

WEST LINN TREE **TECHNICAL MANUAL**

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INTRODUCTION

This tree Technical Manual is a separately published document issued by the City Manager, through the Departments of Parks and Recreation, Planning and Building and Engineering to establish specific technical regulations, standards, and specifications necessary to implement the Community Tree Ordinance, and to achieve the City's tree preservation goals. These goals are intended to provide consistent care and serve as benchmark indicators to measure achievement in the following areas:

- Ensure and promote preservation of the existing tree canopy cover within city limits.
- Provide standards of maintenance required for protected and city-owned trees.
- Provide standards for preservation and enhancement of existing trees on privately owned property.
- Provide a standardized content for tree reports required by the City.
- Establish criteria for determining when a tree is unsafe and a possible threat to the public health, safety, and welfare.
- Provide standards for the replacement of trees permitted to be removed.
- Increase the survivability of trees during and after construction events by providing protection standards and best management practices.

DEFINITIONS

Basal flare: That portion of a tree where there is a rapid increase in diameter at the confluence of the trunk and root crown.

Building footprint: The two-dimensional configuration of an existing building's perimeter boundaries as measured on a horizontal plane at ground level.

Business days: Monday through Friday – exempting any holidays.

Calendar Days: All days as noted on a calendar, inclusive of weekends and holidays.

Certified Arborist: An individual who has either obtained certification as an arborist from the International Society of Arboriculture, or who is a member of the American Society of Consulting Arborists.

City Arborist: The person designated as such by the City Manager.

City Manager: The City Manager or his/her designee.

City Right of Way: Land that is not owned by a private individual or company that has been either deeded or dedicated to the City for a public purpose. As referred to with a road, the area of the road and area adjacent to the road in City ownership.

Compaction: Compression of the soil structure or texture by any means that creates an upper layer that is impermeable. Compaction is injurious to roots and the health of a tree.

DBH: Diameter at Breast Height is a tree's diameter at 4-1/2 feet or 54 inches above the highest natural ground level. DBH measured in this fashion is considered the accepted method for measuring the size of a tree, by both industry and scientific standards.

Dead Tree: A tree that is dead or has been damaged beyond repair or is in an advanced state of decline (where an insufficient amount of live tissue, green leaves, limbs, or branches exists to sustain life) and has been determined to be such by a certified arborist.

Disturbance: All of the various activities from construction or development that may damage trees.

Drip line Area: The area under the tree's canopy as defined by an imaginary vertical line extending downward from the outermost tips of a tree's natural length branches to the ground.

Erosion: Detachment and movement of soil, rock fragments, mulch, fill, or sediment.

Excessive pruning: Removal of more than one-third of the functioning leaf, stem, or root area of a tree in any twelve-month period, or removal of foliage so as to cause the unbalancing of a tree. Removal of more than one-third of functioning leaf, stem, or root area is considered a tree removal.

Groves: A group of two or more trees with meeting or overlapping canopies. The trees need not be the same species.

Hazard tree: Any tree with a structural defect and/or disease which makes it subject to a high probability of failure, and which threatens persons or property, including other trees.

Hazardous Growth Habit: The development of a tree that, due to a combination of structural defect, disease, or existing disturbance, is subject to a high probability of failure; and such failure would result in a threat to persons or improved property.

Heritage Tree: A tree designated by the City Council as having significant historic or community value to the City of West Linn.

I.S.A.: International Society of Arboriculture.

Injury: A wound resulting from any activity, including but not limited to excessive pruning, cutting, trenching, excavating, altering the grade, or paving/compaction within the tree protection zone of a tree. Injury shall include bruising, scarring, tearing or breaking of roots, bark, trunk branches or foliage, herbicide or poisoning, or any other action foreseeable leading to the death or permanent damage to tree health.

Major Pruning: Removal of over 20 percent of the tree's canopy, or disturbance of over 10 percent of a tree's root system.

Project Arborist: A certified arborist hired by a design review applicant who will handle tree related issues and correspondence with the City Arborist regarding developments in the City. A Project Arborists specific duties are outlined later in this document.

Protected Tree: All trees that are specifically designated to be saved on private property pursuant to an approved development permit, or for which the City Manager has not issued a tree removal permit. Protected trees are to be indicated on building permit or development plans submitted for approval.

Protected Tree Fencing: A temporary enclosure erected around a tree to be protected at the boundary of the tree protection zone. The fence serves three primary functions: 1) to keep the foliage crown, branch structure and trunk clear from direct contact and damage by equipment, materials, or disturbances; 2) to preserve roots and soil in an intact and non-compacted state; and 3) to identify the tree protection zone in which no soil disturbance is permitted and activities are restricted.

Soil Compaction: The compression of soil particles that may result from the movement of heavy machinery and trucks, storage of construction materials, structures, paving, etc. within the tree protection zone. Soil compaction can result in atrophy of roots and potential death of the tree, with symptoms often taking years to manifest.

Street Tree: Any tree existing on or in the City's road right of way.

Topping: The severe cutting back of a tree's limbs within the tree's crown so as to remove the natural canopy and disfigure the tree.

Tree: For the purposes of determining whether a tree removal permit is required, the following definition of Tree is used. Only those trees that meet or exceed the size standards stipulated in this definition require permits to be removed. It is to be explicitly understood, however, that within this Ordinance there are some references to "Tree" or "Trees" (such as with street trees or replacement trees) where the term "Tree" is used (because it would be cumbersome to invent a different term) but to which the size requirements do not apply.

Any woody, perennial plant, deciduous, evergreen, or coniferous, having a main stem or trunk of a minimum 20-inch circumference (6.37-inch diameter DBH) (for Oregon white oak, Pacific madrone or native dogwood), or a minimum 38-inch circumference (12.1-inch diameter DBH) (all other tree species). Trees with multiple trunks will be measured at the 54-inch standard and computed as a total circumference.

Tree Appraisal: A method of determining the monetary value of a tree as it relates to the real estate value of the property, neighborhood, or community. When required, a certified arborist determines the appraisal by adjusting a tree's basic value by its condition, location, and species using the most recent edition of the *Guide for Plant Appraisal*, published by the Council of Tree and Landscape Appraisers.

Tree Canopy: For the purposes of determining tree removal, it is the sum total of the branch and leaf structure of a tree including the trunk and/or trunks. When referred to as the City tree canopy, it refers to the total ground area that is shielded by tree foliage as would be determined from an aerial view of the City

Tree Protection and Preservation Plan: A plan prepared by a certified arborist that outlines measures to preserve protected trees on a project site. This plan shall include requirements for pre-construction, treatments during demolition and/or construction, establishment of a tree protection zone for each tree, tree monitoring and inspection schedule, and provide for continuing maintenance of those trees after construction according to the requirements in this Manual.

Tree Protection Zone (TPZ): unless otherwise specified by a project arborist or City Arborist, the area of temporary fenced tree enclosure. The Tree Protection Zone is a restricted activity zone where no soil disturbance is permitted, unless otherwise approved.

Tree Removal: Any of the following: (1) Complete removal, such as cutting to the ground or extraction, of a tree; (2) Taking any action foreseeably leading to the death of a tree or permanent damage to its health; including but not limited to excessive pruning, cutting, girdling, poisoning, over watering, unauthorized relocation or transportation of a tree, or trenching, excavating, altering the grade, compacting the soil or paving within the drip line area of a tree; (3) removal of more than one-third of functioning leaf and stem area of a tree in any 12-month period, or removal of foliage so as to cause the unbalancing of a tree is considered as removal for purposes of this ordinance.

Visually Prominent: Visible from 1000 feet of the tree. Removal of a visually prominent tree would result in a marked difference in a view from an adjacent property or from a public right-of-way.

TREE MAINTENANCE GUIDELINES

This chapter establishes the minimum standard of care and maintenance for West Linn's trees. These standards apply to all persons who own or are engaged in the business of

repairing, maintaining, or preserving these trees. The following standards of care are set forth for pruning (including utility, fire and traffic encroachment), planting, watering, soil and nutrient requirements, insect, disease and fruit control. Guidelines for selecting an arborist are also given. These standards and guidelines are based on sound arboricultural principles and are applicable to trees, shrubs and woody plants. All owners of trees are to follow the required maintenance standards set forth in this Manual. If special pruning or situations require a variance from these standards, it is the responsibility of the certified arborist and property owner to clarify why the changes are needed and review them with the City Arborist.

PROHIBITED ACTS

Improper maintenance may constitute a prohibited act as defined by the West Linn Municipal Code, and a violation which may be subject to penalty. The following permitted and prohibited maintenance practices for trees apply:

- **Excessive Pruning:** Excessive pruning shall be considered a prohibited act.
- **Topping:** Topping shall be considered a prohibited act.
- **Other prohibited actions:** Taking any action foreseeably leading to the death of a tree or permanent damage to its health, including but not limited to excessive pruning, cutting, girdling, poisoning, over watering, unauthorized relocation or transportation of a tree, or trenching, excavating, altering the grade, or paving within the dripline area of a tree.

PRUNING STANDARDS

The most compelling reason to prune trees is to develop a strong, safe framework. All work to be performed on trees shall be in accordance with the standards set forth in this manual. All specifications for working on trees shall be written and shall be administered by a qualified arborist, and shall be designed to promote the preservation of tree structure and health. All work on trees shall be in accordance with the most current industry standards. Climbing and pruning practices shall not injure the tree except for the pruning cuts. To reduce the probability of insect infestation, disease or infection, seasonal recommendations apply, except when public safety is a concern. All species should not be pruned during the flush of spring shoot growth. Trees with thin bark should not be pruned in summer when sunscald injury may be a factor. Deciduous trees are best pruned November-February. Hazardous trees of any species may be pruned any time of the year for abatement reasons.

Mature Trees

There are six types of pruning that may be required on mature trees. Prior to entering the tree, the tree worker is required to be familiar with these types of pruning as stated in the Performance Standards, ANSI, A300-1995. 'Species-specific' pruning promotes the natural shape of the tree (i.e. excurrent, decurrent, vase-shaped, fast growing, etc.) The six pruning types are:

- Crown Cleaning
- Crown Thinning
- Crown Raising
- Crown Restoration
- Crown Reduction
- Utility Pruning

Distressed Trees

Distressed trees require as much leaf area as possible to overcome stressed conditions. To avoid additional injury, the following measures shall be followed for these trees:

- If a tree has been damaged by injury or disturbance, delay pruning until deadwood becomes evident (typically 1-3 years after injury). Crown cleaning is then recommended.
- Trees that have received little or no care or maintenance may need moderate crown thinning, reduction of end weights or entire crown restoration.

Young Trees

By pruning trees early, it will improve life expectancy and is a proven, cost-effective measure. Added benefits are also reflected in safer trees with fewer branch failures. For trees that serve as a replacement tree, they shall be pruned in the following way:

- Prune during the second year after planting to improve their structure, and only minor crown cleaning every 3-7 years thereafter. Refer to *ISA Tree Pruning Guidelines*.
- Do not top the main leader except to position the lowest main branch. Other main branches should be spaced at least 18-inches apart to alleviate a tight grouping branches.
- Select permanent branching and allow temporary low branching on the lowest part of the trunk to remain.

FERTILIZING

This section outlines performance standards for fertilizing and apply only if fertilizing is specified. Fertilizing mature trees is generally not necessary. Fertilizing may be specified for trees that will be impacted by upcoming disturbance, grade changes or a modified environment. Benefits gained from the increase stored resources may aid the tree to overcome the stress caused by disturbance.

Specifications

Fertilizing, if specified, shall be performed to the following standards:

- Method of application: The method shall be subsurface injection, on approximate 3-foot centers (within the root ball on young trees; 2-feet out on older trees) and out to the approximate dripline perimeter. Specific situations may justify other variations such as vertical mulch, soil-fracture or surface-broadcast methods.
- Material and Rates: Unless specified otherwise, fertilizer formula shall be a slow-release, complete fertilizer with chelate trace elements (e.g. 22-14-14 or 20-20-20) and mixed at label rates not to exceed 4-pounds nitrogen per 100-gallons of water. Extraordinary cases may require soil and tissue sampling to correct target deficiencies.
- Amount: Unless specified otherwise, volume shall be determined by mixing 10-gallons of water per inch of trunk diameter when measured at 54-inches above natural grade.
- Timing: Timing should not be detrimental to tree health. Best results are derived from applications made during the prior growing season. Apply fertilizer between May and September for best results.

WATERING

Newly installed trees, including drought tolerant species, are dependent upon supplemental irrigation until established, typically for two years. Periods of extreme heat, wind or drought may require more or less water than recommended in these specifications. The method and amount that is applied may vary depending upon soil composition, heat, wind, companion plantings, rainfall amounts. The watering of trees or their replacements shall follow the standards set forth in this manual.

New Trees

During the establishment period (1-2 years) trees should be watered thoroughly to their root depth as frequently as needed. The minimum standards shall be as follows:

- 3 months in the ground: 4 times per month or as necessary
- 6 months in the ground: 2 times per month or as necessary
- 12 months in the ground: 1 time per month or as necessary

Mature trees

- 1 time per month during irrigation season (usually June through September)

Watering Methods

The following options shall fulfill the watering requirements. One or more of the following may be utilized dependent upon unique circumstances subject to the City Arborist determination. The options are as follows:

- Automated Watering Systems. All new trees shall be provided with one of the following automatic watering systems. Other city maintained systems shall be per Parks Department specifications.
- Bubbler heads (Preferred). One or two bubbler heads mounted on flexible tubing are to be placed adjacent to or on top of the root ball. The placement of bubbler within an aeration tube is not allowed.
- Drip Loop system. A continuous loop of drip tubing circling around the trunk at a point two-thirds out from the trunk to the edge of the root ball (for new trees 36-inch box size and greater, a second loop of drip tubing is required at a point just beyond the root ball on native soil).
- Hand watering systems. Recommended for trees that are part of a development project that must be watered to insure tree survival during the course of construction until automatic irrigation is installed.
- Flood watering. Newly installed trees must be 'flood or basin-watered' on top of the root ball to allow the water to infiltrate through the root zone.
- Subsurface injections using a hydraulic spray pump (practical for use in hard, compacted soils or steep hillsides).
- Soaker hose. Slow, deep watering using a garden type soaker hose.
- Wetting agent. A root ball that has been allowed to dry out beyond the wilting point shall require the addition of a wetting agent to the water (such as Aqua-grow or equivalent).

Amount

Unless otherwise specified, the volume of water applied at each irrigation should be in the range of 10-gallons per inch of trunk diameter when measured at 54-inches above natural grade. The final decision of whether to water or not should be based on accurate soil probe samples that are taken from the root ball.

SOIL IMPROVEMENT

During development, compaction of the soil is the largest single factor responsible for the decline of older trees. Ninety percent of the damage to the upper eighteen inches of soil occurs during the first pass of heavy equipment - and cannot be reversed. Every effort to avoid compaction of soil porosity within the tree protection zone shall be taken at all times. When required as mitigation for injury or a prohibited action, the following performance standards for improvement of compacted or damaged soil shall be implemented:

Aeration

Soil that is damaged or compacted within the dripline of trees shall be loosened or aerated to promote root growth and enhance tree vitality. One of the following aeration methods shall be specified in an effort to correct compacted soil conditions:

- Vertical Mulching: Auger holes 2 to 4-inch diameter, 2 to 3-feet deep, on 4-

foot centers and backfilled with porous material such as perlite, vermiculite or volcanic rock.

- Radial Trenching: With an air excavator, excavate a soil trench 3 to 6-inches wide and a minimum of 12-inches deep from (approximately) 3-feet from the trunk out to the dripline area. The trenches shall radiate out from one foot apart at the closest point.
- Soil-fracturing with a pneumatic air-driven device.
- Subsurface injections under moderate hydraulic pressure using a three foot probe and applied on 3-foot centers under the dripline.

Drainage

Adequate drainage must be provided to the surrounding soil for the planting of new trees. If the trees are to be planted in impermeable or infertile soil, and water infiltration rates are less than 2-inches an hour, then one of the following drainage systems or other approved measures must be implemented:

- French drain, a minimum of three feet in depth
- Drain tiles or lines beneath the trees
- Auger six drain holes at the bottom perimeter of the planting pit, a minimum of 4-inches in diameter, 24-inches deep and filled with medium sand or fine gravel

INSECT AND DISEASE CONTROL

Generally, insect populations do not threaten tree health to the point of mortality. More often, when their populations become too great they create a nuisance. If action is warranted, Integrated Pest Management (I.P.M.) suggests that the pest source be identified and targeted with a specific and timely treatment. If insects or disease can lead to the death of a *protected* tree, then it is the responsibility of the property owner to evaluate the condition according to the guidelines set forth in this manual, and treat the problem in a timely fashion to prevent further deterioration of the tree.

Insects

Accurate timing is critical for success. Nontoxic materials should be used whenever possible to control leaf-chewing insects.

Disease and Decay - above ground

Disease such as heart-rot decay that erodes the health or weakens the structure of a tree may compromise the safety of people or property. It is the property owner's responsibility to correct a known hazardous condition in a timely fashion.

Consult with a certified arborist for remedy possibilities, for example, pruning out infected branches, thinning, or the spray application of a chemical treatment.

Disease - below ground

Soil-borne diseases, such as Armillaria or Phytophthora, are present in West Linn soils. Often, a poor landscape design surrounding old trees encourages harmful, and often lethal diseases. Combined with poorly drained soil, these factors often activate normally dormant fungi to become opportunistic and infect the tree to cause the decline and eventual death of the tree. This decline can be slow and may not be evident for many years. To identify cultural conditions that may lead to diseases such as Verticillium, Phytophthora or other soilborne fungi, review the *Sunset Western Garden Book* or consult with a Certified Arborist. The following conditions that favor a disease environment must be avoided:

- Compacting of the soil within the tree's dripline, adding fill dirt, roto-tilling, trenching, removing soil from the tree root area.
- Excessive or regular watering on or near the tree trunk area and planting incompatible water-loving plants within the tree's dripline.
- Landscape Design: When planning landscaping around a tree, an evaluation of the tree and soil must be performed to determine if there is a disease present. If the tree is diseased and landscaping will contribute to decline, permanent damage or render it hazardous, it is the obligation of the property owner to take reasonable measures to reduce or eliminate the conditions that may cause the decline of the protected or designated tree.

Foliar disease

Leaf spot or galls may be chronic or reoccur with specific seasons. Though many of these diseases destroy leaf tissue and become unsightly, they may not significantly reduce the trees health and therefore normally need not be treated unless otherwise specified.

TREE PLANTING SPECIFICATIONS

Planting specifications apply for trees that are planted as a replacement for a tree approved for removal. Using the following specifications will result in consistent city-wide plantings, and superior tree growth and vitality. To achieve this, landscape architects shall incorporate these items into their specifications.

PLANTING STOCK

It is the contractor's responsibility to supply stock that meets ANSI 760.1-1996 and City of West Linn *Tree Technical Manual Standards*. All plants and trees installed within the City of West Linn shall conform with American Association of Standards, ANSI Z60.1, *Specifications for Acceptance of Nursery Trees at the Time of Delivery*, in all ways.

- Plants shall be sound, healthy, vigorous, and free of plant disease and insect pests and their eggs.

- Container stock shall be grown for at least 8-months in containers in which delivered and shall not be root bound or have girdling roots.
- Trees shall not have been topped or headed.
- Plants and trees with broken tops, branches or injured trunks shall be rejected.

RECOMMENDED STREET TREES

There are many trees available that are appropriate for use as street trees, and new varieties are being developed every year. The City shall maintain a list of appropriate trees for planting in the City, either as street trees, or for use in yards, parks, etc. ~~and is appendix A to this manual.~~ The list will be updated periodically as new varieties are available, or as information is received about diseases, insects and other nuisances. Please consider the location, size of planting area, and other site specific variables when choosing a tree.

MISCELANEOUS MATERIALS

The following materials shall be used unless otherwise specified:

- **Tree stakes:** Support stakes shall be treated 2-inch diameter pine or equal, two stakes per tree. No cross brace shall be used. After installation, stakes shall be trimmed so that the branches clear the top of the stake.
- **Tree Ties:** Twist brace, fabric-reinforced rubber (3/8-inch minimum), or equivalent approved by the City of West Linn shall be used and installed in a figure eight fashion to support the tree to the stakes.
- **Mulch:** Screened untreated wood chips, bark dust or approved equal, spread to a 2-inch depth out to the edge of the root ball. The mulch should be kept at least two inches away from the trunk and shall be applied to each tree.
- **Mower guards:** For trees in turf areas requiring regular mowing, the tree stem shall be protected with TreeGuard or equivalent.
- **Tree Grates:** Where sidewalk width is less than 8-feet and new trees will be installed in a tree well, metal tree grates shall be used and approved by Public Works. Minimum size grates shall be 4' x 4' unless specified otherwise. All tree grates shall be mounted in frames inset into a concrete foundation within the sidewalk or surface material and shall be flush with the surrounding surface.

SOIL PREPARATION AND CONDITIONING

- All debris, wood chips, pavement, concrete and rocks over 2-inches in diameter shall be removed from the planting pit to a minimum of 24-inch depth, unless specified.
- Trees in a confined planter pit or sidewalk area: The planting hole shall be excavated to a minimum of 30-inches deep x the width of the exposed area.

Scarify the sides of the pit. Soil beneath the rootball shall be compacted to prevent settling.

- Trees in all other areas: Excavate the hole's width a minimum of three times the diameter of the container, and deep enough to allow the root ball of the container to rest on firm soil. Scarify the sides and the bottom of the pit.
- The height of the container root ball should be 1-2-inches higher than grade level, except when structural urban tree soil mix is used, in which case the tree may be planted at level grade.
- If the soil is dry, add a few inches of water in the hole. Let it drain before planting the tree.

PLACING THE TREE

- **Roots:** Remove tree from the container and trim the root ball in the following way: Straighten and/or cut cleanly any thick circling roots. For thin roots make three to four vertical cuts 1/2-inch deep around root ball and spread the bottom out if necessary
- **Orientation:** Locate the tree in the hole, and rotate the tree to direct the main branches away from the street side, if possible.
- **Filling the Hole:** Place the aeration tubes, fill the hole halfway up with original soil (amended soil only when approved), and gently tamp out air pockets with a pole or shovel handle. Add about 1-inch of water, and let drain. Fill the rest of the hole to grade, water the fill soil, and let drain.
- **Staking:** Place the stakes at the edge of the root ball (drive them 2-feet into undisturbed ground), and avoid contact with the branches. If in a windy area, set the stakes in a plane at right angles to the wind. Remove the nursery stake. Loosely place two ties in a figure eight around the trunk, as low as needed to hold the tree upright and nail to the stake. Stakes shall be trimmed so that the branches clear the top of the stake. Do not install a cross-brace.
- **Berm, Mulch and Water:** In non-turf areas, form a soil berm 3 to 4-inches high at the outermost edge of the root ball. Place 1 to 2-inches of mulch or bark over root ball and berm, keeping the mulch away from the trunk a minimum of 2-inches. Fill the berm with water to capacity.
- **Turf Areas:** In turf areas that receive regular watering, the watering berm may be eliminated. The turf shall be maintained a minimum of one foot from the new tree stem, and mulch placed on top of the root ball. The mulch shall not be touching the tree stem. In turf areas, install tree ???
- **Aeration Tubes for Trees:** If required, 4-inch diameter perforated aeration tubes with grated plastic caps placed at the edge of the root ball to the bottom of the pit. Irrigation heads shall not be installed inside the aeration pipes. Any of the above holes, pipes, grates or fixtures shall include the installation of Filter Fabric wrap over the side openings and secured as recommended by manufacturer when connected to an approved aeration system.
- **Alternate Specifications:** Occasionally, tree planting must occur in poor or difficult soil where standard planting techniques will result in poor-to-average performance or mortality (such as unique or unusual regional geology, slope,

soil volume, restrictive physical or chemical properties, poor drainage, etc.). In this case, the responsible party must investigate alternative solutions to enable long term tree growth. Alternative planting specifications or plans that vary from the native or typical soil conditions shall be submitted to the *City Arborist* for approval prior to installation. Alternative or specified soils, such as engineered, amended or structural urban tree soil mix, including written specifications and physical samples, shall be submitted for approval from the City Arborist and/or Landscape Architect.

HAZARDOUS TREES

Property owners are responsible for the trees on their own property. The City requires advance permission for removal of trees in emergencies, unless the tree poses an imminent danger of falling and posing a threat to life and property prior to the ability of the Manager to consider issuing an emergency tree removal permit. However, in such cases the property owner must submit documentation of the problem after the fact. This is to avoid the unlawful removal of sound trees on the grounds that they are hazardous. If there was no immediate danger, and the City determines that there was no reasonable basis for the tree to be removed prior to the ability of the City to issue an emergency tree removal permit, the property owner may face penalties for violating City law.

The health and safety of a tree are two distinct and separate functional characteristics. A vigorous and healthy tree may not necessarily be of sound wood or structure. To remove a dangerous tree, it must first be evaluated and the tree determined to be hazardous as defined in this section.

On private property, it is the responsibility of the property owner to mitigate or abate a known hazardous condition of a tree that may be of questionable structure or deemed as hazardous. Most tree hazards can be prevented with regular checkups by a tree care professional and timely maintenance action by the property owner.

Determining whether or not a tree's defects constitute a condition that presents an imminent hazard to an area requires a high degree of knowledge and experience. Hazard tree assessment of a tree should only be evaluated by an arborist who is familiar with tree physiology and can interpret the external signs of weaknesses, and who can perform internal checks if necessary and make recommendations.

CRITERIA USED BY THE CITY TO DETERMINE IF A TREE IS HAZARDOUS

- **Definition of Hazardous Growth Habit:** The West Linn Municipal Code defines "Hazardous Growth Habit" as: the development of a tree that, due to a combination of structural defect, disease, or existing disturbance, is subject to a high probability of failure, and such failure would result in a threat to persons or improved property.
- **Evaluation Form:** In some cases, the City may require a Hazard Evaluation

Form, before approval is granted. The City uses the national standard, an ISA Hazard Evaluation Form as a basis to determine the hazard rating of a tree. This form, or an approved equivalent, must be completed by a certified arborist. The City Arborist retains discretionary right to approve, request in writing a second opinion of a rating, or recommend action that may reduce the condition to a less-than significant level of hazard.

- **Authorization:** If the hazardous growth habit cannot be mitigated or reduced to a less than significant level then the Manager shall issue a permit authorizing removal of the tree in accordance with the City Municipal Tree Ordinance.

DETERMINING A TREE'S HAZARD RATING

A tree may be a potential hazard if it is: (a) a tree with the potential to fail (b) in an environment that increases the likelihood of failure and (c) a tree that would strike a target. The hazard rating formula is based upon the following factors:

- **Failure Potential Rating:** Failures do not occur at random, but are the result of a combination of defects and aggravating conditions. The scope of the professional evaluation will include structural defects in the tree (including branches, trunk and roots; and if necessary, shall employ the use of the most current methods of internal decay inspection available), soil/slope and/or creek bank stability, individual species susceptibility to failure, pruning, history, decay weaknesses and any other compromising or pertinent factors considered by the consultant.
- **Target Rating:** Evaluation of potential targets shall include people, structures or property use and occupancy that are imminently threatened. Property use shall consider what structures or activities are under or around the tree (e.g. building, parking, pedestrian, recreational, utility lines, hardscape, etc.). Occupancy shall consider frequency of the use (occasional, intermittent, frequent or constant), and whether the *target* will be present when failure occurs. Consideration shall be given as to whether the *target* can be reasonably removed or isolated to reduce the hazard rating to a less than significant level. A target means people or property (public or private).
- **Additional Factors:** Evaluation of other factors that contribute to aggravating conditions shall be considered, such as: size of the affected defect (i.e. a small branch vs. the entire tree uprooting), significant potential of fire, utility line contact or catastrophic effects, etc.

DEVELOPMENT REVIEW, BUILDING PERMITS, AND PROTECTION OF TREES DURING CONSTRUCTION

The objective of this section is to provide guidelines to reduce the negative impacts of construction on trees to a less than significant level. Trees vary in their ability to adapt to altered growing conditions. Mature trees have established stable biological systems in the

pre-existing physical environment. Disruption of this environment by construction activity interrupts the tree's physiological processes causing depletion of energy reserves and a decline in vigor, often resulting in the tree's death. Typically, this reaction may develop from one to twelve years or more after disruption. The tree protection regulations are intended to guide a construction project to insure that appropriate practices will be implemented in the field to eliminate undesirable consequences that may result from uninformed or careless acts, and preserve both trees and property values.

Typical negative impacts that may occur during construction include:

- Mechanical injury to roots, trunk or branches
- Compaction of soil, which degrades the functioning roots, inhibits the development of new ones and restricts drainage, which desiccates roots and enables water mold fungi to develop
- Changes in existing grade which can cut or suffocate roots
- Alteration of the water table - either raising or lowering
- Microclimate change, exposing sheltered trees to sun or wind
- Sterile soil conditions, associated with stripping off topsoil.

STEPS IN THE PROCESS

Construction project managers are required to implement the tree protection practices described in this section. The following steps shall be taken in regard to tree protection on any construction project in the City. For more detailed information regarding these steps, please reference the desired topic later in this section.

- **Site Plans, Tree Surveys and Arborist Reports:** Prior to land use approval or building permit issuance, a property owner shall have prepared an appropriate *Site Plan, Tree Survey, and/or Arborist Report*. Any tree protection plans or reports must be approved and accepted by the City Arborist before proceeding to the next step. Notes and/or changes to the protection plans may be made or requested by the City Arborist at this time.
- **Verification of Tree Protection:** The project arborist or contractor shall verify, in writing, that all pre-construction conditions have been met and that all tree protection measures are in place. Written verification must be submitted to and approved by the City prior to demolition, grading or building permit issuance.
- **Pre-Construction Meeting:** The City Arborist, Project Arborist, Project Manager, Site Superintendent and other pertinent personnel may be required to meet at the site prior to beginning work to review procedures, tree protection measures and to establish haul routes, staging areas, contacts, watering, etc.
- **Project Construction:** Project Managers, Site Superintendents and Project Arborists in conjunction with City inspectors and staff are to ensure that trees on site are protected in accordance with the approved Arborist Report for the project for the duration of construction activity.
- **Post Construction:** Project Managers, Site Superintendents and Project Arborists in conjunction with City Inspectors and staff are to ensure that post construction activity is in accordance with the approved Arborist Report for the project.

SITE PLANS, TREE SURVEYS, TREE APPRAISAL REPORTS, AND ARBORIST REPORTS

A *Site Plan* and/or *Tree Survey* and *Arborist Report* will be required for development projects containing trees. Site Plans for individual building permits may be prepared by the applicant. Tree Surveys and Arborist Reports will be required for projects that require Design Review as referenced in the City Community Development Code (CDC), and must be prepared by a licensed surveyor and certified arborist respectively for the applicant and submitted to the City for the purpose of providing accurate information and opinion regarding the condition, welfare, maintenance, preservation or value of trees on the project site. Occasionally, information about trees offsite will be required if the project will affect them, for example, trees near the property line of a development. Site Plans and Arborist Reports will be reviewed and approved by the City Arborist. Trees are defined by the City as having a minimum 6 inch DBH for Oregon White Oak, Pacific Madrone, and Pacific Dogwood, and 12 inch DBH for all other species. Any trees not meeting these minimum thresholds need not be shown on any site plans or surveys.

Following are the types of documentation that may be required by the City:

- **Site Plan:** A site plan will be required for all non-interior construction activity that requires a building permit. The site plan shall show the accurate location

of property lines, existing structures, proposed new construction, staging and spoils areas, and all trees at or above the City's minimum threshold, with DBH and species indicated. Other non-tree related, City requirements may be shown on the site plan as well. A copy of the site plan will be reviewed and returned to the applicant with notes, tree protection fence locations, and other requirements. Another copy will be retained in the project file. Applicable building permits will not be issued without approved site plans.

- **Tree Survey:** For projects requiring Design Review (CDC governed), a tree survey shall be submitted to the City at the beginning of the process for the purpose of identifying significant trees. The survey shall indicate property lines, existing structures and other site conditions, as well as all trees at or above the City's minimum threshold, clearly identified by DBH and species on the plan, or in a numbered table. After receiving the survey, the City Arborist shall determine which trees are significant, and clearly indicate these findings on the survey. One copy of this document shall be returned to the applicant, and one copy will go into the project file as an exhibit.
- **Tree Appraisal Report:** Occasionally, the City may require a *Tree Appraisal Report*. Landscape value may contribute from seven to 20-percent of the real estate property value. An individual tree has an inherent value to the real estate that can be determined by an appraisal prepared by a certified arborist. An appraisal is a process for determining a monetary opinion of the value of a tree as it relates to either the property, a group of trees and/or the immediate community. A certified arborist is required to determine this value, and must exercise good and fair judgment by adjusting the basic value by the tree's condition and location. There are two methods to determine tree value; (1) the Replacement Method, based upon the size and availability of the replacement tree or, (2) the Trunk Formula Method, if the tree cannot be replaced (e.g. not sufficient room on site or it is too large to replace). In all cases, the type of formula used must be identified. A certified arborist must prepare the appraisal by using the most current edition of the '*Guide for Plant Appraisal*', published by the Council of Tree and Landscape Appraisers.
- **Arborist Report:** An *Arborist Report* is required for all development projects governed by the Community Development Code and shall be submitted for review by the City as part of the design review documents. The *Arborist Report* shall assume compliance with standards this Manual.

All *Arborist Reports* shall contain the following information:

1. Arborist name and certification number
2. Cover letter
3. Title page
4. Table of contents
5. Site address and date of the inspection(s)

6. Tree survey as outlined above. Failure to show a tree on the plans and later determined to be affected by construction may require the work to stop until mitigation can be agreed upon by the property owner and the City.
7. Tree inventory data for all trees on the project site including tree species, DBH, health, structure, etc. Tables may be used.
8. Written recommendations for the health and long-term welfare of trees, that will be followed during pre-construction, demolition, construction and post construction phases of the project. Recommendations include methods of avoiding injury, damage treatment and inspection schedule. Overall project schedule shall be referenced with these recommendations.
9. A tree protection and preservation plan showing tree protection zones (TPZ) for each tree or group of trees to be protected. The TPZ's shall be shown on all sheets within the document set as a bold dashed line with shading inside, and clearly indicated with proper notation. Additionally, all trunk locations, trunk diameters, and dripline areas shall be accurately plotted on the plans. For large groups of trees to be preserved, accurate trunk locations and dripline areas are not required for interior trees which are not affected by proposed construction activities because of the existence of perimeter trees subject to impact. Notes and details clearly outlining specific measures for protection of the trees during construction shall be included in the plan set. Any approved construction activity within the TPZ will also be clearly indicated.
10. Written recommendations for the maintenance of the trees for a minimum of two years after project completion.

If necessary, other supporting information, ISA hazard ratings, photographs, diagrams, etc. may be required or provided.

After project approval, any changes to the protection measures or preservation plans must be approved in writing by the City Arborist.

SPECIFICATIONS FOR TREE PROTECTION DURING CONSTRUCTION

TREE PROTECTION ZONE (TPZ)

Each tree to be retained shall have a designated tree protection zone (TPZ) identifying the area sufficiently large enough to protect the tree and roots from disturbance. The standard for computing the size of the TPZ shall be a ½ foot radius per caliper inch

measured from the trunk of the tree. For example, a 30 inch DBH tree would have a TPZ with a radius of 15 feet from the trunk, or a 30 foot diameter full circle around it. A diagram of TPZ sizing is included as Appendix C to this manual. The tree protection zone shall be shown on all site plans for the project. Improvements or activities such as paving, utility and irrigation trenching and other ancillary activities shall occur outside the tree protection zone, unless authorized by the City Arborist, or by project approval. Unless otherwise specified, the protective fencing shall serve as the tree protection zone. Activities prohibited within the tree protection zone include:

- Storage or parking vehicles, building materials, refuse, excavated spoils or dumping of poisonous materials on or around trees and roots. Poisonous materials include, but are not limited to, paint, petroleum products, concrete or stucco mix, dirty water or any other material which may be deleterious to tree health.
- The use of tree trunks as a winch support, anchorage, as a temporary power pole, sign posts or other similar function.
- Cutting of tree roots by utility *trenching*, foundation digging, placement of curbs and trenches and other miscellaneous excavation without prior approval of the City Arborist.
- Soil disturbance or grade change.
- Drainage changes.

Activities permitted or required within the tree protection zone include:

- Mulching. During construction, wood chips may be spread within the TPZ to a 4-to 6-inch depth, leaving the trunk clear of mulch to help inadvertent *compaction* and moisture loss from occurring. The mulch may be removed if improvements or other landscaping is required. Mulch material shall be 2-inch unpainted, untreated wood chip mulch or approved equal.
- Root Buffer. When areas under the tree canopy cannot be fenced, a temporary buffer is required and shall cover the root zone and remain in place at the specified thickness until final grading stage.
- Irrigation, aeration, fertilizing or other beneficial practices that have been specifically approved for use within the tree protection zone.
- Erosion Control. If a tree is adjacent to or in the immediate proximity to a grade slope of 8% or more, then approved erosion control or silt barriers shall be installed outside the TPZ to prevent siltation and/or erosion within the tree protection zone.

TREE PROTECTION FENCING

Fenced enclosures shall be erected around trees to be protected to achieve three primary goals, (1) to keep the foliage crowns and branching structure clear from contact by equipment, materials and activities; (2) to preserve roots and soil conditions in an intact and non-compacted state and; (3) to identify the tree protection zone in which no soil disturbance is permitted and activities are restricted, unless otherwise approved.

- **Size and type of fence:** All trees to be preserved shall be protected with six foot high chain link fences. Fences are to be mounted on two inch diameter galvanized iron posts, driven into the ground to a depth of at least 2-feet at no more than 10-foot spacing. This detail shall appear in the construction plan set, and can be referenced in the City's Construction Standards.
- **Area to be fenced:** The fences shall enclose the entire area within the tree protection zone of the tree(s) to be saved throughout the life of the project as mapped by the building permit approval, or as mapped within the tree protection and preservation plan contained in the Arborist Report for the project. The fencing shall remain until final improvement work within the area is required, typically near the end of the project. If the fencing must be located on paving or sidewalk that will not be demolished, the posts may be supported by an appropriate grade level concrete base. For trees situated within a narrow planting strip, only the planting strip shall be enclosed with the required chain link protective fencing in order to keep the sidewalk and street open for public use. Trees situated in a small tree well or sidewalk planter pit, shall be wrapped with 2-inches of orange plastic fencing as padding from the ground to the first branch with 2-inch thick wooden slats bound securely on the outside. During installation of the wood slats, caution shall be used to avoid damaging any bark or branches. Major scaffold limbs may also require plastic fencing as directed by the City Arborist.
- **Duration:** Tree fencing shall be erected before demolition, grubbing, grading or construction begins and remain in place until final inspection of the project permit, except for work specifically required in the approved plans in which case the project arborist or City Arborist (in the case of street trees) must be consulted.
- **Warning Sign:** A warning sign shall be prominently displayed on each fence. The sign shall be a minimum of 8.5 x 11-inches and clearly state: WARNING: Tree Protection Zone.
- **Violations:** The penalty for the unauthorized removal or relocation of a tree protection fence, and/or unauthorized activity within a TPZ, is \$500, plus \$500 per day until the fence is repaired or replaced and any damage to the tree properly mitigated.

CONSTRUCTION MEETING AND INSPECTION SCHEDULE

A certified arborist may be required to be retained by the applicant during the construction of large development projects. This project arborist retained shall conduct the following required inspections for the duration of construction activity. Correspondence may be as simple as e-mail in some cases or may require larger documents with tables, photographs, etc. for others.

- **Inspection of Protective Tree Fencing:** The City Arborist shall be in receipt of a written statement from the applicant or project arborist verifying that the protective tree fencing has been installed and may be inspected by the City

Arborist prior to issuance of a demolition, grading, or building permit, unless otherwise approved.

- **Pre-Construction Meeting:** Prior to commencement of construction, the applicant or contractor may be required to conduct a pre-construction meeting to discuss tree protection with the job site superintendent, grading equipment operators, certified arborist, and City Arborist.
- **Monthly Inspections:** If a project arborist is required for the development project, he/she shall perform monthly inspections to monitor changing conditions and tree health. The City Arborist shall be in receipt of an inspection summary during the first week of each calendar month or, immediately if there are any changes to the approved plans or protection measures.
- **Special Activity Within the Tree Protection Zone:** Work in this area (TPZ) requires the direct onsite supervision of the City Arborist.
- **Project Summary and Conclusion:** A brief summary discussing the project's trees shall be submitted to the City Arborist at the conclusion of all construction activity. It shall include concerns about trees that may have been negatively impacted as well as recommendations for care of the trees in the future.

TREE PRUNING, SURGERY AND REMOVAL

Prior to construction, various trees may require that branches be pruned clear from structures, activities, building encroachment or may need to be strengthened by means of mechanical support or surgery. The most compelling reason to prune is to develop a strong, safe framework and tree structure. Such pruning, surgery or the *removal* of trees shall adhere to the following standards:

- **Minimum Pruning:** If the project arborist recommends that trees be pruned, and the type of pruning is left unspecified, the standard pruning shall consist of '*crown cleaning*' as defined by ISA pruning guidelines. Trees shall be pruned to reduce hazards and develop a strong, safe framework.
- **Maximum Pruning:** Maximum pruning should only occur in special situations approved by the City Arborist. No more than one-third (33 percent) of the functioning leaf and stem area may be removed within one calendar year of any tree, or removal of foliage so as to cause the unbalancing of the tree. It must be recognized that trees are individual in form and structure, and that pruning needs may not always fit strict rules. The project arborist shall assume all responsibility for special pruning practices that vary from the standards outlined in this manual.
- **Tree Workers:** Pruning shall not be attempted by construction or contractor personnel, but shall be performed by a qualified tree care specialist or certified tree worker, according to specifications contained within this Manual.
- **Surgery:** Prior to construction, if it is necessary to promote health and prolong useful life or the structural characteristics, then trees shall be provided

the appropriate treatments as specified by the project arborist or City Arborist.

- **Tree Removal:** Removal of trees that extend into the branches or roots of protected trees shall not be attempted by demolition or construction personnel, grading or other heavy equipment. A certified arborist or tree worker shall remove the tree carefully in a manner that causes no damage above or below ground to trees that remain.
- **Stump Removal:** Before performing stump extraction, the developer shall first consider whether or not roots may be entangled with trees that are to remain. If so, these stumps shall have their roots severed before extracting the stump. *Removal* shall include the grinding of stump and roots to a minimum depth of 24-inches but expose soil beneath stump to provide drainage. In sidewalk or small planter areas to be replanted with a new tree, the entire stump shall be removed and the planting pit dug to a depth of 30-inches. If dug below 30-inches, compact the backfill to prevent settling. Large surface roots three feet from the outside circumference shall be removed, including the spoils and backfilled with City approved topsoil to grade, and the area tamped to settle the soil.

CONSTRUCTION ACTIVITY

Construction is normally prohibited in the TPZ. Under certain circumstances it may be necessary to work in the TPZ, however only with approval from the City Arborist. If any construction activity is to occur in the TPZ the following guidelines apply:

- **Excavation and Grading**

The following guidelines shall be followed in regard to excavation and grading activities:

1. Contractor shall notify the Project Arborist and City Arborist a minimum of 24 hours in advance of the activity in the tree protection zone.
2. Roots that are encountered shall be cut to sound wood and repaired. Roots 2-inches and greater must remain injury free and uncut.
3. Any approved excavation, demolition or extraction of material shall be performed with equipment sitting outside the tree protection zone. Methods permitted are by hand digging, hydraulic or pneumatic air excavation technology. Avoid excavation within the TPZ during hot, dry weather. If excavation or trenching for drainage, utilities, irrigation lines, etc.,
4. Grade changes within the tree protection zone are not permitted unless approved by the City Arborist.
5. Grade changes outside of the tree protection zone shall not significantly alter drainage within the TPZ.
6. Grade changes under specifically approved circumstances shall not allow more than 6-inches of fill soil added or allow more than 4-inches of existing soil to be removed from natural grade.
7. Grade fills over 6-inches or impervious overlay shall incorporate an

approved permanent aeration system, permeable material or other approved mitigation.

8. Grade cuts exceeding 4-inches shall incorporate retaining walls or an appropriate transition equivalent.
9. If excavation or trenching for drainage, utilities, irrigation lines, etc., it is the duty of the contractor to tunnel under any roots 2-inches in diameter and greater. Prior to excavation for foundation/footings/walls, grading or trenching within the TPZ, roots shall first be severed cleanly 1-foot outside the tree protection zone and to the depth of the future excavation. The trench must then be hand dug and roots pruned with approved root pruning equipment.
10. If injurious activity or interference with roots greater than 2-inches will occur within the tree protection zone, plans shall specify a design of special foundation, footing, walls, concrete slab or pavement designs subject to *City Arborist* approval. Discontinuous foundations such as concrete pier and structural grade beam must maintain natural grade (not to exceed a 4-inch cut), to minimize root loss and allow the tree to use the existing soil.
11. Basement excavations shall be designed outside the tree protection zone of all protected trees unless approved by the City Arborist, and shall not be harmful to other neighboring property trees.
12. Use of backhoes, steel tread tractors or any heavy vehicles within the TPZ is prohibited unless approved by the City Arborist. If allowed, a protective root buffer is required. The protective buffer shall consist of a base course of tree chips spread over the root area to a minimum of 6-inch depth, layered by 3/4-inch quarry gravel to stabilize 3/4-inch plywood on top. This buffer within the tree protection zone shall be maintained throughout the entire construction process.

- **Trenching, Tunneling and Directional Drilling for Utilities**

1. If trenching or pipe installation has been approved within the tree protection zone, then the trench shall be either cut by hand, air-spade, hydraulic vac-on excavation or, by mechanically boring the tunnel under the roots with a horizontal directional drill and hydraulic or pneumatic air excavation technology.
2. Utility pipe must be installed immediately, backfilled with soil and soaked within the same day.
3. Street Trees that are in conflict with utility infrastructure where the conflict cannot be resolved may be removed if approved by the City Arborist. All Street Tree removals are subject to replacement.
4. Emergency utility repairs shall be exempt from the above restriction zones within the Tree Protection Zone. The City Arborist shall be contacted after any such repairs that may result in significant tree damage or removal.

- **Pavement and Hardscape**

Conflicts may occur when tree roots grow adjacent to paving, foundations, sidewalks or curbs (hardscape). Improper or careless extraction of these elements can cause severe injury to the roots and instability or even death of the trees. The following alternatives must first be considered before root pruning within the tree protection zone of a tree:

1. Grinding a raised sidewalk edge.
2. Ramping the walking surface over the roots.
3. Routing the sidewalk around the tree roots.
4. Install flexible paving or rubberized sections.
5. On private property, new sidewalk or driveway design should consider alternatives to conventional pavement and sidewalk materials. Substitute permeable materials for typical asphalt or concrete overlay, sub-base or footings to consider are: permeable paving materials (such as ECO-Stone or RIMA pavers), interlocking pavers, flexible paving, wooden walkways, porches elevated on posts and brick or flagstone walkways on sand foundations.

Removal of existing pavement over tree roots shall include the following precautions:

1. Break hardscape into manageable pieces with a jackhammer or pick and hand load the pieces onto a loader. The loader must remain on undisturbed pavement or off exposed roots.
2. Do not remove base rock that has been exploited by established absorbing roots.

Replacement of pavement or sidewalk:

1. An alternative to the severance of roots greater than 2- inches in diameter should be considered before cutting roots.
2. If an alternative is not feasible, remove the sidewalk, remove roots only as approved by the City Arborist and replace sidewalk using #3 dowels at the expansion joint if within 10-feet of a street tree. Use a wire mesh reinforcement within if within 10-feet of the trunk of a protected or street tree. Any work in the right-of-way requires a street work permit from Public Works Department.

Conflicts and associated costs can be avoided or reduced by the following planting practices:

1. Plant deep rooted trees that are proven to be non-invasive.
2. Over soil that shrinks and swells, install a sidewalk with higher strength that has wire mesh and/or expansion slip joint dowel

reinforcement.

3. Follow soil loosening planting techniques to promote deep rooting.
4. Install root barrier only along the hardscape area of the tree and allow roots to use open lawn or planter strip areas.
5. Dedicate at least 10-linear feet of planting space for the growth of each tree.
6. When designing hardscape areas near trees, the project architect or engineer should consider the use of recommended base course material such as an engineered structural soil mix.

- **Invasive species removal**

Often, contractors will be required to remove invasive plant species from the understory in TPZ's. In most cases, native understory plants shall be saved and the area will be fully cleared of invasive species. The following practices must be followed when removing invasives:

1. The preferred method for invasive plant removal, is by hand, extracting the entire plant, including the roots. Other manual methods include cutting the plants to ground level, either mechanically, or with hand tools, and spraying the new growth with an approved herbicide. In either case, native understory plants may not be harmed or removed.
2. If heavy machinery is used, for example, a brush rake attached to an excavator, the machine must stay outside of the TPZ and "reach" into the area, carefully extracting the invasives without damaging the protected trees or native understory whatsoever.
3. In some cases, a restoration of native understory may be required. An approved list of native plants is included as *appendix B*

CONSTRUCTION DAMAGE TO PROTECTED TREES

Any damage or injury to trees shall be reported within 6-hours to the Project Arborist and Site Superintendent or City Arborist so that mitigation can take place. All mechanical or chemical injury to branches, trunk or to roots over 2-inches in diameter shall be reported in the monthly inspection report. In the event of injury, the following mitigation and damage control measures shall apply:

- **Root injury:** If trenches are cut and tree roots 2-inches or larger are encountered they must be cleanly cut back to a sound wood lateral root. All exposed root areas within the TPZ shall be backfilled or covered within one hour. Exposed roots may be kept from drying out by temporarily covering the roots and draping layered burlap or carpeting over the upper 3-feet of trench walls. The materials must be kept wet until backfilled to reduce evaporation from the trench walls.

- **Bark or trunk wounding:** Current bark treatment methods shall be performed by a qualified tree care specialist within two days.
- **Scaffold branch or leaf canopy injury:** Remove broken or torn branches back to an appropriate branch capable of resuming terminal growth within five days. If leaves are heat scorched from equipment exhaust pipes, consult the Project Arborist within 6 hours.

Construction Injury Mitigation

A mitigation program may be required if it is found the approved development will cause drought stress, dust accumulation or soil compaction to trees that are to be saved. To help reduce impact injury, one or more of the following mitigation measures shall be implemented and supervised by the Project Arborist as follows:

- **Irrigation Program:** Irrigate to wet the soil within the tree protection zone to a depth of 24-inches to 30-inches. Or, apply sub-surface irrigation at regular specified intervals by injecting on approximate 3-foot centers, 10-gallons of water per inch trunk diameter within the tree protection zone. Duration shall be until project completion or monthly until seasonal rainfall totals at least 8-inches of rain, unless specified otherwise by the certified arborist.
- **Dust Control Program:** During periods of extended drought, wind or grading, spray wash trunk, limbs and foliage to remove accumulated construction dust.
- **Compaction Mitigation:** If inadvertent compaction of the soil has occurred within the tree protection zone, the soil shall be loosened by one or more of the following methods to promote favorable root conditions: vertical mulching, soil fracturing, core-venting, radial trenching or other method approved by the City Arborist.
- **Aeration System:** If an approved paving, hardscape or other compromising material encroaches within the tree protection zone, an aeration system may be required and shall be designed by the Project Arborist and used within this area.

Non-compliance, Penalty and Enforcement

Non-compliance with any City mandated mitigation shall result in enforcement of penalties set forth in section 8.740 of the West Linn Tree Ordinance.