years into the future. With the planned construction of the Tri-Met bridge this tree will be impacted by the construction process. The success of protecting this tree to insure that it continues to have a long life will depend on the dedication of the construction firms and others that are to work around this tree from the start of the project through the completion.

Introduction

Assignment

1. An initial visual evaluation of a 36-inch Oregon white Oak located in Kronberg Park. Evaluation to include a visual assessment of the tree's health and structural condition from the ground to determine the tree's existing condition and determine the need and location on tree for additional sonic tomography measurements.
2. Meet with client, Tri-Met and contractor(s) as desired by the client, City of Milwaukie to provide information on the location of the rail line, the location of improvements to occur in the vicinity of the tree of all construction plans that may impact the tree and possibility of processes available to limit impacts to the tree.
3. Second site visit to complete more intensive evaluation of the tree utilizing sonic tomography. A total of six sonic tomography measurements are included in the bid price. Additional test locations can be done after consultation with the client on the need and benefit of such additional tests.
    a. Tests to include sonic tomography of the lower trunk and main scaffolds of the tree.
4. Written recommendations for long term care of the tree.
5. Review of arborist report provided by Mark W. Hynson of Mason, Bruce & Girard, Inc.
6. Provide a written report outlining the findings and recommendations of the evaluation of the tree.

Limiting Conditions

No root crown excavation was done to inspect the root condition of the tree as no sign or symptom was present to indicate that the roots have been compromised.

Generally when work is completed in proximity to trees that are to be retained on site during the construction project, the project arborist is required to oversee any construction activity that may occur within the critical root zone of the tree. The critical root radius of a tree can be 18 times the diameter of the tree measured out from the center of tree on a radius. The oversight during the construction of the project is not included as part of this report as work has not started. It is also not part of the proposal that was presented to complete this tree evaluation.

Purpose and Use of the Report

The purpose of this report is to evaluate if the health and structural condition of the tree to see if it warrants an effort to work around the tree while building the new Tri-Met line. If the tree warrants the effort, the report is also to lay out a tree protection plan that would direct the construction activities in the vicinity of the tree to protect its long term survivability.

Investigation Methods

A visual assessment was completed on February 7, 2012 by me, Terrence P. Flanagan, prior to the meeting on site with Wendy Hemmen from the City of Milwaukie, a representative from Stacy and Witbeck, Inc., Steve Schantzen and Jeff Johnson from Tri-Met. During the first site meeting, an initial review of the construction processes for the installation Tri-Met bridge on the tree was discussed.

A second site visit was completed on February 9, 2012 to complete sonic tomography measurements on the tree as well as additional discussion regarding the construction process and the possible impacts on the tree. During this site visit a sample of fruiting conks was removed from the surface of the bark from the tree on the southwest side of the tree that was sent to the OSU pathology lab for identification and analysis.

A third visit was completed on February 15, 2012 to complete an aerial inspection of a branch graft and unusual configuration of a large diameter branch attachment in the crown of the tree.

A fourth site visit was completed on February 16, 2012 to complete tree measurements in regard to tree height, branch height and drip line extension of the tree.

Site Description

The oak tree is located on the western side of Kronberg Park just east of existing wooden rail trestle, north and east of McLoughlin Blvd., south of Kellogg Lake. Kronberg Park is an undeveloped park owned by the City of Milwaukie located at 11910 DW McLoughlin Blvd. The westernmost portion of the park has been approved for the location of a light rail bridge and the necessary construction staging.

Observations

Description and Examination of Subject Trees

The subject tree is a 36 inch diameter Oregon white oak *(Quercus garryana)*. The tree is in good health as indicated by the amount of twig growth which was between 6 to 9 inches this past growing season in 2011 and 3.5 to 4 inches the year before, 2010. Additional indicators of good health include the absence of excessive branch die back and lack of any other signs or symptoms of decline.

The visual evaluation of the tree's structural condition from the ground revealed the following;

- A cavity in one of the main leaders in the tree's northeast sector approximately 10 feet above ground level.
- An unusual configuration for a large branch that was growing almost straight down from its point of attachment on the tree's NE side approximately 30 feet above ground level.
- A broken branch, approximately 3 inches in diameter in the upper crown on the tree's SE side approximately 30 feet above ground level. .
- A branch that has grafted to one of the larger leaders on the tree's SE side approximately 25 feet above ground level.
- Broken, hanging branches in the crown of the tree.

To assess the structural integrity of the tree, sonic tomography was completed on the tree; on the trunk of the tree and lower leaders to determine if there were there are any decay pockets in the trunk, lower

leaders and the area around the cavity. An aerial inspection was also completed to inspect the aerial portions of the tree, specifically the area of attachment of the unusual branch and the grafted branch.

Discussion

Sonic Tomography Measurements

The sonic tomography measurements showed that there was little decay in any of the measurements. Tomography measurements were made at the following locations on the tree;

Measurement Height Above Ground Level	Reason for measurement	Results of tree strength loss (see appendix # 1 for the measurements)
5 cm	To determine if any strength loss due to decay might be present that would be working its way into the tree from its roots.	No strength loss in the tree at this point in the trunk of the tree.
130 cm	To determine if there were any decay pockets or other weaknesses in the main trunk that would lead to strength loss.	No strength loss in the tree at this point in the trunk of the tree.
260 cm	To determine if there were any decay pockets or other weaknesses in the upper trunk that may be associated with the decay cavity in the leader to the west above this measurement that would lead to tree strength loss.	No significant loss in strength of the tree at this point. The amount of strength loss is less than 2%
560 cm	Measurement of the widest point of the cavity opening to determine the strength loss in the leader.	No significant loss in strength of the tree at this point. The amount of strength loss is less than 4%. The tree has grown very strong reaction wood to compensate for the loss of the leader wood to decay.
620 cm	Measurement of leader above the decay cavity to determine if there was any decay in the leader above the cavity that would lead to strength loss.	No strength loss in the tree at this point in the trunk of the tree.
370 cm	This measurement was of the east leader that had to cavity to insure it was solid.	No indication of any decay. No strength loss indicated.
Combined View	Sonic tomography measurements of the three trunk readings were combined to give estimated 3-D view of any decay columns.	While this graphic does show some decay in the center of the tree as indicated by the color red, it is NOT a significant amount and has not led to any strength loss that would compromised the structural integrity of the tree.

Aerial Inspection Results

The aerial inspection of the crown did not reveal any concerns. The inspection of the unusual positioned branch revealed that it was strongly attached with no weakness apparent. The inspection of the graft of the branch to the leader also revealed a strong attachment with no concerns.

Sample of Fruiting Conks

No information has been received as of the date of this report from the OSU plant pathology lab. I do not expect that the results from the lab will indicate any concern. Given the condition of the conks, it may not be possible to identify the fungi that caused it to form. Also, given the location where the conks were found, I do not anticipate the fungal organism is one that would cause harm to the tree. It is most likely a species that lives off the bark of the tree and would not cause any harm to the tree's health or structural condition.

Existing Tree Dimensions

The diameter of the tree is 36 inches in diameter.

The measurement of the drip line extension or the measurement from the face of the tree's trunk to the tip of the longest branch of the tree is as follows;
To the north – 24 feet
To the east – 31 feet
To the south – 33 feet
To the west – 20.5 feet
These are the dimensions of the tree's crown as it exists. It does not have a symmetrical crown and as such the critical root zone is defined as a measurement based on the tree's diameter at 4.5 feet above ground level. The distribution of the trees roots will extend beyond these dimensions and should be protected as much as possible. The dimensions of the critical root zone are outlined below in the Tree Protection Plan section.

The height of the tree is approximately 60 feet. The distance above the ground to the bottom of the branches of the leaders on the tree that will be above the Tri-Met line is 40 feet.

Tree Protection Plan

The first step to complete in the tree protection plan is to crown clean the tree to remove all dead branches, branches conflicting with each other and branches that are damaged. In addition, in order for the light rail bridge to be built, the west side of the tree will have to prune to a point 10 feet east of the east edge of the light rail platform to allow construction access and clearance from the rail. The west side pruning will entail removing the lowest leader that grows to the west side of the tree and a few other smaller branches on the lower half of the tree's crown to provide the necessary clearance. Any branches that encroach into the 10 foot setback that arise from the leaders/branches of the tree in the upper half of the tree's crown shall be tied back during the lifting of the long trusses to build the bridge. The project arborist shall oversee the pruning to ensure it is done properly and not done to excess.

In order to properly protect a mature tree such as the subject tree from damage during a construction project, the ideal tree protection area would be equal to 18 times the tree's diameter laid out on a radius from the tree's trunk center. This would equal a circle with a radius from the center of the tree equal to 54 feet. This is not practical on this site. When the tree is healthy is it possible to reduce the protection area to less than the ideal. Many times when only one side of the tree will be impacted, it is possible to get as close at 6 times the diameter of the tree on a radius which is equal to 18 feet.

In this case, the tree's root zone will be impacted as close as 10 feet in the west side of the tree well within the minimum. To compensate it will be important to install measures that can prevent root compaction from occurring that will be placed outside of the tree protection fencing location. It will also

be important to protect as much of the critical root zone in the other directions from the tree. I am calling for the root protection zone to be established as a truncated circle on its west side to be established by setting tree protection fencing on the north, east and south side of the tree to be set at 36 feet from the center of the tree. The drip line of the tree to the north is only 24 feet so that would entail adding 12 feet beyond the tree's drip line to the north. To the east, the tree's drip line extends 31 feet requiring the tree protection area to be set an additional 5 feet beyond the drip line. To the south an addition of 3 feet beyond the tree's drip line will be needed to establish the necessary tree protection area. The construction company will have to review these requirements to insure that they can work with these constrictions.

As mentioned above, measures will have to be taken to prevent soil compaction on the west side of the tree from the tree to the edge of the existing dirt roadway. Such measures include the placement of geotextile fabric, wood chips to a depth of 12 inches with steel plates or mats place on top wherever equipment will have to travel. It will still be important to limit the amount of traffic in this area to the absolute minimum. The measures could be utilized in a limited manner for allow a few of the long loads that will have to travel on the east side of the tree to access the temporary work bridge. These measures could also be utilized on a temporary basis on the tree's northwest and northeast sides to allow limited access within the tree root protection area as well.

If soil cuts or fills are necessary to allow the temporary roadway on the tree's east side to meet the elevation of the temporary bridge within the stated critical root zone then a review of this tree protection plan would be necessary.

The protection area that is set will have to be protected with the installation of a chain link fence that is 6 feet tall supported by posts every 10 feet that are at least 8 feet long and driven into the ground 2 feet to insure that this fence does not sag, fall down or can be climbed over. Please refer to appendix number three for additional tree protection specifications that must be followed.

On project such as this where construction activity will be occurring in very close proximity to the tree, it will be critical that the project arborist inspect the tree protection measures on a weekly basis for the time that construction activity is occurring in the vicinity of the tree.

Review of Previous Arborist's Report

The review of the tree by another arborist was limited to a visual assessment from the ground.

The arborist stated that the tree was estimated to be more than 60 years old. It is difficult to accurately estimate a tree's age, especially in the northwest where trees can grow quickly due to the favorable climate. I would estimate the tree to be 100 years old, give or take 25 years which is still a generous estimate. The process necessary to age a tree causes a hole in the wood of the tree which opens the tree to fungal attack so as such, it is a practice that is discouraged except in the forestry where the tree is expected to be harvested before it matures.

The statement that the tree is in decline is not substantiated. I found that the tree is in good condition. The growth rate of the tree's twig growth is very good and the strength loss from cavity in the tree's lower west leader is limited as indicated by the sonic tomography readings. The readings show that the strength loss of the wood in the area of the cavity has not exceeded more than 4 %. The amount of broken and dead branches in the crown of the tree is expected given the lack of maintenance this tree has received

over the years. The presence of fungal fruiting bodies (conks) on the tree's outer bark does not necessarily indicate decay within the tree. It appears that the conks have arisen on the bark of the tree and are not associated with any internal decay. A sample of the conk has been sent to the Oregon State University Plant Clinic for identification to make sure it is not an aggressive pathogen. A report is expected to be received by February 24, 2012. It should be noted that given the number of existing fungal species and the ability to collect the proper life stage for identification it may make the identification very difficult. Regardless, the observed conk was not recognized by this arborist as one that is associated with advance decay on Oregon white oaks.

Oregon oaks have a very strong capacity to successfully wall off or contain the spread of decay that may have infected a tree. Even though the cavity in this tree does have decay, it is unlikely that the decay would spread within this tree's safe useful life to be of concern to the structural stability of the tree.

Recommendation

If the decision is to retain this tree, it will be critical that all agreed to tree protection measures are followed without deviation at any time.

The installation of tree protection measure shall be the first construction activity to occur on site. All tree protection measures shall be kept in place unless approved in writing by the project arborist. The tree protection measures shall be the last construction activity on the site. This will include any landscaping that is to be done. The project arborist shall dictate how landscaping within the tree protection area shall be done in order to ensure that the effort to install and maintain the new landscape does not injury the tree or cause it to decline over the long term.

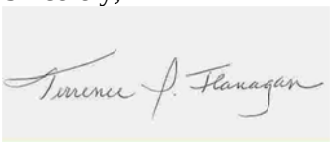
A project arborist shall be hired to inspect the tree protection measures on a weekly basis to insure that the changing aspects of construction do not cause the tree protection measures to be compromised over time.

Conclusion

It is possible to retain this tree during the construction of the new light rail line. It should be realized that it will take a great deal of additional costs, effort and skill to build this line in close proximity to this tree. While there are no guarantees on the long term survivability of this tree after the completion of this project, if the tree protection measures are followed, the tree has a very good chance of continuing to offer its benefits to the community for a long time into the future.

Please call if you have any questions or concerns regarding this report.

Sincerely,



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Appendix # 1 – Photographs of the Kronberg Oak

Photo taken from the east showing cavity in northeast leader.

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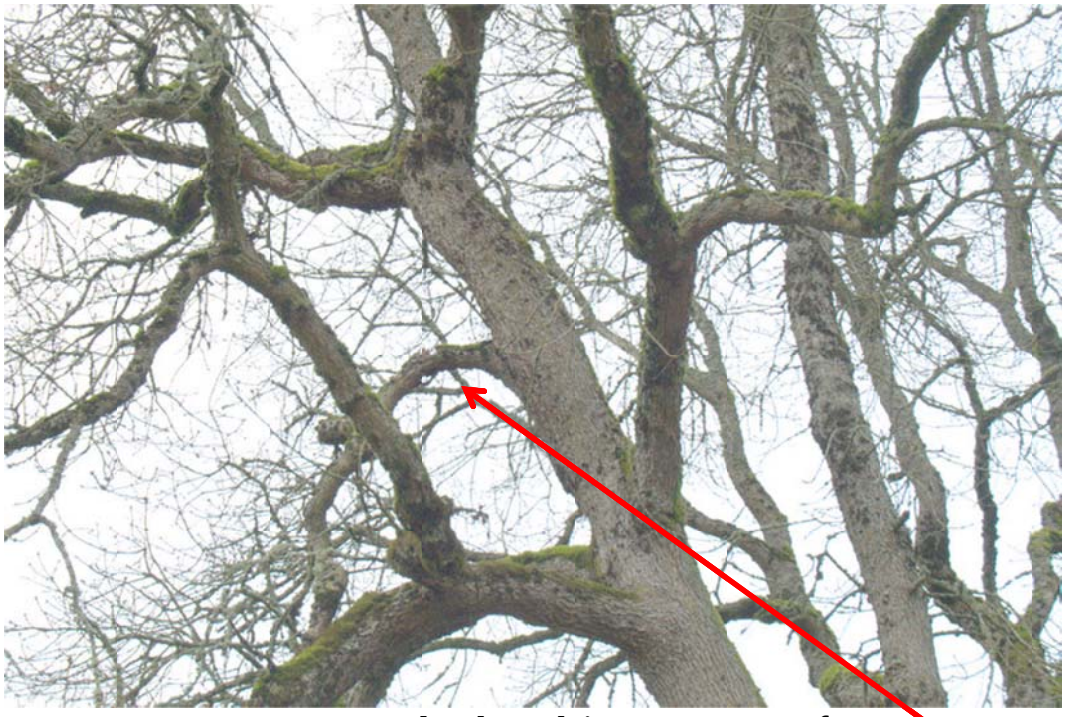
Odd branch attachment angle



Broken branch in upper crown of tree

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Grafted branch to main leader

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Approximate location of cut line that the tree will need to be pruned back to clear the east side of the bridge deck and 10 foot construction access deck. Lowest leader will be cut back to the trunk of the tree, other branches to be pruned back to appropriate location as defined by ANSI A300 pruning standards.

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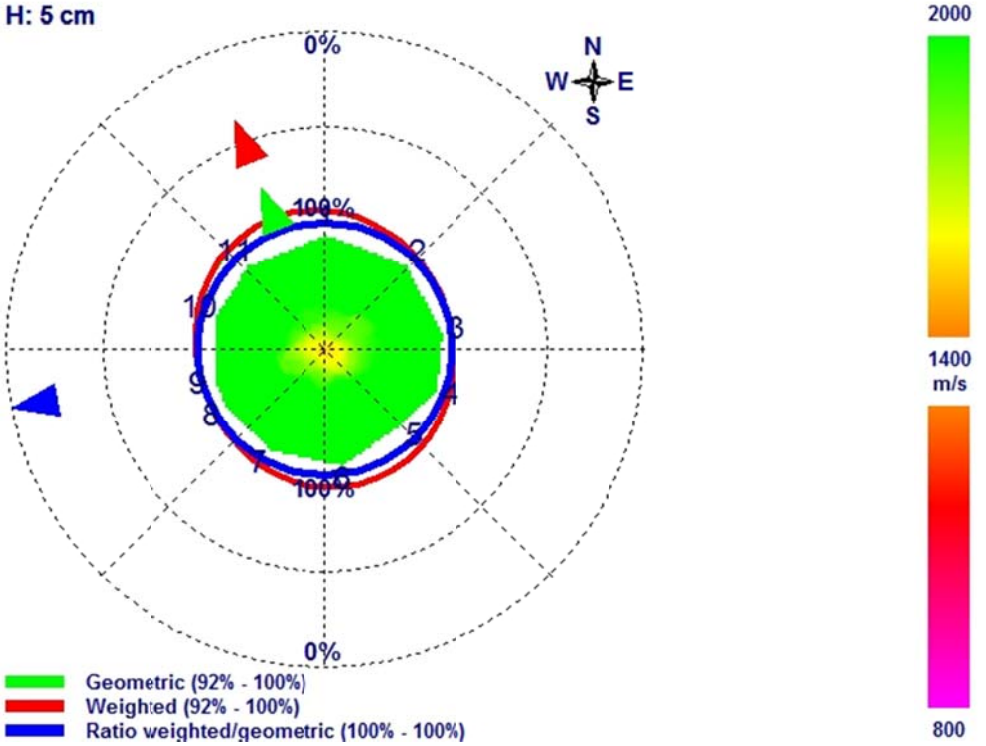
Appendix #2 - Sonic Tomography Measurements

5 cm Level Sonic Tomography Measurements

Project: milwuakie Oregon quercus 2-9-11 reading 1 5cm
Location: milwuakie Oregon park

Tree: Quercus garryana
Tree species: Quercus

Date: 2/9/2012
North: 0°



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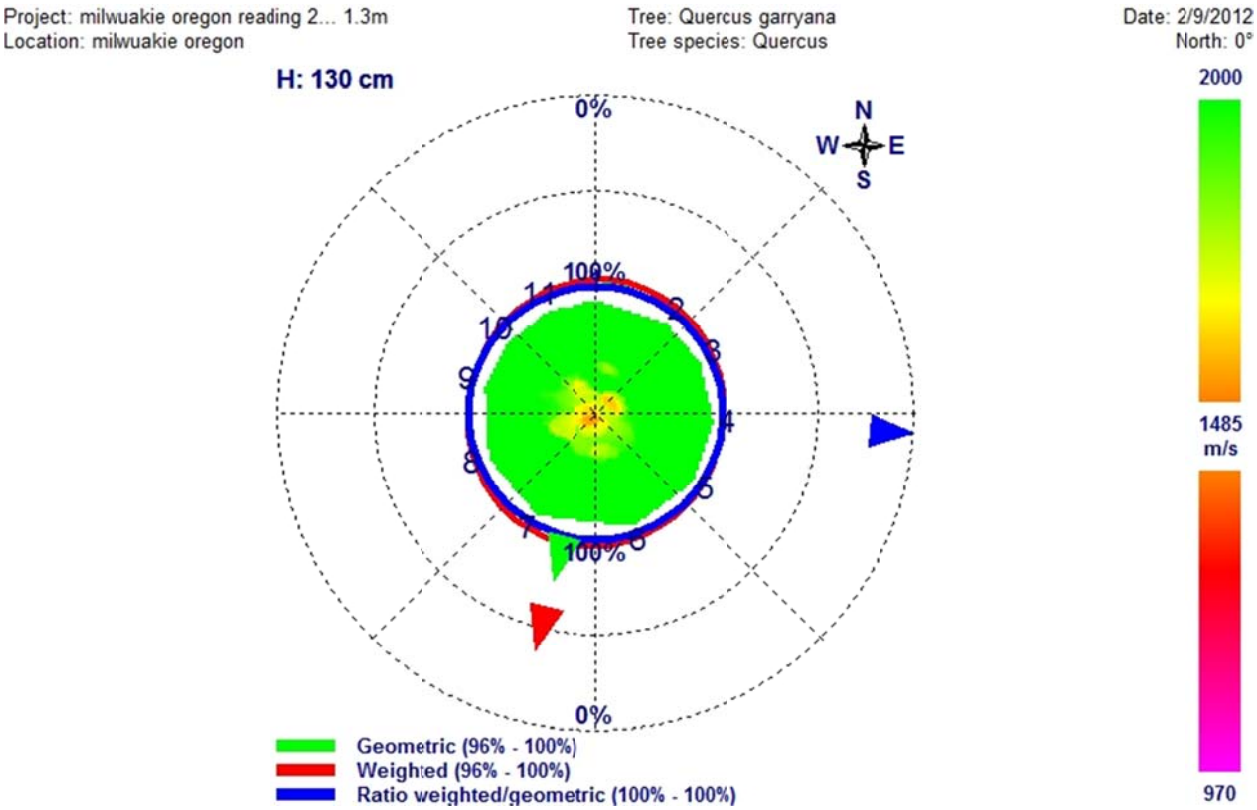
130 cm Level Sonic Tomography Measurements



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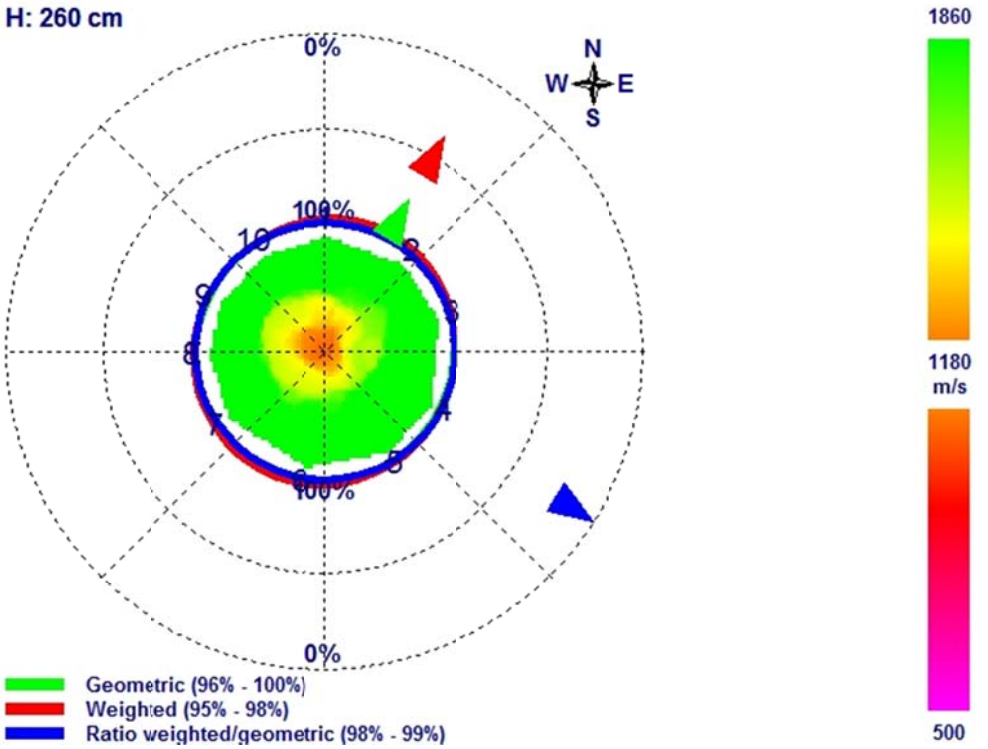
260 cm Level Sonic Tomography Measurement

Project: milwuakie oregon quercus Reading 3, 2.6m
Location: milwuakie oregon

Tree: Quercus garryana
Tree species: Quercus

Date: 2/9/2012
North: 0°



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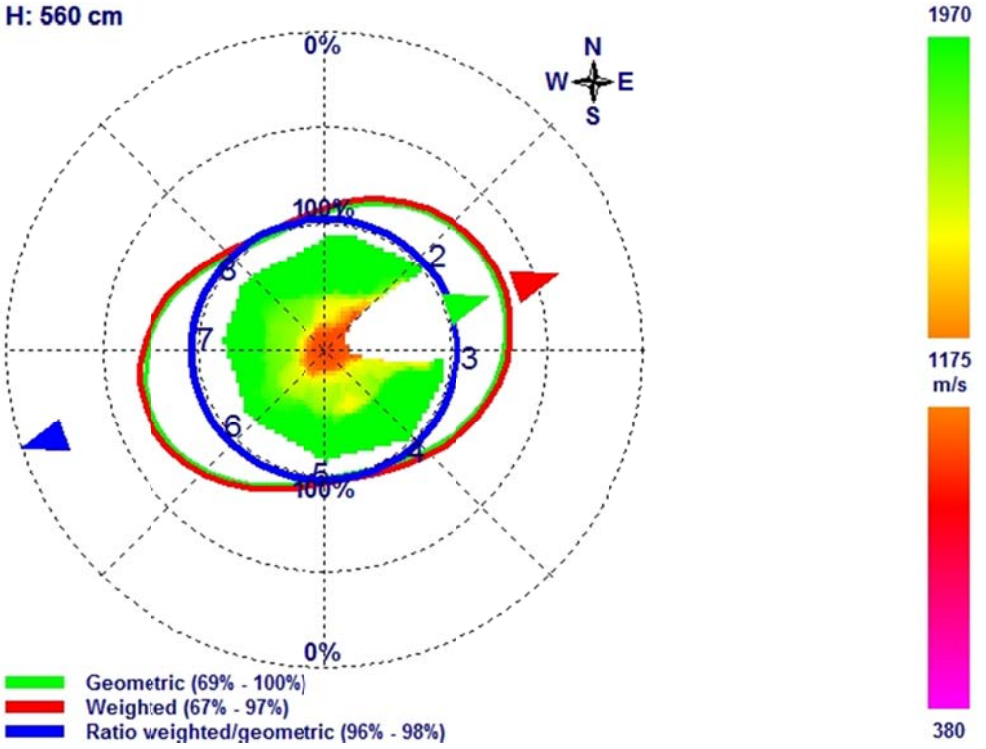
560 cm Level Sonic Tomography Measurement

Project: Milwuakie Oregon reading 4 ...5.6m
Location: Milwuakie Oregon

Tree: Quercus garryana
Tree species: Quercus

Date: 2/9/2012
North: 0°



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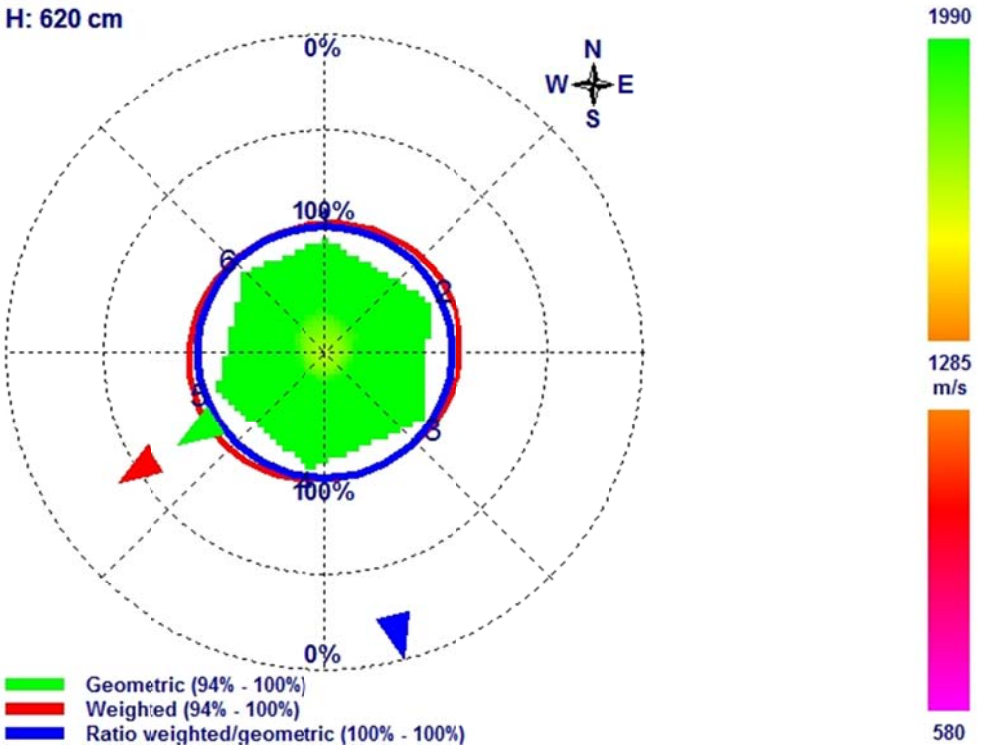
620 cm Level Sonic Tomography Measurement

Project: Milwuakie Oregon Quercus
Location: Milwuakie Oregon

Tree: Quercus garryana
Tree species: Quercus

Date: 2/9/2012
North: 0°



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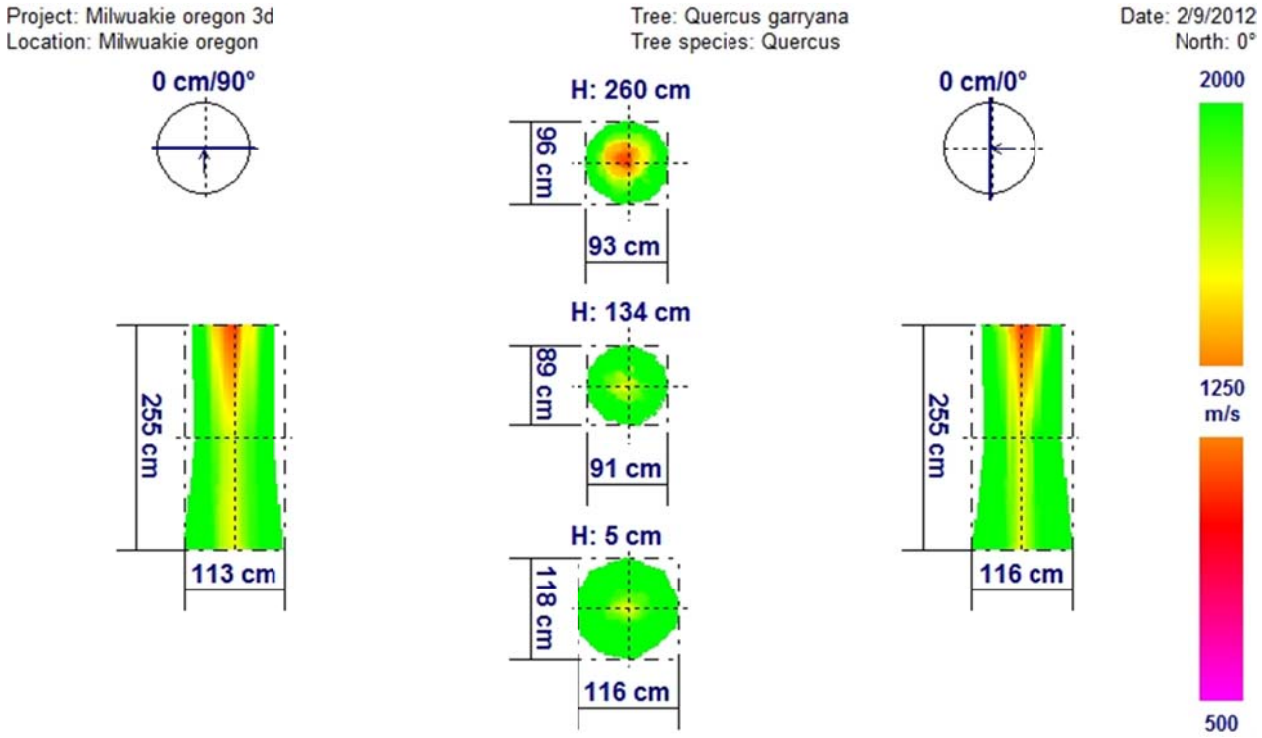
Appendix #2 - Combined Sonic Tomography Readings View of Trunk



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Appendix # 3 – Tree Protection Steps

It is critical that the following steps be taken to ensure that the trees that are to be retained are protected.

Before Construction Begins

1. Notify all contractors of the trees protection procedures. For successful tree protection on a construction site, all contractors must know and understand the goals of tree protection. It can only take one mistake with a misplaced trench or other action to destroy the future of a tree.
    a. Hold a Tree Protection meeting with all contractors to fully explain goals of tree protection.
    b. Have all sub-contractors sign memoranda's of understanding regarding the goals of tree protection. Memoranda to include penalty for violating tree protection plan. Penalty to equal appraised value of tree(s) within the violated tree protection zone per the current Trunk Formula Method as outline by the Council of Tree & Landscape Appraisers current edition of the ***Guide for Plant Appraisal*** or other penalty set by the City of Milwaukie. Penalty is to be paid to owner of the property.
2. Fencing
    a. Establish fencing around each tree or grove of trees to be retained.
    b. The fencing is to be put in place before the ground is cleared in order to protect the trees and the soil around the trees from any disturbance at all.
    c. Fencing is to be placed at the edge of the root protection zone. Root protection zones are to be established by the project arborist based on the needs of the site and the tree to be protected.
    d. Fencing is to consist of 6-foot chain link fencing secured to the ground with 8-foot metal posts to prevent it from being moved by contractors, sagging or falling down.
    e. Fencing is to remain in the position that is established by the project arborist and not to be moved without written permission from the project arborist until the end of the project. .
3. Signage
    a. All tree protection fencing should have signage as follows so that all contractors understand the purpose of the fencing:

TREE PROTECTION ZONE

DO NOT REMOVE OR ADJUST THE APPROVED LOCATION OF THIS TREE PROTECTION FENCING.

Please contact the project arborist or owner if alterations to the approved location of the tree protection fencing are necessary.

Owner's and Project Arborist's Contact Information

    c. Signage should be place as to be visible from all sides of a tree protection area and spaced every 75 feet.

During Construction

1. Protection Guidelines Within the Root Protection Zone
    a. No traffic shall be allowed within the root protection zone. No vehicle, heavy equipment, or even repeated foot traffic unless tree root and soil protection measures have been installed per the tree protection plan.
    b. No storage of materials including but not limiting to soil, construction material, or waste from the site.
        i. Waste includes but is not limited to concrete wash out, gasoline, diesel, paint, cleaner, thinners, etc.
    c. Construction trailers are not to be parked / placed within the root protection zone without written clearance from project arborist.
    d. No vehicles shall be allowed to park within the root protection areas.
    e. No activity shall be allowed that will cause soil compaction within the root protection zone.
2. The trees shall be protected from any cutting, skinning or breaking of branches, trunks or roots.
3. Any roots that are to be cut from existing trees that are to be retained, the project consulting arborist shall be notified to evaluate and oversee the proper cutting of roots with sharp cutting tools. Cut roots are to be immediately covered with soil or mulch to prevent them from drying out.
4. No grade change should be allowed within the root protection zone.
5. Any necessary deviation of the root protection zone shall be cleared by the project consulting arborist in writing.
6. Provide water to trees during the summer months. Tree(s) that will have had root system(s) cut back will need supplemental water to overcome the loss of ability to absorb necessary moisture during the summer months.
7. Any necessary passage of utilities through the root protection zone shall be by means of tunneling under roots by hand digging or boring.

After Construction

1. Carefully landscape in the area of the tree. Do not allow trenching within the root protection zone. Carefully plant new plants within the root protection zone. Avoid cutting the roots of the existing trees.
2. Do not plan for irrigation within the root protection zone of existing trees unless it is drip irrigation for a specific planting or cleared by the project arborist in writing.
3. Provide for adequate drainage of the location around the retained trees.
4. Pruning of the trees should be completed as one of the last steps of the landscaping process before the final placement of trees, shrubs, ground covers, mulch or turf if needed (for this tree, it shall be one of the first steps).
5. Provide for inspection and treatment of insect and disease populations that are capable of damaging the retained trees and plants.
6. Trees that are retained may need to be fertilized as called for by project arborist after final inspection.

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Appendix # 4
Assumptions and Limiting Conditions

1. Any legal description provided to the consultant is assumed to be correct. Information supplied by the City of Milwaukie was the basis of the recommendations provided in this report. Teragan and Associates, Inc. checked the species identification and tree diameter in the field.
2. It is assumed that this property is not in violation of any codes, statutes, ordinances, or other governmental regulations.
3. The consultant is not responsible for information gathered from others involved in various activities pertaining to this project. Care has been taken to obtain information from reliable sources.
4. Loss or alteration of any part of this delivered report invalidates the entire report.
5. Drawings and information contained in this report may not be to scale and are intended to be used as display points of reference only.
6. The consultants' role is only to make recommendations, inaction on the part of those receiving the report is not the responsibility of the consultant.
7. This report is to certify the trees that are on site, their condition, outlining the tree protection steps to protect the trees to be retained on site. This report is written to meet the requirements for tree protection on properties that are to be developed for residential or commercial use.

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